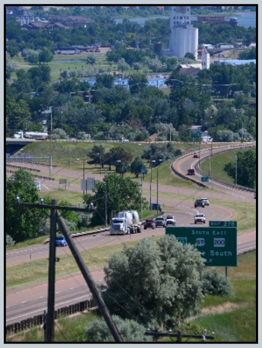
Appendix 4:

Existing and Projected Conditions Report



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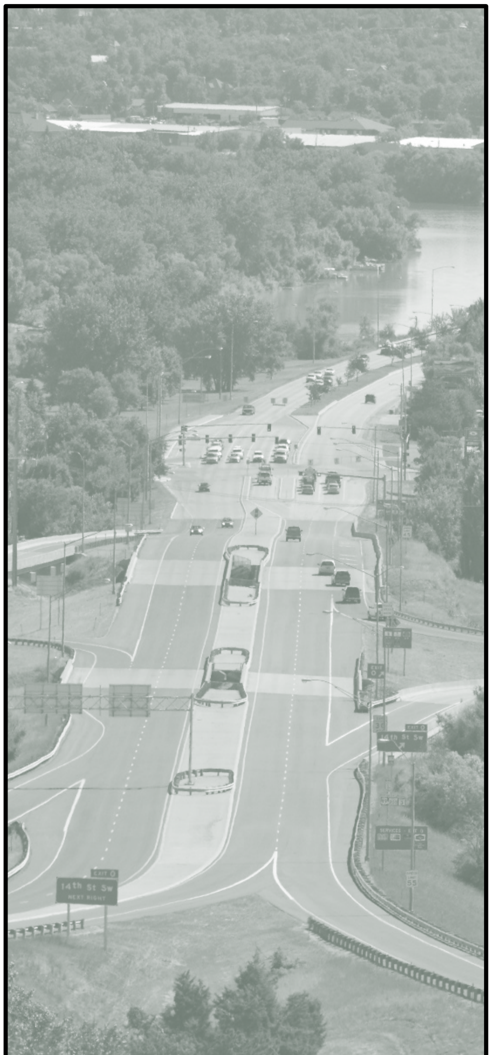

Interstate 15 Gore Hill to Emerson Junction Corridor Planning Study

EXISTING AND PROJECTED CONDITIONS

December 31, 2014

prepared for:
Montana Department of Transportation

Montana MDT Department of Transportation

RPA

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EXISTING AND PROJECTED CONDITIONS

1.0 INTRODUCTION

This report identifies existing and projected roadway conditions and social, economic, and environmental factors that influence the Great Falls Interstate System. The analysis performed includes a planning level examination of the corridor by applying technical and environmental considerations to determine known issues, constraints, and/or areas of concern.

The analysis contained in this report is based on existing and historic traffic data, field measurements and observations, roadway as-built plans, aerial imagery, Geographical Information Systems (GIS), and publically available environmental information and demographics. The analysis was conducted for three main categories: demographics, transportation, and environment.

1.1 STUDY AREA

The study area for the *I-15 Gore Hill to Emerson Junction Corridor Planning Study* includes Interstate 15 (I-15) through Great Falls, beginning southwest of the Gore Hill Interchange (I-15, Exit 277) near Reference Post (RP) 277 and ending northwest of Emerson Junction (Exit 282) near RP 284. Additionally, the study area includes Interstate 315 (I-315) and 10th Avenue South, west of the Missouri River (RP 95). **Figure 1.1** presents the study area boundary.

Within the study area, I-15 is classified as a principal arterial and is part of the National Highway System (NHS). The Interstate serves as the main north-south corridor through Montana from the Idaho state line at Monida to the Canada boundary at Sweet Grass. I-315 is an interstate spur from I-15 and is known as Business Loop I-15. I-315 transitions to 10th Avenue South, east of the intersection with Fox Farm Road.

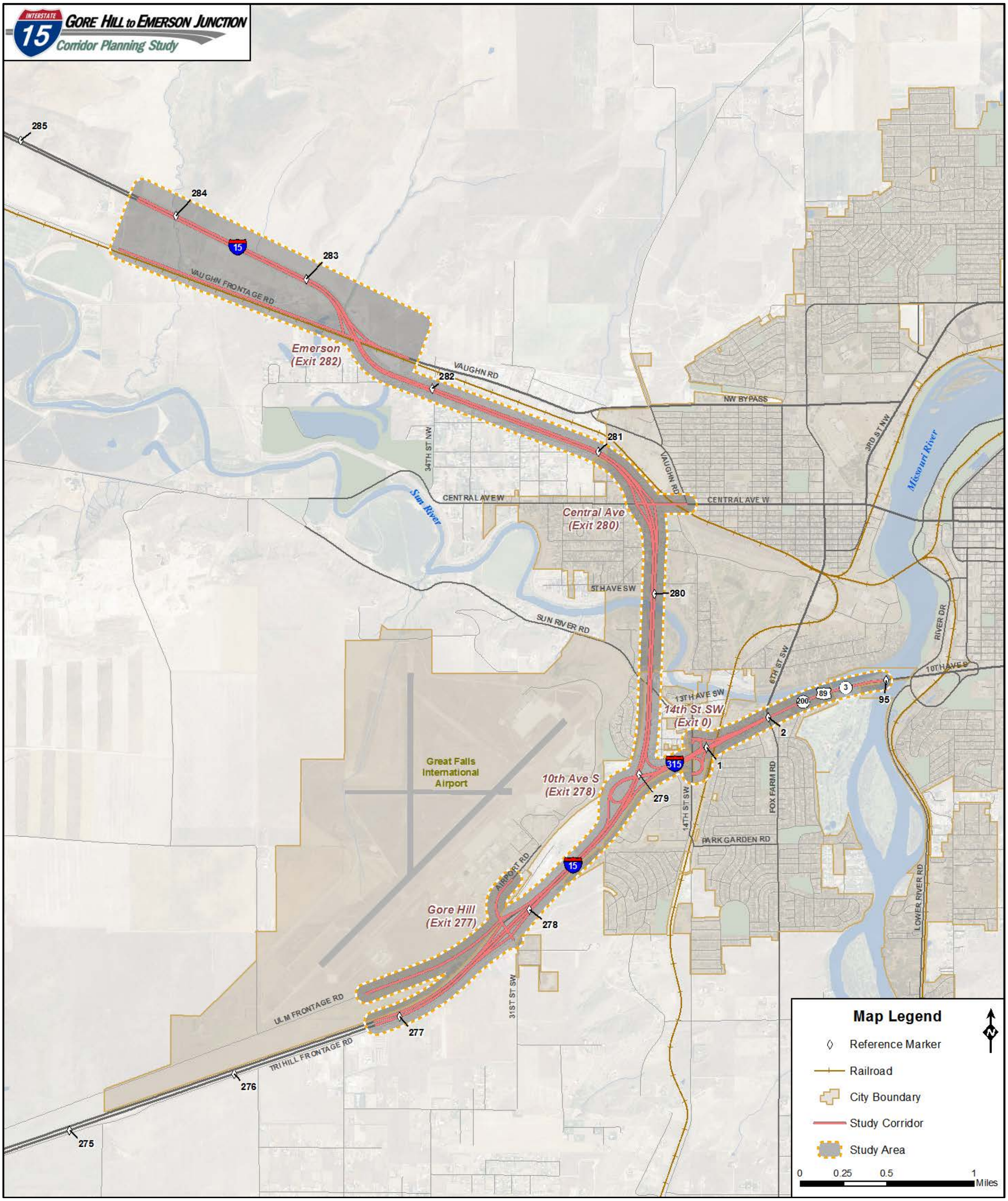

Figure 1.1: Study Area

1.2 Past, Current and Planned Projects

The Montana Department of Transportation's (MDT's) online summary of road and bridge construction projects awarded since July 23, 1987, was reviewed to identify projects previously implemented within the study area. Since 1987, MDT lists 14 completed projects along the corridor. **Table 1.1** lists these projects, along with a brief description of the scope available in MDT's Program and Project Management System.

Table 1.1: MDT Projects within the Study Area Since 1987

Project Designation	Description
10TH AVE SOUTH - WARDEN BR TO 6TH SOUTHWEST	Concrete repair, median adjustment, and diamond grinding from Warden Bridge to Fox Farm intersection
2002-10TH AVE SOUTH/FOX FARM RD-GREAT FALLS	Roadway and Roadside Safety Improvements
BRIDGE DECKS-GREAT FALLS	Rehabilitation of I-15 bridges at Sun River and the overpass at 5th Avenue Southwest
FOX FARM RD & 10TH AVE SOUTH - GREAT FALLS - CASCADE COUNTY	Safety improvement project to address rear end crashes involving right turning vehicles
GREAT FALLS - CENTRAL AVE WEST BRIDGE APPROACHES – CASCADE COUNTY	Rehabilitation of the eastbound Warden Bridge
GREAT FALLS – FOX FARM RD./10TH AVE. SO CASCADE COUNTY	Concrete resurfacing between 6th Street Southwest / Fox Farm Road and Warden Bridge
GREAT FALLS-NORTH & SOUTH	Interstate rehabilitation
GREAT FALLS-NORTH & SOUTH CASCADE COUNTY	Interstate fence replacement and installation of cattle guards
GREAT FALLS URBAN (I-315)	Overlay of I-315 and ramps at 10th Avenue South and exit 0
I15-BRIDGE REPAIR-GREAT FALLS	Emergency repair of beams damaged by trucks hauling high load
SF 129-GREAT FALLS WRONG WAY-PH 1	New signing to address wrong way traffic on off ramps on I-15
2002 INTERSECTION IMPVT-GF	Safety adjustments to northbound I-15 off ramp at Central Avenue West
D3 SIGNING (I-15)	Guide sign replacement
GREAT FALLS-VAUGHN	Seal and cover from Emerson Junction to the north

Source: MDT Project List accessible at *http://www3.mdt.mt.gov:7782/mttplc/mttplc.tplk0007.project_init*

The Montana 2014-2018 *Final 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 2014-2018 Final STIP identifies the following future projects within the study area:

- **Emerson Junction to Manchester:** This project will be a major rehabilitation of I-15 beginning at RP 282.2 and ending at RP 285.9. It is estimated that the letting date for this project will be in 2017.
- **Bridge Preservation, Great Falls IM:** This project is bridge deck preservation on I-15 between RP 209.1 and 247.2 (outside of the study limits) and I-315 at RP 1.06. It is estimated that the letting date for this project will be in 2016.

1.3 Existing Plans and Regulations

The following provides a summary of existing planning documents and regulations associated with transportation in the area. A number of local plans exist with goals and objectives related to the transportation system. Additionally, Federal regulations would have to be adhered to should changes occur to the Interstate System.

Great Falls Area Long Range Transportation Plan – 2014

The *Great Falls Area Long Range Transportation Plan (LRTP) – 2014* is intended to offer guidance for the decision-makers in the Great Falls Area by responding to existing transportation system concerns through a menu of large and small improvements to the transportation network. The LRTP provides a blueprint for guiding transportation infrastructure investments based on system needs and associated decision-making principles.

The LRTP identified the need for an Interstate Corridor Study through the Great Falls area. The LRTP states the following:

> *Due to preliminary recommendations to make improvements to both the Emerson Junction and Gore Hill interchanges and other identified needs for added lanes and operational improvements on I-15 and I-315, an Interstate Corridor Study for the Great Falls area is recommended. The need for new interchanges, feasibility, and analysis of capacity and operational concerns, will assist in identifying potential locations, priorities, costs and scope for improvements. The study should include westbound movements on 10th Avenue South, east of the intersection of Fox Farm Road and 6th Street SW, for traffic that exits at "Exit 0", as well as connections with I-315 to I-15.*

Cascade County Growth Policy Update (2014)

The *Cascade County Growth Policy Update (2014)* was drafted as a comprehensive plan to provide guidance on decisions regarding land development and public investments within Cascade County. The document outlines 13 goals, of which the transportation goal is most relevant:

Goal 6:

Promote and maintain a transportation system that provides safety, efficiency, and is cost effective.

Objectives:

A. New additions to the transportation system should be compatible with the existing road system and coordinated with roads from other jurisdictions.
B. Transportation planning for new developments should support the Cascade County Growth Policy.
C. Ensure that all new roads, both public and private, are built to county design standards for new construction. These standards can be found within the Cascade County Subdivision Regulations.
D. Encourage provisions for multi-modal types of transportation including: bike lanes, trails, pedestrian facilities, etc.
E. Develop and implement road and bridge improvement standards and maintenance schedules.
F. Develop a policy and implementation program in cooperation with developers and school districts to provide walks, bridges and pathways for children to improve safety and reduces transportation costs between residential neighborhoods, schools and stores.

G. Develop secondary means of access, where practical, to settlements and subdivisions in order to improve safety and overall traffic circulation.
H. Continue using Road Improvement Districts and Rural Maintenance Districts to maximize funding strategies.
I. Coordinate transportation issues with wildfire and fire protection issues, policies and goals.

City of Great Falls Growth Policy Update (2013)

The *City of Great Falls Growth Policy Update (2013)* is intended to provide guidance to the local government with regard to establishing policy and a framework to guide the social, environmental, economic, and physical makeup of the city of Great Falls. The *Growth Policy* recognizes that transportation and growth go hand in hand. Furthermore, the *Growth Policy* identifies I-15 as the main regional route. Tenth Avenue South is also identified within the *Growth Policy* as being the largest road facility in the city.

Great Falls International Airport Master Plan (Ongoing)

Great Falls International Airport is currently developing a master plan to evaluate the long-term vision for its properties and adjacent areas. The Airport is primarily served by the Gore Hill Interchange. Changes to the transportation system and land use near the airport could impact the function of the Interstate System.

Great Falls Transit Development Plan (2010)

The *Great Falls Transit Development Plan (TDP)* was developed to analyze and recommend strategies that will affect the delivery of public transportation services for the Great Falls Transit District. The TDP states the following: "The mission of the Great Falls Transit District is to provide a safe, reliable, affordable and fiscally sound transportation system for the people of Great Falls and Black Eagle, Montana." Currently no fixed routes use roads within the I-15 corridor study area, with the exception of one line using the intersection of Fox Farm Road and 10th Avenue South. Furthermore, no new alternative routes were recommended within the study area.

Interstate System Access Informational Guide (2010)

The intent of the Interstate system is to provide for movement of military and civilian equipment, freight, and personnel over long distances and between and within states. The Federal Highway Administration (FHWA) is charged with administrating the Interstate System to ensure its structural and operational integrity. In 2010, FHWA published the *Interstate System Access Informational Guide* to provide guidance for both FHWA field staff and state departments of transportation (DOTs) on how and what should be addressed in requests for new or modified access to the Interstate System. The *Guide* provides information and methods for evaluating requests for new access to the Interstate System. Specifically, the *Guide* references eight policy requirements that must be met for new or modified interchanges.[1] The goal of the *Guide* is to provide technical and policy support for access to the Interstate System.

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[1]U.S. Department of Transportation, Federal Highway Administration, *Access to the Interstate System*, Notice of revised policy statement, http://www.gpo.gov/fdsys/pkg/FR-2009-08-27/html/E9-20679.htm

2.0 DEMOGRAPHICS

This section provides an overview of the socioeconomic characteristics of the study area. 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.

Demographic and socioeconomic information was reviewed to help determine recent trends in population, age distribution, employment, economic status, and commuting for area residents. Socioeconomic data sources do, however, often lag considerably behind the actual years of interest. This analysis presents the most current data and statistics available and indicates recent and potential changes in the area.

2.1 Population Characteristics

A review of demographics within the study area is appropriate to gain an understanding of historical trends in population, age, race, and ethnicity. 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 of transportation improvements such as transit services and/or non-motorized infrastructure improvements. The presence of a disadvantaged population may warrant other considerations, especially during project development activities.

Table 2.1 shows total population and growth statistics for the city of Great Falls and Cascade County. A comparison of similar statistics for the state of Montana and the United States is also provided. Between 1990 and 2010, the population of the city of Great Falls increased at a higher rate than Cascade County during the same time. Both the city and the county experienced lower growth than the state of Montana and the United States over the same period.

Table 2.1: Current Population and Past Growth

Area	Population (1990)	Population (2000)	Population (2010)	Percent Growth (1990-2010)	Current Population (2013 Estimate)
City of Great Falls	55,097	56,690	58,505	6.2%	59,351
Cascade County	77,691	80,357	81,327	4.7%	82,384
State of Montana	799,065	902,195	989,415	23.8%	1,015,165
United States	248,709,873	281,421,906	308,745,538	24.1%	316,128,839

Source: U.S. Bureau of the Census, Census of the Population

Table 2.2 depicts race and ethnicity characteristics in the city of Great Falls, Cascade County, and the state of Montana at the time of the 2010 Census. The population of Great Falls is predominately white with percentages of minority populations slightly higher than for the state of Montana. The Census data show that Great Falls and Cascade County have roughly the same ethnic composition.

Table 2.2: Population Race and Ethnicity Data (2010)

Race / Ethnicity	City of Great Falls		Cascade County		State of Montana	
White	50,723	86.7%	71,100	87.4%	868,628	87.8%
Hispanic or Latino	1,978	3.4%	2,711	3.3%	28,565	2.9%
Black or African American	583	1.0%	958	1.2%	3,743	0.4%
American Indian and Alaska Native	2,753	4.7%	3,274	4.0%	59,902	6.1%
Asian	505	0.9%	665	0.8%	6,138	0.6%
Native Hawaiian and Other Pacific Islander	66	0.1%	78	0.1%	609	0.1%
Some Other Race	29	0.0%	45	0.1%	540	0.1%
Two or More Races	1,868	3.2%	2,496	3.1%	21,290	2.2%
Total	**58,505**		**81,327**		**989,415**	

Source: U.S. Bureau of the Census, Census of the Population

Table 2.3 presents the change in total population and age for the city of Great Falls and Cascade County since 1980. Between 1980 and 2010, the percentage of county and city residents age 65 or older showed a notable increase, while the percentage of those younger than 18 decreased over the same period. The median age in the city increased from 30.6 years in 1980 to 39.0 years in 2010. The county experienced a similar increase in median age, rising from 28.6 years in 1980 to 38.9 years in 2010. These statistics point to the aging of the population and follow similar trends within Montana and across the United States.

Table 2.3: Age Distribution (1980 to 2010)

Year	< 18 Years		18-64 Years		65+ Years		Total Population	Median Age
City of Great Falls								
1980	15,713	27.7%	34,489	60.8%	6,523	11.5%	56,725	30.6
1990	14,325	26.0%	32,507	59.0%	8,265	15.0%	55,097	34.4
2000	14,138	24.9%	33,654	59.4%	8,898	15.7%	56,690	37.8
2010	13,161	22.5%	35,648	60.9%	9,696	16.6%	58,505	39
Change (1980 to 2010)	-2,552	-16.2%	1,159	3.4%	3,173	48.6%	1,780	8.4
Cascade County								
1980	23,544	29.2%	49,164	60.9%	7,988	9.9%	80,696	28.6
1990	21,520	27.7%	46,304	59.6%	9,867	12.7%	77,691	32.7
2000	20,912	26.0%	48,197	60.0%	11,248	14.0%	80,357	36.7
2010	18,630	22.9%	50,007	61.5%	12,690	15.6%	81,327	38.9
Change (1980 to 2010)	-4,914	-20.9%	843	1.7%	4,702	58.9%	631	10.3

Source: U.S. Bureau of the Census, Census of the Population

Table 2.4 presents housing occupancy data for the city of Great Falls, Cascade County, and the state of Montana. The city of Great Falls has 26,602 housing units. Of those units, 24,660 are occupied. Cascade County has 37,260 housing units, of which 33,352 are occupied. The average household size for owner-occupied houses in the city of Great Falls, Cascade County, and the state of Montana is roughly the same at 2.45 individuals per household. For renter-occupied households, the city of Great Falls has a lower occupancy at 2.06 persons per household compared to Cascade County and the state of Montana, which both have approximately 2.20 persons per household.

Table 2.4: Housing Occupancy and Tenure

Housing	City of Great Falls	Cascade County	State of Montana
Total Housing Units	**26,602**	**37,260**	**481,401**
Occupied Housing Units	24,660	33,352	405,508
Owner-occupied	15,659	22,057	277,816
Average Household Size	*2.46*	*2.45*	*2.45*
Renter-occupied	9,001	11,295	127,692
Average Household Size	*2.06*	*2.21*	*2.20*

Source: 2008-2012 American Community Survey 5-Year Estimates

Table 2.5 portrays data for the availability of vehicles per household. This information can be used to identify alternative transportation-dependent populations. The city of Great Falls has a higher percentage of households with no vehicles available compared to Cascade County and the state of Montana with 9.3, 7.6, and 5.3 percent, respectively. Data indicate that 2,287 of the 2,536 households (90 percent) in Cascade County with no vehicle available are within the city of Great Falls.

Table 2.5: Vehicles Available

Vehicles	City of Great Falls		Cascade County		State of Montana	
Occupied Housing Units	**24,660**		**33,352**		**405,508**	
No Vehicles Available	2,287	9.3%	2,536	7.6%	21,329	5.3%
1 Vehicle Available	7,954	32.3%	9,856	29.6%	114,421	28.2%
2 Vehicles Available	8,904	36.1%	12,230	36.7%	153,045	37.7%
3 or More Vehicles Available	5,515	22.4%	8,730	26.2%	116,713	28.8%

Source: 2008-2012 American Community Survey 5-Year Estimates

2.2 Population Projections

The Montana Department of Commerce Census and Economic Information Center provides county-level population projections. The projections were developed by Regional Economic Models, Inc. (REMI) for the state of Montana using the firm's *eREMI* model. Projections of Cascade County based on the *eREMI* model show a population increase of approximately 19 percent by 2035. In comparison, the model projects that the state of Montana's population will grow by approximately 17 percent by 2035.

Table 2.6 shows the populations for Cascade County and the state of Montana in the 2010 Census, and it provides population estimates for key years from 2015 through 2035 based on the *eREMI* model. The projections suggest that Cascade County's population will have an average annual growth rate of approximately 0.7 percent per year.

Table 2.6: Population Projections through 2035

Area	2010	2015	2020	2025	2030	2035	Average Annual Growth Rate (2010-2035)
Cascade County	81,327	85,673	90,176	94,147	96,502	96,676	0.69%
State of Montana	989,415	1,043,653	1,094,712	1,134,324	1,156,494	1,162,253	0.65%

Source: U.S. Bureau of the Census, Census of the Population and eREMI for Montana and Counties by REMI.

2.3 Employment and Income Characteristics

Table 2.7 presents data on the estimated number of employees (age 16 years and older) and the industries in which they are employed within the city of Great Falls, Cascade County, and the state of Montana. The data in **Table 2.7**, taken from the 2008-2012 American Community Survey (ACS) profile for these geographies, also include employment estimates by industry. The data show that most employment in the county and in the city of Great Falls is associated with service industries, followed by the retail trade and construction industries.

Table 2.7: Employment by Industry

Industry	City of Great Falls		Cascade County		State of Montana	
Agriculture, Forestry, Fishing and Hunting, and Mining	472	1.7%	1,133	2.9%	34,024	7.1%
Construction	2,326	8.2%	3,156	8.0%	39,115	8.1%
Manufacturing	846	3.0%	1,282	3.2%	22,791	4.7%
Wholesale Trade	814	2.9%	1,143	2.9%	12,009	2.5%
Retail Trade	3,867	13.6%	5,171	13.0%	56,945	11.8%
Transportation, Warehousing, and Utilities	1,281	4.5%	1,939	4.9%	23,871	5.0%
Information	541	1.9%	609	1.5%	8,913	1.8%
Finance, Insurance, Real Estate, and Rental and Leasing	2,305	8.1%	2,770	7.0%	26,526	5.5%
Professional, Scientific, Management, Administrative, and Waste Management Services	2,213	7.8%	2,709	6.8%	39,353	8.2%
Educational Services, Health Care, and Social Assistance	6,075	21.4%	8,343	21.0%	108,970	22.6%
Arts, Entertainment, Recreation, Accommodation, and Food Services	3,345	11.8%	4,209	10.6%	53,023	11.0%
Other Services, Except Public Administration	1,266	4.5%	1,724	4.3%	22,361	4.6%
Public Administration	1,770	6.2%	2,586	6.5%	30,353	6.3%
Armed Forces	1,228	4.3%	2,865	7.2%	3,553	0.7%
Total Employed Population 16 Years and Over	**28,349**		**39,639**		**481,807**	

Source: 2008-2012 American Community Survey 5-Year Estimates

Unemployment rates are represented in **Table 2.8** and are current as of July 2014. The data show an unemployment rate for Cascade County that is lower than the rate for the state of Montana (4.0 percent versus 4.4 percent) and the United States (6.5 percent). Conversely, the unemployment rate for the city of Great Falls is higher than the rate for the state of Montana (6.1 percent versus 4.4 percent).

Table 2.8: Employment Status

Labor Force	Cascade County	State of Montana	United States
Labor Force	40,826	531,972	157,573,000
Employed	39,195	508,741	147,265,000
Unemployed	1,631	23,231	10,307,000
Unemployment Rate	4.0%	4.4%	6.5%

Source: Montana Department of Labor and Industry, Research and Analysis Bureau – Labor Force Statistics, July 2014 (data are not seasonally adjusted).

Information about the number of workers (16 years and older) and their commuting characteristics is available from the ACS. The ACS information provided estimates of the transportation modes used by commuters. **Table 2.9** presents mode choice characteristics for workers in the city of Great Falls, Cascade County, and the state of Montana. According to the ACS, more than 90 percent of the commuting workers in Cascade County and the city of Great Falls rely on personal vehicles or carpools for transportation to work destinations. The share of workers that drove alone from both the county and the city is greater than that seen statewide.

Table 2.9: Commuting to Work Statistics

Mode Choice	City of Great Falls		Cascade County		State of Montana	
Workers 16 Years and Over	**27,980**		**39,075**		**470,377**	
Car, Truck, or Van — Drove Alone	22,855	81.7%	31,142	79.7%	352,644	75.0%
Car, Truck, or Van — Carpooled	2,847	10.2%	4,273	10.9%	48,324	10.3%
Public Transportation (excluding taxicab)	316	1.1%	369	0.9%	4,369	0.9%
Walked	708	2.5%	1,211	3.1%	22,790	4.8%
Other means	561	2.0%	764	2.0%	11,779	2.5%
Worked at home	693	2.5%	1,316	3.4%	30,471	6.5%
Mean Travel Time to Work	**14.5**		**16.1**		**18.0**	

Source: 2008-2012 American Community Survey 5-Year Estimates

Table 2.10 presents income statistics for the city of Great Falls, Cascade County, and the state of Montana. The ACS shows estimated household incomes for the city of Great Falls and Cascade County to be $42,085 and $43,817, respectively. These values are below the median household income for the state of Montana, which is $45,456. The per capita income for both the city of Great Falls ($23,238) and Cascade County ($23,976) is lower than that of the state of Montana ($25,002).

Table 2.10 also contains poverty statistics for the city of Great Falls, Cascade County, and the state of Montana. According to the 2008-2012 ACS profile, the number of residents living below the poverty line was higher for the city of Great Falls than for Cascade County and the state. About 14.8 percent of all individuals living in Montana were estimated to be below the poverty line. The ACS estimates show that 16.9 percent of individuals living in the city of Great Falls and 14.9 percent in Cascade County are living in poverty.

The ACS data also show that the county and city likely had a greater percentage of persons under the age of 18 living in poverty than the percentage for same age group in the state. The share of persons over the age of 65 living in poverty is, however, similar among the city, the county, and the state.

Table 2.10: Income Statistics

Income	City of Great Falls	Cascade County	State of Montana
Median Household Income	$42,085	$43,817	$45,456
Median Family Income	$56,368	$56,958	$58,951
Per Capita Income	$23,238	$23,976	$25,002
Persons Living in Poverty (%)	16.9%	14.9%	14.8%
Persons Under 18 Living in Poverty (%)	27.8%	24.2%	19.9%
Persons over 65 Living in Poverty (%)	8.6%	8.5%	8.4%
Families Living in Poverty (%)	13.2%	11.4%	9.8%
Families with Children under 18 Living in Poverty (%)	24.1%	20.9%	17.0%

Source: 2008-2012 American Community Survey 5-Year Estimates

3.0 EXISTING TRANSPORTATION SYSTEM

I-15 is functionally classified as a principal arterial on the NHS Interstate System. The Interstate serves as the main north-south corridor through Montana and connects Canada to the southern border of California. The roadway was constructed or improved at various times, beginning in 1939 and extending to 2009. I-15 is part of the Canamex Trade Corridor, which Congress designated as a "High Priority Corridor" in the 1995 *National Highway Systems Designation Act*. The corridor's main objective is to facilitate trade and strengthen the corridor's position in the global economy.

I-315 begins at the 10th Avenue South junction with I-15 (RP 279). It was opened to traffic in late 1967. The corridor is currently signed as Business Loop 15, US 89, and MT 200. I-315 is one of the shortest Interstate highways in the country at 0.828 miles, and it terminates at the intersection of Fox Farm Road and 6th Street Southwest.

Primary users of the corridors consist of all types of individuals including locals, commuters, travelers, and freight operators. Interstate highways are considered part of the principal arterial freeway system. Freeways are characterized by having fully controlled access, high design speeds, and a high level of driver comfort and safety. For these reasons, freeways have separate geometric design criteria than those of a standard principal arterial highway.

3.1 Physical Features and Characteristics

This section discusses the physical features and characteristics of the study corridor. Information was gathered using publically available sources, field observations, GIS data, and MDT as-built drawings.

3.1.1 Hydraulics

I-15 crosses the Sun River at RP 279.35, between the 10th Avenue South Interchange and the Central Avenue West Interchange. The crossing consists of a concrete bridge structure. Additionally, a steel culvert is located along I-15 at RP 283.4 for drainage conveyance.

3.1.2 Bridges

MDT's Highway Bridge Program (HBP) 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 the bridge program objectives and performance measures. The objectives and measures are intended to identify the right treatments for Montana's bridge assets, as well as promoting cost-effective bridge preservation, appropriate safety-related work, and economic growth.

MDT uses a Structure Condition Performance Measure and a Deck Performance Condition Measure. These measures categorize bridge conditions as good, fair, or poor, based on the condition rating given to the bridge deck (riding surface), superstructure (generally beams underneath the riding surface), and substructure (support structure extending into the ground). Additionally, the Structure Condition Performance Measure assigns a poor rating to a bridge that is structurally deficient.

A bridge is considered structurally deficient if load-carrying elements have deteriorated enough to be considered in "poor condition" or the adequacy of the waterway opening provided by the bridge is insufficient, causing intolerable traffic interruptions. When a bridge is classified as structurally deficient, it does not mean that it is unsafe. A structurally deficient bridge typically requires increased maintenance and repair to remain in service and eventual rehabilitation or replacement to address overall deficiencies.

The deck condition performance measure uses the National Bridge Inventory (NBI) deck rating to give an indication of the deck condition and a planning level indication of needed preservation treatment. The deck condition ranking is a general indicator of the condition of any individual deck. The rankings are useful for planning purposes on a system wide basis.

There are 17 bridges within the study area. **Table 3.1** shows the bridge locations and condition ratings. All 17 bridges have a structure condition of "good," which indicates that they are candidates for continued preservation. The bridge deck ratings include "good" (possible candidate for sealing), "fair-1" (candidate for healer/sealer), and "fair-2" (candidate for resurfacing). Detailed bridge inspection reports are available in **Appendix A**.

Table 3.1 also lists the width of each bridge within the study area. According to the MDT *Bridge Design Standards*, a bridge on the Interstate System is recommended to consist of 12-foot travel lanes, 4-foot inside shoulder, and 10-foot outside shoulder. This recommendation results in a total bridge width of 50 feet for three travel lanes, 38 feet for two travel lanes, and 26 feet for one travel lane. A number of bridges on the Interstate System within the study area have widths narrower than the recommended standards, as noted in the table below. However, the recommended standards are for new bridges on the Interstate System. Bridges to remain in place that do not meet the recommended width may be considered for additional signing or widening depending on further engineering analysis[2].

Table 3.1: Bridge Locations and Condition

Location		Feature Crossed	Year Built	Width (feet)	Length (feet)	Structure Condition	Deck Condition
I-15	RP 279.98 (NB)	Sun River	1966	28[(a)]	485	Good	Good
	RP 279.98 (SB)	Sun River	1966	28[(a)]	485	Good	Good
	RP 280.09 (NB)	5th Ave SW	1967	37[(a)]	125	Good	Good
	RP 280.09 (SB)	5th Ave SW	1967	37[(a)]	125	Good	Good
	RP 282.55 (NB)	Vaughn Rd / BNSF RR	1967	28[(a)]	354	Good	Fair-1
	RP 282.55 (SB)	Vaughn Rd / BNSF RR	1967	28[(a)]	359	Good	Fair-1
I-315	RP 0.01	I-15	1967	45[(a)]	294	Good	Fair-1
	RP 0.34 (EB)	14th St SW	1967	36[(a)]	150	Good	Fair-2
	RP 0.34 (WB)	14th St SW	1967	45[(a)]	145	Good	Fair-1
	RP 0.34 (EB Off)	14th St SW	1997	23[(a)]	136	Good	Good
	RP 1.06 (EB)	BNSF RR	1946	45[(a)]	178	Good	Fair-2
	RP 1.06 (WB)	BNSF RR	1967	37[(a)]	208	Good	Fair-2
	RP 1.06 (WB Off)	BNSF RR	1996	23[(a)]	186	Good	Good
Central Ave	RP 0.16 (EB)	BNSF RR	1967	27	551	Good	Fair-1
	RP 0.16 (WB)	BNSF RR	1967	27	551	Good	Fair-1
10th Ave S	RP 94.61 (EB)	Missouri River	1983	40	2122	Good	Fair-1
	RP 94.61 (WB)	Missouri River	1951	28	2093	Good	Good

Source: MDT Bridge Management System, 2014.
[(a)] *Interstate bridge width does not meet existing standards.*

[2] MDT *Bridge Design Standards*, National Highway System (NHS) Interstate

3.1.3 Operations

The Interstate System within the study area is considered a Level I winter maintenance level according to the MDT *Maintenance Operations and Procedures Manual.*[3] A Level I roadway receives the highest level of maintenance and attention during inclement weather events. Level I routes are eligible to receive up to 24-hour-per-day coverage during storms. The primary objective is to keep at least one travel lane in each direction open to traffic and to provide intermittently bare pavement as soon as possible. Within the study area, there are additional operation controls aimed at improving the function of the transportation system.

- **Snow Fence:** There are multiple locations with snow fences at and near the 10th Avenue South Interchange. The snow fence is intended to trap and prevent snow from blowing across the roadway.
- **Variable Message Sign (VMS):** To address vehicle operations related to adverse weather conditions, portable VMSs are used to alert motorists of changes in weather conditions. The VMSs are commonly deployed near the Gore Hill Interchange during high wind events.
- **Bridges:** Bridges typically freeze quicker than the normal roadway surface, causing operational issues for motorists. Signing alerting motorists to watch for ice on the bridges are used during the winter months.
- **Detours:** Concerns have been noted about not having a viable detour route for the Gore Hill area. Incidents occurring near Gore Hill have resulted in closed lanes on the Interstate, as well as increases in vehicle delay and queuing.

3.1.4 Pavement Condition

MDT annually tracks and measures pavement condition indices in the corridor. MDTs 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, as well as overall ride quality. By understanding the condition of the pavement, MDT can identify the most appropriate treatments and resources needed to extend pavement life. Several pavement condition indices are monitored through MDT's PvMS. The performance measures and corresponding indices are such that the numerical value of 100 is assigned to a new pavement with no flaws, and zero is assigned to a highly degraded pavement. The following performance measures are routinely used to track pavement conditions:

- **Ride Index:** This is determined by using an internationally applied roughness index (IRI) in inches per mile and converting the number to a 0 to 100 scale.
- **Rut Index (RI):** This is 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):** This is measured by combining all load-associated cracking and converting the index to a 0 to 100 scale.
- **Miscellaneous Cracking Index (MCI):** This is calculated by combining all non-load-associated 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

[3] MDT *Maintenance Operations and Procedures Manual*, Chapter 9, Winter Maintenance Program, December 2009, http://www.mdt.mt.gov/publications/docs/manuals/mmanual/chapt9c.pdf

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 3.2**, the various pavement condition performance measures generally indicate good performance for I-15. Between RP 282.2 and RP 286.6 on I-15, however, the OPI indicates poor overall performance. A resurfacing project is planned for I-15 between RP 282.2 and RP 285.9. It is anticipated that this project would be let in 2017. Information for OPI on I-315 indicates a poor to fair pavement condition.

Table 3.2: Pavement Condition

Route	Begin RP	End RP	Surface Width	Last Surface	Last Treatment	Flexible Thickness (feet)	IRI	RI	ACI	MCI	OPI
I-15 NB	270.5	282.2	38	2007	2007	0.33	86.2	76.5	99.8	100.0	79.7
I-15 SB	270.5	282.2	38	2007	2007	0.33	88.8	78.7	99.2	100.0	82.6
I-15 NB	282.2	286.6	38	1999	2006	0.75	49.0	64.0	69.3	95.1	43.1
I-15 SB	282.2	286.6	38	1999	2006	0.75	44.0	72.0	88.0	96.2	51.0
I-315 EB	0.0	1.4	38	1996	1996	0.34	59.3	67.0	91.3	98.3	60.5
I-315 WB	0.0	1.4	38	1996	1996	0.34	83.0	73.0	80.1	99.8	57.6

Source: MDT Pavement Management System, 2014

3.1.5 Alternative Transportation Modes

There are currently no dedicated bicycle or pedestrian facilities along the study corridor. The *Great Falls Area LRTP* identifies a recommendation for a multi-use path adjacent to the study area near the junction of 6th Street SW and I-315. Spot improvements to the Central Avenue crossing of I-15 and the railroad are also recommended in the *LRTP* to accommodate bike lanes.[4]

3.1.6 Railroad

A service line for BNSF Railway runs within the study area. The Interstate crosses over the railroad at two locations within the study area: along I-15 Emerson Junction and along I-315 just east of 14th Street Southwest. Additionally, Central Avenue crosses over the railroad just west of Vaughn Road within the study area. More information about the bridge structures is provided in **Section 3.1.2**.

3.1.7 Air Service

The Great Falls International Airport is adjacent to the study area. Access to the airport is provided by Airport Drive, which connects to the Gore Hill Interchange. While it has been categorized as a “primary commercial service” airport by the National Plan of Integrated Airport Systems, it also has a military component. The airport is home to Great Falls Air National Guard Base and the Montana Air National Guard’s 120th Air Lift Wing, an Air National Guard unit employed in air defense. The airport also offers substantial infrastructure for the air cargo industry. FedEx operates a warehouse as a sorting and distribution hub for Montana. The U.S. Customs Border Patrol operates an office at the airport, which facilitates international travel.

[4] *Great Falls Area Long Range Transportation Plan – 2014*, page 219.

3.1.8 Utilities

I-15 in the study area includes overhead power and telephone crossings. Longitudinal occupancy of Interstate right-of-way is not permitted, and, as such, utility involvement is limited. Electric power and natural gas utilities are provided by Northwestern Energy. CenturyLink provides telecommunication services to the study area.

3.2 Geometric Conditions

Existing roadway geometrics were evaluated and compared to current MDT standards. Available as-built drawings were reviewed for the freeway system within the study area. Field reviews of the study corridor took place in July 2014 to confirm and supplement information contained in the as-built drawings, as well as to identify additional areas of concern within the study area.

The MDT *Road Design Manual* and *Traffic Engineering Manual* specifies general design principles and controls that determine the overall operational characteristics of the roadway. Of critical importance to determining design standards is the design speed. MDT's manuals provide guidance for design speed based on facility and operating characteristics; however, some judgment is necessary. A facility's design speed and its operating speed may differ. The design speed is a selected speed used to determine the various geometric design features of the roadway. The operating speed is the highest overall speed at which a driver may travel on a given section of roadway under favorable weather conditions and prevailing traffic conditions without at any time exceeding the safe speed as determined by the design speed. The design criteria for the study corridor are based on current MDT standards as described in the following sections.

3.2.1 Mainline Interstate

The mainline Interstate is characterized as a controlled access, four-lane, divided highway with high travel speeds. The key purpose of the mainline Interstate is to carry traffic over large distances quickly. The following subsections provide the analysis of the current geometric conditions along the Interstate within the study area. The evaluation compares the existing geometrics to current design standards. Note that design standards change over time. Locations that do not meet current design standards may have met standards in place during the time of construction. Additionally, it is possible that design exceptions may have been used during the initial design process.

Design Criteria

Table 3.3 lists current design standards for freeway (NHS-Interstate) routes according to MDT design criteria. The freeway design criteria depend on terrain and area context (i.e., urban or rural). Based on the definitions provided in MDT's *Road Design Manual*, most of I-15 within the study area appears to be of rural context with level terrain (70-miles-per-hour [mph] design speed) with some areas of rolling terrain (60-mph design speed). I-315 appears to be of urban context (50-mph design speed). For the purposes of this report, areas along I-15 that do not meet 70-mph design standards and areas along I-315 that do not meet 50-mph design standards were noted as being substandard. A final determination of design speed will ultimately be made during project development.

Table 3.3: Geometric Design Criteria (Freeway)

Design Element			Rural			Urban
Design Controls	Design Forecast Year (Geometrics)		20 Years			20 Years
	Design Speed(a)	Level	70 mph			50 mph
		Rolling	60 mph			
		Mountainous	50 mph			
	Level of Service		B			B
Roadway Elements	Travel Lane Width(a)		4@12'			4@12'
	Shoulder Width(a)	Outside Shoulder	10'			10'
		Inside Shoulder	4'			4'
	Cross Slope	Travel Lane(a)	2%			2%
		Shoulder	2%			2%
	Median Width	Level	Minimum: 36'			Desirable: 36' Minimum: 16'
		Rolling	Minimum: 36'			
		Mountainous	Minimum: 16'			
Earth Cut Sections	Ditch	Inslope	6:1 (Width: 6')			6:1 (Width: 6')
		Width	10' Min.			10'
		Slope	20:1 towards back slope			20:1 towards back slope
	Back Slope; Cut Depth at Slope Stake	0' - 5'	5:1			5:1
		5' - 10'	Level/Rolling: 4:1; Mountainous: 3:1			3:1
		10' - 15'	Level/Rolling: 3:1; Mountainous: 2:1			2:1
		> 15'	Level/Rolling: 2:1; Mountainous: 1.5:1			1.5:1
Earth Fill Slopes	Fill Height at Slope Stake	0' - 10'	6:1			6:1
		10' - 20'	4:1			4:1
		20' - 30'	3:1			3:1
		> 30'	2:1			2:1
Alignment Elements	DESIGN SPEED		50 mph	60 mph	70 mph	50 mph
	Stopping Sight Distance(a)		425'	570'	730'	425'
	Minimum Radius (e=8.0%)(a) (b)		760'	1,200'	1,820'	760'
	Superelevation Rate(a)		e_{max}=8.0%			e_{max}=8.0%
	Vertical Curvature (K-Value) (a)	Crest	85	151	247	84
		Sag	96	136	181	96
	Maximum Grade(a)	Level	3%			5%
		Rolling	4%			
		Mountainous	5%			
	Minimum Vertical Clearance(a)		17.0'			17.0'

Source: MDT Road Design Manual, Chapter 12, Figure 12-3, "Geometric Design Criteria for Rural Principal Arterials" (National Highway System-Non-Interstate), 2008
(a) Controlling design criteria (see Section 8.8 of the MDT Road Design Manual)
(b) Super elevation rate (e)

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 standards for horizontal curves are defined in terms of curve radius, and they vary based on design speed. For a 70-mph design speed (level terrain), the minimum recommended radius is 1,810 feet with a minimum stopping sight distance (SSD) of 730 feet. The minimum recommended radius and SSD for a 60-mph design speed (rolling terrain) are 1,200 feet and 570 feet, respectively. For an urban freeway (50-mph design speed), a minimum radius of 760 feet and a minimum sight distance of 425 feet are recommended.

Table 3.4 summarizes each horizontal curve on the Interstate roadways within the study area. A determination of whether the curve met standards was noted based on the design criteria discussed previously. The controlling design criteria for the horizontal curves are radius and SSD. Stopping sight distance for a horizontal curve is evaluated based on the ability to see through the inside of the corner. Minimum sight obstruction distances were calculated based on the criteria contained in the *Traffic Engineering Manual.*[5] 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.

There are five existing horizontal curves along I-15 within the study area and two horizontal curves along I-315. Four of the five curves along I-15 meet the minimum standards for horizontal curvature based on a 70-mph design speed (level terrain). The failing curve, at RP 282.37, does not meet the minimum radius requirements at a 70-mph design speed; however, the curve does meet the radius requirements for a 60-mph design speed (rolling terrain). Along I-315, one horizontal curve does not meet urban freeway standards (50-mph speed) based on curve radius. All horizontal curves were found to have adequate SSD.

Table 3.4: Horizontal Curve Attributes

Curve Location (RP)		Length (feet)	Radius (feet)	Min. Sight Obstruction (feet)	Design Speed Met (mph)	Meets Standards	Comments
I-15	277.2	2,557	5,730	11.6	70	**YES**	
	278.9	4,334	5,732	11.6	70	**YES**	
	280.7	3,892	3,274	20.3	70	**YES**	
	282.4	986	1,637	40.5	60	**NO**	Does not meet level terrain standards based on curve radius.
	282.9	956	1,909	34.8	70	**YES**	
I-315	0.07	350	739	30.3	45	**NO**	Does not meet urban freeway standards based on curve radius.
	0.29	250	1,146	19.6	55	**YES**	

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.

[5] MDT *Traffic Engineering Manual*, Chapter 25, Section 25.5, Equation 25.5-1

Table 3.5 lists the location and controlling design features for each vertical curve along the Interstate roadways within the study area. According to the *Road Design Manual*, the maximum allowable grades are 3 percent for level terrain, 4 percent for rolling terrain, and 5 percent for mountainous terrain, although grades of up to 7 percent may be provided with approval. The rate of vertical curvature is expressed in terms of the K-value. The K-value is defined as a function of the length of the curve compared to the algebraic change in grade, which comprises either a sag or a crest vertical curve. For a 70-mph design speed (level terrain), minimum K-values of 247 and 181 are recommended for crest and sag vertical curves, respectively. A minimum SSD of 730 feet is recommended for a 70-mph design speed. For sag curves, SSDs only apply where overhead structures exist. No sag curves have existing overhead obstructions within the study area.

Within the study area, there are 19 vertical curves along I-15 and 2 vertical curves on I-315. Both vertical curves along I-315 meet urban freeway standards. Of the 19 vertical curves along I-15, 15 meet existing standards for a 70-mph design speed (level terrain). Two curves have maximum grades that do not meet level terrain standards; however, they do meet standards for mountainous terrain. One curve has a K-value below standards for level terrain, while another curve does not meet level terrain standards for K-value and SSD.

Table 3.5: Vertical Curve Attributes

Curve Location (RP)		Type	Length (feet)	Grade Back	Grade Ahead	K-value	SSD (feet)	Design Speed Met (mph)	Meets Standards	Comments
I-15	276.2	Crest	800	0.8%	0.1%	1,188.7	2,003	70	**YES**	
	276.7	Crest	800	0.1%	-0.6%	1,164.5	1,971	70	**YES**	
	277.1	Crest	1,000	-0.6%	-1.5%	1,127.4	1,717	70	**YES**	
	277.3	Sag	1,000	-1.5%	-0.2%	777.0	-	70	**YES**	
	277.6	Crest	800	-0.2%	-0.8%	1,232.9	2,063	70	**YES**	
	277.9	Crest	1,100	-0.9%	-5.0%	265.1	756	50	**NO**	Does not meet level terrain standards based on grade.
	278.8	Sag	1,000	-5.0%	-1.0%	250.0	-	50	**NO**	Does not meet level terrain standards based on grade.
	279.3	Crest	1,000	-1.0%	-2.9%	540.5	1,083	70	**YES**	
	280.0	Sag	1,100	-2.9%	0.9%	292.6	-	70	**YES**	
	280.2	Crest	1,100	0.9%	-0.8%	643.3	1,181	70	**YES**	
	280.5	Sag	400	-0.8%	1.5%	173.9	-	60	**NO**	Does not meet level terrain standards based on K-value.
	280.8	Crest	600	1.5%	-0.3%	329.7	893	70	**YES**	
	281.7	Sag	800	-0.2%	0.2%	2,000.0	-	70	**YES**	
	282.3	Sag	800	0.2%	2.5%	355.6	-	70	**YES**	
	282.5	Crest	750	2.5%	-1.0%	220.6	690	60	**NO**	Does not meet level terrain standards based on K-value and SSD.
	282.7	Sag	200	-1.0%	-0.2%	250.0	-	70	**YES**	
	282.7	Crest	200	-1.0%	-1.1%	5,000.0	2,708	70	**YES**	
	283.0	Crest	200	-0.2%	-0.9%	266.7	1,539	70	**YES**	
	283.0	Sag	200	-1.1%	-0.9%	1,333.3	-	70	**YES**	
I-315	0.09	Crest	800	1.0%	-4.5%	145	560	50	**YES**	
	0.28	Sag	400	-4.5%	-2.3%	180	-	50	**YES**	

3.2.2 Interchanges

The purpose of an interchange is to allow traffic to enter or exit the Interstate with minimal disturbance to its traffic stream. This is accomplished by using grade-separated intersections connected by ramps. There are four interchanges along I-15 and one interchange along I-315 within the study area. This section discusses the geometric conditions of the five interchanges.

Standards

The five interchanges within the study area were evaluated based on a variety of standards. The MDT *Road Design Manual* provides general geometric standards for horizontal and vertical curvature for interchange ramps, while the MDT *Traffic Engineering Manual* provides guidance for ramp lengths to allow for vehicle acceleration and deceleration. **Table 3.6** provides the interchange ramp standards used to evaluate the interchanges as defined by MDT.

Table 3.6: Interchange Ramp Standards

Type	Criteria		Standard
Exit Ramp	Taper Rate	Taper Design	2 to 5 degrees
		Parallel Design	215 feet
	Deceleration Length (L_d)		[a]
	Sight Distance in Advance of Gore		1,180 feet
Entry Ramp	Taper Rate	Taper Design	50:1 to 70:1
		Parallel Design	350 feet
	Acceleration Rate (L_a)		[b]
	Horizontal Curve Radius		1,000 feet
Spacing	Exit - Entrance		500 feet
	Entrance - Exit		2,000 feet
Auxiliary Lane Drop [c]	Within an Interchange		500 feet to 1,000 feet

Source: MDT Traffic Engineering Manual, Chapter 29, November 2007
[a] *MDT Traffic Engineering Manual, Section 29.5.1.3*
[b] *MDT Traffic Engineering Manual, Section 29.5.2.3*
[c] *An auxiliary lane should be provided where the distance between the end of the entrance terminal and the beginning of an exit terminal is less than 1,500 feet. An auxiliary lane may be dropped at an exit if properly signed and designed.*

Ensuring adequate ramp lengths and proper geometrics is necessary to provide for safe vehicle interaction at Interstate entrance and exit points. Additionally, the spacing between interchange ramps affects vehicle interactions and can influence traffic flow and safety. Ramps that are too close together can result in additional vehicle conflicts due to merging and diverging traffic. An additional concern regarding ramp spacing is vehicle lane-shifting patterns. Closely spaced interchanges and/or intersections may require vehicles to shift between lanes to reach their intended lane. Traffic flow and safety issues may result if enough length is not provided for in areas where lane shifts are necessary to enter or exit the Interstate.

Horizontal Alignment

The horizontal alignment of a ramp is controlled by the radius of any curve on the ramp, super elevation, taper angle, taper length, gap acceptance length (L_g), and deceleration/acceleration lengths (L_d/L_a). The limiting values for these characteristics are functions of the design speed for a given ramp. For this analysis, the minimum design speed was determined based on the super elevation and radius for each given curve. **Table 3.7** presents the horizontal geometric attributes for each of the ramps.

Table 3.7: Interchange Horizontal Alignment Attributes

Curve Location		Radius (feet)	Super-elevation	Taper Rate	L_d/L_a (feet)	L_g (feet)	Design Speed Met (mph)	Meets Standards	Comments
Gore Hill	SB ON	2,865	0.04	50:1	1,513	300	50	NO	Does not meet standards based on acceleration length.
	SB OFF	2,953	0.05	4°30'00"	358	-	50	YES	
		3,773	0.03[a]	-	-	-	45	YES	
	NB ON	2,865	0.04[a]	50:1	1,604	300	50	NO	Does not meet standards based on acceleration length.
	NB OFF	2,865	0.04	4°30'00"	323	-	50	NO	Does not meet standards based on deceleration length.
10th Ave S	SB ON	764	0.08	-	-	-	50	YES	
		764	0.07	[b]	-	[b]	50	YES	
	SB OFF	5,730	0.03	5°00'00"	463	-	60	NO	Does not meet standards based on deceleration length.
		385	0.08	-	-	-	35	YES	
		198	0.08	-	-	-	25	YES	
		358	0.08	-	-	-	35	YES	
	WB OFF	382	0.08	4°30'00"	310	-	35	YES	
	NB ON			[b]	590[c]	590[c]		NO	Does not meet standards based on acceleration length.
	NB OFF	5,730	0.03	4°30'00"	-	-	60	YES	
		2,339	0.03	-	740	-	35	YES	
Central Ave	NB OFF	3,274	0.03[a]	4°30'00"	1,388	-	45	YES	
		5,730	0.03[a]	-	-	-	60	YES	
	NB ON	7,640	0.02[a]	50:1	1,491	428	55	NO	Does not meet standards based on acceleration length.
	SB ON	1,359	0.06[a]	50:1	1,379	300	45	NO	Does not meet standards based on acceleration length.
	SB OFF	3,204	0.03[a]	7°43'00"	1,144	-	45	NO	Does not meet standards based on taper rate.
		1,637	0.03[a]	-	-	-	30	YES	
Emerson Junction	NB ON	1,433	0.05[a]	-	-	-	40	YES	
		1,146	0.04[a]	50:1	266	266	30	NO	Does not meet standards based on acceleration length.
	SB OFF	1,910	0.06[a]	4°30'00"	0	-	50	NO	Does not meet standards based on deceleration length.
		1,146	0.08[a]	-	-	-	55	NO	
14th St SW	EB OFF	230	0.08[a]	4°34'26"	503	-	30	YES	
	EB SHARED	246	0.06[a]	-	-	-	30	YES	
	EB ON	382	0.02[a]	3°48'51"	930	790	<25	YES	
	WB ON	170	0.08[a]	3°49'00"	505	305	25	NO	Does not meet standards based on acceleration and gap acceptance length.
		170	0.08[a]	-	-	-	25	YES	
	WB OFF	521	0.02[a]	4°34'26"	714	-	<25	YES	
		382	0.07[a]	-	-	-	35	YES	

[a] Value measured in the field.
[b] Information unavailable.
[c] Estimated based on aerial photography.

Vertical Alignment

The vertical alignment of a ramp is expressed in terms of the rate of curvature (K-value) and vertical grade. For a crest curve, the minimum curvature depends on the SSD for a given design speed. For sag curves, the minimum curvature depends on rider comfort at a given design speed. The vertical curves on the interchange ramps were evaluated based on a 50-mph design speed. The minimum K-value for a crest or sag vertical curve is 84 or 96, respectively. The maximum grade for a 50-mph design speed is 5 percent.

Table 3.8 presents the vertical geometric design attributes of the each interchange ramp within the study area. Many of the vertical curves fail to meet the minimum curvature required for a 50-mph design speed. A lower design speed may, however, result in acceptable curvature values. The design speed met based on the K-value is shown in the table. In addition, there are some ramps with grades exceeding 5 percent.

Interchange Spacing

Providing for proper interchange spacing is necessary to accommodate vehicular maneuvers, for all signing, and to achieve optimal capacity. In urban areas such as Great Falls, interchanges are more likely to be spaced closer together than in rural areas. The recommended spacing from an exit ramp to an entrance ramp is 500 feet. Conversely, 2,000-foot spacing is recommended between an entrance ramp and an exit ramp.[6] These are initial recommendations, and further traffic analysis should be conducted according to procedures outlined in the *Highway Capacity Manual*. **Table 3.9** shows the interchange spacing attributes within the study area.

For locations where recommended spacing lengths are unachievable, auxiliary lanes may be used to accommodate weaving and merging/diverging traffic characteristics. Auxiliary lanes should be provided where the distance between entrance and exit ramps is less than 1,500 feet.[7] No auxiliary lanes are currently provided within the study area.

The 10th Avenue South and 14th Street Southwest Interchanges along I-315 are spaced closer than 1,500 feet. This location has weaving and merging/diverging characteristics that result in reduced capacity and operational concerns (**See Section 3.3.3**).

[6] MDT *Traffic Engineering Manual*, Chapter 29, Section 29.3.6
[7] MDT *Traffic Engineering Manual*, Chapter 29, Section 29.3.7

Table 3.8: Interchange Vertical Alignment Attributes

Curve Location (RP)		Type	Length (feet)	Grade Back	Grade Ahead	K Value	Stopping Sight Distance (feet)	Design Speed Met (mph)	Meets Standards	Comments
Gore Hill	SB ON	Sag	200	-1.0%	2.3%	60.4	-	40	**NO**	Does not meet standards based on rate of curvature.
	SB OFF	Crest	450	-0.9%	-5.8%	93.2	448	50	**NO**	Does not meet standards based on grade.
	NB ON	Crest	300	-1.3%	-5.0%	80.4	439	45	**NO**	Does not meet standards based on rate of curvature.
	NB OFF	Sag	300	-1.0%	3.9%	60.7	-	35	**NO**	Does not meet standards based on rate of curvature.
		Crest	300	3.9%	0.0%	76.5	425	45	**NO**	Does not meet standards based on rate of curvature.
10th Ave S	SB ON	Sag	700	-5.5%	1.0%	107.4	-	50	**NO**	Does not meet standards based on grade.
	SB OFF	Crest	300	-1.0%	-6.8%	51.7	336	40	**NO**	Does not meet standards based on rate of curvature and grade.
		Sag	350	-6.8%	-3.2%	97.2	-	50	**NO**	Does not meet standards based on grade.
	NB ON	Crest	600	2.1%	-0.2%	260.9	769	70	**YES**	
	NB OFF	Sag	400	-4.7%	-0.8%	102.0	-	50	**YES**	
		Crest	500	-0.8%	-5.0%	119.0	507	55	**YES**	
Central Ave	NB OFF	Sag	300	-0.6%	3.5%	74.1	-	40	**NO**	Does not meet standards based on rate of curvature.
		Crest	200	3.5%	0.0%	57.1	408	40	**NO**	Does not meet standards based on rate of curvature.
	NB ON	Crest	300	-2.0%	-4.0%	150.0	690	55	**YES**	
		Sag	400	-4.0%	1.3%	75.8	-	40	**NO**	Does not meet standards based on rate of curvature.
	SB ON	Sag	400	-1.2%	2.0%	127.0	-	55	**YES**	
	SB OFF	Crest	300	0.0%	-1.5%	200.0	869	65	**YES**	
		Sag	400	-1.5%	1.7%	123.5	-	55	**YES**	
Emerson Junction	NB ON	Sag	500	-0.7%	4.3%	100.0	-	50	**YES**	
		Crest	400	4.3%	-1.0%	76.2	406	45	**NO**	Does not meet standards based on rate of curvature.
	SB OFF	Sag	250	0.0%	4.5%	55.6	-	35	**NO**	Does not meet standards based on rate of curvature.
		Crest	400	4.5%	-0.2%	84.4	428	50	**YES**	
I-315 Exit 0 (14th St)	EB OFF	Crest	300	-2.3%	-3.9%	187.4	824	60	**YES**	
		Crest	300	-3.9%	-5.0%	271.2	1126	70	**YES**	
	EB SHARED	Sag	300	-5.0%	-0.4%	65.4	-	40	**NO**	Does not meet standards based on rate of curvature.
	EB ON	Crest	400	5.0%	0.3%	85.3	430	50	**YES**	
		Crest	200	0.3%	-2.0%	88.1	575	50	**YES**	
	WB ON	Crest	250	-3.1%	-5.6%	99.5	555	50	**NO**	Does not meet standards based on grade.
	WB OFF	Crest	500	3.0%	-4.2%	69.4	387	45	**NO**	Does not meet standards based on rate of curvature.

Table 3.9: Interchange Spacing Attributes

	Location	Type	Length (feet)	Meets Standards	Comments
I-15 NB	Gore Hill	Exit - Entrance	2,500	**YES**	
	Gore Hill to 10th Ave S	Entrance - Exit	3,640	**YES**	
	10th Ave S	Exit - Entrance	2,250	**YES**	
	10th Ave S to Central Ave	Entrance - Exit	5,960	**YES**	
	Central Ave	Exit - Entrance	2,475	**YES**	
I-15 SB	Central Ave	Exit - Entrance	2,440	**YES**	
	Central Ave to 10th Ave S	Entrance - Exit	7,760	**YES**	
	10th Ave S	Exit - Entrance	1,400	**YES**	
	10th Ave S to Gore Hill	Entrance - Exit	2,700	**YES**	
	Gore Hill	Exit - Entrance	2,640	**YES**	
I-315 EB	I-15 to 14th St SW	Entrance - Exit	570	**NO**	Does not meet interchange spacing standards.
	14th St SW	Exit - Entrance	1,100	**YES**	
I-315 WB	14th St SW	Exit - Entrance	1,340	**YES**	
	14th St SW to I-15	Entrance - Exit	780	**NO**	Does not meet interchange spacing standards.

Access

The FHWA *Interstate System Access Informational Guide* provides technical and policy support for evaluating new or modified access to the Interstate System. The *Guide* provides information and methods for analyzing Interstate access to support planning, design, and safety analysis. Included in the *Guide* are eight policy requirements that must be addressed when requesting access to the Interstate. One of the policy requirements states that new or revised access points should provide for all traffic movements.[8] Note that the Emerson Junction is currently configured as a partial interchange. According to current policy, new construction of partial interchanges are not supported by FHWA except in extreme circumstances.

3.2.3 Intersections

The placement of intersections at the termini of ramps can affect the operation of the Interstate and the crossing roadway. If the intersections were placed too close to each other, they could generate queuing issues that could back up onto the Interstate mainline. Queuing can also affect the operation of the crossroad by creating unnecessary delay. As such, intersection locations must be carefully considered to allow enough space for the necessary turn bays needed to alleviate possible queuing issues. The geometric design of an intersection can also cause unnecessary delay if large vehicles cannot make left- or right-hand turns without interfering with traffic. Interchange ramps and intersections should be designed to accommodate a standard semi-truck with a 67-foot wheelbase (WB-67).

Table 3.10 presents the analysis of the left-turn bays, when present, at the intersections within the study area. Included in the table are values for the recommended length based on MDT standards, as well as the 95th percentile queue based on the existing peak hour traffic analysis. The 95th percentile queue is the length at which queue lengths are shorter 95 percent of the time. For example, if the 95th percentile

[8] FHWA *Interstate Access Guidelines Informational Guide*, August 2010, page 6.

queue is 100 feet, queue lengths would be shorter than 100 feet 95 percent of the time and longer than 100 feet 5 percent of the time.

Table 3.10: Left-Turn Bay Lengths

Intersection	Peak Hour Turning Volume (vph)	Recommended Length (feet)	95th Percentile Queue (feet)	Existing Length (feet)	Meets Standards	Comments
14th St SW / EB Ramps	102	70	25	300	**YES**	
14th St SW / WB Ramps	638	(a)	330	115	**NO**	Vehicle queuing along interchange ramp.
Fox Farm Rd / 10th Ave S (EB)	242	280	310	200	**NO**	Does not meet turn-bay length standards.
Fox Farm Rd / 10th Ave S (WB)	486	325(b)	310	350	**YES**	
Central Ave / NB Ramps (EB)	6	50	0	50	**YES**	
Central Ave / SB Ramps (WB)	230	192	20	105	**NO**	Does not meet turn-bay length standards.
Vaughn Road / Central Ave (EB)	71	59	10	150	**YES**	

(a) Outside of the range of standards.
(b) Existing dual-turn lanes

Gore Hill Interchange

Four intersections exist within the immediate vicinity of the Gore Hill Interchange. The southbound off-ramp terminates at a four-legged, two-way, stop controlled intersection with Airport Road and I-15 Frontage Road. Traffic turning from the off-ramp to Airport Road has a free-flowing dedicated right-turn lane. One concern at this intersection is the possibility that drivers traveling northbound on I-15 Frontage Road may travel straight and enter the southbound off-ramp traveling in the wrong direction. Another concern is the proximity of this intersection to the intersection of Airport Road and the southbound on-ramp, a distance of approximately 60 feet. Vehicles attempting to make a left turn onto the southbound on-ramp have to contend with any oncoming traffic leaving the southbound off-ramp intersection.

The intersection of Airport Road and the northbound on- and off-ramps is a typical two-way, stop-controlled intersection. This intersection is located approximately 80 feet from the intersection of Airport Road and Tri-Hill Frontage Road. Traffic performing a left-hand turn onto Tri-Hill Frontage Road has to contend with traffic making a right turn off of the northbound off-ramp, in addition to the traffic traveling southeast across the interchange. The distance between the southbound on-ramp and the northbound ramps is approximately 370 feet.

14th Street Southwest Interchange

The intersections at the ramp termini at 14th Street Southwest are both four-legged signalized intersections. They are approximately 925 feet apart and appear to meet geometric spacing standards. Left-turn bays are provided at both intersections. The intersection of 14th Street Southwest and the westbound ramps has a high volume of left-turning vehicles along the east leg. During the PM peak-hour, left-turn volume exceeds the range of recommended turn bay lengths provided by MDT. Vehicle queuing was noted along the interchange ramp approaching the mainline Interstate.

Fox Farm Road

The intersection of Fox Farm and 10th Avenue South is a four-legged, stop-controlled intersection. This intersection is at the terminus of I-315. A single left-turn bay is provided along the eastbound leg, and dual left-turn lanes are provided along the westbound leg. The left-turn bay along the eastbound leg does not appear to meet existing standards. During the on-site evaluation, observers noted that the queue length from the eastbound left-turn lane often exceeded available storage during the PM peak hour.

Central Avenue Interchange

The Central Avenue Interchange is a diamond interchange with stop-controlled intersections at the ramp terminals and raised medians to provide protected turn-bays. The intersections are spaced approximately 450 feet apart, and they appear to meet geometric design standards. Both on-ramps include channelized right-turn lanes, which require vehicles to merge at the entrance to the ramp.

The intersection along the northbound ramps includes an eastbound left-turn bay that appears to meet minimum length standards. The southbound ramp intersection has a dedicated westbound left-turn lane for vehicles accessing the Interstate. The existing turn-bay length does not appear to meet existing standards; however, minimal vehicle queuing was shown by the traffic analysis.

The southbound off-ramp has a channelized right-turn lane and a dedicated receiving lane along Central Avenue. However, a stop sign requires vehicles to stop before entering Central Avenue. At the intersection of the southbound off-ramp and Central Avenue, three westbound lanes merge to a single lane within approximately 300 feet. There does not appear to be proper signage and/or markings indicating the dropping of two travel lanes.

Emerson Junction

The intersections located at Emerson Junction are both three-legged, unsignalized intersections and are spaced approximately 750 feet apart. The northbound on-ramp intersection with Vaughn Road has a right-turn slip lane for traffic traveling westbound on Vaughn Road. Eastbound traffic has a 40-foot, left-turn storage area between Vaughn Road and the northbound on-ramp. The southbound off-ramp has a single lane serving both left- and right-turning traffic. The southbound off-ramp intersection is scheduled for reconstruction, which will result in a shift to the northwest to provide a more standard “T” intersection.

3.3 Traffic Characteristics

An evaluation of traffic characteristics was completed using available data provided by MDT, as well as field-collected data. Peak-hour, turning-movement counts were conducted at 12 intersections within the study area. Mainline traffic volume counts were also completed at nine locations along the Interstate. Additional traffic information for vehicle speeds, driving patterns, and lane-changing interactions was also documented at various locations along the corridor. The following sections provide details about the existing traffic characteristics of the corridor. Detailed data is included in the **Appendices B**, **C**, and **D**. **Figure 3.1** shows the existing traffic conditions of the study area.

3.3.1 Traffic Volumes

MDT administers annual traffic count data at 12 locations within the study area. MDT, the city of Great Falls, or Cascade County conducts the annual traffic counts, which are adjusted to represent yearly averages for traffic. In addition, an automatic traffic recorder (ATR) is located outside of the study area approximately 3 miles to the northwest of Emerson Junction. The ATR collects traffic data year-round from sensors embedded in the roadway. Data from the other traffic count sites are collected annually at limited times by using pneumatic tube counters.

In addition to existing conditions, MDT provided historic data for the traffic count sites within the study area. The average annual daily traffic (AADT) on I-15 ranges from 5,950 vehicles per day (vpd) north of Central Avenue, to as high as 14,670 vpd north of Gore Hill. Volumes on I-315 approach 25,000 vpd west of Fox Farm Road. The AADT on the non-interstate roads ranges from 4,555 vpd on the Vaughn Frontage Road to 29,800 vpd on 10th Avenue South. **Table 3.11** shows the growth rates experienced within the study area over various time intervals.

Table 3.11: Historic Average Annual Growth Rates

Location		2013 AADT	1994-2013	2000-2013	2007-2013
I-15	S of Gore Hill	6,370	1.4%	0.4%	0.1%
I-15	N of Gore Hill	14,670	1.6%	1.3%	-0.1%
I-15	N of 10th Ave	10,550	1.5%	1.3%	0.3%
I-15	N of Central Ave	5,950	1.2%	0.5%	-1.8%
I-15	N of Emerson	9,090	0.9%	0.1%	-1.2%
I-315	W of 14th St SW	15,140	(a)	(a)	0.8%
I-315	W of Fox Farm	24,680	4.2%	1.8%	0.1%
31st St SW	S of Interchange	8,360	5.6%	4.7%	-0.8%
Airport Dr	N of Interchange	3,640	-0.1%	0.7%	2.3%
10th Ave S	Warden Bridge	29,800	1.5%	1.5%	0.4%
Central Ave	E of Interchange	12,514	0.0%	0.5%	3.0%
Central Ave	W of Interchange	7,746	0.6%	1.5%	4.4%
Vaughn Rd	E of Interchange	6,530	0.0%	-0.4%	1.5%
Vaughn Rd	W of Interchange	4,555	0.4%	0.7%	7.4%

Source: MDT Data and Statistics Bureau, Traffic Data Collection Section, 2014
(a) Data unavailable

3.3.2 Mainline Operation

The operational condition of a mainline Interstate highway is often characterized by the level of service (LOS). LOS is a qualitative description of a driver's experience on a highway or facility, as defined in the 2010 Highway Capacity Manual (HCM). LOS of a mainline freeway segment is affected by geometric and traffic characteristics. LOS is determined based on the traffic density of the highway in terms of passenger cars per mile per lane (pc/mi/ln). The inputs used to calculate traffic density include traffic volume, free-flow speed, percentage of trucks and busses, driver population, peak-hour factors, number of travel lanes, and the terrain. LOS can range from A to F with A representing free flow conditions and F representing heavily congested conditions. Analysis of I-15 was performed using Highway Capacity Software (HCS) 2010. The LOS was evaluated during AM and PM peak hour conditions. **Table 3.12** shows the results of the LOS analysis.

Table 3.12: Mainline Level of Service

Location		Direction	AM Peak Hour		PM Peak Hour	
			LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-15	South of Gore Hill	Northbound	A	2.1	A	2.1
		Southbound	A	2.3	A	3.3
	North of Gore Hill	Northbound	A	4.8	A	7.3
		Southbound	A	4.7	A	6.0
	South of Central Ave	Northbound	A	3.0	A	4.6
		Southbound	A	3.0	A	4.5
	North of Central Ave	Northbound	A	3.2	A	3.0
		Southbound	A	2.0	A	3.2
	North of Emerson Junction	Northbound	A	2.8	A	5.9
		Southbound	A	5.0	A	4.3
I-315	West of 14th St SW	Eastbound	A	5.7	A	7.5
		Westbound	A	5.6	A	6.5
	East of 14th St SW	Eastbound	A	10.9	A	10.7
		Westbound	A	6.0	B	12.4

The MDT *Traffic Engineering Manual* states that a LOS of B or better is recommended for both urban and rural freeways. I-15 is shown to operate at LOS A during the existing peak hours within the study area. I-315 also operates at LOS A, with the exception of the westbound lane east of 14th Street Southwest, which operates at LOS B during the PM peak hour.

Vehicle Speeds

Vehicle speed data was collected along the I-15 southbound mainline between the 10th Avenue South and Gore Hill Interchanges. This location has a steep upgrade, and it has been noted to have speed differentials between the left and right travel lanes in the southbound direction. The speed data were collected over 24 hours in July 2014. The existing speed limit at this location is 65 mph.

Table 3.13 shows the results of the speed data collection. Included in the table are the 85th percentile speed, the average speed, and the pace. The primary speed data factor for determining the validity of the posted speed limit is the 85th percentile speed. The 85th percentile speed is that speed at or below which 85 percent of vehicles are traveling. For example, if the 85th percentile speed is 65 mph, it means that 85 percent of vehicles are traveling 65 mph or below. The pace is also an important factor, and it represents the 10-mph range within which most vehicles travel.

Table 3.13: Vehicle Speed Data

Location		Volume	Speed Limit (mph)	85th Percentile Speed (mph)	Average Speed	Pace (mph)	
I-15 SB	Right Lane	7,039	65	68.2	59.9	60 - 70	49%
	Left Lane	855	65	74.4	60.6	65 - 75	57%

As shown in the table, it appears that vehicles are generally traveling at higher speeds in the left lane than in the right lane. The 85th percentile speed for the right lane is more than 6 mph lower than the left lane. The pace of the left lane is also shown to be higher than in the right lane. Due to the steep upgrade and the mix of vehicle types, there are often slow-moving vehicles mixed with faster ones at this location. A higher percentage of vehicles in the pace represents fairly even travel speeds, while a lower percent within the pace may point to high-speed variations. At this location, the percentage of vehicles within the pace is relatively low. This is an indicator of large distribution of vehicle speeds. The varying vehicle speeds is likely a result of a mixture of slower moving heavy truck traffic combined with faster moving passenger vehicles.

10th Avenue South / Gore Hill Origin-Destination

An origin-destination (OD) study was conducted between the 10th Avenue South and Gore Hill Interchanges. The intent of the study was to evaluate the travel patterns between the 10th Avenue South and Gore Hill Interchanges in the southbound direction. The study found that during the AM peak hour approximately 65 percent of vehicles that enter the Interstate at 10th Avenue South immediately exit at Gore Hill. During the PM peak hour, this percentage was found to be approximately 48 percent.

3.3.3 Interchange Ramps

Connection between the mainline Interstate highway and local roads is provided by a dedicated ramp road. Similar to the Interstate mainline, the performance of the interchange ramps can be evaluated for LOS. As with traditional roadways, interchange ramps are impacted by the amount of traffic congestion present. For on-ramps, the capacity of the ramp roadway is rarely an issue due to generally free-flowing conditions with no traffic control. For off-ramps, however, congestion on the ramp can cause queuing that may cause failure at the ramp-to-freeway junction. **Table 3.14** provides the results of the LOS analysis for the interchange ramps.

As with the Interstate mainline, a LOS of B or better is recommended for the interchange ramps. Each of the ramps along I-15 within the study area is shown to function at LOS A and appear to have available capacity. All ramps along I-315 function at LOS B or better during the peak hours.

Table 3.14: Interchange Ramp Level of Service

Location		AM Peak Hour		PM Peak Hour	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
Gore Hill	NB On-ramp	**A**	3.9	**A**	8.7
	NB Off-ramp	**A**	3.7	**A**	3.7
	SB On-ramp	**A**	0.0	**A**	0.0
	SB Off-ramp	**A**	6.2	**A**	7.1
10th Ave S	NB On-ramp	**A**	6.5	**A**	8.6
	NB Off-ramp	**A**	2.9	**A**	5.7
	SB On-ramp	**A**	3.2	**A**	4.7
	SB Off-ramp	**A**	3.4	**A**	5.1
14th St SW	EB On-ramp	**B**	13.5	**B**	12.9
	EB Off-ramp	**A**	5.1	**A**	6.9
	WB On-ramp	**A**	8.3	**A**	9.2
	WB Off-ramp	**A**	3.4	**B**	10.1
Central Ave	NB On-ramp	**A**	0.0	**A**	0.2
	NB Off-ramp	**A**	0.0	**A**	0.0
	SB On-ramp	**A**	1.5	**A**	3.6
	SB Off-ramp	**A**	0.0	**A**	0.0
Emerson Junction	NB On-ramp	**A**	2.8	**A**	8.0
	SB Off-ramp	**A**	6.8	**A**	5.9

I-315 Interchanges

The I-315 Interstate has unique urban traffic characteristics. The Interstate mainline is less than a mile long and begins at the 10th Avenue South Interchange. The 14th Street Southwest Interchange is located close to the 10th Avenue South Interchange, which causes traffic flow issues related to vehicle weaving and merging/diverging. A video of the I-315 Interstate was recorded during the peak hours to evaluate the influence of traffic movements to the area. From the video, traffic movement volumes were counted during the peak hours.

Table 3.15 shows the peak hour volumes along the influencing ramps, as well as the destination of the vehicles expressed as a percentage. For example, during the AM peak hour, 338 vehicles traveled along the I-15 northbound off-ramp at the 10th Avenue South Interchange. Of those 338 vehicles, 10 percent exited at 14th Street Southwest, 58 percent stayed on I-315 in the right lane, and 32 percent merged to the left lane on I-315.

Table 3.15: I-315 Interchange Volumes

Location		AM Peak Hour	PM Peak Hour
10th Ave S	**I-15 NB Off**	**338**	**436**
	14th St SW Off	*10%*	*22%*
	I-315 Right Lane	*58%*	*57%*
	I-315 Left Lane	*32%*	*21%*
	I-15 SB Off	**192**	**239**
	14th St SW Off	*12%*	*35%*
	I-315 Right Lane	*10%*	*10%*
	I-315 Left Lane	*78%*	*55%*
14th St SW	**I-315 EB On**	**498**	**523**
	I-315 Right Lane	*48%*	*55%*
	I-315 Left Lane	*52%*	*45%*
	I-315 WB On	**122**	**161**
	I-15 NB On	*62%*	*49%*
	I-15 SB On, Right Lane	*33%*	*46%*
	I-15 SB On, Left Lane	*5%*	*5%*

3.3.4 Intersections

A LOS analysis was performed at 12 intersections within the study area. The LOS analysis was completed using PTV Vistro software during the AM and PM peak hours. For intersections, LOS is based on vehicle delay, which is influenced by the number of stops, available gaps, and impediments caused by other vehicles. A LOS of A represents little to no delay, while a LOS of F represents substantial delay. A LOS of C or better is generally recommended. The results of the peak-hour, intersection LOS analysis are shown in **Table 3.16**.

For signalized intersections, the LOS is based on the average stopped delay per vehicle. The procedures used to evaluate signalized intersections are based on detailed information on geometry, lane-use, signal timing, peak-hour volumes, arrival types, and other parameters. This information is then used to calculate delays and determine the capacity of each intersection.

LOS for two-way, stop-controlled intersections is based on the delay experienced by each movement within the intersection, rather than on the overall stopped delay per vehicle at the intersection. LOS is defined by the movement with the highest amount of delay. As a result, the intersection LOS may not accurately reflect the performance of the intersection as a whole. For example, a single, left-turning vehicle along the minor, stop-controlled approach may experience high amounts of delay due to a lack of available gaps. This movement may, however, only represent a small portion of the total intersection volume.

Table 3.16: Intersection Level of Service

Intersection Name	Control Type	AM Peak Hour		PM Peak Hour	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS
Tri Hill and Frontage Airport Rd	Two-way stop	13.5	**B**	14.5	**B**
I-15 NB and Airport Rd	Two-way stop	16.9	**C**	55.4	**F**
I-15 SB On and Airport Rd	Two-way stop	8.6	**A**	11.0	**B**
I-15 SB Off and Airport Rd	Two-way stop	12.7	**B**	35.3	**E**
14th St SW and I-315 EB	Signalized	14.4	**B**	13.0	**B**
14th St SW and I-315 WB	Signalized	23.0	**C**	19.4	**B**
Fox Farm and I-315	Signalized	45.3	**D**	38.5	**D**
Central Ave and I-15 SB	Two-way Stop	28.0	**D**	42.0	**E**
Central Ave and I-15 NB	Two-way Stop	19.9	**C**	29.1	**D**
Central Ave and Vaughn Rd	Two-way Stop	27.1	**D**	65.0	**F**
Vaughn Rd and I-15 SB	Two-way Stop	10.1	**B**	10.1	**B**
Vaughn Rd and I-15 NB	Two-way Stop	7.3	**A**	7.3	**A**

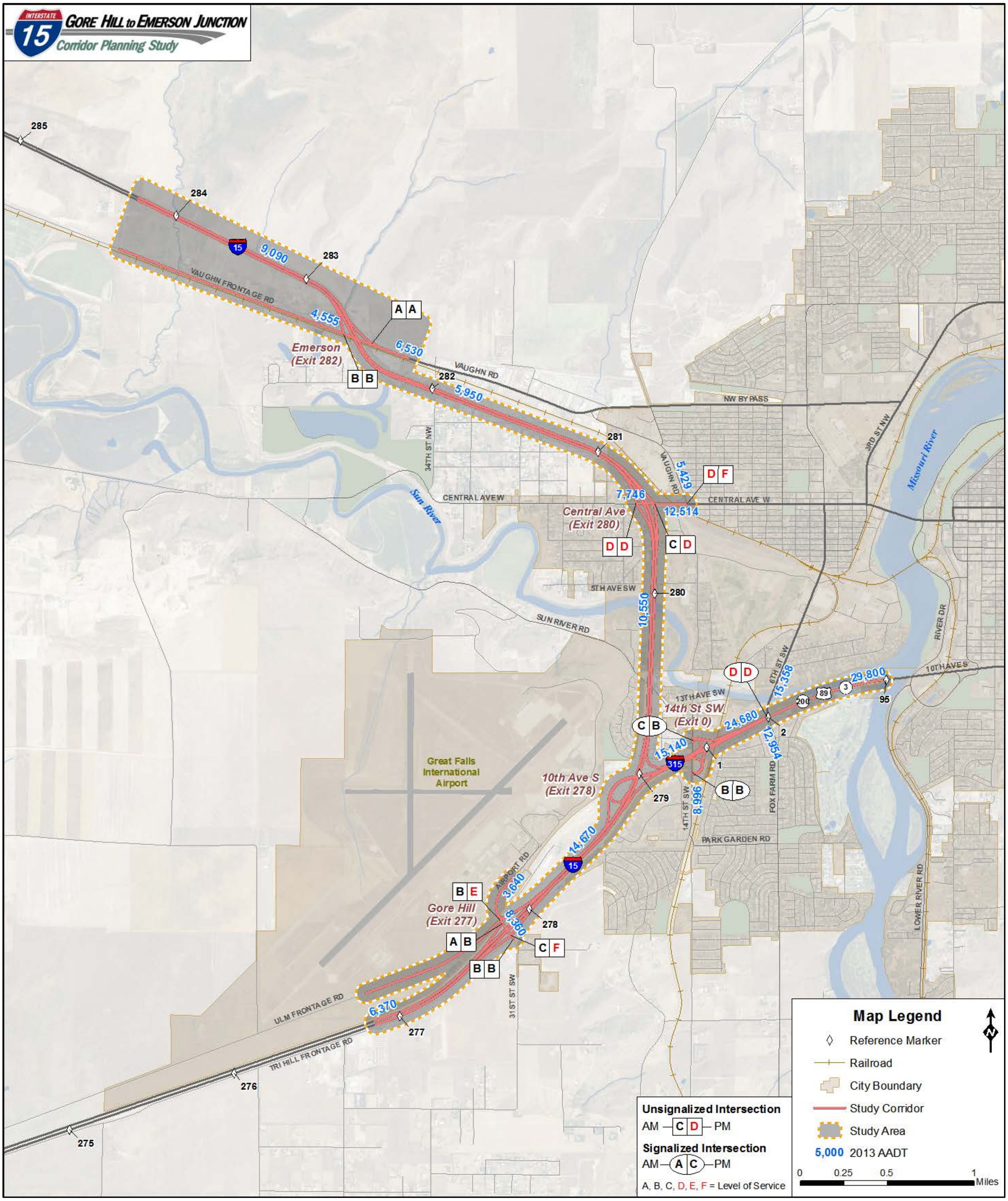


Figure 3.1: Existing Traffic Conditions

3.4 Safety

The MDT Traffic and Safety Bureau provided crash data for all of Cascade County from January 1, 2009, to December 31, 2013. Crash data for the study area were selected using GIS. Records show 525 crashes occurring within the study area during the crash analysis period. Four crashes resulted in fatalities, eight crashes resulted in incapacitating injuries, 41 crashes produced non-incapacitating evident injuries, and 71 crashes resulted in possible injuries. An incapacitating injury is defined as an injury, other than a fatality, which prevents the injured person from walking, driving, or normally continuing the activities the person was capable of performing before injury. **Figure 3.2** presents the spatial distribution of the crash data for the five-year analysis period.

Table 3.17 provides a comparison of the crash rate, crash severity index, and crash severity rate within the study area. The crash data presented in the table are based on crashes occurring from calendar year 2009 through 2013. Crash rates are defined as the number of crashes per million vehicle miles of travel. The crash severity index is the ratio of the sum of the level of crash degree to the total number of crashes. Crash severity rate is determined by multiplying the crash rate by the crash severity index.

Between 2008 and 2012, the statewide average rural crash rate, severity index, and severity rate for the Interstate system was 0.90, 1.83, and 1.65, respectively. For urban Interstates during this same time period, the statewide average crash rate, severity index, and severity rate was 1.21, 1.72, and 2.08, respectively.

Table 3.17: Crash Statistics

	Segment	Begin RP	End RP	# Fatal	# Incap	Total Crashes	AADT 3-year Average	Crash Rate	Severity Index	Severity Rate
I-15	Southwest of Gore Hill	270.4	277.8	0	0	18	6,360	1.55	1.00	1.55
	Northeast of Gore Hill	277.8	278.9	1	2	70	13,474	2.85	1.16	3.29
	10th Ave South to Central Ave	279.9	280.5	0	1	32	9,786	1.79	1.06	1.90
	Central Ave to Emerson Junction	280.5	282.5	0	0	48	6,486	4.06	1.00	4.06
	North of Emerson Junction	282.5	286.5	2	1	43	9,470	2.49	1.37	3.41
I-315	10th Ave South to 14th St Southwest	0	0.3	0	0	13	15,890	0.45	1.00	0.45
	14th St Southwest to Fox Farm	0.3	1.4	0	2	114	25,870	2.41	1.04	2.50
	East of Fox Farm	94.4	95.7	0	0	137	30,890	2.43	1.00	2.43

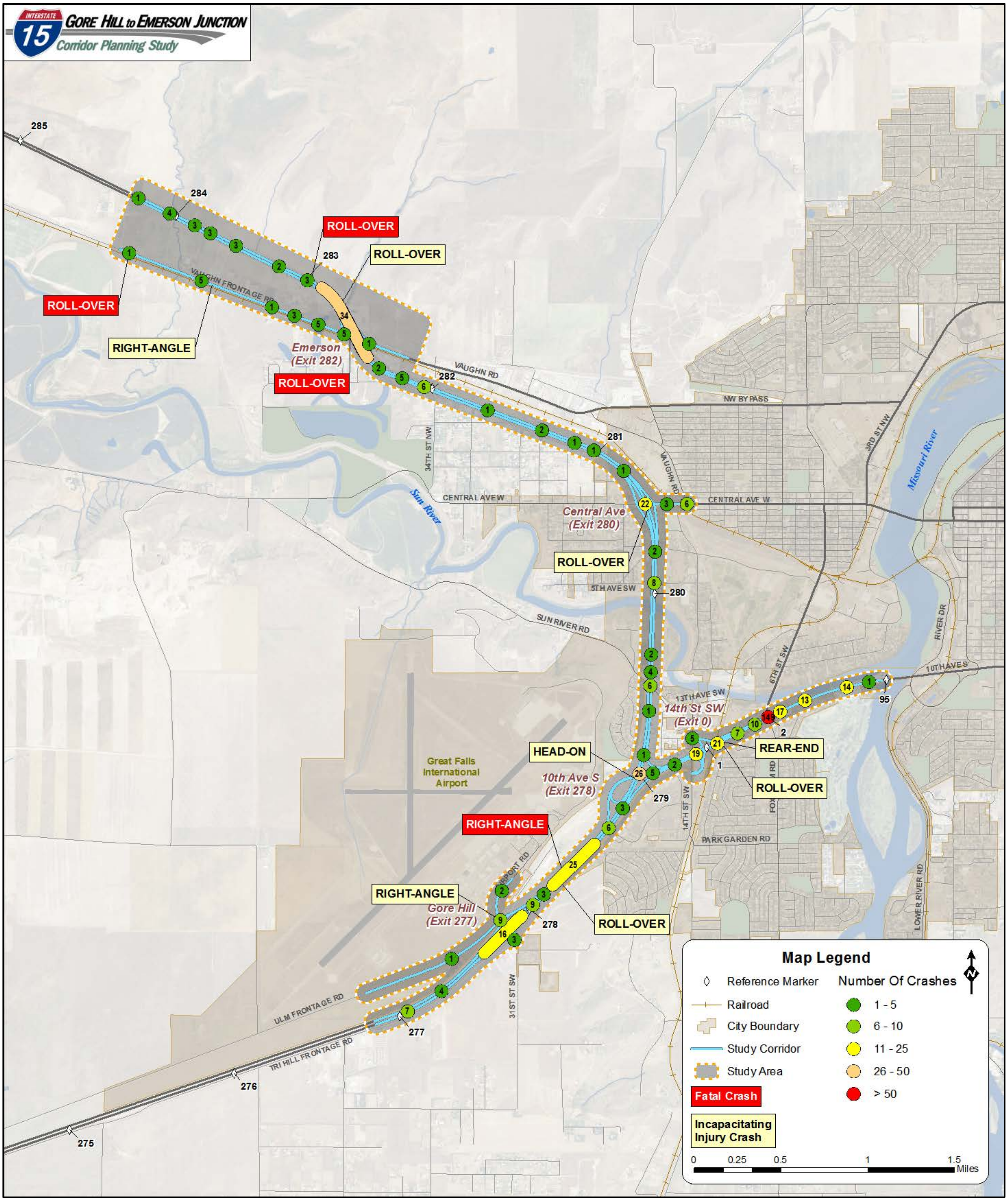


Figure 3.2: Crash Locations

3.4.1 Safety Trends, Contributing Factors, and Crash Clusters

On average, approximately 105 crashes occurred each year during the crash analysis period. Multi-vehicle crashes accounted for nearly 53 percent of crashes, with approximately 62 percent of all crashes occurring in dry conditions. Furthermore, 61 percent of crashes occurred during daylight. Approximately 38 percent of crashes during the analysis period happened when roads were icy, snowy, or wet. The primary contributing factors listed in crashes during the analysis period included careless driving (32 percent of crashes), driving too fast for conditions (21 percent of crashes), disregarding traffic markings/signs/signals (16 percent of crashes), and driving under the influence of alcohol/drugs (14 percent of crashes).

Of the vehicles involved in a crash, 92 percent were passenger vehicles (automobiles, pickups, SUVs, etc.). Records show 15 crashes involving motorcycles, 38 crashes involving heavy trucks with trailers, and 2 crashes involving buses.

The main observed crash trends are rear-end collisions (178) followed by fixed-object collisions (138). Of the fixed-object collisions, 90 of the collisions list contact with guardrails, median barriers, bridge rails, or impact attenuators as the first harmful event. Rear-end collisions are clustered on I-315 and 10th Avenue South. Clusters of fixed-object collisions are present between the Gore Hill and 10th Avenue South Interchanges (11 crashes), I-15 underpass of Sun River Road (7 crashes), I-15 bridge over the Sun River (5 crashes), Central Avenue Interchange (7 crashes), Emerson Junction Interchange (15 crashes), and I-315 from RP 0 to RP 1 (21 crashes).

Approximately 8 percent of reported crashes resulted in rollovers (44 crashes). Two clusters were identified between the Gore Hill and 10th Avenue South Interchanges (7 crashes) and at the Emerson Junction Interchange (10 crashes). Each of the seven rollover crashes between the Gore Hill and the 10th Avenue South Interchanges occurred with dry road conditions.

The road condition was listed as icy or snow-covered in 138 crashes. These crashes appear to be clustered between the Gore Hill and 10th Avenue South Interchanges (12 crashes), I-15 underpass of Sun River Road (6 crashes), Emerson Junction Interchange (19 crashes), and I-315 between 14th Street Southwest Interchange and Fox Farm (60 crashes).

4.0 PROJECTED TRANSPORTATION SYSTEM

Projected transportation conditions were analyzed to estimate how traffic patterns and characteristics may change compared to existing conditions. The analysis was based on known existing conditions and anticipated land development expected to occur out to 2035. The travel demand model developed for the *Great Falls Area LRTP – 2014* was used to determine growth rates for the study area. **Table 4.1** shows the average annual growth rate (AAGR) up to 2035, as defined by the traffic demand model. The AAGR values were applied to known traffic count locations to project 2035 AADT volumes.

Table 4.1: Projected Traffic Volumes

Location		2013 AADT	Traffic Model Projected AAGR [(a)]	2035 Projected AADT
I-15	S of Gore Hill	6,370	0.9%	7,681
I-15	N of Gore Hill	14,670	1.9%	22,358
I-15	N of 10th Ave	10,550	2.1%	16,693
I-15	N of Central Ave	5,950	0.6%	6,804
I-15	N of Emerson	9,090	0.9%	10,998
I-315	W of 14th St SW	15,140	0.8%	17,979
I-315	W of Fox Farm	24,680	0.7%	28,546
31st St SW	S of Interchange	8,360	2.3%	13,678
Airport Dr	N of Interchange	3,640	4.6%	9,887
10th Ave S	Warden Bridge	29,800	0.7%	34,630
Central Ave	E of Interchange	12,514	2.4%	21,270
Central Ave	W of Interchange	7,746	0.1%	7,974
Vaughn Rd	E of Interchange	6,530	1.4%	8,835
Vaughn Rd	W of Interchange	4,555	1.1%	5,762

[(a)] AAGRs were calculated from the traffic model developed for the Great Falls Area LRTP – 2014.

The growth rates from the travel demand model were used to project Interstate mainline peak hour volumes. A LOS analysis was conducted for the Interstate under projected 2035 conditions. **Table 4.2** presents the resulting LOS values for both the AM and PM peak hours. As indicated in the table, all segments along I-15 and I-315 are projected to remain at a LOS B or better under 2035 conditions.

The traffic volumes along the interchange ramps were similarly projected to 2035 using growth rates defined in the travel demand model. The projected LOS of the interchange ramps is presented in **Table 4.3**. All of the interchange ramps are projected to remain within the acceptable bounds of LOS B put forth by MDT.

Table 4.2: Projected Mainline LOS

Location		Direction	AM Peak Hour		PM Peak Hour	
			LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-15	South of Gore Hill	Northbound	**A**	2.6	**A**	2.6
		Southbound	**A**	3.1	**A**	4.0
	North of Gore Hill	Northbound	**A**	7.4	**B**	11.3
		Southbound	**A**	7.2	**A**	9.3
	South of Central Ave	Northbound	**A**	4.8	**A**	7.4
		Southbound	**A**	4.8	**A**	7.2
	North of Central Ave	Northbound	**A**	3.7	**A**	3.4
		Southbound	**A**	2.4	**A**	3.7
	North of Emerson Junction	Northbound	**A**	3.4	**A**	6.5
		Southbound	**A**	6.1	**A**	5.2
I-315	West of 14th St SW	Eastbound	**A**	6.7	**A**	8.9
		Westbound	**A**	6.3	**A**	7.3
	East of 14th St SW	Eastbound	**A**	10.9	**B**	12.5
		Westbound	**A**	6.7	**B**	13.8

Table 4.3: Projected Interchange Ramp LOS

Location		AM Peak Hour		PM Peak Hour	
		LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
Gore Hill	NB On-Ramp	**A**	9.3	**B**	17.5
	NB Off-Ramp	**A**	5.7	**A**	5.6
	SB On-Ramp	**A**	0.3	**A**	1.2
	SB Off-Ramp	**A**	9.1	**B**	11.5
10th Ave S	NB On-Ramp	**A**	8.4	**B**	11.5
	NB Off-Ramp	**A**	5.9	**B**	10.3
	SB On-Ramp	**A**	6.2	**A**	8.3
	SB Off-Ramp	**A**	6.5	**A**	9.7
14th St SW	EB On-Ramp	**B**	16.1	**B**	15.4
	EB Off-Ramp	**A**	6.1	**A**	8.2
	WB On-Ramp	**A**	9.1	**B**	10.1
	WB Off-Ramp	**A**	4.0	**B**	11.4
Central Ave	NB On-Ramp	**A**	0.0	**A**	1.3
	NB Off-Ramp	**A**	0.0	**A**	0.0
	SB On-Ramp	**A**	6.3	**B**	10.1
	SB Off-Ramp	**A**	0.0	**A**	0.0
Emerson Junction	NB On-Ramp	**A**	3.7	**B**	10.3
	SB Off-Ramp	**A**	8.0	**A**	7.0

Intersection volumes were projected to 2035 by applying growth rates along each intersection approach leg as defined by the travel demand model. The projected intersection LOS results are presented in **Table 4.4**. Similar to the existing LOS, many of the poor-performing intersections are two-way, stop-controlled intersections. All intersections on Central Avenue are projected to operate at a LOS of F if no changes are made before 2035. At Gore Hill, all but the southbound on-ramp intersections are expected to operate at a poor LOS. The three signalized intersections are projected to continue operating at levels similar to their current performance.

Table 4.4: Projected Intersection LOS

		AM Peak Hour		PM Peak Hour	
Intersection Name	Control Type	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Tri Hill and Frontage Airport Rd	Two-way stop	27.3	D	43.7	E
I-15 NB and Airport Rd	Two-way stop	44.2	E	[a]	F
I-15 SB On and Airport Rd	Two-way stop	10.4	B	23.5	C
I-15 SB Off and Airport Rd	Two-way stop	121.8	F	3138.9	F
14th St SW and I-315 EB	Signalized	13.3	B	12.4	B
14th St SW and I-315 WB	Signalized	22.2	C	19.6	B
Fox Farm and I-315	Signalized	39.0	D	35.6	D
Central Ave and I-15 SB	Two-way Stop	178.9	F	314.9	F
Central Ave and I-15 NB	Two-way Stop	113.1	F	445.2	F
Central Ave and Vaughn Rd	Two-way Stop	406.0	F	1422.7	F
Vaughn Rd and I-15 SB	Two-way Stop	11.0	B	11.0	B
Vaughn Rd and I-15 NB	Two-way Stop	7.3	A	7.4	A

[a] Outside the bounds of the software.

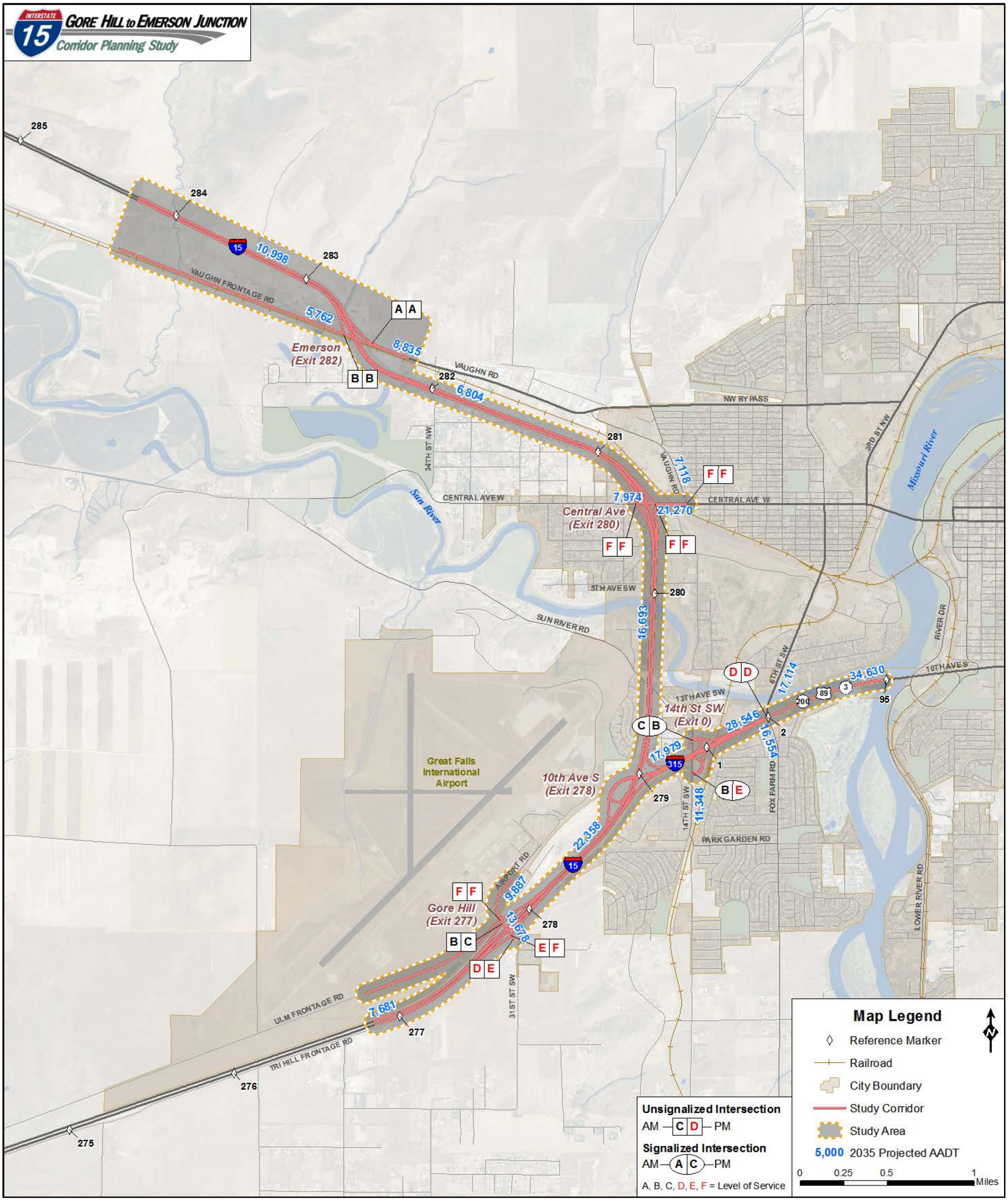


Figure 4.1: Projected Traffic Conditions

5.0 ENVIRONMENTAL SETTING

This section provides a summary of the *Environmental Scan* developed by MDT.[9] The primary objective of the *Environmental Scan* is to determine potential constraints and opportunities within the study area. As a planning-level scan, the information is obtained from various publicly available reports, websites, and other documentation, as well as a "windshield survey" conducted by MDT staff. This scan is not a detailed environmental investigation. Refer to the MDT *Environmental Scan* for more detailed information.

5.1 Physical Environment

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

5.1.1 Soil Resources and Prime Farmland

Information obtained on soils is used to determine the presence of prime and unique farmland in the study area to demonstrate compliance with the Farmland Protection Policy Act. Farmland includes prime farmland, some prime if irrigated farmland, unique farmland, and farmland (other than prime or unique farmland) that is of statewide or local importance. Prime farmland soils are those that have the best combination of physical and chemical characteristics for producing food, feed, and forage; the area must also be available for these uses. Prime farmland can be either non-irrigated or lands that would be considered prime if irrigated. Farmland of statewide importance is defined as follows: land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops.

Soil surveys of the study area are available from the U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS). NRCS indicates that prime if irrigated farmlands and farmlands of statewide importance are present in this corridor. Land from approximately RP 278.8 to 279.0 and 280.5 to 284.3 is considered prime if irrigated farmland. The approximate location of farmlands of statewide importance is from RP 266.8 to 278.0, 279.5 to 280.5, and 282.5 to 284.3.

If a federally funded improvement option forwarded from the study will require acquisition of lands from these areas, MDT will have to complete a CPA-106 Farmland Conversion Impact Rating Form for Linear Projects and coordinate with NRCS. NRCS will use information from that form to keep an inventory of the prime and important farmlands within the state. Some areas designated as prime farmland have previously been developed. Previously developed land designated as prime farmland is no longer subject to the Farmland Protection Policy Act and should not be an impact to future improvement options.

5.1.2 Geologic Resources

Information on the geology and seismicity in the area of the corridor study was obtained from several published sources. Geologic mapping was reviewed for rock types, the presence of unconsolidated material, and fault lines. The seismicity and potential seismic hazards were also reviewed. This geologic information can help determine potential design and construction issues related to embankments and road design.

[9] MDT Environmental, *I-15 Gore Hill to Emerson Junction Corridor Study – Environmental Scan*, August 2014

Hillside slopes between the uplands and valley floor appear to be marginally stable at a maximum approximate slope of 2H:1V. There are numerous visible signs of instability, but most are relatively small and presently inactive. MDT exerted considerable effort stabilizing the cuts through Gore Hill in the 1980s; several landslides required regrading, and a substantial network of pipes and drains was installed. Appropriate cut slope and drainage design will minimize the risk of destabilizing these hillside slopes again.

Settlement of embankment fills on valley floor deposits poses some risk through the proposed corridor. This risk may be mitigated by using a combination of methods, which include preloading embankments, lowering fill heights, and using wick drains to speed settlement.

Improvements brought forward from the study will be subject to a more detailed analysis of the above-mentioned geotechnical risk factors. Part of this detailed analysis may involve taking advance borings to evaluate soil characteristics at exact project locations. This is standard procedure for most MDT road projects. The design of any improvements should consider specific requirements that come from the detailed analysis.

5.1.3 Surface Waters

Maps and GIS data were reviewed to identify the location of surface water bodies within the study area, including rivers, streams, lakes, or reservoirs. The Sun River is the main surface water in the corridor. Additionally, various surface waters, including streams, natural drainages, and wetlands, are also present in the area, but in small numbers. Impacts on these surface waters may occur from project improvements such as culverts under the roadway or rip rap armoring of banks. Effects on those water bodies will have to be identified and coordinated with applicable agencies during any future project design.

Much of the study area is also located within the Great Falls Municipal Separate Storm Sewer System (MS4) area. Under the Small MS4 General Permit, new development or redevelopment projects greater than or equal to 1 acre must implement, when practicable, low-impact development (LID) practices that infiltrate, evapo-transpire, or capture for reuse the runoff generated from the first half-inch of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation. MS4 issues, including potential applicability of LID requirements, will have to be further evaluated during any future project design.

Total Maximum Daily Load Information

Section 303, subsection d (303d) of the Clean Water Act requires the state of Montana to develop a list, subject to U.S. Environmental Protection Agency (EPA) approval, of water bodies that do not meet water quality standards. When water quality fails to meet state standards, the Montana Department of Environmental Quality (DEQ) determines the causes and sources of pollutants in a subbasin assessment and sets maximum pollutant levels, called total maximum daily load (TMDL).

A TMDL sets maximum pollutant levels in a watershed. The TMDLs become the basis for implementation plans to restore the water quality to a level that supports its designated beneficial uses. The implementation plans identify and describe pollutant controls and management measures (such as best management practices), the mechanisms by which the selected measures are to be put into action, and the individuals and entities responsible for implementation projects.

The study corridor travels through the Sun River Watershed. The Sun River crosses I-15 under a bridge within the study area and runs parallel to, and north of, 10th Avenue South on the eastern edge of the corridor. In this segment of the Sun River, bank erosion and channel alterations decrease the quality of the instream habitat. Water coming from Muddy Creek upstream of the corridor augments flows in the

Sun River during the irrigation season; the Muddy Creek water is high in nutrients and suspended sediments.

According to a 2014 DEQ report, the Sun River fully supports the beneficial use of drinking water. The creek does not support aquatic life (cold-water fishery and warm water fishery) use based on numerous reports indicating severe impairment. Macroinvertebrate and periphyton sampling results indicate moderate to severe impairment. Aquatic life habitat is severely impaired due to siltation, flow alteration, bank erosion, and habitat degradation. Aquatic life chemistry is severely impaired due to high nutrient concentrations, turbidity, and temperatures. Agricultural uses are severely impaired due to relatively high total dissolved solids that decrease suitability for irrigation. The lack of support for recreation use is due to high amounts of nutrients that increase the risk of nuisance algal blooms.

The 2014 Integrated 303(d)/305(b) Water Quality Report for Montana by DEQ lists the Sun River watershed as impaired. The water bodies within the Sun River watershed that are located in the study area are Category 4A. Category 4A water bodies are waters where one or more applicable beneficial uses are impaired, threatened, or not supported, and a TMDL has been completed and approved to address the factors causing the impairment or threat. Any construction practices will have to comply with the requirements set forth in the TMDL plan.

Wild and Scenic Rivers

The Wild and Scenic Rivers Act Congress created in 1968 provided for the protection of certain selected rivers, as well as their immediate environments, that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. At this time, neither the Sun River, nor any of its tributaries, carries the wild and scenic designation. The Missouri River at the east terminus of the corridor study also does not carry the wild and scenic designation.

5.1.4 Groundwater

There are currently 6,105 wells on record in Cascade County; some of these wells exist within the study area. There are three State Monitoring Network wells and 28 public water supply wells in Cascade County. The wells in Cascade County have many different uses, the most common being domestic use. The typical setback for a public water supply well is a 100-foot isolation zone in which no source of pollutant should be inside, making a public well an item of avoidance. If either a private or public well is to be impacted, standard right-of-way procedures would need to be followed. Impacts on existing wells should be considered if a project is forwarded from this study.

5.1.5 Wetlands

The U.S. Army Corps of Engineers (COE) defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Formal wetland delineations according to standard COE- and MDT-defined procedures will have to be conducted during the project development process. Additionally, impacts on wetlands will have to be avoided and minimized to the greatest extent possible through conscientious project design. Documentation of avoidance and minimization measures will have to be included in the project development. Unavoidable wetland impacts will have to be mitigated in accordance with COE regulations and Executive Order 11990: Protection of Wetlands. During any project development process, evaluation of potential stream impacts according to COE's May 2013 Stream Mitigation Procedure (or revised version) will be necessary.

5.1.6 Floodplains and Floodways

Executive Order 11988, Floodplain Management, requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, "each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities" for the following actions:

- Acquiring, managing, and disposing of federal lands and facilities
- Providing federally undertaken, financed, or assisted construction and improvements
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities

Federal-Aid Policy Guide, 23 CFR 650, Bridges, Structures, and Hydraulics, provides "policies and procedures for the location and hydraulic design of highway encroachments on flood plains, including direct Federal highway projects administered by the FHWA." This document defines the "Base Flood" as the "flood or tide having a 1 percent chance of being exceeded in any given year" and the "Base Flood Plain" as the "area subject to flooding by the base flood."

Federal Emergency Management Agency Issued Flood Maps for Cascade County indicate that the Zone AE 100-Year Flood with base flood elevations exists along only two small portions of the study area. The remainder of the study area is Zone X, which is the 500-Year Flood, or is not within a floodplain at all. Forwarding of improvement options from the study that result in the placement of fill within the regulatory floodplain will require identifying and evaluating impacts on the floodplains. Project development could require coordination with Cascade County and the City of Great Falls to minimize floodplain impacts and obtain necessary floodplain permits for project construction.

5.1.7 Irrigation

Irrigated grazing land exists within the study area. Depending on the improvement option(s) proposed, there is a potential to impact irrigation facilities. Project development may require redesigning, modifying existing, and/or constructing new irrigation canals, ditches, or pressurized systems in consultation with the owners to minimize impacts on agricultural operations. Additional expenses may occur if impacts on irrigation facilities will occur based on study findings.

5.1.8 Air Quality

EPA designates communities that do not meet National Ambient Air Quality Standards (NAAQS) as "non-attainment areas." States are then required to develop plans to control source emissions and ensure future attainment of NAAQS. Great Falls was designated non-attainment for carbon monoxide (CO) in 1980, and eventually the limits of the non-attainment area were mapped as the 10th Avenue South Corridor. In 2002, Great Falls received designation to attainment status for carbon monoxide. Great Falls is now under a December 2000 Carbon Monoxide Limited Maintenance Plan (CO LMP). The Montana DEQ submitted an updated Great Falls CO LMP in 2011, and revisions to the State Implementation Plan that would include some alternative CO monitoring strategies were laid out in the 2011 LMP. However, until EPA acts on these submittals, the December 2000 CO LMP is the controlling document for current air quality conformity determinations. The former non-attainment area is not located within the study area, so no further transportation conformity analysis will be necessary.

Depending on the scope of the project under consideration along this corridor, an evaluation of mobile source air toxics (MSATs) may be required. MSATs are compounds emitted from highway vehicles and off-road equipment that are known or suspected to cause cancer or other serious health and environmental effects. The expectation that special air-quality design considerations will be required is low when considering future project design.

5.1.9 Hazardous Substances

The Natural Resource Information System database was searched for underground storage tank (UST) sites, leaking underground storage tank (LUST) sites, abandoned mine sites, remediation response sites, landfills, National Priority List sites, hazardous waste, crude oil pipelines, and toxic release inventory sites within the study area.

USTs and LUSTs

There is a cluster of UST and LUST sites at the Airport Interchange and numerous tank sites along Terminal Drive with facilities associated with the airport. None of these sites is likely to result in added cost or resources to any project that is forwarded from the study, however.

There is one unresolved LUST site near 34th St Southwest, referred to as the Ruth Graham Property, and two other LUST sites along the Northwest Bypass both east and west of 34th St Northwest. Both of those sites are also currently unresolved. One is the Yellowstone Truck Stop, and the other is N&H Transportation. Construction near these leaking tank sites may result in handling and disposal of contaminated soils, which will increase costs.

Water Quality Act/State Superfund Sites (Comprehensive Environmental Cleanup and Responsibility Act)

There are four Water Quality Act (WQA) or State Superfund Sites listed in DEQ's on-line database; only one of the four is active. The active site, Western by Products, is located near the north end of the study area between I-15 and Vaughn Road. Information available for this site indicates that it is currently an "Active" site; however, a No Further Action status was issued in 1984. If a project encroaches onto this facility, there may be additional costs associated with contaminated soil and groundwater. Efforts should be made to avoid impacts on this site if possible as it is still listed on the WQA Ranking list.

5.2 Biological Environment

The following information applies to natural resources 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.

5.2.1 Mammals

Wildlife species inhabiting or traversing the project study area are typical of those that occur in developed and disturbed areas of central Montana. Most species habituate to disturbed areas and, as a result, are predominately generalist species.

Common mammals occupying habitats in, traversing, or having a distribution range that overlaps the study area are white-tail deer, mule deer, and coyote. Other common mammals potentially occurring in the project area include, but are not limited to, porcupine, raccoon, striped skunk, badger, bobcat, red fox, muskrat, Richardson's ground squirrel, deer mouse, and meadow vole.

A review of the MDT Maintenance Animal Incident Database for from January 2004 through December 2013 shows 39 records of animal carcasses within the study area. With the exception of only a few other animals, white-tail deer and mule deer account for most of the recorded wildlife mortality within the study area. One elk, one pronghorn antelope, one mountain lion, and two coyotes comprise the other records. The majority of the carcass pickups were located around the bridge over the Sun River and to the north, from RP 279.5 to RP 284.

5.2.2 Birds

Trees or structures that will be impacted by any project resulting from this corridor study should be removed outside of the nesting season (typical nesting season is from April 15 to August 15) or when active nests are not present. Any projects forwarded from this study will have to include consideration of potential constraints that may result from nesting times of migratory birds.

No bald eagle or golden eagle nests were identified within one-half mile of the study area. Review of the corridor for eagle nests will have to occur during project design and before construction to verify that no new nests are present.

5.2.3 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) maintains the federal list of threatened and endangered species. Species on this list receive protection under the Endangered Species Act. An "endangered" species is one that is in danger of extinction throughout all or a significant portion of its range. A "threatened" species is one that is likely to become endangered in the foreseeable future. USFWS also maintains a list of species that are candidates or proposed for possible addition to the federal list. According to USFWS, five threatened, endangered, or candidate species are listed as occurring in Cascade County (see **Table 5.1**).

Table 5.1: Threatened and Endangered Species in Cascade County

Common Name	Status
Canada Lynx	Threatened
Red Knot	Proposed
Wolverine	Proposed*
Sprague's Pipit	Candidate
Whitebark Pine	Candidate

**Note that the wolverine has since been removed as a proposed threatened and endangered species.*

The Montana Natural Heritage Program - Natural Heritage Map Viewer (report generated May 15, 2014) database records and maps documents observations of species in a known location. According to the database (report generated May 15, 2014), there are no records of any threatened, endangered, proposed, or candidate species within the boundaries of the corridor study.

As the federal status of protected species changes over time, reevaluation of the listing status and a review for the potential occurrence of these species in the project area should take place before issuing a determination of effect relative to potential project impacts. If a project moves forward from this study, completion of an evaluation of potential effects on any of the species listed above has to occur during the project development process.

5.2.4 Species of Concern

Montana Species of Concern (SOCs) are native animals breeding in the state that are considered to be at risk due to declining population trends, threats to their habitats, and/or restricted distribution. Designation of a species as an SOC is not a statutory or regulatory classification. Instead, these designations provide a basis for resource managers and decision-makers to direct limited resources to priority data collection needs and to address conservation needs proactively.

According to the Montana Natural Heritage Program - Natural Heritage Map Viewer (report generated May 15, 2014) database, which records and maps documented observations of SOCs in a known location, there is one historic record of many-headed sedge within the study area. This record is from 1891, and there is no expectation for this species to occur within the study area due to development of Great Falls since 1891.

Conducting a reevaluation for the presence of SOCs is important during the project design phase. If present, developers should consider adding special conditions to the project design and/or construction documents to avoid or minimize impacts to these species.

5.2.5 Vegetation

According to the Montana National Heritage Program Landcover Report, the dominate land cover near the study area is developed land consisting of major roads, including the Interstate, residential, and commercial land. Outside the developed land in the city of Great Falls are some cultivated crops, including hay land south of the Gore Hill Interchange and north of the Emerson Junction, as well as a minor amount of grassland, wetlands, and riparian habitat near the Sun River crossing. All land types in the project area are disturbed to some extent. If forwarding a project from the study, following practices outlined in Standard Specification 201 and any related supplemental specifications will help minimize adverse impacts on vegetation.

5.2.6 Fisheries Information

Montana Fish, Wildlife, and Parks (FWP) listed the Sun River as a substantial fishery resource value and manages the Sun River as a trout water. I-15 crosses the Sun River within the study area. According to the Montana Fisheries Information System (MFISH) database (report generated May 15, 2014), fish species commonly occurring within the Sun River within the study area are as follows:

- Brown trout
- Longnose sucker
- Longnose dace
- Stonecat
- Walleye
- White sucker

Rare fish species within the study area include the following:

- Mottled sculpin
- Rainbow trout
- Mountain whitefish

- Burbot
- Common carp
- Flathead chub
- Northern pike

FWP listed the Missouri River as a substantial fishery resource value and manages the Missouri River as a non-trout water. 10th Avenue South crosses the Missouri River at the east terminus of the study area.

Forwarding any projects that affect the Sun River or Missouri River will likely require incorporation of design measures to facilitate aquatic species passage. Notification to FWP is necessary for impacts on the Sun River aquatic resources.

5.2.7 Noxious Weeds

Noxious weeds can degrade native vegetative communities, choke streams, compete with native plants, create fire hazards, degrade agricultural and recreational lands, and pose threats to the viability of livestock, humans, and wildlife. Areas with a history of disturbance, like highway rights-of-way, are at particular risk of weed encroachment. The Invaders Database System lists 28 exotic plant species and 10 noxious weed species documented in Cascade County, some of which may be present within the study area.

Seeding disturbed areas with desirable plant species will reduce the spread and establishment of noxious weeds and allow reestablishing permanent vegetation. If forwarding a project from the study, field surveys for noxious weeds should begin before any ground disturbance.

5.2.8 Crucial Areas Planning System

The Crucial Areas Planning System (CAPS) is a resource intended to provide useful and non-regulatory information during the early planning stages of development projects, conservation opportunities, and environmental review. The finest data resolution within CAPS is at the square-mile section scale or water body. Use of these data layers at a more localized scale is not appropriate and may lead to inaccurate interpretations since the classification may or may not apply to the entire square-mile section. This scale is too broad for use during MDT's assessment of potential impacts at the project level. The CAPS system provides a general overview of the study area. CAPS results are presented in the *Environmental Scan*.

CAPS provides general recommendations and recommendations specific to transportation projects for both terrestrial and aquatic species and habitat. These recommendations of the CAPS system can have a generic application to possible project locations moving forward from the study. Coordination with the FWP wildlife biologist should occur during project development.

5.3 Social and Cultural Environment

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

5.3.1 Demographic and Economic Conditions

Under the National and Montana Environmental Policy Acts and associated implementing regulations, state and federal agencies must assess potential social and economic impacts resulting from proposed actions. FHWA guidelines recommend consideration of impacts on neighborhoods and community cohesion, social groups including minority populations, and local and/or regional economies, as well as growth and development induced by transportation improvements. **Section 2.0** presents demographic and economic information to assist in identifying human populations that improvements may affect within the study area.

Title VI of the U.S. Civil Rights Act of 1964, as amended (USC 2000(d)) and Executive Order 12898 require that no minority, or, by extension, low-income person shall be disproportionately adversely impacted by any project receiving federal funds. For transportation projects, this means that no particular minority or low-income person may be disproportionately isolated, displaced, or otherwise subjected to adverse effects. If forwarding a project from the improvement option(s) occurs, an Environmental Justice evaluation will have to occur during the project development process.

5.3.2 Land Ownership and Land Use

Ownership of the land within the study area is a mix of private and public. MDT and State Trust are the only holders of public land within the corridor. Most of the public land is in the form of right-of-way or state parklands. Most of the land in the study area is either residential rural and/or urban. The other land uses within the corridor are commercial, industrial, agricultural, and recreational.

Additional research and coordination will be required to ascertain the specific encumbrances associated with particular parcels of land. Any projects that move forward from this study will have to consider adjacent land use.

5.3.3 Recreational Resources

The intent of Section 4(f) is to protect publically owned parks, recreation areas, wildlife and waterfowl refuges, and public and private historic sites of local, state, and national significance. Transportation projects using federal funds cannot use properties that are protected by Section 4(f) unless there are no feasible and prudent avoidance alternatives and all possible planning to minimize harm has occurred.

Various recreational resources exist within and near the study area. A green belt on the northeast corner of 10^{th} Avenue South and 6^{th} St SW, owned by MDT, is not protected under Section 4(f) per 23CFR774.13(H)(2014). According to the Montana FWP resources list, there are two state-owned parks inside the study area, Westside Viaduct Park and West Hill Park. Currently the only development on either of these two parks is a lift station in West Hill Park. The remainder of this parkland is undeveloped and not currently available for public use. There is also one City of Great Falls park located, Community Hill Park, within the study area. The Community Hill Park is currently being used as a community garden / orchard that has standard access hours, outside of which it is locked preventing access by the public.

If a project is forwarded that may impact these parks, a reevaluation should take place to determine what the parks availability for use by the public is at that time. If these parks become available for full time public use in the future, additional investigation and coordination with the officials having jurisdiction over the parks will be necessary to determine whether the parks are “significant” and protected by Section 4(f) of the U.S. Department of Transportation Act.

Section 6(f) of the National Land and Water Conservation Fund Act is another federal measure intended to preserve, develop, and assure the quality and quantity of outdoor recreation resources. Section 6(f) protection applies to all projects that impact recreational lands purchased or improved with land and water conservation funds. At this time, there are no Section 6(f) resources identified in the study area. If a project were to be developed outside of the study area, reevaluation of 6(f) resources would have to occur, as they exist close to the study area limits. Avoiding impacts on 6(f) resources is a priority. Approval for a 6(f) use is a lengthy process involving rigorous mitigation requirements and approvals from several resource agencies.

5.3.4 Cultural Resources

If a project is federally funded, MDT will conduct a cultural resource survey of the area of potential effect for this project, as specified in Section 106 of the National Historic Preservation Act (36 CFR 800). Section 106 requires federal agencies to “take into account the effects of their undertakings on historic properties.” The purpose of the Section 106 process is to identify historic and archaeological properties that could be affected by the undertaking, assess the effects of the project, and investigate methods to avoid, minimize, or mitigate any adverse effects on historic properties. Special protections for these properties are also afforded under Section 4(f) of the Transportation Act.

A file search of the study area through the Montana State Historic Preservation Office revealed one historic property located within 0.15 mile of the existing alignment, the Missouri River/Warden Bridge. In addition, five National Registry of Historic Places (NRHP) listed historic districts and properties are located within a mile of the study corridor, but are outside the study area (see **Table 5.2**). An examination of the Montana Cadastral Survey information indicates that at least 33 historic age properties are located within 0.2 mile of the existing corridor. The study area contains many cultural resources, all of which consist of historic sites. Cultural resources will not likely be a substantial issue, but the issue is important to address as planning progresses.

Table 5.2: Historic Properties

Site	Site No.	NRHP Eligibility
Missouri River/Warden Bridge	24CA0401	Listed
Cascade County Courthouse	24CA0233	Listed
Great Falls Central Business District	24CA0977	Listed
C.M. & St. P. Passenger Depot	24CA0271	Listed
Great Falls Railroad Historic District	24CA0335	Listed
Great Falls West Bank Historic District	24CA1527	Listed

If a project is forwarded from the study, a cultural resource survey for unrecorded historic, pre-historic, and archaeological properties within the area of potential effect will be completed during the project development process. Flexibility in design will be important to avoid and/or minimize impacts on historically significant sites.

5.3.5 Noise

Traffic noise may have to be evaluated for planned improvements to the study corridor. Noise analysis is necessary for “Type I” projects. If the roadway improvements are limited (e.g., the horizontal and vertical alignments are not changed, and the highway remains a two-lane facility), then the project would not be considered a Type I project.

If the improvements planned for the road would include a substantial shift in the horizontal or vertical alignments, increasing the number of through-lanes, passing lanes, or turning lanes, or increasing the traffic speed and volume, then the project would be considered a Type I project, which would require a detailed noise analysis. The analysis would include measuring ambient noise levels at selected receivers and modeling design-year noise levels using projected traffic volumes.

Noise abatement measures would be considered for the project if noise levels would approach or substantially exceed the noise abatement criteria. The noise abatement measures must be considered reasonable and feasible before implementation. If noise abatement measures were deemed necessary, they could increase costs of proposed future Type I roadway improvements.

5.3.6 Visual Resources

The visual resources of an area include landforms, vegetation, water features, and physical modifications caused by human activities that give the landscape its visual character and aesthetic qualities. Visual resources are typically assessed based on the landscape character (what is seen), visual sensitivity (human preferences and values regarding what is seen), scenic integrity (degree of intactness and wholeness in landscape character), and landscape visibility (relative distance of seen areas) of a geographically defined view shed. The study area is a blended landscape that has been developed with islands of natural beauty persevering. An evaluation of the potential effects on visual resources may be necessary, depending on the improvement options forwarded from this study.

6.0 AREAS OF CONCERN AND CONSIDERATION SUMMARY

This section provides a list and description of areas of concern and consideration within the study area. 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. **Figure 6.1** provides a graphical summary of the areas of concern.

6.1 Transportation System

Bridges

- Bridges along the Interstate within the study area have surface widths that do not meet current standards.

Operations

- The Interstate System is considered a Level I winter maintenance level.
- Snow fence and VMS are currently used to address vehicle operations related to adverse weather conditions.

Pavement Condition

- A segment of I-15 currently has poor surfacing conditions. A resurfacing project is planned for this location in 2017.
- I-315 had poor to fair surfacing conditions.

Railroad

- The Interstate crosses over the railroad at two locations within the study area.

Air Service

- The Great Falls International Airport is adjacent to the study area and is accessed primarily by the Gore Hill Interchange.

Mainline Interstate

- One location on I-15 has a vertical grade that does not meet current standards.
- Two vertical curves on I-15 do not meet current standards.
- One horizontal curve on I-15 and one horizontal curve on I-315 do not meet current standards.

Interchanges

- Seven of eight interchange on-ramps do not appear to meet current standards for acceleration length.
- Three of seven interchange off-ramps do not appear to meet current standards for deceleration length.

- Spacing between the 10th Avenue South and 14th Street SW Interchanges does not appear to meet current standards.
- Emerson Junction is a partial interchange and does not support full vehicle movements.

Intersections

- Six of the twelve intersections evaluated have a LOS of D or worse during one or both peak hours.

Safety

- Four fatal crashes and eight incapacitating injury crashes occurred during the five-year analysis period.
- A trend of fixed-object collisions was noted occurring along the Interstate.

6.2 Environmental Considerations

Physical Environment

- Areas of prime farmland if irrigated and farmlands of statewide importance exist within the study area.
- There are signs of instability and past landslides near the Gore Hill area.
- Much of the study area is located within the Great Falls MS4 area.
- I-15 crosses over the Sun River.

Biological Environment

- Thirty-nine animal carcasses were recorded over the past ten years.
- Five threatened, endangered, or candidate species are listed within Cascade County.
- Seven rare fish species are listed within the study area.
- Twenty-eight exotic plant species and ten noxious weed species are documented within Cascade County.

Social and Cultural Environment

- Two 4(f) resources are located within the study area.
- The Missouri River/Warden Bridge is listed as a historic property.

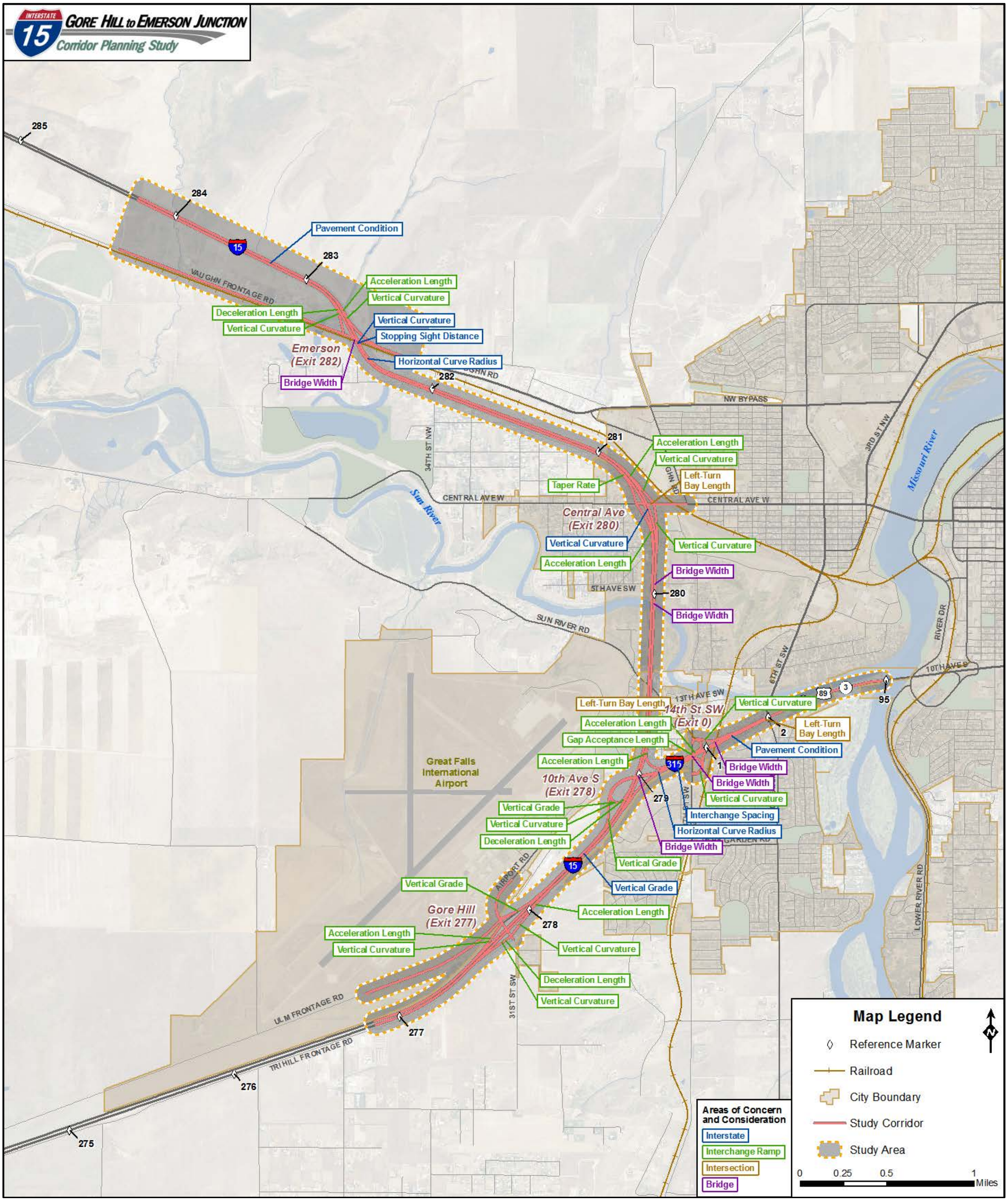
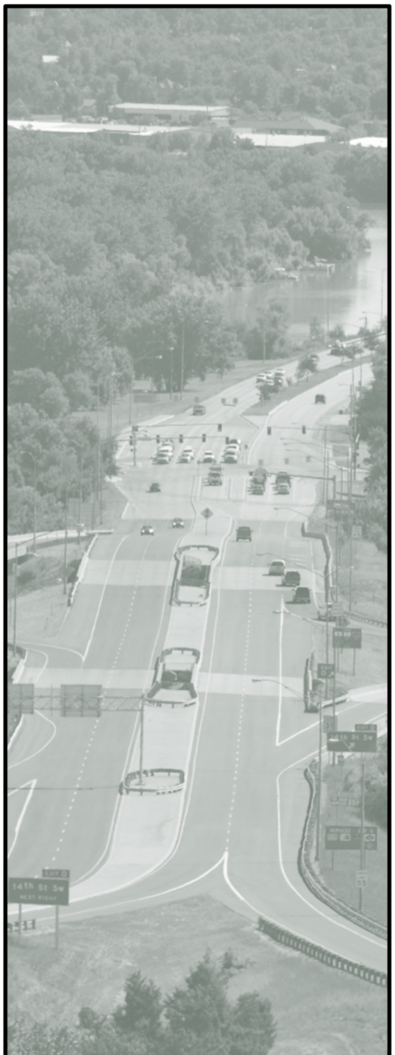


Figure 6.1: Areas of Concern and Consideration



Gore Hill to Emerson Junction Corridor Planning Study

APPENDIX A

Bridge Inspection Reports

Form: bms001d
Printing Date : Thursday, May 22 2014

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09761

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**
County Code, Location : **013 CASCADE**
Kind fo Hwy Code, Description : **1 1 Interstate Hwy**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **SUN RIVER**
Structure on the State Highway System : **X**
Structure on the National Highway System : **X**
Str Meet or Exceed NBIS Bridge Length : **X**
Latitude : **47°29'58"**
Longitude : **111°20'34"**

MDT Maintenance Section : **31-01 Great Falls**
Division Code, Location : **31 GREAT FALLS**
City Code, Location : **32800 GREAT FALLS**
Signed Route Number : **00015**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **450.57 km 279.97**

Construction Data

Construction Project Number : **I 15-5(22)273**
Construction Station Number : **589+50.00**
Construction Drawing Number : **6903**
Construction Year : **1966**
Reconstruction Year :

Traffic Data

Current ADT : **9,150** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**33.5 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**58.32**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **147.83 m**
Deck Area : **1,442.00 m sq**
Deck Roadway Width : **8.53 m**
Approach Roadway Width : **11.28 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **N Feature not hwy or RR**
Vertical Clearance Under the Structure : **0.00 m**
Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**
Minimum Lateral Under Clearance Right : **0.00 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **5**
Material Type Code, Description : **5 Prestressed concrete**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **3 Latex Concrete or similar additive**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

(52) Out-to-Out Width : **9.75 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **15°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure I-15 NB	I00015	N/A			North	99.99 m	8.53 m

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09761

Continue

Inspection Data

Sufficiency Rating : **78.5**
Structure Status : **Func Obs - Elg Rehab**

Inspection Due Date : 19 December 2014
(91) Inspection Frequency (months) : **24**

Next Under Water Insp : **15 Nov 2016**
Under Water Insp Type : **Type II**

NBI Inspection Data

(90) Date of Last Inspection : 19 December 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	3	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	6	(36B) Transition Rating :	1	(61) Channel Rating :	6
(60) Substructure Rating :	6	(69) Under Clearance :	N	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	7	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	5

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 1.00 in

Inspection Hours

Crew Hours for inspection :	2
Helper Hours :	0
Special Crew Hours :	0
Special Equipment Hours :	0
Snooper Required :	N
Snooper Hours for inspection :	0
Flagger Hours :	0

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States

Late Reason:
Inspection Date: 12/19/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09761

Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 22 - P Conc Deck/Rigid Ov										
	1	3	1441	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Random, tight cracks in all of the Spans. Minor studded tire wear in the wheel paths. UZGZ

12/27/2010 - 9.75 * 147.83 = 1441.34 Deck had 1" milled off and then placed 2" of silica fume concrete in 2010. Deck looks Good today. Some cracking near Abutment 1 that were sealed during construction. ZBDZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	739	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Good condition. Spall is unchanged in Span 5 and no new hits were observed. UZGZ

12/27/2010 - Good condition. Small spall on the Right girder in Span 5 has not changed. ZBDZ

12/02/2008 - Good Condition. Same on the Right most girder in Span 5. DZGZ

11/02/2006 - Right girder in Span 5 has been hit by overheight equipment and caused a small spalled area. No cracking or visible strands in this area. CKDP

10/18/2002 - 147.83 * 5 = 739.15m No change. VZJZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 210 - R/Conc Pier Wall Piers 2 thru 5										
	1	3	41	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Some tight vertical cracking. Small spalls along the backside of the ice breakers. Small delamination on the face of Pier 4 near the waterline. Some surface scale on the Pierwalls near the waterline. UZGZ

12/27/2010 - Tight mapping cracks in the Pierwall faces. Some small spalls along the ice breakers. Some small delaminated areas observed during last snooper inspection in the worst cracked areas.
There are no additional comments from the underwater inspection by Infrastructure Engineers on 11/15/2011. CRH ZBDZ

12/02/2008 - Small spalls, Condition State 2, and some small delaminations, Condition State 3. DZGZ

11/02/2006 - Minor concrete spall at the waterline near the Pier noses. Several areas of tight mapping cracks in all (4) Pier walls. Ice breakers painted this past summer.
Per Infrastructure Engineers August 22, 2006 underwater inspection, the substructure units are in good condition. There are no significant structural defects below the high waterline. There are vertical cracks up to 1/16" wide with light efflorescence on both the north face and south face of pier 3 starting at the waterline and extending up 10 feet. CKDP

10/18/2002 - 10.14 * 4 = 40.56m Same as snooper inspection of 05-29-2001. VZJZ

04/13/1998 - Snooper Inspection of 5-29-2001: Some minor section loss at the water line from debris and ice. Some drift at the nose of the pier shafts. Ice breakers could be painted. RHGY

02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09761

Continue

* * * * * * * * * * Span : **Main-0 -** **(cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 6										
	1	1	27	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Left corner of Abutment 6 is delaminated. Small spalls at the backwall to cap area. UZGZ

12/27/2010 - Delaminations on Left end of Abutment 6's cap. A couple of small surface spalls in the backwalls near girder embedments. Tight shrinkage cracks in both backwalls. ZBDZ

12/02/2008 - Abutment 6 has a small delminaiton on the Left end of the cap; Condition State 3. Tight cracks in both backwalls; Condition State 2. None are a problem. DZGZ

11/02/2006 - Minor and tight cracks in both Abutments. Both backwalls have a couple of small spalls near the bearings where girder are embedded. CKDP

10/18/2002 - (10.14 * 2) (4 * 17.75) = 27.28m ok VZJZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Piers 2 thru 5										
	1	1	41	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Small delamination on the Right end and Span 4 side of Pier 5's cap. Small spalls in random areas along the edges of the caps; none are a problem. Bird debris on tops of the caps. UZGZ

12/27/2010 - Small delamination on the Span 4 side of Bent 5's cap. Some minor spalls. Bird debris on the caps. ZBDZ

12/02/2008 - Small spalls and some cracks; Condition State 2. A couple of small delaminations; Condition State 3. DZGZ

11/02/2006 - Staining from past leaking joints. Some small areas where there is shallow and rusty tie wire which is causing some small surface spalling. CKDP

10/18/2002 - Change Env. State to a "1" as the leaky joints have been removed. Rest is the same as last several reports. VZJZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 303 - Assembly Joint/Seal Pier 2 and 5 - New in 2010										
	1	3	20	m.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Sanding material is packed in the joint glands. Steel sound solid when tapped on. UZGZ

12/27/2010 - All of the steel looks Good. Ends of the joints area at the curb shows sloppy workmanship pathces. ZBDZ

12/02/2008 - Steel sounds solid when tapped on. Some small spalls along the stell. Gland is full of sanding material. No leakage observed. DZGZ

11/02/2006 - Joint area is packed full of sanding material. Some spalling along the joint steel. Steel sounds soild when tapped on. No leaking is apparent from either joint. CKDP

10/18/2002 - 10.14 * 2 = 20.28m Replaced all (4) sliding plates with 303's. Full of sanding material. VZJZ

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09761

Continue

********** Span : **Main-0 - (cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 311 - Moveable Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	25	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Alignment is ok. Spot rust, paint loss, and faded paint. UZGZ
12/27/2010 - Spot rust, paint loss, and bird debris. ZBDZ
12/02/2008 - Some spot rust and bird debris. DZGZ
11/02/2006 - Blown off and overcoat painted in 2006. CKDP
10/18/2002 - No change. VZJZ
04/13/1998 - Snooper inspection of 5-29-2001: Some rust, pitting, and minor paint loss; mostly on the north most pier. RHGY
02/01/1994 - None REFI

Inspection Notes:

Element 313 - Fixed Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	25	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Spot rust, paint loss, and faded paint. UZGZ
12/27/2010 - Spot rust and paint loss. Bird debris. ZBDZ
12/02/2008 - Some spot rust and bird debris. DZGZ
11/02/2006 - Blown off and overcoat painted in 2006. CKDP
10/18/2002 - No change from last report. VZJZ

Inspection Notes:

Element 331 - Conc Bridge Railing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	296	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Generally in Good ocndition. Random shrinkage cracks. Spalling on the backside of the barrier where the W-Beam bolts up. UZGZ
12/27/2010 - Unchanged from previous inspections. ZBDZ
12/02/2008 - Same as past inspections and add that the ends have been upgraded to new rail shoes since the last inspection. Curbs under the barrier are in Good condition with surface spall near the deckline. DZGZ
11/02/2006 - Minor and random verrtical cracks along the front face and some cracks also along the rebar in random spots on the backside of the rail. Some rubs and scrapes to the rail. CKDP
10/18/2002 - 147.83 * 2 = 295.63m Minor, vertical cracks and scrapes. Rail was placed in front of the metal bridge rail in 1999. VZJZ

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09761
Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Steel Posts and Top Round Pipe --- Now behind the Concrete Rail										
	1	3	296	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Rusty spots, paint loss, and scale on the rail posts and top pipe tube. UZGZ
12/27/2010 - Removed W-Beam in 2010. Rust spots, minor surface pitting, and paint loss on the posts and top rail. ZBDZ
12/02/2008 - Rust, paint peel, some surface pitting, and exposed base coat. DZGZ
11/02/2006 - Rusty, pitting, faded paint, peeling paint, and some prime coat visible on the rail psots and top rail pipe. W-beam has rusty spots throughout. CKDP
10/18/2002 - 147.83 * 2 = 295.63m Rust, pitting, and paint loss throughout. VZJZ
04/13/1998 - None RHGY
02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Some reflective cracking was visible today. UZGZ
12/27/2010 - Milled off 1" and replaced with 2" of new silica fume concrete. ZBDZ
12/02/2008 - Due to quantity and need to start tracking. DZGZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09761
Continue

General Inspection Notes

12/19/2012 - Good markers on both sides of Abutment 1 today.	UZGZ
12/27/2010 - NBI 72, roadway alignment, rated a "7" as bridge is narrower than the approach roadway. Good markers on Left and Right corners of Abutment 1.	ZBDZ
12/02/2008 - Good markers on the approach section.	DZGZ
11/02/2006 - Markers on both side of the approach and they are in Good condition. Steel bridge rail could be removed as it is not serving any purpose. Deck will be needing periodic patching and would be a Good candidate for a re-hab. Per Infrastructure Engineers August 22, 2006 underwater inspection, the substructure units are in good condition. There are no significant structural defects below the high waterline. There is no significant local or general scour present. There are no significant restrictions in the channel that will adversely impact flow. There is light timber debris at the upstream nose of pier 3. The channel bottom consists of mud/silt, and riprap. NBI ITEM 61 CHANGED PER INFRASTRUCTURE ENGINEERS UNDERWATER INSPECTION.	CKDP
10/18/2002 - NBI 36 is up to current standards; 26A is now concrete barrier rail.	VZJZ
04/13/1998 - 5-29-2001: Snooper inspection this pm. Should remove the trees that are going up near and under the bridge on both ends.	RHGY
02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:44:28 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:02	REFI
09/01/1991 - Updated with tape 1994	NB94
02/01/1990 - Updated with tape 1991	NB91
02/01/1988 - Updated with tape 1989	NB89
02/01/1986 - Updated with tape 1987	NB87
01/01/1984 - Updated with tape 1985	NB85
08/01/1981 - Updated with tape 1984	NB84
03/01/1979 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09762

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **1 1 Interstate Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **SUN RIVER**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°29'58"**

Longitude : **111°20'35"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00015**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **450.57 km 279.97**

Construction Data

Construction Project Number : **I 15-5(22)273**

Construction Station Number : **589+50.00**

Construction Drawing Number : **6903**

Construction Year : **1966**

Reconstruction Year : **1977**

Traffic Data

Current ADT : **9,150** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**33.5 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**58.32**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **147.83 m**

Deck Area : **1,442.00 m sq**

Deck Roadway Width : **8.53 m**

Approach Roadway Width : **11.28 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **N Feature not hwy or RR**

Vertical Clearance Under the Structure : **0.00 m**

Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**

Minimum Lateral Under Clearance Right : **0.00 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **5**

Material Type Code, Description : **5 Prestressed concrete**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **3 Latex Concrete or similar additive**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**

Material Type Code, Description :

Span Design Code, Description :

(52) Out-to-Out Width : **9.75 m**

(50A) Curb Width :

(50B) Curb Width :

Skew Angle : **15°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure I-15 SB	I00015	South	99.99 m	8.53 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09762
Continue

Inspection Data

Sufficiency Rating : **78.5**
Structure Status : **Func Obs - Elg Rehab**

Inspection Due Date : 19 December 2014
(91) Inspection Frequency (months) : **24**

Next Under Water Insp : **17 Nov 2016**
Under Water Insp Type : **Type II**

NBI Inspection Data

(90) Date of Last Inspection : 19 December 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 7
(59) Superstructure Rating : 7
(60) Substructure Rating : 6
(72) App Rdwy Align : 7

(68) Deck Geometry : 3
(67) Structure Rating : 6
(69) Under Clearance : N
(41) Posting Status : A

(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 1
(36C) Approach Rail Rating : 1
(36D) End Rail Rating : 1

(62) Culvert Rating : N
(61) Channel Rating : 6
(71) Waterway Adequacy : 8
(113) Scour Critical : 5

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 1.00 in

Inspection Hours

Crew Hours for inspection : 2
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0

Snooper Required : N
Snooper Hours for inspection : 0
Flagger Hours : 0

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	**Date Requested**						
D31-FY2007-000037	**26 December 2006**	**Approved**	**High**	M Main	334 Metal Rail Coated	Repl Paint	
Clean and paint the rail and posts. Approved. DRC							
D31-FY2013-000018	**20 December 2012**	**Not Approved**	**Medium**	M Main	210 R/Conc Pier Wall	Min Repair	
Remove the drift at the nose of Pier 3.							

Late Reason:
Inspection Date: 12/19/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09762

Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 22 - P Conc Deck/Rigid Ov Silica Fume Concrete oOverlay in 2010										
	1	3	1441	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Some minor studded tire wear in the wheel paths. Some reflective cracking.	UZGZ
12/27/2010 - 9.75 * 147.83 = 1441.34 Deck had 1" milled off and then placed 2" of silica fume concrete in 2010. Deck looks Good today. Some cracking near Abutment 1 that were sealed during construction.	ZIDZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	739	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Good condition.	UZGZ
12/27/2010 - Good condition.	ZIDZ
12/02/2008 - Good condition. Same on the scrapes in Span 5.	DZGZ
11/02/2006 - No problems observed. A couple of the girders in Span 5 have scrapes on their bottoms from overheight equipment.	CZDP
10/18/2002 - 5 * 147.83 = 739.15m	VCKA

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 210 - R/Conc Pier Wall Piers 2 thru 5										
	1	3	42	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Small spalls behind the ice breakers. Pier 4 has a small delaminated area in the underwater inspection; photo. Tight cracks in the Pierwalls.	UZGZ
12/27/2010 - Unchanged from previous inspections. The 11/15/2011 underwater inspection by Infrastructure Engineers shows that this element is in the same condition with the same minor defects noted in the 2006 inspection. CRH	ZIDZ
12/02/2008 - Condition State 3 for shallow surface delaminations and Condition State 2 for minor spalls and cracking. Wear at the waterline.	DZGZ
11/02/2006 - Minor wear/scaling of the concrete at the waterline and behind the ice breakers. Some areas of tight mapping cracks in the Pier walls sides. Patched areas appear to be holding up well, but some delamiantion also noted. Ice breakers overcoat painted in 2006. Per Infrastructure Engineers August 22, 2006 underwater inspection, the substructure units are in good condition. There are no significant structural defects below the high waterline. Pier 3 and 4 have light concrete scale up to 1/32" deep and light algae growth.	CZDP
10/18/2002 - 4 * 10.14 = 40.56m Same as previous reports.	VCKA
04/13/1998 - Snooper Inspection of 5-29-2001: Some of the repaired areas are ok, some are questionable in their attachment to the existing concrete. Some wear and minor deterioration at the water line. Some drift at the nose of the peir shafts.	RHGN
02/01/1994 - None	REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09762

Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 6										
	1	1	27	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Small spalls by some of the girder embedments and along the cap to backwall area. UZGZ

12/27/2010 - Small spalls near girder embedments. Abutment 1 has some plywood on the chamfered area from past construction. ZIDZ

12/02/2008 - Some tight cracks in both backwalls and small spalls near the girder embedments. DZGZ

11/02/2006 - Both backwalls have a small spall near the bearings where the ends of the girders are embedded. Both caps have a couple of tight cracks that are not a problem. CZDP

10/18/2002 - 10.14 * 2) (4 * 1.75) = 27.28 VCKA

Inspection Notes:

Element 234 - R/Conc Cap Piers 2 thru 5										
	1	1	41	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Small spall on the Left end of Pier 2's cap. Some staining from past joint leakage. Some bird nests/debris on top of the caps. Small spall on the caps of Pier 3 and 5. UZGZ

12/27/2010 - Unchanged from previous inspections. Pier 2 and 5 were cleaned off this past summer. ZIDZ

12/02/2008 - Cap at Bent 2 has a small spall and delaminated area. Some cracks; none are a problem. DZGZ

11/02/2006 - Stained from prior leaky joints. Some tight cracking under the girders and a couple of shallow tie wires are visible. Some delaminated patched areas also found. CZDP

10/18/2002 - Dropped Env. State as no longer un leaky joints; YET. 4 * 10.14 = 40.56m No change from previous reports. VCKA

Inspection Notes:

Element 303 - Assembly Joint/Seal Pier 2 and 4 - New in 2010										
	1	3	20	m.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Joint is packed with sanding material today. No apparent leakage. Steel is solid when tapped on. UZGZ

12/27/2010 - Underside of deck at curbs shows poor workmanship in construction patches. ZIDZ

12/02/2008 - Steel sounds solid when tapped on. Small spalls along the joint edge. Full of sanding material. No leaking observed. DZGZ

11/02/2006 - Joint gland is full of sanding material. No apparent leaking. Joint steel sounds solid when tapped on. Some spalling and delamiantion concrete along the joint steel. CZDP

10/18/2002 - 2 * 10.14 = 20.28m Mostly full of sanding material. VCKA

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09762

Continue

********** Span : **Main-0 -** **(cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing										
	1	1	25	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Alignment is Good. Paint loss, spot rust, and bird debris. UZGZ
12/27/2010 - Spot rust, paint loss, and bird debris. ZIDZ
12/02/2008 - Spot rust and bird debris. DZGZ
11/02/2006 - Blown off and overcoat painted in 2006. CZDP
10/18/2002 - Moved to Env. State 2 as no longer under a leaky joint; YET. Rest is the same as the last several reports. VCKA

Inspection Notes:

Element 313 - Fixed Bearing										
	1	1	25	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Paint loss, spot rust, and birde debris. UZGZ
12/27/2010 - Spot rust, paint loss, and bird debris. ZIDZ
12/02/2008 - Spot rust and bird debris. DZGZ
11/02/2006 - Blown off and overcoat painted in 2006. CZDP
10/18/2002 - Dropped Env. State as no lnger under a leaky joint; YET. Rest is the same as previous reports. VCKA

Inspection Notes:

Element 331 - Conc Bridge Railing										
	1	3	296	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Patch on the Right barrier at Abutment 6 looks Good and is holding up well. Some random shrinkage cracks. Spalls at the W-Beam to barrier connection. UZGZ
12/27/2010 - Unchanged from previous inspections. ZIDZ
12/02/2008 - Same as past inspections on the tight cracks. Ends have been updated since the past inspections for new guardrail. Both curbs look Good with small surface spall near the deckline. DZGZ
11/02/2006 - Minor dings and scrapes. Random vertical cracking on both sides with the backside at some of the rebar locations. CZDP
10/18/2002 - 147.83 * 2 = 295.66m   Some dings and scrapes with some vertical shrinkage cracks throughout. VCKA

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09762

Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Steel Posts w\ Round Top Rail behind the Concrete Rail										
	1	3	296	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Rusty spots, paint loss, and some scale on the posts and top pipe rail. UZGZ

12/27/2010 - Rusty spots, paint loss, and some minor surface pitting on the rail posts and top pipe. W-Beam removed in 2010. ZIDZ

12/02/2008 - Rusty spots, peeling paint, fading paint, and minor surface pitting. DZGZ

11/02/2006 - Rusty, pitted, paint loss, faded paint, and prime coat visible on the rail posts and top pipe rail. W-Beam has rusty spots. CZDP

10/18/2002 - 147.83 * 2 = 295.66m More rust, pitting, and paint loss. VCKA

04/13/1998 - Snooper inspection of 5-29-2001: in the 2nd from the last span, the 5th post on the right, back from the pier has spalled concrete at it's attachment point to the deck. It is behind barrier rail now. RHGN

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Some reflective cracking throughout the overlay in all the Spans. UZGZ

12/27/2010 - Milled off 1" and overlayed with 2" of silica fume concrete in 2010. ZIDZ

12/02/2008 - Due to density and size of the cracks; especially in the areas where the delaminations are starting to spall. DZGZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015279+09762

Continue

General Inspection Notes

12/19/2012 - Good markers on both sides of Abutment 6.	UZGZ
12/27/2010 - NBI 72, roadway alignment, rated a "7" as bridge is narrower than the approach roadway. Good markers on both sides of Abutment 6.	ZIDZ
12/02/2008 - Good markers on the approach corners.	DZGZ
11/02/2006 - Markers on the Left and Right sides of the approach end and in Fair to Good condition. Steel bridge rail could be removed as it is not serving any purpose. Bridge deck has had some patched spalls and will be needing more. This would be a Good candidate for a deck re-hab. Per Infrastructure Engineers August 22, 2006 underwater inspection, the substructure units are in good condition. There are no significant structural defects below the high waterline. There is no significant local or general scour present. There are no significant restrictions in the channel that will adversely impact flow. NBI 61 CHANGED PER INFRASTRUCTURE ENGINEERS UNDERWATER INSPECTION.	CZDP
10/18/2002 - NBI 36 is now up to current standards; 36A upgraded to concrete barrier rail now.	VCKA
04/13/1998 - 5-29-2001: Snooper inspection this am. Should clean out the trees & brush that is going next to and underneath the structure.	RHGN
02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:44:28 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:03	REFI
09/01/1991 - Updated with tape 1994	NB94
02/01/1990 - Updated with tape 1991	NB91
02/01/1988 - Updated with tape 1989	NB89
02/01/1986 - Updated with tape 1987	NB87
01/01/1984 - Updated with tape 1985	NB85
08/01/1981 - Updated with tape 1984	NB84
03/01/1979 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00941

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **1 1 Interstate Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **SEP 5TH AVE SW**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°30'04''**

Longitude : **111°20'34''**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00015**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **450.76 km 280.09**

Construction Data

Construction Project Number : **IG 15-5(27)274**

Construction Station Number : **595+55.00**

Construction Drawing Number : **7092**

Construction Year : **1967**

Reconstruction Year :

Traffic Data

Current ADT : **9,150** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**36.2 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**83.84**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **38.10 m**

Deck Area : **455.00 m sq**

Deck Roadway Width : **11.35 m**

Approach Roadway Width : **11.89 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **H Hwy beneath struct**

Vertical Clearance Under the Structure : **4.60 m**

Reference Feature for Lateral Underclearance : **H Hwy beneath struct**

Minimum Lateral Under Clearance Right : **3.66 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **3**

Material Type Code, Description : **5 Prestressed concrete**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **3 Latex Concrete or similar additive**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**

Material Type Code, Description :

Span Design Code, Description :

(52) Out-to-Out Width : **11.95 m**

(50A) Curb Width : **0.05 m**

(50B) Curb Width : **0.05 m**

Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under 5TH AVE. SW	L07544	Both	4.60 m	10.36 m	N/A		
Route On Structure I - 15 NB	I00015	N/A			North	99.99 m	11.35 m

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00941
Continue

Inspection Data

Sufficiency Rating : **96.6**
Structure Status : **Not Deficient**

Inspection Due Date : 15 October 2014
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 15 October 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 7
(59) Superstructure Rating : 7
(60) Substructure Rating : 7
(72) App Rdwy Align : 8

(68) Deck Geometry : 5
(67) Structure Rating : 7
(69) Under Clearance : 6
(41) Posting Status : A

(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 1
(36C) Approach Rail Rating : 1
(36D) End Rail Rating : 1

(62) Culvert Rating : N
(61) Channel Rating : N
(71) Waterway Adequacy : N
(113) Scour Critical : N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 1.00 in

Inspection Hours

Crew Hours for inspection : 2
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0

Snooper Required : **N**
Snooper Hours for inspection : 0
Flagger Hours : 0

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2004-000064	**28 January 2004**	**Approved**	**Medium**	All Spans	Bridge	Spot Paint (flex)	

Clean around bearings and repaint.

Approved. DRC

Late Reason:
Inspection Date: 10/15/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00941
Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 22 - P Conc Deck/Rigid Ov										
	1	3	455	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Minor wear in the wheel paths. Tight transverse cracks over both Bent 2 and 3. Random cracking in Span 1. QZHZ
10/18/2010 - 11.95 * 38.10 = 455.30 1" milled off, A and B repairs done, and 2" overlay then placed. Good condition today. SODZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	191	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Unchanged from past inspections and generally in Good condition. QZHZ
10/18/2010 - Generally Good condition. Minor rubs from overheight loads and some minor cracking on ends of the girders noted at Bents 2 and 3. SODZ
10/15/2008 - Good condition. Some minor rubs and scrapes from overheight loads. QZGZ
10/24/2006 - Good condition. Minor cracks from backside of the embedded bearing plate to the ends of several of the girders. ZZGZ
10/08/2002 - 38.10 * 5 = 190.5m IZDK

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bent 2 and 3										
	1	1	4	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - All (4) are generally in Good condition with a small spall on the Right column of Bent 3. QZHZ
10/18/2010 - Good condition. Minor and tight surface shrinkage cracks. SODZ
10/15/2008 - Generally Good condition. Some tight surface shrinkage cracks. QZGZ
10/24/2006 - Tight surface shrinkage cracks. ZZGZ
10/08/2002 - ok IZDK

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00941

Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 4										
	1	2	30	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Tight cracks in both of the backwalls and caps. Small spalls on the cap to backwall connection area and a couple of the embedded bearings. QZHZ

10/18/2010 - Minor and tight cracks in both backwalls. Small spalls near a couple of the girder embedded bearings. SODZ

10/15/2008 - Small spall near the bearings in the backwalls. Tight cracks in both of the backwalls and caps. QZGZ

10/24/2006 - Damp at the backwall to cap joint and around the bearings. A couple of small spalls where the girders are embedded in the backwalls. ZZGZ

10/08/2002 - (11.95 1.50 1.50) * 2 = 29.90m Minor, tight cracks in backwalls. Env. State 2 due to wet soil in median near the bridge ends. IZDK

04/13/1998 - None RHGR

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bent 2 and 3										
	1	1	24	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Small delaminations on the Right ends of both of the Bent caps. Minor surface spalls on the underside of both caps from rebar chair feet. Stains from past joint leakage. QZHZ

10/18/2010 - Same comments as past inspections. Small delamination on Right ends of Bent 2 and 3's caps. Very minor surface distress in these areas. SODZ

10/15/2008 - Left end of the cap at Bent 2 has a small delaminated area, 6" x 14"; Condition State 3. Tight cracks at the steps. Small surface spall on the underside of the caps from exposed rebar chair feet. QZGZ

10/24/2006 - Minor surface spalls on the underside of the caps from exposed/rusty rebar chairs. ZZGZ

10/08/2002 - 11.95 * 2 = 23.90m Minor stains from exposed rebar chairs. Underside of left end of cap at Bent 3 has minor popouts along rebar chairs. IZDK

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing Bent 2 and 3										
	1	1	20	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Spot rust, paint loss, and some debris. QZHZ

10/18/2010 - Spot rust and paint loss. SODZ

10/15/2008 - Spot rust and paint loss. QZGZ

10/24/2006 - Spot rust throughout. Bents 2 and 3's have pigeon debris around them. ZZGZ

10/08/2002 - Rusty spots throughout. IZDK

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00941
Continue

* * * * * * * * * * Span : **Main-0 -** **(cont.)** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated W-Beam w\ Steel Posts										
	1	3	76	m.		85	10	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - W-Beam had dings and rubs on both sides. Left rail is bent near Abutment 1. Loose and twisted blocks. Rail posts show rusty spots, scale, and paint loss. Curbs are in Good condition. QZHZ

10/18/2010 - Rusty spots and paint loss on the W-Beam. Several twisted and loose blocks. Left rail near Abutment 1 has a bent area. SODZ

10/15/2008 - Rusty spots on the rail and posts. Some loose and twisted wood rail blockouts. Curbs are in Good condition. QZGZ

10/24/2006 - Rusty spots on the W-Beam and rail posts. Both rails have scrapes and bent areas. Curbs are in Good condition. ZZGZ

10/08/2002 - 38.10 * 2 = 76.20m Rusty spots, pitting, and scrapes throughout both rails. Rust on the posts. IZDK

04/13/1998 - None RHGR

02/01/1994 - None REFI

Inspection Notes:

General Inspection Notes

10/15/2012 - Good 14' - 2" clearance signs on both sides of the bridge for travellers on 5th Ave. SW. QZHZ

10/18/2010 - NBI 36A, bridge rail, is rated a "1" as if meets the Bridge Bureau's policy of "no retro-fit" needed. SODZ
NBI 58, deck, rated a "8" due to new overlay. Overlaid with Silica Fume Concrete in 2010.
NBI 59, superstructure, rated a "7" due to rubs on the bottom of the girders and tight cracks on the ends of the girders.
Good 14' - 2" clearance signs on both sides of the bridge for 5th Ave. SW.

10/15/2008 - Good 14'-2" overheight signs on both sides of the structure for 5th Ave. SW. QZGZ
Consultant's crew doing chloride content testing of the structure's deck yesterday.
Close to a deck cracking smart flag due to wide cracks over Bents 2 and 3.
Removed Abutment bearing.

10/24/2006 - NBI 58, deck, rated a "6" due to wear and delaminations/spalls. ZZGZ
NBI 60, substructure, rated a "7" due to small surface spalls on the underside of the caps at Bents 2 and 3 from exposed/rusty rebar chairs. Also small spalls in the backwalls where the girders are embedded.
Posted with a 14' - 2" clearance signs for 5th Ave. SW

10/08/2002 - NBI 36A to a "0" as rail is W-beam blocked out to the curb face. 36B, transition rail, Bridge approach section and curbs tapers on approach ends of the structure only. IZDK
Element 304 was removed during 1999 rehab project.

04/13/1998 - None RHGR

02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:44:28 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:04

01/01/1992 - Updated with tape 1994 NB94

03/01/1990 - Updated with tape 1991 NB91

02/01/1988 - Updated with tape 1989 NB89

02/01/1986 - Updated with tape 1988 NB88

01/01/1984 - Updated with tape 1985 NB85

08/01/1981 - Updated with tape 1984 NB84

03/01/1979 - Updated with tape 1980 NB80

Form: bms001d
Printing Date : Thursday, May 22 2014

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00942

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **1 1 Interstate Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **SEP 5TH AVE SW**

Structure on the State Highway System : X

Structure on the National Highway System : X

Str Meet or Exceed NBIS Bridge Length : X

Latitude : **47°30'04"**

Longitude : **111°20'35"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00015**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **450.76 km 280.09**

Construction Data

Construction Project Number : **IG 15-5(27)274**

Construction Station Number : **595+55.00**

Construction Drawing Number : **7092**

Construction Year : **1967**

Reconstruction Year :

Traffic Data

Current ADT : **9,150** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**34.4 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**83.84**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **38.10 m**

Deck Area : **455.00 m sq**

Deck Roadway Width : **11.35 m**

Approach Roadway Width : **11.89 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **H Hwy beneath struct**

Vertical Clearance Under the Structure : **4.57 m**

Reference Feature for Lateral Underclearance : **H Hwy beneath struct**

Minimum Lateral Under Clearance Right : **3.66 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **3**

Material Type Code, Description : **5 Prestressed concrete**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **3 Latex Concrete or similar additive**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**

Material Type Code, Description :

Span Design Code, Description :

(52) Out-to-Out Width : **11.95 m**

(50A) Curb Width : **0.05 m**

(50B) Curb Width : **0.05 m**

Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under 5TH AVE. SW	L07544	Both	4.57 m	10.36 m	N/A		
Route On Structure I - 15 SB	I00015	South	99.99 m	11.35 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00942

Continue

Inspection Data

Sufficiency Rating : **96.6**
Structure Status : **Not Deficient**

Inspection Due Date : 15 October 2014
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection :	15 October 2012	Last Inspected By :	Charles Pepos - 107
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	7	(68) Deck Geometry :	5	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	7	(36B) Transition Rating :	1	(61) Channel Rating :	N
(60) Substructure Rating :	7	(69) Under Clearance :	6	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	N
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	N

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 1.00 in

Inspection Hours

Crew Hours for inspection :	2	Snooper Required :	N
Helper Hours :	0	Snooper Hours for inspection :	0
Special Crew Hours :	0	Flagger Hours :	0
Special Equipment Hours :	0		

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2004-000065	**28 January 2004**	**Approved**	**Medium**	All Spans	Bridge	Spot Paint (flex)	
Clean around bearings and repaint. Approved. DRC							

Late Reason:
Inspection Date: 10/15/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00942

Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element Description										
Element 22 - P Conc Deck/Rigid Ov										
	1	3	455	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Minor wear in the hweel paths. Random cracking on the Left side of the deck near Abutment 4 in Span 3. QZHZ

10/18/2010 - 11.95 * 38.10 = 455.30   Milled off 1", Class A and B repair, and then placed a 2" Silica Fume Concrete overlay in 2010. Good condition today. SZDZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	191	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Unchanged from past inspections and in Good condition. QZHZ

10/18/2010 - Gernally Good condition. Minor scrapes and rubs from overheight loads on the bottom of the girders. Tight cracks on the ends of the girders at Bent 2 and 3. SZDZ

10/15/2008 - Generally in Good condition. Minor scrapes to the Left two girders from overheight loads. QZGZ

10/24/2006 - Minor scrape to the Left girder in Span 2 from overheight load. Several of the girders have minor cracks from the backside of the embedded bearing plate to the ends of the girders. ZCGZ

10/08/2002 - 38.10 * 5 = 190.5m ISDL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bent 2 and 3										
	1	1	4	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - All are generally in Good condition with small spalls on (2) columns from construction activity. QZHZ

10/18/2010 - Good condition. SZDZ

10/15/2008 - Good condition. Small scrape on the Left column of Bent 2. QZGZ

10/24/2006 - No major probelms noted with minor and tight surface shrinkage cracks. ZCGZ

10/08/2002 - Minor, tight shrinkage cracks. ISDL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00942

Continue

* * * * * * * * * * Span : Main-0 - (cont.) * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 4										
	1	2	30	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Tight cracks in both of the backwalls and caps. Small spalls near the cap to backwall connections and at a couple of the embedded bearings. QZHZ

10/18/2010 - Generally Good condition. Tight cracks in both backwalls. SZDZ

10/15/2008 - Same as prior inspection and add some tight cracks in both caps and backwalls of the Abutments. QZGZ

10/24/2006 - Minor seepage at the bearings and along the cap to backwall joint. A couple of small spalls where the girders are embedded in the backwalls. ZCGZ

10/08/2002 - (11.95 1.50 1.50) * 2 = 29.90m Env. State 2 as some moisture coming from between the backwall to cap connection on this date and wet soil in median area. ISDL

03/13/1998 - None RHGT

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bent 2 and 3										
	1	1	24	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Minor surface spalls on the underside of both caps from rebar chair feet. Right end of Bent 3's cap has a small surface delamination and both caps show tight cracking on their ends. Spall with exposed rebar on the Left end of Bent 2's cap. QZHZ

10/18/2010 - Minor surface spalls on the underside of both caps. Spall with exposed rebar ends on the Left end of Bent 2's cap. SZDZ

10/15/2008 - Surface spalls on the underside of both caps. Tight cracks on the ends of both caps. QZGZ

10/24/2006 - Minor and small surface spalls where rebar chairs are exposed on the underside of the caps. Staining from leakage in the past. ZCGZ

10/08/2002 - 2 * 11.95 = 23.90m Minor staining from areas where the rebar chairs are exposed. ISDL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing Bent 2 and 3										
	1	1	20	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Spot rust, paint loss, and some debris. QZHZ

10/18/2010 - Spot rust and paint loss. SZDZ

10/15/2008 - Spot rust and paint loss. QZGZ

10/24/2006 - Spot rust on the bearings. Pigeon debris on the bearings at Bents 2 and 3. ZCGZ

10/08/2002 - Rusty spots throughout. ISDL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015280+00942
Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated W-Beam w\ Steel Posts										
	1	3	76	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

10/15/2012 - Curbs are in Good condition with some minor spalls and cracking. Rusty spots, paint loss, and scale on the rail posts. W-Beam has rubs and dings on both sides.	QZHZ
10/18/2010 - Rusty spots on the W-Beam and rail posts. Both curbs are in Good condition.	SZDZ
10/15/2008 - Rusty spots on the rail posts and W-Beam. Right curb has been repaired. Curbs are now in Good condition.	QZGZ
10/24/2006 - Rusty spots on the W-Beam and steel posts. Rail has been hit in a couple of spots with a bent post and broken curb concrete on the Right side at Abutment 4.	ZCGZ
10/08/2002 - 38.10 * 2 = 76.20m Rusty, pitting, and scrapes throughout both rails. Rust on posts.	ISDL
03/13/1998 - None	RHGT
02/01/1994 - None	REFI

Inspection Notes:

General Inspection Notes

10/15/2012 - Good 14' - 2" clearance signs on both sides of the bridge for traffic on 5th Ave. SW.	QZHZ
10/18/2010 - NBI 36A, bridge rail, is rated a "1" as if meets the Bridge Bureau's policy of "no retro-fit" needed. NBI 58, deck, rated a "8" due to new overlay. Overlaid with Silica Fume Concrete in 2010. NBI 59, superstructure, rated a "7" due to rubs on the bottom of the girders and tight cracks on the ends of the girders. Good 14' - 2" clearance signs on both sides of the bridge for 5th Ave. SW.	SZDZ
10/15/2008 - Good 14'-2" overheight signs on both sides of the structure for 5th Ave. SW. Consultant's crew doing chloride content testing of the structure's deck yesterday. Close to a deck cracking smart flag due to wide cracks over Bents 2 and 3.	QZGZ
10/24/2006 - NBI 58, deck, rated at a "6" due to wear in the wheel paths and some spalling/delamiantions. NBI 60, substructure, rated a "7" due to minor spalls on the underside of the caps at Bents 2 and 3 from exposed rebar chairs. Also small spalls where girders are embedded in both Abutments. 5th Ave. SW signed for 14' - 2" clearance.	ZCGZ
10/08/2002 - NBI 36A is a "0" because rail is W-beam and blocked out to the face of the curbs. 36B-Transition rail and bridge approach section/curb taper are on the approach end of the structure only. Element 304 - These were removed during 1999 renab project.	ISDL
03/13/1998 - None	RHGT
02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:44:29 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:05	REFI
01/01/1992 - Updated with tape 1994	NB94
03/01/1990 - Updated with tape 1991	NB91
02/01/1988 - Updated with tape 1989	NB89
02/01/1986 - Updated with tape 1988	NB88
01/01/1984 - Updated with tape 1985	NB85
08/01/1981 - Updated with tape 1984	NB84
03/01/1979 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05471

Location : 1M N GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**
County Code, Location : **013 CASCADE**
Kind fo Hwy Code, Description : **1 1 Interstate Hwy**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **INT EMERSON, BNSF RR**
Structure on the State Highway System : **X**
Structure on the National Highway System : **X**
Str Meet or Exceed NBIS Bridge Length : **X**
Latitude : **47°31'17"**
Longitude : **111°22'45"**

MDT Maintenance Section : **31-01 Great Falls**
Division Code, Location : **31 GREAT FALLS**
City Code, Location : **32800 GREAT FALLS**
Signed Route Number : **00015**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **454.70 km 282.54**

Construction Data

Construction Project Number : **IG 15-5(27)274**
Construction Station Number : **724+45.00**
Construction Drawing Number : **7104**
Construction Year : **1967**
Reconstruction Year :

Traffic Data

Current ADT : **9,280** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**34.4 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**63.18**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **107.90 m**
Deck Area : **1,052.00 m sq**
Deck Roadway Width : **8.55 m**
Approach Roadway Width : **11.58 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **H Hwy beneath struct**
Vertical Clearance Under the Structure : **6.76 m**
Reference Feature for Lateral Underclearance : **H Hwy beneath struct**
Minimum Lateral Under Clearance Right : **2.75 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **6**
Material Type Code, Description : **5 Prestressed concrete**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **3 Latex Concrete or similar additive**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

(52) Out-to-Out Width : **9.75 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **30°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under VAUGHN ROAD	N00123	Both	6.76 m	9.14 m	N/A		
Route On Structure I-15 NB / EMERSON JCT	I00015	N/A			North	99.99 m	8.55 m

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05471
Continue

Inspection Data

Sufficiency Rating : **76.4**
Structure Status : **Func Obs - Elg Rehab**

Inspection Due Date : 19 December 2014
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 19 December 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 6
(59) Superstructure Rating : 7
(60) Substructure Rating : 7
(72) App Rdwy Align : 7

(68) Deck Geometry : 3
(67) Structure Rating : 7
(69) Under Clearance : 4
(41) Posting Status : A

(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 1
(36C) Approach Rail Rating : 1
(36D) End Rail Rating : 1

(62) Culvert Rating : N
(61) Channel Rating : N
(71) Waterway Adequacy : N
(113) Scour Critical : N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 2
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0

Snooper Required : **N**
Snooper Hours for inspection : 0
Flagger Hours : 0

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2007-000030	**27 November 2006**	**Approved**	**Medium**	M Main	Bridge	Spot Paint (flex)	
Clean and spot paint bearings. Approved. DRC							
D31-FY2007-000029	**27 November 2006**	**Approved**	**High**	M Main	300 Strip Seal Exp Joint	Min Repair	
Clean sanding material from joints. Approved. DRC							
D31-FY2011-000025	**11 January 2011**	**Not Approved**	**Low**	M Main	334 Metal Rail Coated	Repl Paint	
Clean and spot paint rail.							

Late Reason:
Inspection Date: 12/19/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05471

Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	1052	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Wider and open cracks over the un-jointed Bents. Random and mapping cracks in all of the Spans. Small surface spalls and delaminations along the edges of the joint steel. UZGZ

12/27/2010 - Small surface spalls and delaminations along joint steel. Wear in the wheel paths and mapping cracks in all Spans. Wider transverse cracks over Bent that are without joints. ZZDZ

11/19/2008 - Placed into Condition State 2 as a couple of small delaminations were observed with chain drag near the joints/guard angles. Wear in the wheel paths. Wider transverse cracks over the unjointed Bents. Some mapping cracks also. TZDT

11/02/2006 - Open transverse cracks over the Bents without joints. Minor wear in the wheel paths. Some very minor flaking of latex concrete paste at the joint steel, but none delamianted or spalling. CODN

10/07/2002 - 107.90 * 9.75 = 1052.03 Deck was hydromilled and the removed material was replaced with latex concrete. The deck has some transverse cracks over the Bents that do not have expansion joints. IZHP

04/14/1998 - None RHHP

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	519	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - No problems observed. UZGZ

12/27/2010 - Good condition. ZZDZ

11/19/2008 - Generally Good condition. TZDT

11/02/2006 - Minor tight cracks from the backside of the embedded bearing plate to the ends of the girders on several of the girders; none are a problem. CODN

10/07/2002 - (6 * 19.8) (4 * 40.8) (5 * 47.3) = 518.5m Minor cracking of the concrete near the beam seat on a couple of girders; not a problem. IZHP

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column 2 thru 6										
	1	1	10	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Small surface delaminations near the ground on the construction joints. Shallow surface spalls on a couple of the columns. Generally in Good condition. UZGZ

12/27/2010 - Some small delaminated sack patches at construction joints near groundline on a couple of the columns. Small surface spalls along shallow tie wire. ZZDZ

11/19/2008 - Condition State 2 due to shallow tie wire and surface spalls. Condition State 3 for delaminations that have not popped off. Some cracks and small delaminations on the webwalls. TZDT

11/02/2006 - Tight surface shrinkage cracks. Some areas where shallow tie wire is on the surface. Wire is rusty and causing small surface spalls. CODN

10/07/2002 - Minor, tight random cracks on several coulmns. IZHP

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05471

Continue

* * * * * * * * * * Span : Main-0 - (cont.) * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 215 - R/Conc Abutment 1 and 7

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	29	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Good condition. Small spalls along the cap to backwall area. Erosion at the corners of the wingwalls. Some missing fill under Abutment 1's cap. Tight surface shrinkage cracks.	UZGZ
12/27/2010 - Small spalls along a couple of the embedded bearings. Minor and tight cracks under G2 and G3 in Abutment 1's cap.	ZZDZ
11/19/2008 - Same as last comments.	TZDT
11/02/2006 - Both caps have minor and tight cracks. A couple of small spalls where girders ends are embedded in the backwall.	CODN
10/07/2002 - (11.48 1.40 1.40) * 2 = 28.56m Minor cracking in Abutment backwalls. Minor erosion at wingwalls.	IZHP

Inspection Notes:

Element 234 - R/Conc Cap Bents 2 thru 6

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	57	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Bent 4's cap has a small delamination under G4 on the Span 3 side. Shallow surface spalls and delaminations on the underside of the caps from rebar chair feet.	UZGZ
12/27/2010 - Small delamination under G4 on the Span 3 face of Bent 4's cap. Mostly in Good condtion. Some staining. Shallow surface spalls on under of caps from rebar chair feet.	ZZDZ
11/19/2008 - Condition State 3 for surface delaminations and Condition State 2 for cracks and small surface spalls. Staining form past joint leakage.	TZDT
11/02/2006 - Most all of the undersides of the Bent caps have small surface spalls with rust staining from shallow rebar chairs.	CODN
10/07/2002 - 5 * 11.48 = 57.40m Bottom side of cap at Bent 3-Right has some minor spalling concrete around exposed rebar chairs.	IZHP

Inspection Notes:

Element 300 - Strip Seal Exp Joint

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	23	m.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Lots of sanding material is packed into the gland area. No obvious leaking. Steel portions sound solid when tapped on. Small surface spalls and paste delaminations along the joint steel.	UZGZ
12/27/2010 - Steel sounds solid when tapped on. Small surface spalls and delaminations along edges of the steel. Both joints are full of sanding material. No leakage observed.	ZZDZ
11/19/2008 - Steel sounds solid when tapped on. Small spalls and delamianations along the joint edges. Gland is pushed down from debris, but no tears or leakage was observed.	TZDT
11/02/2006 - Joint steel is solid when tapped on. Joints are full of debris/sanding material which is pushing on the gland. No apparent leaking observed.	CODN
10/07/2002 - 11.48 * 2 = 22.96m Joints are filled with sanding material/debris. Gland is in Good condition with no tears or leaking evident.	IZHP

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05471

Continue

* * * * * * * * * * Span : Main-0 - (cont.) * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing										
	1	1	25	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Spot rust, scale, faded paint, and some paste from the hydo-demolition. Alignment is ok. UZGZ
12/27/2010 - Spot rust, paint loss, and some scale. ZZDZ
11/19/2008 - Spots of rust, paint loss, and some concrete paste from past hydomilling. TZDT
11/02/2006 - Rusty spots, paint loss, and fading of the paint system. CODN
10/07/2002 - Rusty spots with some pitting. IZHP

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing										
	1	1	29	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Spot rust, paint loss, and faded paint. UZGZ
12/27/2010 - Spot rust and paint loss. ZZDZ
11/19/2008 - Spots of rust, paint loss, and some concrete paste from past hydomilling. TZDT
11/02/2006 - Minor spot rust. CODN
10/07/2002 - Minor rusty spots with pitting. IZHP

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	216	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Random shrinkage cracks. Minor surface spalls near the deck line. Spalls on the backside of the W-Beam bolt-up. UZGZ
12/27/2010 - Unchanged from past inspections. ZZDZ
11/19/2008 - Same comments as the past inspections and add some surfce spalls of the original curb near the deck line. TZDT
11/02/2006 - Minor cracks along the rebar lines in a couple of the areas. Some minor and random vertical cracking. CODN
10/07/2002 - 107.9 * 2 = 215.80m Minor, vertical cracks throughout. During a rehab project a barrier rail was biult on top of the curb. IZHP

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05471
Continue

********** Span : Main-0 - (cont.) **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Single W-Beam and Steel Round Handrail w\ Steel Posts										
	1	3	216	m.		85	10	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Rusty spots, paint loss, fading of the paint, and minor surface pitting to the posts near the curb line. UZGZ

12/27/2010 - Rusty spots, paint loss, and scale on the W-Beam and posts. Some sanding material starting to build up on top of the curb against the rail posts. ZZDZ

11/19/2008 - No change. TZDT

11/02/2006 - W-beam, steel posts, and handrail are rusted and pitted. Some paint is peeling also. All componenets are behind the concrete rail. CODN

10/07/2002 - 107.90 * 2 = 215.80m Rusty and pitting throughout the rail and posts. The metal rail is behind the concrete barrier now. IZHP

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Unchanged from past inspections. UZGZ

12/27/2010 - Wide and open cracks over the Bents that don't have joints. Some wider mapping cracks in all Spans. ZZDZ

11/19/2008 - Open cracks over the unjointed Bents and need to start tracking it. TZDT

Inspection Notes:

General Inspection Notes

12/19/2012 - Fair markers at the Abutment 1 corners. UZGZ

12/27/2010 - Fair markers on the Right and Left side of Abutment 1.
Erosion on all (4) corners with the NE corner being the worse. ZZDZ

11/19/2008 - NBI 58, deck, rated a "6" due to small delaminations and cracking in the deck surface.
Markers on the Right and Left sides of Abutment 1 and in Fair condition. TZDT

11/02/2006 - Minor bumps on and off of the structure. Markers on the approach end of the bridge and in Fair condition. CODN

10/07/2002 - Markers on both side of the approach of the bridge and in Good condition. IZHP

04/14/1998 - None RHHP

02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:44:29
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:06 REFI

01/01/1992 - Updated with tape 1994 NB94

03/01/1990 - Updated with tape 1991 NB91

02/01/1988 - Updated with tape 1989 NB89

02/01/1986 - Updated with tape 1988 NB88

01/01/1984 - Updated with tape 1985 NB85

08/01/1981 - Updated with tape 1984 NB84

03/01/1979 - Updated with tape 1980 NB80

Montana Department
of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05472

Location : 1M N GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03** **Dist 3** **GREAT FALLS**

County Code, Location : **013** **CASCADE**

Kind fo Hwy Code, Description : **1** **1 Interstate Hwy**

Str Owner Code, Description : **1** **State Highway Agency**

Intersecting Feature : **INT EMERSON, BNSF RR**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°31'17"**

Longitude : **111°22'47"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31** **GREAT FALLS**

City Code, Location : **32800** **GREAT FALLS**

Signed Route Number : **00015**

Maintained by Code, Description : **1** **State Highway Agency**

Kilometer Post, Mile Post : **454.70 km** **282.54**

Construction Data

Construction Project Number : **IG 15-5(27)274**

Construction Station Number : **724+45.00**

Construction Drawing Number : **7104**

Construction Year : **1967**

Reconstruction Year :

Traffic Data

Current ADT : **9,280** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**34.4 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**63.18**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **109.42 m**

Deck Area : **1,067.00 m sq**

Deck Roadway Width : **8.55 m**

Approach Roadway Width : **11.58 m**

Median Code, Description : **0** **No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **H Hwy beneath struct**

Vertical Clearance Under the Structure : **6.76 m**

Reference Feature for Lateral Underclearance : **H Hwy beneath struct**

Minimum Lateral Under Clearance Right : **2.75 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **6**

Material Type Code, Description : **5** **Prestressed concrete**

Span Design Code, Description : **2** **Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1** **Concrete Cast-in-Place**

Deck Surfacing Type : **3** **Latex Concrete or similar additive**

Deck Protection Type : **0** **None**

Deck Membrain Type : **0** **None**

Approach Span

Number of Spans : **0**

Material Type Code, Description :

Span Design Code, Description :

(52) Out-to-Out Width : **9.75 m**

(50A) Curb Width : **0.00 m**

(50B) Curb Width : **0.00 m**

Skew Angle : **30°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under VAUGHN ROAD	N00123	Both	6.76 m	9.14 m	N/A		
Route On Structure I-15 SB / EMERSON JCT	I00015	South	99.99 m	8.55 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05472
Continue

Inspection Data

Sufficiency Rating : **76.4**
Structure Status : **Func Obs - Elg Rehab**

Inspection Due Date : 19 December 2014
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 19 December 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	6	(68) Deck Geometry :	3	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	7	(36B) Transition Rating :	1	(61) Channel Rating :	N
(60) Substructure Rating :	7	(69) Under Clearance :	4	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	N
(72) App Rdwy Align :	7	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	2	Snooper Required :	N
Helper Hours :	0	Snooper Hours for inspection :	0
Special Crew Hours :	0	Flagger Hours :	0
Special Equipment Hours :	0		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2007-000032	**27 November 2006**	**Approved**	**Medium**	M Main	Bridge	Spot Paint (flex)	
Paint the rail. Approved. DRC							
D31-FY2007-000031	**27 November 2006**	**Approved**	**Medium**	M Main	300 Strip Seal Exp Joint	Min Repair	
Clean debris/sanding material from the joints. 11-19-2008 Full. Approved. DRC							
D31-FY2011-000026	**11 January 2011**	**Not Approved**	**Low**	M Main	Bridge	Spot Paint (flex)	
Paint the bearings.							

Late Reason:
Inspection Date: 12/19/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05472

Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Element Description

Element 12 - Bare Concrete Deck

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	1067	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Open cracks over the un-jointed Bents. Minor studded tire wear in the wheel paths. Small surface spalls and delaminations along the edges of the joint's steel. Random and mapping cracks in all of the Spans. UIGZ

12/27/2010 - A couple of small surface delaminations along the joint steel. Minor wear in the wheel paths. Open cracks over the Bents without a joint. Wider mapping cracks in all Spans. ZWDZ

11/19/2008 - A couple of small delaminations near the joints. Wear in the wheel paths. Wide transverse cracks over the unjointed Bents. Mapping cracks in most of the Spans. TEDU

11/02/2006 - Transverse cracks over the Bents without joints. Wear in the wheel paths. Minor scale/flaking of latex paste at the joint steel, but no delaminations or spalling observed. CXDN

10/07/2002 - 109.42 * 9.76 = 1066.85 Deck was hydromilled and the removed material was replaced with latex concrete. The deck has transverse cracks over all the Bents that don't have expansion joints. IZHQ

04/14/1998 - None RHHJ

02/01/1994 - None REFI

Inspection Notes:

Element 109 - P/S Conc Open Girder

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	526	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Good condition. UIGZ

12/27/2010 - Good condition. ZWDZ

11/19/2008 - No problems observed. TEDU

11/02/2006 - Girders are in Good condition. Some minor cracks from the backside of the embedded bearing plate to the ends of the several of the girders; not a problem. CXDN

10/07/2002 - (4 * 40.8) (6 * 19.8) (5 * 48.8) = 526.0m Some girders have minor cracks near beam seats. IZHQ

Inspection Notes:

Element 205 - R/Conc Column 2 thru 6

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	10	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Small areas of surface delaminations near the groundline at the cold joints. Right column of Bent 5 has a small spalled area. UIGZ

12/27/2010 - Small delaminations to sack patches at construction joint near groundline with the Left column of Bent 4 being the worse. Some small scrapes and surface spalls on the web ties from construction. ZWDZ

11/19/2008 - Condition State 3 for small delamiantions observed in the Left column at Bent 4. Some small scrapes/spalls from construction acivities and the webwalls for Bents 3 and 4 show some cracks and delaminations. TEDU

11/02/2006 - Tight surface shrinkage cracks. Several small areas where tie wire is exposed and rusting. Some small surface spalling along the exposed tie wire. CXDN

10/07/2002 - Minor, tight cracks on several columns. IZHQ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05472

Continue

********** Span : **Main-0 - (cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 7										
	1	1	29	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Small spalls along the cap to backwall area. Tight vertical crack under G2 at Abutment 1 and under G2 and G3 at Abutment 7. Erosion at all (4) wingwalls. UIGZ
12/27/2010 - Small spalls near a couple of the girders in the backwalls. Vertical crack under G2 at Abutment 1 and G2 and G3 at Abutment 7 in their caps. ZWDZ
11/19/2008 - Unchanged from past inspections. TEDU
11/02/2006 - Tight vertical cracks in both caps witth Abutment 1's being the worse. A couple of small spalls along the ends of the girders where they are embedded in the backwalls. CXDN
10/07/2002 - (11.48 1.40 1.40) * 2 = 28.56m Minor, vertical cracks under girders at Abutment 1. Erosion at all (4) wingwalls. IZHQ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap 2 thru 6										
	1	1	57	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Small surface spalls on the faces of (3) caps near the outer anchors. Small delaminations on Span 4 face of Bent 4 under G5. Small surface spalls and delaminations on the underside of the caps from rebar chair feet. UIGZ
12/27/2010 - Unchanged for small delamination under G5 on Span 4 side of Bent 4's cap. Several small surface spalls on the cap faces near outer most anchors. Some shallow surface spalls on underside of the caps. ZWDZ
11/19/2008 - Condition State 3 for small surface delaminations and Condition State 2 for cracks and minor spalling. Small spall on Bent 4's cap under G5 on the Span 4 side. TEDU
11/02/2006 - Underside of the caps show surface spalling from exposed and rusty rebar chairs. Also some staining around the chairs. CXDN
10/07/2002 - 5 * 11.48 = 57.40m Minor stains where construction rebar chairs are exposed. Minor, tight cracks on most caps. IZHQ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 300 - Strip Seal Exp Joint										
	1	3	23	m.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Joints are packed full of sanding material today. No apparent leakage. Steel portions sound solid when tapped on and there are small spalls/delaminations along the edges of the joint's steel. UIGZ
12/27/2010 - Full of sanding material today. Steel portions of the joints sound solid when tapped but do have some shallow spalls and surface delaminations along their edges. ZWDZ
11/19/2008 - Steel sounds solid when tapped on. A couple of small spalls and delaminations along the steel edges. Gland is pushed down from debris with no obvious tears or leakage. TEDU
11/02/2006 - Joint steel sounds solid when tapped on. Joint area is full of debris/sanding material which is pushing down on the gland. No leaking was noted. CXDN
10/07/2002 - 11.48 * 2 = 22.96m Joints are full of sanding material. Gland doesn't appear to be torn anyplace and not leaking. IZHQ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05472

Continue

* * * * * * * * * * Span : Main-0 - (cont.) * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing										
	1	1	25	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Spot rust, concrete paste, scale, and faded paint. Alignment is ok. UIGZ
12/27/2010 - Paint loss, spot rust, and minor scale. ZWDZ
11/19/2008 - Spot rust, paint loss, and some concrete paste from past hydromilling operations. TEDU
11/02/2006 - Spot rust, paint loss, and some dirt/debris. CXDN
10/07/2002 - Minor rust spots with minor pitting. IZHQ

Inspection Notes:

Element 313 - Fixed Bearing										
	1	1	33	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Paint loss, spot rust, and faded paint. UIGZ
12/27/2010 - Paint loss and spot rust. Some bird debris. ZWDZ
11/19/2008 - Spot rust, paint loss, and some concrete paste from past hydromilling operations. TEDU
11/02/2006 - Spot rust, paint loss, and some debris. CXDN
10/07/2002 - Minor rust spots and minor pitting. IZHQ

Inspection Notes:

Element 331 - Conc Bridge Railing										
	1	3	219	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Random surface shrinkage cracks. Spalls on the backside of the barriers at the rail bolt-ups. Small surface spalls and deterioration along the deck line. UIGZ
12/27/2010 - Vertical cracking throughout. A couple of small scrapes. ZWDZ
11/19/2008 - Unchanged. Small areas of surface deterioration on the original curbs near the deck line. TEDU
11/02/2006 - Minor cracks along the rebar lines on the backside. Randonm vertical cracks. CXDN
10/07/2002 - 109.42 * 2 = 218.84m   Minor, vertical cracks throughout. During a rehab project a barrier was added on top of the existing curbs, IZHQ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05472

Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Singe W-Beam with Round Steel Handrail w\ Steel Posts										
	1	3	219	m.		85	10	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Faded paint, spot rust, and paint loss. Minor surface pitting on the rail posts near the curb line. UIGZ

12/27/2010 - Paint loss, minor surface pitting, and scale on the W-Beam and posts. Sanding material starting to build up behind the barrier on the top of the curb and against the rail posts. ZWDZ

11/19/2008 - No significant change. TEDU

11/02/2006 - Rust, pitting, paint peel, and exposed prime coat on the rail posts and top handrail pipe. W-Beam has some rusty spots throughout. CXDN

10/07/2002 - 109.42 * 2 = 218.84m Rusty spots with pitting throughout rail and posts. The metal rail and posts are now behind a concrete barrier rail. IZHQ

04/14/1998 - None RHHJ

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/19/2012 - Unchanged from previous inspections. UIGZ

12/27/2010 - Wide cracks over un-jointed Bents. Some wider mapping cracks in all Spans. ZWDZ

11/19/2008 - Condition State 2 due to size of the cracks and nearing the density limit also. TEDU

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015282+05472
Continue

General Inspection Notes

12/19/2012 - Good markers on the corners of Abutment 7.	UIGZ
12/27/2010 - Good markers on both sides of Abutment 7 for approaching traffic. Minor erosion on all (4) corners.	ZWDZ
11/19/2008 - NBI 58, deck, rated a "6" due to small delamiantions and cracking. Bumps on and off of the structure. Markers on both corners of Abutment 7, approach roadway, and in Fair condition.	TEDU
11/02/2006 - Minor bumps on and off of the structure. There are markers on the Right and Left approach rail into the bridge and in Fair to Good condition.	CXDN
10/07/2002 - Markers on North end of the structure, approach side, and in Good condition.	IZHQ
04/14/1998 - None	RHHJ
02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:44:30 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:07	REFI
01/01/1992 - Updated with tape 1994	NB94
03/01/1990 - Updated with tape 1991	NB91
02/01/1988 - Updated with tape 1989	NB89
02/01/1986 - Updated with tape 1988	NB88
01/01/1984 - Updated with tape 1985	NB85
08/01/1981 - Updated with tape 1984	NB84
03/01/1979 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015284+00001

Location : 1M N EMERSON JCT Structure Name:

General Location Data

District Code, Number, Location : **03** **Dist 3** **GREAT FALLS**

County Code, Location : **013** **CASCADE**

Kind fo Hwy Code, Description : **1** **1 Interstate Hwy**

Str Owner Code, Description : **1** **State Highway Agency**

Intersecting Feature : **DRAINAGE**

Structure on the State Highway System : X

Structure on the National Highway System : X

Str Meet or Exceed NBIS Bridge Length :

Latitude : **47°31'54"**

Longitude : **111°24'06"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31** **GREAT FALLS**

City Code, Location : **00000** **RURAL AREA**

Signed Route Number : **00015**

Maintained by Code, Description : **1** **State Highway Agency**

Kilometer Post, Mile Post : **457.10 km** **284.03**

Construction Data

Construction Project Number : **I 15-5(9)275**

Construction Station Number : **862+50.00**

Construction Drawing Number :

Construction Year : **1960**

Reconstruction Year :

Traffic Data

Current ADT : **9,280** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**B ASD Assigned**
Operating Load, Design :	**32.6 mton**	**B ASD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**48.6**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **3.86 m**

Deck Area : **0.00 m sq**

Deck Roadway Width : **0.00 m**

Approach Roadway Width : **23.16 m**

Median Code, Description : **0** **No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **N Feature not hwy or RR**

Vertical Clearance Under the Structure : **0.00 m**

Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**

Minimum Lateral Under Clearance Right : **0.00 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **1**

Material Type Code, Description : **3** **Steel**

Span Design Code, Description : **19** **Culvert (includes frame culverts)**

Approach Span

Number of Spans : **0**

Material Type Code, Description :

Span Design Code, Description :

Deck

Deck Structure Type : **N Not applicable**

Deck Surfacing Type : **N Not Applicable (applies only to strutures with no dec**

Deck Protection Type : **N Not applicable (applies only to structures with no de**

Deck Membrain Type : **N Not applicable (applies only to structures with no de**

(52) Out-to-Out Width : **0.00 m**

(50A) Curb Width : **0.00 m**

(50B) Curb Width : **0.00 m**

Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	I00015	Both	99.99 m	12.10 m	N/A		
I - 15							

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015284+00001
Continue

Inspection Data

Sufficiency Rating : **80**
Structure Status : **Not Deficient**

Inspection Due Date : 28 April 2016
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 28 April 2014
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating : N	(68) Deck Geometry : 9	(36A) Bridge Rail Rating : N	(62) Culvert Rating : 6
(59) Superstructure Rating : N	(67) Structure Rating : 6	(36B) Transition Rating : N	(61) Channel Rating : 7
(60) Substructure Rating : N	(69) Under Clearance : N	(36C) Approach Rail Rating : N	(71) Waterway Adequacy : 8
(72) App Rdwy Align : 8	(41) Posting Status : A	(36D) End Rail Rating : N	(113) Scour Critical : 8

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 1
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0

Snooper Required :
Snooper Hours for inspection : 0
Flagger Hours : 0

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2006-000196	**03 May 2006**	**Approved**	**High**	M Main	240 Steel Culvert	Rehab Elem	

Clean debris from inlet and outlet of the pipe and back to R/W. Also complete the outlet drainage ditch so as to drain the standing water in the pipe.
05-03-2010 Lots of tumbleweeds at both ends today.
05-07-2012 Pipe was clean today. Ditch needs to be taken past R/W to get rid of standing water.
04-28-2014 Inlet is full of tumbleweeds today and outlet needs to be cleaned up.

Approved. DRC

Late Reason:
Inspection Date: 04/28/2014

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015284+00001

Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 240 - Steel Culvert										
	1	3	65	m.		85	10	5	0	
						%	%	%	%	%

Previous Inspection Notes :

04/28/2014 - Area under SB lanes has rust, scale, and pin holes in the roof area in random spots. Concrete in the invert looks Good. (2) small holes in the roof about 30' in from the inlet. ZEDZ

05/07/2012 - Pipe was clean today with knee deep water standing in the outlet. Rust, scale, and surface pitting on the invert. Some small pin holes in the invert. Holes 30 ft. in from the inlet end are unchanged. IZGZ

A concrete liner was placed in this pipe during 2013 construction project. This took care of the problems on the invert of the pipe.

05/03/2010 - Same comments as the last inspections. Lots of tumbleweeds in the inlet and outlet of the pipe today. EZGY

04/24/2008 - No change on the 4" x 4" holes, 30 ft in from the inlet. 5 percent in Condition State 3 as a couple of small holes in the invert and because of loss of shape. Rusty spots, scale, and pitting on the bottom 1 ft of the pipe. Outlet is bouncy as hollow under the last 10 ft of the pipe. YZDZ

04/18/2006 - 64.62 * 1 = 64.62m Plans say it is a 13'-0" SSPP but field measurements show it to be 12'-8"(S) x 13'-9"(R). Concrete slope protection and cutoff wall added on the Right-Inlet end after initial construction. Pipe is dry at the inlet, 1' deep standing water at outlet and 2' of standing water under the SB lnae. Pipe has some rust spots and light scale on the invert. Hollow under the first 6 ft of the outlet of the pipe with no cut off wall or slope protection in place. Pipe end bounces when jumped on. About 30 ft in from the inlet is a 4" x 4" hole in the top-Left portion of the pipe. This hole does not appear to be a problem. DQCV

Inspection Notes:

General Inspection Notes

04/28/2014 - Outlet ditch needs to be worked on as still about 1-1/2' of water backed up in the inlet of the pipe for about 40'. ZEDZ

05/07/2012 - Outlet end of the pipe is hollow under the pipe; back 15 ft.
Pipe's shape is Fair with some egg shape to it from construction activity. IZGZ

05/03/2010 - Hollow area under outlet is unchanged. Mid-thigh deep at outlet today to ankle deep at inlet. EZGY

04/24/2008 - Scour hole at outlet and shallow stream bed 50 ft from the pipe has water standing 2 ft deep back into the pipe. YZDZ

04/18/2006 - Cutoff wall and slope protection on Right end added in a construction project that also cleaned out the pipe. Guardrail for I-15 at the pipe due to slope steepness and is up to current standards. DQCV

Form: bms001d
Printing Date : Thursday, May 22 2014

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015284+02351

Location : 6M S VAUGHN Structure Name:

General Location Data

District Code, Number, Location : **03** **Dist 3** **GREAT FALLS**

County Code, Location : **013** **CASCADE**

Kind fo Hwy Code, Description : **1** **1 Interstate Hwy**

Str Owner Code, Description : **1** **State Highway Agency**

Intersecting Feature : **JR GRADE SEP**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length :

Latitude : **47°31'60"**

Longitude : **111°24'23"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31** **GREAT FALLS**

City Code, Location : **00000** **RURAL AREA**

Signed Route Number : **00015**

Maintained by Code, Description : **1** **State Highway Agency**

Kilometer Post, Mile Post : **457.42 km** **284.23**

Construction Data

Construction Project Number : **I 15-5(9)275**

Construction Station Number : **0+00.00**

Construction Drawing Number : **4209**

Construction Year : **1960**

Reconstruction Year : **1974**

Traffic Data

Current ADT : **9,280** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**B ASD Assigned**
Operating Load, Design :	**54.4 mton**	**B ASD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**120.29**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **5.49 m**

Deck Area : **210.00 m sq**

Deck Roadway Width : **38.30 m**

Approach Roadway Width : **22.00 m**

Median Code, Description : **0** **No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **N Feature not hwy or RR**

Vertical Clearance Under the Structure : **3.58 m**

Reference Feature for Lateral Underclearance : **N Feature not hwy or RR**

Minimum Lateral Under Clearance Right : **0.00 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **1**

Material Type Code, Description : **1** **Concrete**

Span Design Code, Description : **1** **Slab**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **6 Bituminous**

Deck Protection Type : **0 None**

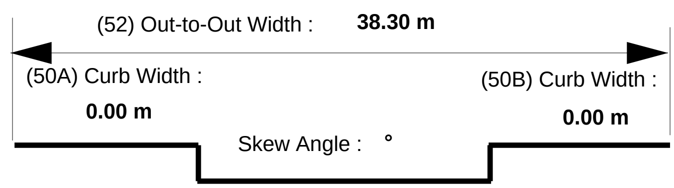
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**

Material Type Code, Description :

Span Design Code, Description :



Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	I00015	South	99.99 m	11.00 m	North	99.99 m	11.00 m
I - 15 --- NB AND SB							

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015284+02351
Continue

Inspection Data

Sufficiency Rating : **96.6**
Structure Status : **Not Deficient**

Inspection Due Date : 06 August 2014
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 06 August 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 7
(59) Superstructure Rating : 7
(60) Substructure Rating : 6
(72) App Rdwy Align : 8

(68) Deck Geometry : 9
(67) Structure Rating : 6
(69) Under Clearance : N
(41) Posting Status : A

(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 0
(36C) Approach Rail Rating : 1
(36D) End Rail Rating : 0

(62) Culvert Rating : N
(61) Channel Rating : N
(71) Waterway Adequacy : N
(113) Scour Critical : N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 4.00 in

Inspection Hours

Crew Hours for inspection : 1
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0

Snooper Required : **N**
Snooper Hours for inspection : 0
Flagger Hours : 0

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2004-000066	**28 January 2004**	**Approved**	**Low**	M Main	215 R/Conc Abutment	Min Repair	
Clean material away from the backwall drains. Approved. DRC							
D31-FY2005-000030	**07 October 2004**	**Approved**	**Low**	M Main	39 Unp Conc Slab/AC Ovl	Min Repair	
Seal cracks between the deck slabs and the median slab. Also between the slab and asphalt surfacing. Some done, 8-6-2012. Approved. DRC							

Late Reason:
Inspection Date: 08/06/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015284+02351

Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 39 - Unp Conc Slab/AC Ovl										
	1	3	210	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

08/06/2012 - Minor rutting in wheel paths. Roadway is smooth over structure. HZGZ

08/09/2010 - No change from the previous inspections. JZDZ

07/10/2008 - Chip seal in the past years. Minor ruts in the wheel paths, but surfacing is generally Good. Small section of exposed rebar on the underside of the slab at the Right edge of Abutment 1. KZCJ

06/08/2006 - Crack at centerline under the NB lanes that has efflorescence. Minor rutting in the aspahlt surfacing. IZDU

09/21/2004 - Same as previous report. Joints at the median slabs to NB and SM slabs are leaking. VULZ

10/07/2002 - Mapping cracks on slab over the median with efflorescence on most cracks. IFHR

08/02/2000 - 38.30 * 5.49 = 210.27
Seperation at the joints. GHJY

04/14/1998 - None RHHO

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment										
	1	2	101	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

08/06/2012 - Some small delaminated areas near cracks with efflorесence. Still partially buried backwall drains. On both abutments worse cracks are from corners of spalls under traveled lanes. HZGZ

08/09/2010 - No change from the previous inspections. JZDZ

07/10/2008 - 5 percent in Condition State 3 for a small delmainated areas. 5 percent in Condition State 2 for cracks with efflorescence. Left wingwall at Abutment 1 has a slight seperation from the backwall. Some backwall drains are partially buried. KZCJ

06/08/2006 - Same as previously reported plus some spalled patch, 4" x 10", on the Right end of Abutment 1 just under the deck. IZDU

09/21/2004 - Cracking from the corners of lane slabs with efflorescence on the cracks. Wingwalls are tight to the backwalls. VULZ

10/07/2002 - Same as previous report. Add weep drains along both backwalls are either buried or partially covered. IFHR

08/02/2000 - (38.3 * 2) + (4 * 6.10) = 101.00m
Cracks with some water marking at the joints of the median section to the sections under the roadway. Slight seperation on the left end at the wingwalls to the backwall joint. GHJY

04/14/1998 - None RHHO

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00015284+02351

Continue

********** Span : **Main-0 -** **(cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Single W-Beam w\ Steel Posts										
	1	3	11	m.		95	5	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

08/06/2012 - Some spot rust and faded paint on rail posts. Some sanding material in lower post webs near bases.	HZGZ
08/09/2010 - No change from the previous inspections.	JZDZ
07/10/2008 - Spot rust on the W-Beam rail and top half of the posts. Paint loss and surface pitting on the lower portions of the webs and bases.	KZCJ
06/08/2006 - Unchanged.	IZDU
09/21/2004 - Spot rust on the rail posts and W-Beam rail.	VULZ
10/07/2002 - Minor rusty spots to both posts and rail.	IFHR
08/02/2000 - 5.49 * 2 = 10.98m Some rust and pitting.	GHJY
04/14/1998 - None	RHHO
12/01/1995 - None	YDNF
02/01/1994 - None	REFI

Inspection Notes:

General Inspection Notes

08/06/2012 - Area under bridge was dry today as was all of the exposed backwall drains.	HZGZ
08/09/2010 - NBI 36A, bridge rail, rated a "1" as if meets the "no retro-fit needed" policy of the Bridge Bureau. NB-Right end shoe is lapped against traffic flow.	JZDZ
07/10/2008 - Median barrier, PVC pipe, is in Good condition.	KZCJ
06/08/2006 - NBI 58, deck, rated a "7" due to minor rutting and cracks in the asphalt surfacing. NBI 59, superstructure, rated a "7" due to minor cracking on the underside of the deck slab. Small delineators on the rail blocks.	IZDU
09/21/2004 - Weep drains on both of the backwalls and they are parially buried. Should be uncovered and cleaned out.	VULZ
10/07/2002 - NBI 36A, B, and D do not meet current standards. 36A is part of continuous run and is only W-beam with steel posts.	IFHR
08/02/2000 - New seal and cover in 1999.	GHJY
04/14/1998 - None	RHHO
12/01/1995 - Sufficiency Rating Calculation Accepted by PONTIS31 at 2/20/97 16:59:27 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:08	YDNF
02/01/1994 -	REFI
01/01/1992 - Updated with tape 1994	NB94
03/01/1990 - Updated with tape 1991	NB91
02/01/1988 - Updated with tape 1989	NB89
02/01/1986 - Updated with tape 1988	NB88
01/01/1984 - Updated with tape 1985	NB85
08/01/1981 - Updated with tape 1984	NB84

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+00001

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**
County Code, Location : **013 CASCADE**
Kind fo Hwy Code, Description : **1 1 Interstate Hwy**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **INT I-15**
Structure on the State Highway System : **X**
Structure on the National Highway System : **X**
Str Meet or Exceed NBIS Bridge Length : **X**
Latitude : **47°29'06"**
Longitude : **111°20'42"**

MDT Maintenance Section : **31-01 Great Falls**
Division Code, Location : **31 GREAT FALLS**
City Code, Location : **32800 GREAT FALLS**
Signed Route Number : **00315**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **0.02 km 0.01**

Construction Data

Construction Project Number : **I 15-5(26)271**
Construction Station Number : **536+44.00**
Construction Drawing Number : **6792**
Construction Year : **1967**
Reconstruction Year :

Traffic Data

Current ADT : **15,040** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**36.2 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**72.91**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **89.61 m**
Deck Area : **1,475.00 m sq**
Deck Roadway Width : **13.72 m**
Approach Roadway Width : **15.00 m**
Median Code, Description : **2 Closed median (no barrier)**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **H Hwy beneath struct**
Vertical Clearance Under the Structure : **5.48 m**
Reference Feature for Lateral Underclearance : **H Hwy beneath struct**
Minimum Lateral Under Clearance Right : **3.55 m**
Minimum Lateral Under Clearance Left : **6.70 m**

Span Data

Main Span

Number Spans : **5**
Material Type Code, Description : **5 Prestressed concrete**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **5 Epoxy Overlay**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

(52) Out-to-Out Width : **16.46 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **30°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under	I00015	South	6.75 m	11.58 m	North	5.48 m	11.58 m
I-15 NB AND SB							
Route On Structure	I00315	West	99.99 m	8.53 m	East	99.99 m	4.88 m
10TH AVE. SOUTH INT.							

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+00001
Continue

Inspection Data

Sufficiency Rating : **88.4**
Structure Status : **Not Deficient**

Inspection Due Date : 05 December 2014
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection :	05 December 2012	Last Inspected By :	Charles Pepos - 107
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	6		(68) Deck Geometry :	4		(36A) Bridge Rail Rating :	1		(62) Culvert Rating :	N	
(59) Superstructure Rating :	7		(67) Structure Rating :	6		(36B) Transition Rating :	1		(61) Channel Rating :	N	
(60) Substructure Rating :	6		(69) Under Clearance :	5		(36C) Approach Rail Rating :	1		(71) Waterway Adequacy :	N	
(72) App Rdwy Align :	7		(41) Posting Status :	A		(36D) End Rail Rating :	1		(113) Scour Critical :	N	

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 1.50 in

Inspection Hours

Crew Hours for inspection :	2			Snooper Required :	N	
Helper Hours :	0			Snooper Hours for inspection :	0	
Special Crew Hours :	0			Flagger Hours :	0	
Special Equipment Hours :	0					

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2003-000158	**13 November 2002**	**Approved**	**High**	All Spans	300 Strip Seal Exp Joint	Min Repair	
Clean the sanding material out of the rubber gland. Approved. DRC							
D31-FY2004-000074	**28 January 2004**	**Approved**	**Low**	All Spans	Bridge	Spot Paint (flex)	
Clean and paint bearings. Approved. DRC							
D31-FY2011-000022	**28 December 2010**	**Not Approved**	**Low**	M Main	205 R/Conc Column	Min Repair	
Repair spalling / delaminations on the Right column of Bent 4.							

Late Reason:
Inspection Date: 12/05/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+00001
Continue

Element Inspection Data

********** Span : Main-0 - **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 22 - P Conc Deck/Rigid Ov										
	1	3	1475	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Mapping cracks in all Spans. Surface delaminations along the guard angles and joint steel. Studded tire wear in the wheel paths. GZFZ

12/06/2010 - Mapping cracks in most of the Spans with 4 and 5 being the worse. Wear in the wheel paths. Small delaminations along the joint steel. GAEZ

11/17/2008 - Wear in the wheel paths. Transverse cracks over the Bents w\o joints. EB lane has mapping cracks in all of the Spans. RZDZ

11/02/2006 - Small delaminations along the joint over Bent 4. Wear in the wheel paths. Transverse cracking over the unjointed Bents. CXDO

10/16/2002 - 16.46 * 89.61 = 1474.98 Same on cracks with some delamination and transverse cracking also; quick chain drag. QZCJ

06/03/1998 - Numerous small, tight mapping cracks throughout the wear surface of the new overlay. A seal coat was applied in 1995 after the 1-1/2" rigid overlay. 19.19 * 89.61 QFBC

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	781	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Girders are in Good condition. GZFZ

12/06/2010 - Good conditions with no hits observed. GAEZ

11/17/2008 - Genreally in Good condition. RZDZ

11/02/2006 - Generally in Good condition. Some minor cracks from the back of the embedded bearing plate to the ends of the girders on several of the girders. None of these are a problem. CXDO

10/16/2002 - (7 * 28.12) (10 * 43.5864) (8 * 18.5166) QZCJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bent 2, 3, 4, and 5										
	1	2	8	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Right column of Bent 4 shows spalls, delaminations, and deteriorated concrete on its' SE corners; photo. Tight surface shrinkage cracks. Columns of Bent 4 have some staining from joint leakage. GZFZ

12/06/2010 - All look Good except the Right column at Bent 4 which has delaminations and spalling that is getting worse; photo. GAEZ

11/17/2008 - Right column at Bent 4 has delaminations and spalling for Condition State 3 and 2 respectively; photo. Tight surface shrinkage cracks throughout. RZDZ

11/02/2006 - Very minor spalling on a couple of the columns and none are a problem. A couple of the tie wires are exposed, but not a problem. CXDO

10/16/2002 - Most noticeable on the south column at Bent 4. QZCJ

06/03/1998 - Some spalling of concrete on a couple of the columns. QFBC

02/01/1994 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+00001

Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 6										
	1	1	45	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Abutments are generally in Good condition. Small spalls along the cap to backwall area and (2) small spalls in Abutment 4's backwall by G3 and G6.	GZFZ
12/06/2010 - Generally Good condition. (1) small spall in Abutment 1's backwall at girder embedment.	GAEZ
11/17/2008 - (1) small spall in Abutment 1's backwall near a girder embedment.	RZDZ
11/02/2006 - Minor and tight shrinkage cracks on both caps. (1) small spall along the girder embedment at Abutment 1. Erosion on the Right side of Abutment 1, SW corner.	CXDO
10/16/2002 - (19.19 1.65 1.45) * 2	QZCJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bent 2, 3, 4, and 5										
	1	1	77	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Spall on the Left end of Bent 3's cap had not changed. Bent 4's cap is stained and has surface spalls and delaminations on its' bottom at rebar chair feet.	GZFZ
12/06/2010 - Spall on the Left end of Bent 3's cap on the Span 2 side; photo. Delamainations on the Right end of Bent 4's cap. Some small spalls on the surface of the cap bottoms from shallow rebar chair feet.	GAEZ
11/17/2008 - Spall on Bent 3's cap has not gotten any worse. Surface delaminations and spalls on the underside of the caps from shallow tie wire and exposed rebar chair feet.	RZDZ
11/02/2006 - Underside of the caps have small surface spalls where rusty rebar chairs are exposed. Also staining around the spalls. Left end of the cap at Bent 3 has a spall under the Span 2 side bearing; see photo.	CXDO
10/16/2002 - 19.19 * 4 = 76.76m	QZCJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 300 - Strip Seal Exp Joint										
	1	3	19	m.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Joint is packed with sanding material today. Steel sounds solid when tapped on. Small delaminations in header concrete along the joint's steel.	GZFZ
12/06/2010 - Lots of dirt and ice in the joint today. Joint is leaking on its' Right end today. Steel all sounds solid when tapped on.	GAEZ
11/17/2008 - Full of dirt. No obvious leaking observed. Steel sounds solid when tapped on. Some small spalls/delaminations along the steel.	RZDZ
11/02/2006 - Joint steel sounds solid when tapped on. Packed with dirt/sanding material. No apparent areas of leakage. Some minor delaminations along the joint steel.	CXDO
10/16/2002 - Full of sanding material.	QZCJ
06/03/1998 - Need to clean out the sanding material that is in the joint. 19.19 * 1	QFBC
02/01/1994 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+00001

Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing Bent 4										
	1	2	20	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Alignment is Good. Rust, paint loss, staining, and bird debris. GZFZ
12/06/2010 - Alignment is Good. Rust, dirt, paint loss, and bird debris. GAEZ
11/17/2008 - Rusty, paint loss, and debris. Also staining from prior joint. RZDZ
11/02/2006 - Rusty, paint loss, dirt, and bird debris. CXDO
10/16/2002 - Add and some paint loss. QZCJ
06/03/1998 - Some rust & pitting. QFBC
02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing										
	1	1	64	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Bent 2, 3, and 5 show faded paint and spot rust. Abutment bearings have paint loss, rust, minor surface pitting, and debris. Outer bearings at the Abutments are the worst. GZFZ
12/06/2010 - Rust, dirt, paint loss, and bird debris. GAEZ
11/17/2008 - Spot rust on the Bent bearings with paint loss and surface pitting on some of the Abutment bearings. RZDZ
11/02/2006 - Some minor spot rust and bird debris. CXDO
10/16/2002 - No change. QZCJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	180	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Rubs on both barriers. Spalls at the bolt holes on the backside of the barriers. Some shrinakge cracks. Generally in Good condition. GZFZ
12/06/2010 - Generally Good condition. Rubs and scrapes on both. Backside of the barrier has spalls near the ends around bolt holes. GAEZ
11/17/2008 - Unchanged with some rubs and scrapes noted. RZDZ
11/02/2006 - Numerous vertical cracks and some cracks along the rebar line. Backside of the rail at the bolt up areas shows minor spalls from drilling/construction activity. CXDO
10/16/2002 - ok QZCJ
06/03/1998 - New Cast-in-Place concrete barrier rail in 1995. QFBC
02/01/1994 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+00001
Continue

* * * * * * * * * * Span : **Main-0 - (cont.)** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	1	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Due to size and quantity. Spans 4 and 5 are the worst. Little to no sealer left.	GZFZ
12/06/2010 - Lots of mapping cracks, especially in Spans 4 and 5.	GAEZ
11/17/2008 - Condition State 2 due to density of cracks in the EB lane. Underside of the deck looks ok.	RZDZ
11/02/2006 - Cracking very visible today from coating of de-icer. No spalled areas. In Condition State 1 as sealed in 1995.	CXDO
10/16/2002 - No change.	QZCJ
06/03/1998 - Small, tight maping cracks throughout the new rigid overlay. Sealed with a sealer during 1995 also.	QFBC

Inspection Notes:

General Inspection Notes

12/05/2012 - End shoes at Abutment 6 are lapped against traffic. Rail terminal section at Abutment 1-Left, NW corner, has (3) broken rail posts; photo. Slope protection concrete has slid downhill into the columns at Bent 2 and is causing some cracking and spalling in the slope protection concrete, photo.	GZFZ
12/06/2010 - End shoes still lapped against traffic on the NE and SE corners.	GAEZ
11/17/2008 - Approaches overlayed in 2007. NE and SE rail end shoes are lapped against traffic.	RZDZ
11/02/2006 - Slope protection at the Abutment fills shows some minor settlement and cracking.	CXDO
10/16/2002 - None	QZCJ
06/03/1998 - None	QFBC
02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:03 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:32	REFI
01/01/1992 - Updated with tape 1994	NB94
03/01/1990 - Updated with tape 1991	NB91
02/01/1988 - Updated with tape 1989	NB89
02/01/1986 - Updated with tape 1987	NB87

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03421

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **1 1 Interstate Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **FAU 5225-14TH STREET SW**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°29'13"**

Longitude : **111°20'17"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00315**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **0.55 km 0.34**

Construction Data

Construction Project Number : **IG 315-5(3)272**

Construction Station Number : **21+65.00**

Construction Drawing Number : **6813**

Construction Year : **1967**

Reconstruction Year : **1995**

Traffic Data

Current ADT : **25,500** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**35.3 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**83.84**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **45.72 m**

Deck Area : **546.00 m sq**

Deck Roadway Width : **10.96 m**

Approach Roadway Width : **10.96 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **H Hwy beneath struct**

Vertical Clearance Under the Structure : **5.26 m**

Reference Feature for Lateral Underclearance : **H Hwy beneath struct**

Minimum Lateral Under Clearance Right : **1.70 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **3**

Material Type Code, Description : **5 Prestressed concrete**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Approach Span

Number of Spans : **0**

Material Type Code, Description :

Span Design Code, Description :

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **11.95 m**

(50A) Curb Width : **0.00 m**

(50B) Curb Width : **0.00 m**

Skew Angle : **25°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under 14TH STREET SW	U05225	Both	5.26 m	9.14 m	N/A		
Route On Structure I - 315 EB	I00315	N/A			North	99.99 m	10.96 m

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03421
Continue

Inspection Data

Sufficiency Rating : **93**
Structure Status : **Not Deficient**

Inspection Due Date : 05 December 2014
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 05 December 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 5
(59) Superstructure Rating : 8
(60) Substructure Rating : 7
(72) App Rdwy Align : 8

(68) Deck Geometry : 4
(67) Structure Rating : 7
(69) Under Clearance : 4
(41) Posting Status : A

(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 1
(36C) Approach Rail Rating : 1
(36D) End Rail Rating : 1

(62) Culvert Rating : N
(61) Channel Rating : N
(71) Waterway Adequacy : N
(113) Scour Critical : N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 2
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0

Snooper Required : N
Snooper Hours for inspection : 0
Flagger Hours : 0

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2004-000075	**28 January 2004**	**Approved**	**Low**	All Spans	Bridge	Spot Paint (flex)	
Clean and paint bearings. Approved. DRC							
D31-FY2007-000039	**26 December 2006**	**Approved**	**Medium**	M Main	12 Bare Concrete Deck	Min Repair	
Patch any spalled areas in the surfacing. Approved. DRC							

Late Reason:
Inspection Date: 12/05/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03421
Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 -** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	546	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Transverse cracks with some spalls and delaminations over Bents 2 and 3. Small delaminations along the guard angles. Wear from studded tires in the wheel paths. GIFZ
12/06/2010 - Spalls, delaminations, and transverse cracks over Bent 2 and 3. Wear in the wheel paths. 2 percent or less delaminations in the deck surface. GZEV
11/17/2008 - Open transverse cracks over Bent 2 and 3. Some delaminations in all (3) Spans with an estimated 2 percent or less from a quick chain drag. Wear in the wheel paths. RCDZ
11/02/2006 - Wear in the wheel paths. Transverse cracks over Bent 2 and 3 with some spalls over Bent 3 also noted. CZDO
10/10/2002 - 11.95 * 45.72 = 546.35 Add slightly open cracks over both Bents. Some minor cracking throughout. KLKZ
06/03/1998 - 13.15 * 45.72= Studded tires have left an almost exposed aggregate finish in both traffic lanes. QFKU
02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	229	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Good condition. GIFZ
12/06/2010 - Good condition. GZEV
11/17/2008 - Same as prior and in Good condition. RCDZ
11/02/2006 - No problems observed. Some girders have minor cracks from the backside of the embedded bearing plate to the ends of the girders. CZDO
10/10/2002 - 5 * 45.72 = 228.60m KLKZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bent 2 and 3										
	1	1	4	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - (2) small spall on the Right column of Bent 3. Tight surface shrinkage cracks in all (4) columns. Columns are in Good condition. GIFZ
12/06/2010 - Tight surface shrinkage cracks in all (4) columns. (2) small spalls on the Right column of Bent 3; patch has popped off. Generally in Good condition. GZEV
11/17/2008 - Generally in Good condition. Small delamianted patch on the Right column of Bent 3 for Condition State 3 and a small spall near the sidewalk line on the same column for Condition State 2. RCDZ
11/02/2006 - Tight surface shrinkge cracks. Right/South Column at Bent 3 has a small chipped area near the sidewalk and some delamianted areas of the patch at its construction joint to the cap. CZDO
10/10/2002 - Some minor wear, weathering, and shrinkage cracks. KLKZ

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03421

Continue

* * * * * * * * * * Span : Main-0 - (cont.) * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment										
	1	2	33	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Small spalls along the cap to backwall area and (1) small spall at the G3 embedment in Abutment 1's backwall.	GIFZ
12/06/2010 - Small spall at (1) bearing in Abutment 1's backwall. Tight surface shrinkage cracks.	GZEV
11/17/2008 - Unchanged. Graffiti has been painted over.	RCDZ
11/02/2006 - Tight surface shrinakge cracks in both caps and some small spalls where the girders are embedded in the backwalls.	CZDO
10/10/2002 - Add some erosion at the corners.	KLKZ
06/03/1998 - (13.15 * 2) 1.80 1.60 1.50 1.70 Some small, tight cracks with minor water staining.	QFKU
02/01/1994 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bent 2 and 3										
	1	1	26	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Good condition. Lots of pigeon debris on top of the caps.	GIFZ
12/06/2010 - Good condition. Some staining from bird debris.	GZEV
11/17/2008 - Good condition. Same on staining and tight cracks.	RCDZ
11/02/2006 - Some tight cracks at the steps in the caps. Lots of staining from pigeon debris on tops of the caps.	CZDO
10/10/2002 - 13.15 * 2 = 26.30m	KLKZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing										
	1	1	30	ea.		85	15	0		
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Faded paint and debris on the bearings at Bents 2 and 3. Bearings at both of the Abutments have paint loss, minor pitting, and heavy rust.	GIFZ
12/06/2010 - Rusty spots, paint loss, and bird debris.	GZEV
11/17/2008 - Rust, paint loss, and bird debris.	RCDZ
11/02/2006 - Spot rust and paint loss. Lots of piegeon debris on the bearings at Bents 2 and 3.	CZDO
10/10/2002 - Add some paint loss and bird debris.	KLKZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03421
Continue

********** Span : **Main-0 - (cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	91	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Some tight shrinkage cracks. Cracks on the backside of the barrier show efflorescence in areas. Ends shoe at Abutment 1 are lapped against traffic.	GIFZ
12/06/2010 - Scrapes and dings to both barriers. Vertical shrinkage cracks for the length of the rails. End shoes at Abutment 1 are lapped against traffic flow.	GZEV
11/17/2008 - Some scrapes and dings on both rails. Tight vertical cracking, random, throughout.	RCDZ
11/02/2006 - Unchanged from previous reports.	CZDO
10/10/2002 - 45.72 * 2 = 91.44m Minor dings, scrapes, and vertical cracking.	KLKZ
06/03/1998 - New Cast-in-Place concrete rail in 1995.	QFKU
02/01/1994 - None	REFI

Inspection Notes:

Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	0	100	0	
						%	%	%	%	%

Previous Inspection Notes :

12/05/2012 - Widest and densest areas of cracking are over the Bents with spalling and delaminations in the cracked areas.	GIFZ
12/06/2010 - Some cracked areas show spaling starting and small delaminations.	GZEV
11/17/2008 - Wide cracks with spalling over Bents 2 and 3.	RCDZ

Inspection Notes:

General Inspection Notes

12/05/2012 - Light on face of Bent 2's cap was not working today. Minor bumps on and off of the structure.	GIFZ
12/06/2010 - Very minor bumps on and off of the bridge.	GZEV
11/17/2008 - New approach overlay in 2007. Both of the rail end shoes at Approach 1 are lapped against the traffic flow.	RCDZ
11/02/2006 - Recent patches to the roadway approaches. Still minor bumps on and off of the structure.	CZDO
10/10/2002 - ok	KLKZ
06/03/1998 - None	QFKU
02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:04 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:33	REFI
01/01/1992 - Updated with tape 1994	NB94
01/01/1990 - Updated with tape 1991	NB91
02/01/1988 - Updated with tape 1989	NB89
02/01/1986 - Updated with tape 1988	NB88

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03422

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**
County Code, Location : **013 CASCADE**
Kind fo Hwy Code, Description : **1 1 Interstate Hwy**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **FAU 5225-14TH STREET SW**
Structure on the State Highway System : X
Structure on the National Highway System : X
Str Meet or Exceed NBIS Bridge Length : X
Latitude : **47°29'13"**
Longitude : **111°20'18"**

MDT Maintenance Section : **31-01 Great Falls**
Division Code, Location : **31 GREAT FALLS**
City Code, Location : **32800 GREAT FALLS**
Signed Route Number : **00315**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **0.55 km 0.34**

Construction Data

Construction Project Number : **IG 315-5(3)272**
Construction Station Number : **21+65.00**
Construction Drawing Number : **6813**
Construction Year : **1967**
Reconstruction Year : **1995**

Traffic Data

Current ADT : **25,500** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**35.3 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**83.84**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **44.20 m**
Deck Area : **639.00 m sq**
Deck Roadway Width : **13.65 m**
Approach Roadway Width : **14.00 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **H Hwy beneath struct**
Vertical Clearance Under the Structure : **5.20 m**
Reference Feature for Lateral Underclearance : **H Hwy beneath struct**
Minimum Lateral Under Clearance Right : **1.70 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **3**
Material Type Code, Description : **5 Prestressed concrete**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **14.46 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **25°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under	U05225	Both	5.20 m	9.14 m	N/A		
14TH STREET SW							
Route On Structure	I00315	West	99.99 m	13.65 m	N/A		
I - 315 WB							

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03422
Continue

Inspection Data

Sufficiency Rating : **96**
Structure Status : **Not Deficient**

Inspection Due Date : 06 December 2014
(91) Inspection Frequency (months) : **48**

NBI Inspection Data

(90) Date of Last Inspection : 06 December 2010
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 6
(59) Superstructure Rating : 8
(60) Substructure Rating : 7
(72) App Rdwy Align : 8

(68) Deck Geometry : 9
(67) Structure Rating : 7
(69) Under Clearance : 4
(41) Posting Status : A

(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 1
(36C) Approach Rail Rating : 1
(36D) End Rail Rating : 1

(62) Culvert Rating : N
(61) Channel Rating : N
(71) Waterway Adequacy : N
(113) Scour Critical : N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 2
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0

Snooper Required : N
Snooper Hours for inspection : 0
Flagger Hours : 0

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2004-000076	**28 January 2004**	**Approved**	**Low**	All Spans	Bridge	Spot Paint (flex)	
Clean and paint bearings. Approved. DRC							
D31-FY2007-000041	**26 December 2006**	**Approved**	**Medium**	M Main	12 Bare Concrete Deck	Min Repair	
Patch any spalled areas in the deck, very small at this time. Approved. DRC							

Late Reason:
Inspection Date: 12/06/2010

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03422

Continue

Element Inspection Data

********** Span : **Main-0 -** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	639	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Element Description

Previous Inspection Notes :

12/06/2010 - Wear in the wheel paths. Tight cracks over Bents 2 and 3. Some random cracking in all (3) Spans.	GZEW
11/02/2006 - Wear in the wheel paths. Cracking does not appear to be any worse or opening up. Put into Condition State 2 as there was (1) small, 1" x 2", area of delamination near Abutment 4 in the Left lane of traffic.	CZDO
10/10/2002 - 14.46 * 44.20 = 639.13 Numerous, small and tight, transverse and mapping cracks throughout; very noticeable of the repaired areas. Maybe a smart flag for deck cracking the next report.	KYKZ
06/03/1998 - 44.20 * 16.35 Deck was repaired, sealed only and widened in 1995.	QFIX
02/01/1994 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	265	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/06/2010 - Good condition.	GZEW
11/02/2006 - Good condition. A couple of the girders have tight cracks from the backside of the embedded bearing plates to the ends of the girders.	CZDO
10/10/2002 - Some scrapes to the bottom flange, but no dings or spalled concrete.	KYKZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bent 2 and 3										
	1	1	6	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/06/2010 - Surface shrinkage cracks. Generally in Good condition.	GZEW
11/02/2006 - Tight surface shrinkage cracks. Left two(2) columns on the newer portion of the bridge have some loose/spalled patches over the construction joint to the cap.	CZDO
10/10/2002 - Some wear, weathering, shrinkage cracks.	KYKZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 4										
	1	1	39	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/06/2010 - (1) small spall near girder embedment at Abutment 4. Some tight shrinkage cracks.	GZEW
11/02/2006 - Minor and tight cracks in both caps with one small spalleed area in the backwall where the girders are embedded.	CZDO
10/10/2002 - A little more erosion and weathering of the concrete.	KYKZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03422

Continue

* * * * * * * * * * Span : Main-0 - (cont.) * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bent 2 and 3										
	1	1	33	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/06/2010 - Some tight surface shrinkage cracks. Rebar chair feet show some rust on the underside of both caps. Minor staining from bird debris. GZEW

11/02/2006 - Staining from pigeon debris. Some tight cracks at the steps in the caps and none are a problem. CZDO

10/10/2002 - 16.35 * 2 = 32.70m KYKZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing										
	1	1	36	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/06/2010 - Rust spots, paint loss, and bird debris. GZEW

11/02/2006 - Rusty spots and paint loss. Lots of pigeon debris on both of the Bent caps. CZDO

10/10/2002 - Add some paint loss and bird debris. KYKZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	88	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/06/2010 - Same as past inspections. GZEW

11/02/2006 - Left/North rail has a couple of patches areas on its backside. Not a problem, only an aesthetic thing. CZDO

10/10/2002 - Some dings, scrapes, and vertical cracking. KYKZ

06/03/1998 - New in 1995 and was Cast-in-Place. QFIX

44.20 * 2.

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/06/2010 - Condition State 2 due to amount of tight mapping cracks noted; especially when the surface is damp. GZEW

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03422
Continue

General Inspection Notes

12/06/2010 - Minor bumps on and off of the bridge.	GZEW
11/02/2006 - Recent patches on the East approach to the structure and still a minor bump on and off of the structure.	CZDO
10/10/2002 - None	KYKZ
06/03/1998 - None	QFIX
02/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:04 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:34	REFI
01/01/1992 - Updated with tape 1994	NB94
01/01/1990 - Updated with tape 1991	NB91
02/01/1988 - Updated with tape 1989	NB89
02/01/1986 - Updated with tape 1988	NB88

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03423

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**
County Code, Location : **013 CASCADE**
Kind fo Hwy Code, Description : **8 8 Other (incl toll rds)**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **FAU 5225-14TH STREET SW**
Structure on the State Highway System : [ ]
Structure on the National Highway System : [ ]
Str Meet or Exceed NBIS Bridge Length : [X]
Latitude : **47°29'12"**
Longitude : **111°20'17"**

MDT Maintenance Section : **31-01 Great Falls**
Division Code, Location : **31 GREAT FALLS**
City Code, Location : **32800 GREAT FALLS**
Signed Route Number : **00315**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **0.55 km 0.34**

Construction Data

Construction Project Number : **IR 315-5(12)1F**
Construction Station Number : **5+63.00**
Construction Drawing Number : **15883**
Construction Year : **1997**
Reconstruction Year :

Traffic Data

Current ADT : **25,500** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**34.6 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**48.6**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **41.45 m**
Deck Area : **333.00 m sq**
Deck Roadway Width : **7.11 m**
Approach Roadway Width : **7.32 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **H Hwy beneath struct**
Vertical Clearance Under the Structure : **5.71 m**
Reference Feature for Lateral Underclearance : **H Hwy beneath struct**
Minimum Lateral Under Clearance Right : **1.90 m**
Minimum Lateral Under Clearance Left : **0.50 m**

Span Data

Main Span

Number Spans : **3**
Material Type Code, Description : **5 Prestressed concrete**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**
Deck Protection Type : **1 Epoxy Coated Reinforcing**
Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **8.03 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **15°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under 14TH ST SW/BRIDGE ST	U05225	Both	5.71 m	9.14 m	N/A		
Route On Structure I-315 EB OFF RAMP	I00315	N/A			East	99.99 m	7.11 m

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03423

Continue

Inspection Data

Sufficiency Rating : **96**
Structure Status : **Not Deficient**

Inspection Due Date : 16 June 2015
(91) Inspection Frequency (months) : **48**

NBI Inspection Data

(90) Date of Last Inspection : 16 June 2011
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	6	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	7	(36B) Transition Rating :	1	(61) Channel Rating :	N
(60) Substructure Rating :	7	(69) Under Clearance :	4	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	N
(72) App Rdwy Align :	7	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	2	Snooper Required :	N
Helper Hours :	0	Snooper Hours for inspection :	0
Special Crew Hours :	0	Flagger Hours :	0
Special Equipment Hours :	0		

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2007-000143	**02 July 2007**	**Approved**	**Medium**	M Main	313 Fixed Bearing	Rehab Elem	

Clean and spot paint the bearings.

Approved. DRC

Late Reason:
Inspection Date: 06/16/2011

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03423

Continue

Element Inspection Data

********** Span : **Main-0 - -1** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 26 - Conc Deck/Coatd Bars

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	333	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Transverse and mapping cracks over both Bents. Minor wear in the wheel paths from studded tire wear RZGB

05/31/2007 - Minor wear from studded tires. Transverse cracking over Bents 2 and 3 with the worse area at Bent 2. Not enough for a smart flag yet. EZHZ

05/04/2005 - Some wear in the wheel paths. Transverse cracking over both of the Bents. (8.03 * 40.93 (brg to brg) = 328.67m NMS) EIFR

04/30/2003 - Deck has tight mapping cracks throughout the driving surface. Studded tire wear in the wheel paths with some exposed aggregate. BPHZ

08/27/2001 - 8.03 * 41.45 = 332.8
Slightly open cracks at the two bents. Numerous small, tight tansverse &/or mapping cracks throughout the driving surface. NHCO

12/23/1998 - None KBGR

Inspection Notes:

Element 109 - P/S Conc Open Girder

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	166	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Generally in Good condition. Small nick on bottom of G1S1 has not changed. RZGB

05/31/2007 - Small nick on the Left side of the Bottom flange of G1 in Span 1, but not a problem. EZHZ

05/04/2005 - Unchanged from previous reports. (4 * 40.93 = 163.72 NMS) EIFR

04/30/2003 - There is a small nick in the outside-left girder near Abutment 1. No problem with the nick or with any of the other girders noted. Graffti painted on girders near the Abutments. BPHZ

08/27/2001 - 4 * 41.45 = 165.8m NHCO

12/23/1998 - None KBGR

Inspection Notes:

Element 205 - R/Conc Column Bents 2 and 3

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	4	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Generally in Good condition with some small area where small sacked patches are peeling off. Small spall on the Right column of Bent 3 from construction. RZGB

05/31/2007 - Placed 5 percent into Condition State 2 as sacked patches are loose and peeling off of the columns. None of these areas are a problem. EZHZ

05/04/2005 - Same on the small popouts. EIFR

04/30/2003 - No problems noted. A couple of small popouts in areas that were sacked during construction. BPHZ

08/27/2001 - None NHCO

12/23/1998 - _ KBGR

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03423

Continue

********** Span : **Main-0 - -1 (cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 4										
	1	1	20	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Generally in Good condition. Small spall on construction joint of backwall to cap area of Abutment 1. RZGB
05/31/2007 - Minor spall at the cap to backwall construction joint at Abutment 1. Generally in Good condition. EZHZ
05/04/2005 - Minor and tight cracks in both of the backwalls. Erosion at the NW corners is worse. (Bent 1 = 9.62m Bent 4 = 10.67) = 20.29m EIFR
04/30/2003 - Abutments are in Good condition other than the erosion on the NW corner of the structure. Can't rate the element done due to erosion problems, so raised to all in State 1. BPHZ
08/27/2001 - Erosion at the left wingwall of Abutment #1. NHCO
12/23/1998 - _ KBGR

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bents 2 and 3										
	1	1	16	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Good condition. RZGB
05/31/2007 - Tight surface shrinkage cracks. Some loose sacked patches at the connections to the columns. EZHZ
05/04/2005 - No problems noted other than tight surface shrinkage cracks. (7.92 * 2 = 15.84m NMS) EIFR
04/30/2003 - Surface shrinkage cracking; no problems noted. BPHZ
08/27/2001 - 8.03 * 2 = 16.06m NHCO
12/23/1998 - None KBGR

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing										
	1	1	16	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Dirt and bird debris on bearings of both Bents 2 and 3 with some spot rust. RZGB
05/31/2007 - Removed the Abutment bearings as they are not visible back to the anchor bolts . Bent bearings have spot rust and lots of debris on them. EZHZ
05/04/2005 - Same as last report. Bearings at Bents 2 and 3 are now covered by nesting pigeons. (4 8 8 4 = 24 NMS) EIFR
04/30/2003 - Rusty spots throughout the bearings. Pigeon debris on Bent 2 and 3's bearings. Left bearing at Abutment 1 is covered by dirt from erosion at the NW wingwall. BPHZ
08/27/2001 - Some debris and pigeon droppings. NHCO
12/23/1998 - _ KBGR

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315000+03423

Continue

* * * * * * * * * * Span : **Main-0 - -1 (cont.)** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	83	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Generally in Good condition with some tight shrinkage cracks. Small chips on the Right barrier in Span 3. RZGB
05/31/2007 - Rest of the comments from prior reports still apply. EZHZ
05/04/2005 - Same as last report and add some small nicks out of the top of the barrier in Span 3 - Right side. (40.93 * 2 = 81.86 NMS) EIFR
04/30/2003 - Vertical cracking, mostly tight, throughout both barriers. A couple of small popouts in concrete surface of the barriers. BPHZ
08/27/2001 - 41.45 * 2 = 82.90m NHCO
12/23/1998 - None KBGR

Inspection Notes:

Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Added as cracking seemed excessive over the Bents and some of the cracks are a little bigger, 0.5 to 0.7mm in size. Mostly to start a closer monitoring of the cracks. RZGB

Inspection Notes:

General Inspection Notes

06/16/2011 - NBI 72, roadway alignmnet, rated a "7" as deck is slightly narrower than the approach roadway and it is on a curve. RZGB

05/31/2007 - NBI 59, superstructure, rated a "7" due to nick in G1S1 on the girders' bottom flange. EZHZ
NBI 60, substructure, rated a "7" due to small delaminations in the patches on the columns and caps.
Erosion has been repaired on the Left side of Abutment 1.

05/04/2005 - Erosion at the NW corner of the structure is worse with some erosion to the fill under the wingwall. This could become a problem if flow gets under the concrete slope protection underneath the structure. EIFR

04/30/2003 - Same comments as 08-2001 report. Blocking on approach sections of the guardrail are loose and need to be tightened down and toe-nailes. BPHZ

08/27/2001 - Guardrail underneath the structure to protect the bents. On the west(back on line) side it is barrier rail at the Bent with W-beam rail approach sections. End anchors do not meet current standards. Rigth (east) side has impact attunators for end anchors and do meet current standards. NHCO

12/23/1998 - None KBGR

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00691

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **1 1 Interstate Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **BNSF RAILROAD**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°29'16"**

Longitude : **111°20'07"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00315**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **1.71 km 1.06**

Traffic Data

Current ADT : **25,500** ADT Count Year : **2009** Percent Trucks : **2 %**

Construction Data

Construction Project Number : **IR 315-5(12)1F**

Construction Station Number : **29+60.00**

Construction Drawing Number : **1852**

Construction Year : **1946**

Reconstruction Year : **1996**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**B ASD Assigned**
Operating Load, Design :	**52.6 mton**	**B ASD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**120.29**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **54.21 m**

Deck Area : **786.00 m sq**

Deck Roadway Width : **13.59 m**

Approach Roadway Width : **13.59 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **R Railroad beneath struc**

Vertical Clearance Under the Structure : **6.63 m**

Reference Feature for Lateral Underclearance : **R Railroad beneath struc**

Minimum Lateral Under Clearance Right : **3.96 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **3**

Material Type Code, Description : **4 Steel continuous**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **0**

Material Type Code, Description :

Span Design Code, Description :

(52) Out-to-Out Width : **14.50 m**

(50A) Curb Width : **0.00 m**

(50B) Curb Width : **0.00 m**

Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure I-315 - EXIT 0 - EB	I00315	N/A			East	99.99 m	13.59 m

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00691

Continue

Inspection Data

Sufficiency Rating : **75.4**
Structure Status : **Func Obs - Elg Rehab**

Inspection Due Date : 28 June 2014
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection :	28 June 2012	Last Inspected By :	Charles Pepos - 107
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	5		
(59) Superstructure Rating :	7		
(60) Substructure Rating :	7		
(72) App Rdwy Align :	8		
(68) Deck Geometry :	2		
(67) Structure Rating :	7		
(69) Under Clearance :	5		
(41) Posting Status :	A		
(36A) Bridge Rail Rating :	1		
(36B) Transition Rating :	1		
(36C) Approach Rail Rating :	1		
(36D) End Rail Rating :	1		
(62) Culvert Rating :	N		
(61) Channel Rating :	N		
(71) Waterway Adequacy :	N		
(113) Scour Critical :	N		

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	5	
Helper Hours :	0	
Special Crew Hours :	0	
Special Equipment Hours :	0	
Snooper Required :	Y	
Snooper Hours for inspection :	3	
Flagger Hours :	0	

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2004-000080	**28 January 2004**	**Approved**	**Medium**	All Spans	215 R/Conc Abutment	Min Repair	
repair the erosion at the NE corner of the structure. 06-28-2012 Partially repaired with asphalt. Approved. DRC							
D31-FY2005-000241	**13 July 2005**	**Approved**	**Low**	M Main	234 R/Conc Cap	Min Repair	
Fix/repair the small delaminated area on the Span 2 of Bent 2's cap. 06-28-2012 Also (1) on the Span 1 side of Bent 2's and on (1) on the Span 3 side of Bent 3's. Approved. DRC							

Late Reason:
Inspection Date: 06/28/2012

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00691
Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 -** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	787	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - Spalling and delaminations in all (3) Spans. Lots of cracking in all of the Spans. Poor skid resistance on the older portion of the deck. ZRGZ

05/07/2010 - No change from the previous inspections. HZMS

06/16/2008 - Delamiantions/spalls in all (3) spans, but mostly in the newer portion of the deck. About 1/3 of 1 lane is mostly delamiantated as found in a quick chain drag. Old deck surface has little skid resistance remaining. RZDZ

05/31/2007 - None EVHZ

05/04/2005 - Wear in the wheel paths. Some cracking throughout. Newer portion appears to be cracking over the rebar, transverse, on 6" to 8" centers. Placed in Condition State 2 as there are a couple of delaminated areas. Same on the low skid resistance. FZDZ

04/30/2003 - Minor areas of efflorescence on the underside of the deck. Tight transverse cracks throughout the deck; more evident over Bents 2 and 3. Wear in the wheel paths with exposed aggregate. Very low skid resistance. ZHEB

08/06/2001 - 54.25 * 14.50 = 786.63
Studded tire wear in the wheel paths. NHGN

01/14/1999 - Small tight transverse cracks in deck surface. Minor efflorescence on underside of deck. UAIV

04/01/1996 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder										
	1	1	380	m.		85	10	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - Some fading of the paint on the newer girders and the Right side of the Left most older girder. Some rust, scale, and surface pitting of the older girders. ZRGZ

05/07/2010 - No change from the previous inspections. HZMS

06/16/2008 - Newer girders show minor fading of the coating system on the Outer-Right side of the Right most girder. Older portion of the structure's girders has some rusty spots, scale, and surface pitting; especially under open joints. Numerous broken welds on the attached blast plate. RZDZ

05/31/2007 - None EVHZ

05/04/2005 - Rusty spots, scale, minor paint loss, and smoke on the lower flange and lower portions of the web area on the older girders. New girders have no problems noted as of now. FZDZ

04/30/2003 - Some spot rust on the original girders. Worse rust spots are under leaking joints. No paint on the back side of bolts used for connecting diaphragms to old girders and they are rusted. Some pack rust noted in the bottom flange area over both Bents. ZHEB

08/06/2001 - 7 * 54.25 = 379.75m NHGN

01/14/1999 - Very minor rust on original painted steel beams. UAIV

04/01/1996 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00691
Continue

*********** Span : **Main-0 - (cont.)** ***********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bent 2 and 3										
	1	1	8	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - (1) small delamination on Bent 3's - 2nd from the Left column. Spall on the Left column at Bent 2. ZRGZ
05/07/2010 - No change from the previous inspections and in mostly Good condition. HZMS
06/16/2008 - Left column at Bent 2 has a small surface spall from exposed rebar chair; Condition State 2. RZDZ
05/31/2007 - None EVHZ
05/04/2005 - Minor and tight shrinkage cracks. Tight cracks at the cap to column construction joint. FZDZ
04/30/2003 - Some surface shrinkage cracks. ZHEB
08/06/2001 - None NHGN
01/14/1999 - UAIV
04/01/1996 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 4										
	1	1	35	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - Tight cracks in both backwalls. The worse areas are on the older portion of the bridge. Spall on the Left wingwall of Abutment 1. ZRGZ
05/07/2010 - No change from the previous inspections and in mostly Good condition. HZMS
06/16/2008 - Same on tight cracks. Left end of Abutment 1 has a small spalled area at the wingwall. RZDZ
05/31/2007 - None EVHZ
05/04/2005 - Both of the backwalls have cracks. FZDZ
04/30/2003 - Minor and tight cracks in areas where girder ends are embedded in the Abutment backwalls. Some erosion at the NE corner. ZHEB
08/06/2001 - (14.50 * 2) + (4 * 1.60) = 35.40m NHGN
01/14/1999 - None UAIV
04/01/1996 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00691

Continue

* * * * * * * * * * Span : **Main-0 -** **(cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 234 - R/Conc Cap   Bent 2 and 3

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	29	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - Bent 3's cap has a delamianted area under G2 on the Span 3 face and Bent 2's has a small delamination on the Span 2 face along with a small spalled area. ZRGZ

05/07/2010 - No change from the previous inspections and in mostly Good condition. HZMS

06/16/2008 - Small delmainated area on the Span 2 side of Bent 2's cap. Underside of the caps show some minor surface spalls from exposed and rusty rebar chair feet. RZDZ

05/31/2007 - None EVHZ

05/04/2005 - Same on the old to new construction joint. Small delamianted area on the Span 2 side of Bent 2's cap. FZDZ

04/30/2003 - Minor and tight cracks with some minor concrete popouts where old portion and newer portion of the caps are joined together. ZHEB

08/06/2001 - 2 * 14.50 = 29.00m NHGN

01/14/1999 - None UAIV

04/01/1996 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Element 301 - Pourable Joint Seal Bents 2 and 3

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	20	m.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - Joint steel in the older portion of the deck only. Steel is solid when tapped on. Delaminations and spalls along the edge of the steel. No sealant in the joints. ZRGZ

05/07/2010 - No change from the previous inspections and in mostly Good condition. HZMS

06/16/2008 - Joints leak. Spalls along the steel guard angles. The steel sounds solid when tapped on. RZDZ

05/31/2007 - None EVHZ

05/04/2005 - 10.21 * 2 = 20.42m   Double guard angle type joints in the older portions of the deck. When newer deck was added, there was no continuation of the joints. FZDZ

Inspection Notes:

Element 310 - Elastomeric Bearing New girders at Bent 2 and 3

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	4	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - Rubber portion is Good. Spot rust on the steel portion of the bearings. ZRGZ

05/07/2010 - No change from the previous inspections and in Good condition. HZMS

06/16/2008 - Unchanged. Spot rust on the steel portions and bird debris starting to build up. RZDZ

05/31/2007 - None EVHZ

05/04/2005 - Spot rust on the steel potions of the bearings. FZDZ

04/30/2003 - Some minor spot rust forming on the steel potion of the bearings. ZHEB

08/06/2001 - Bent #2 & #3 under the new girders. NHGN

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00691

Continue

*********** Span : **Main-0 -** **(cont.)** ***********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing Bent 2 and 3 under Older Girders										
	1	1	10	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - Alignment was Good today. Some rust, paint loss, and debris. ZRGZ
05/07/2010 - No change from the previous inspections and in mostly Good condition. HZMS
06/16/2008 - Spot rust from leakage. Alignment is Good. RZDZ
05/31/2007 - None EVHZ
05/04/2005 - Some rusty spots and scale. FZDZ
04/30/2003 - Rusty spots as these joints are leaking some. Also dirt and pack rust between bottom of the rocker and bottom plate of the bearings. ZHEB
08/06/2001 - Bent #2 & #3 under the original girders. Some rust and pitting. NHGN
01/14/1999 - None UAIV
04/01/1996 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

Element 331 - Conc Bridge Railing										
	1	3	108	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - Right barrier has a spalled section in Span 2. Retro-fitted barrier on the Left curb is in Good condition with some shrinkage cracks. ZRGZ
05/07/2010 - No change from the previous inspections and in mostly Good condition. HZMS
06/16/2008 - Minor and tight surface shrinkage cracks. Left rail sets on top of older curb. RZDZ
05/31/2007 - None EVHZ
05/04/2005 - Same as previously reported. FZDZ
04/30/2003 - Vertical cracks throughout both rails. Some minor scrapes to rails and a few small popouts of the rail concrete. ZHEB
08/06/2001 - 54.25 * 2 = 108.50m NHGN
01/14/1999 - None UAIV
04/01/1996 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00691
Continue

********** Span : Main-0 - (cont.) **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	1	1	ea.	X	0	0	100	0	
						%	%	%	%	%

Previous Inspection Notes :

06/28/2012 - The worse areas of cracking are showing lots of spalling and delaminated areas. ZRGZ
05/07/2010 - No change. HZMS
06/16/2008 - Many of the cracks are wider, 0.5 to 1.0mm, and are open. Some of the cracks have scaling along their edges. RZDZ
05/31/2007 - None EVHZ
05/04/2005 - Add some cracking over the rebar in Span 2 to the previous reports. FZDZ
04/30/2003 - Tight transverse and mapping cracks throughout. Mostly on the older portion of the deck. ZHEB
08/06/2001 - No change. NHGN
01/14/1999 - Small, tight tranverse cracking throughout the deck. UAIV

Inspection Notes:

General Inspection Notes

06/28/2012 - Access is tough at this bridge due to erosion and fences. ZRGZ
05/07/2010 - None HZMS
06/16/2008 - Deck is getting worse.
Some asphalt placed in the erosion at the NE corner of the bridge. RZDZ
05/31/2007 - None EVHZ
05/04/2005 - NBI 58, deck, rated at a "6" due to delaminations and minor spalling. FZDZ
04/30/2003 - NBI 60, substructure, rated at a "7" due to some cracking in the substructure concrete. ZHEB
08/06/2001 - None NHGN
01/14/1999 - None UAIV
04/01/1996 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:05
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:35 YDNF
02/01/1994 - REFI
08/01/1992 - Updated with tape 1994 NB94
01/01/1991 - Updated with tape 1992 NB92
03/01/1989 - Updated with tape 1991 NB91
04/01/1987 - Updated with tape 1989 NB89
09/01/1984 - Updated with tape 1986 NB86

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **1 1 Interstate Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **BNSF RAILROAD**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°29'17"**

Longitude : **111°20'07"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00315**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **1.71 km 1.06**

Construction Data

Construction Project Number : **IR 315-5(12)1F**

Construction Station Number : **29+98.00**

Construction Drawing Number : **6825**

Construction Year : **1967**

Reconstruction Year : **1996**

Traffic Data

Current ADT : **25,500** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		5 MS 18 (HS 20)
Inventory Load, Design :	32.6 mton	B ASD Assigned
Operating Load, Design :	33.5 mton	B ASD Assigned
Posting :		5 At/Above Legal Loads

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	78.98		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **63.40 m**

Deck Area : **767.00 m sq**

Deck Roadway Width : **11.18 m**

Approach Roadway Width : **11.18 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **R Railroad beneath struc**

Vertical Clearance Under the Structure : **6.93 m**

Reference Feature for Lateral Underclearance : **R Railroad beneath struc**

Minimum Lateral Under Clearance Right : **3.96 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **1**

Material Type Code, Description : **3 Steel**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Approach Span

Number of Spans : **4**

Material Type Code, Description : **5 Prestressed concrete**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **12.09 m**

(50A) Curb Width : **0.00 m**

(50B) Curb Width : **0.00 m**

Skew Angle : **30°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure I-315 AT EXIT 0 - WB	I00315	West	99.99 m	11.18 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692
Continue

Inspection Data

Sufficiency Rating : **93.8**
Structure Status : **Not Deficient**

Inspection Due Date : 16 June 2015
(91) Inspection Frequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 17 June 2013
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	5	(68) Deck Geometry :	5	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	6	(36B) Transition Rating :	1	(61) Channel Rating :	N
(60) Substructure Rating :	6	(69) Under Clearance :	5	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	N
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 4
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0
Snooper Required : Y
Snooper Hours for inspection : 2
Flagger Hours : 0

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2003-000437	**27 June 2003**	**Approved**	**High**	All Spans	301 Pourable Joint Seal	Min Repair	
Seal leaking joints. Approved. DRC							
D31-FY2003-000436	**27 June 2003**	**Approved**	**Low**	A Approach	12 Bare Concrete Deck	Min Repair	
Repair pot hole starting in the deck near centerline over Bent 4. 05/31/2007 Add repairs to the spalls and delamiantions also. 06/15/2011 More starting to spall. Approved. DRC							
D31-FY2004-000081	**28 January 2004**	**Approved**	**Low**	All Spans	Bridge	Spot Paint (flex)	
Clean pigeon debris from caps. Re-paint steel as needed. 05/31/2007 Some done with during snooper inspection. Approved. DRC							
D31-FY2006-000003	**18 October 2005**	**Approved**	**Low**	A Approach	109 P/S Conc Open Girder	Min Repair	
Clean dirt/debris from along the Right girder in Span 5. 06/15/2011 Some work has been done. Approved. DRC							

Late Reason:
Inspection Date: 06/17/2013

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692
Continue

Element Inspection Data

********** Span : **Main-0 - STEEL WF - SPAN 3** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	190	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Cracking with delaminations and spalling in this Span. Some patching done, but the patches are starting to fail. RZEV

10-2013 deck sourvy found 7.2 percetn spalls/delaminations.
06/16/2011 - More of the delaminations are starting to spall and leaving potholes. Some patching has been done since the last inspection. RMGH

06/30/2009 - Wear in wheel paths to the aggregate. Poor skid resistance. Spalls throught span and estimate greater than 3 percent delamination. ZZDZ

05/31/2007 - Wear to the concrete surface. Left in Condition State 2 as estimated less than 2 percent of the surface showing spalls/distress. Some asphalt patching done on the spalls, but blowing out again. EZHZ

05/04/2005 - Tight mapping cracks in the deck surface. 1 m2 delamination and spall near centerline at Bent 4. Wear in the wheel paths from studded tires. (12.09 * 15.70 = 189.81) Nate. FZMK

04/30/2003 - Tight cracking throughout the deck. Studded tire wear in the wheel paths with exposed aggregate. There is a section of delamination and a pothole on the centerline near Bent 4, 1 sq m. ZZEB

08/06/2001 - 12.09 * 15.85 = 191.62
Some small, tight transverse cracking throughout. No brooming left for low skid resistance. Exposed aggregate surface in the wheel paths from studded tire wear. NHGO

01/14/1999 - None DCHF

04/01/1996 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Element 107 - Paint Stl Opn Girder										
	1	1	79	m.		85	10	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Rust blisters with minor surface pitting under the worst rust blisters. Girders are dirty and grimey where de-icer has sat on them. Faded paint and peeling paint in the rust blister areas where mositure can collect. RZEV

06/16/2011 - Rust, scale, and surface pitting to girders under areas that leak. Rust blisters on the lower flanges where water can collect. Paint is faded. RMGH

06/30/2009 - Same comments as past inspection and add rust blisters under areas that leak and minor surface pitting under the rust blisters. Some spot painting done during snooper inspection. ZZDZ

05/31/2007 - Areas on the ends of the girders under joints show the worse rusty spots and loss of paint system. Ends at Bent 3 show pitting and are rusty with paint system failure. The diaphragm vertical stiffener from the new girder, G1, to the older girder is welded solid across the top of the bottom flange; no problems observed and G2 has a hole where added diaphragm bracket was mis-drilled; photos. EZHZ

05/04/2005 - Minor rust and paint loss. Mostly near the leaking joints and the original girders. (5 * 15.70 = 78.50) Nate. FZMK

04/30/2003 - Minor spot rust with some paint loss; especially under leaking joint areas and where there is pigeon debris. ZZEB

08/06/2001 - 5 * 15.85 = 79.25m No change from the last report. NHGO

01/14/1999 - Minor rust on the surface. DCHF

04/01/1996 - MINOR SURFACE RUST ON ORIGINAL BEAMS YDNF

02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692

Continue

*** * * * * * * * * * Span : Main-0 - STEEL WF - SPAN 3 (cont.) * * * * * * * * * ***

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bents 3 and 4										
	1	1	6	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Some tight surface shrinkage cracks and a couple have small spalls on the corners from construction activity. RZEV
06/16/2011 - Generally in Good condition. Small spall on a couple of the columns. RMGH
06/30/2009 - Tight surface shrinkage cracks. Some staining of the concrete from leakage and bird debris. ZZDZ
05/31/2007 - Right column at Bent 3 has a small surface spall at a rebar chair foot. Tight surface shrinkage cracks noted. EZHZ
05/04/2005 - A couple of the columns have tight cracks at the connection area with the cap. FZMK
04/30/2003 - Surface shrinkage cracks. ZZEB
08/06/2001 - None NHGO
01/14/1999 - None DCHF
04/01/1996 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

Element 234 - R/Conc Cap Bents 3 and 4										
	1	1	24	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Small delamination on the Span 3 face of Bent 4's cap. Lots of staining from joint leakage. Small surface spalls in the underside of the cap from rebar chair feet. RZEV
06/16/2011 - Photo of delaminations on Bent 4's cap. Staining from leakage. Some tight shrinkage cracks. Small spall on the surface near the rebar chair feet. RMGH
06/30/2009 - 5 percent in stste 3 for small delaminationon bent 4 cap. Staining from bird debris and leakage on cap. Several small surface spalls near exposed reinforcing chair feet. ZZDZ
05/31/2007 - Same as past inspections and add minor surface spalls on the underside of the older portion of the caps from rebar chair feet. Bent 4's cap has (2) spalls/delaminated areas on the Span 4 edge at the top. EZHZ
05/04/2005 - Tight surface shrinkage cracks. Construction joint between the new to old cap has some minor cracking with minor loose areas along the crack edge; very minor. FZMK
04/30/2003 - Tight surface shrinkage cracks. Staining of concrete due to leaking joints. ZZEB
08/06/2001 - 12.09 * 2 = 24.19m NHGO
01/14/1999 - None DCHF
04/01/1996 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692

Continue

* * * * * * * * * * Span : **Main-0 - STEEL WF - SPAN 3 (cont.)** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 301 - Pourable Joint Seal Bents 3 and 4										
	1	3	24	m.		60	20	20		
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Sealant is pulling loose and/or is missing in some areas along the joint; photo. Spalling along the joint edges. Material that makes up the headers appears to be sound.	RZEV
06/16/2011 - Loose and missing sealant. Header material of the joints is in Good condition. Deck spalls just off of the joint headers.	RMGH
06/30/2009 - More small spalls along joint edges. Some sealant is loose with lakage evident at both bents.	ZZDZ
05/31/2007 - Joint is sound except where gland is torn or missing. Minor spall along the edges of the joint over Bent 4.	EZHZ
05/04/2005 - Spalls along both sides of the joint at Bent 4. Some areas where the sealant has failed and leaking is evident. Most of the sanding material is cleaned out in the traffic lanes.	FZMK
04/30/2003 - Both joints are leaking with the gland falling out. Concrete along the joints is mostly sound except near centerline of Bent 4 where there is some spalling.	ZZEB
08/06/2001 - 2 * 12.09 = 24.18m	NHGO
01/14/1999 - None	DCHF
04/01/1996 - None	YDNF
02/01/1994 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 310 - Elastomeric Bearing Under New Girders										
	1	1	2	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Rubber portion of the bearings is in Good condition with some tight surface rust and faded paint on the steel portions.	RZEV
06/16/2011 - Spot rust on the steel portions of the bearings. Rubber areas are Good.	RMGH
06/30/2009 - Unchanged from prior reports. Some spot rust on steel portions with spot painting done during snooper inspection.	ZZDZ
05/31/2007 - Minor spot rust and faded paint on the steel portions. A minor tear in the rubber of the bearing at Bent 3; see photo.	EZHZ
05/04/2005 - Some spot rust and minor paint loss.	FZMK
04/30/2003 - One slotted and one fixed(Bent 4). Some spot rust on steel portions of the bearings.	ZZEB
08/06/2001 - Under the new girder; left most.	NHGO
01/14/1999 - None	DCHF
04/01/1996 - None	YDNF
02/01/1994 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692

Continue

********** Span : **Main-0 - STEEL WF - SPAN 3** **(cont.)** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing Bent 3										
	1	3	4	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Bearing alignment was Good as mostly plumb; 70F. Staining from joint leakage with rust, scale, and paint loss also. RZEV
06/16/2011 - Good alignment of the bearings. Some paint loss and debris at the bearings. RMGH
06/30/2009 - Some debris and spot rust. Allignment is good. Blew off and spot painted during snooper inspection. ZZDZ
05/31/2007 - Alignment looks Good. Rust, debris, and staining. Blew off and spot overcoat painted. EZHZ
05/04/2005 - Rusty spots, scale, and some debris at the bearings with minor paint loss. FZMK
04/30/2003 - Rusty spots with some debris around the bearings. Moved to Env. State 3 due to leaking joint. ZZEB

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing Bent 4										
	1	1	4	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Rust, scale, debris, peeling paint, and faded paint. RZEV
06/16/2011 - Spot rust, some debris, and scale on the bearings. RMGH
06/30/2009 - Rusty areas, dirt, debris, and scale on steel portions. Some spot painting done. ZZDZ
05/31/2007 - Unchanged with lots of new nests. Some areas blew off and spot overcoat painted. EZHZ
05/04/2005 - Spot rust, minor paint loss, and bird debris at the bearings. FZMK
04/30/2003 - Some rust and paint loss. ZZEB

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	31	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Generally in Good condition. Left side has a small spall on its' backside. Random shrinakge cracks. RZEV
06/16/2011 - Generally in Good condition with some random vertical cracking throughout. RMGH
06/30/2009 - Generally good condition. Some cracking between chamfered areas on both side of structure. ZZDZ
05/31/2007 - Minor popouts and tight surface shrinkage cracks. EZHZ
05/04/2005 - No change from previous reports. (15.70 * 2 = 31.40) Nate. FZMK
04/30/2003 - Vertical cracks throughout both rails. Some minor popouts in the concrete of the rails. ZZEB
08/06/2001 - 15.85 * 2 = 31.70m NHGO
01/14/1999 - None DCHF
04/01/1996 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692

Continue

* * * * * * * * * * Span : **Main-0 - STEEL WF - SPAN 3 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	0	100	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Unchanged from previous report.	RZEV
06/16/2011 - Numerous cracks in the delaminated areas with spalling at the wider cracks.	RMGH

Inspection Notes:

* * * * * * * * * * Span : **Appr-1 - P/S CONC SPANS - 1,2,4,and 5** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	569	sq.m.	X	0	0	100	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Mapping cracks, wear, delaminations, and spalling in some spots. Some exposed rebar in the deepest spalls.	RZEV
06/16/2011 - Wear from studded tires. Some of the delaminated areas are stating to spall and need patching.	RMGH
06/30/2009 - Wear in the wheel paths. Poor skid resistance. Small spalls and delaminations in all spans. Tight transverse cracking over unjointed bents. Estimate 3 percent delamination.	ZZDZ
05/31/2007 - Poor skid resistance. Studded tire wear with exposed aggregate look on the surface. Left in Condition State 2 as estimated at 2 percent or less distressed/delaminated areas.	EZHZ
05/04/2005 - Tight mapping cracks throughout. Small delaminated area is starting to spall near Centerline of Bent 4. Very little skid resistance remains. (47.09 * 12.09 = 569.32) Nate.	FZMK
04/30/2003 - Tight cracking throughout the deck. Studded tire wear in the wheel paths with exposed aggregate. Very little skid resistance left. Small pothole and delamination near centerline at Bent 4.	ZZEB
08/06/2001 - 47.55 * 12.09 = 574.88 Small & tight transverse cracking throughout. No broom marks left for poor skid resistance. Studded tire wear in the wheel paths.	NHGO
01/14/1999 - Spans #1, 2, 4, & 5	DCHF
04/01/1996 - _	YDNF

Inspection Notes:

********** Span : **Appr-1 - P/S CONC SPANS - 1,2,4,and 5 (cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	235	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Generally in Good condition. Diagonal crack/spall on G2 and G3 at Bent 3 has not changed. RZEV

06/16/2011 - G2 at Bent 3 has a diagonal crack from the bearing and has not changed since the last inspection. Spall on G3 has also not changed. RMGH

06/30/2009 - Same comments as past inspections. ZZDZ

05/31/2007 - Unchanged and add that G2 bearing area at Bent 3 has a diagonal crack at 45 degrees in the direction of shear at the Span side of the sole plate; photo to Helena-D. Crumley. G3 at Bent 3 is spalled on the Span side behind the sole Plate; photos to Helena-D. Crumley. EZHZ

05/04/2005 - Minor and tight cracks on the ends of the girders near both Abutments; girders are embedded in the backwalls. 2nd girder from the Right in Span 1 has several small hits on its' lower flange with small areas of section loss; probably from construction activities when the structure was widened. No cracks visible in the hit areas and no exposed tendons. (47.09 * 5 = 235.45) FZMK

04/30/2003 - Some minor cracking on the ends of the girders. Graffiti on girders near the Abutments. ZZEB

08/06/2001 - 47.55 * 5 = 237.75m NHGO

01/14/1999 - None DCHF

04/01/1996 - INCLUDES SPANS 1,2,4,5 YDNF

02/01/1994 - None REFI

Inspection Notes:

Element 205 - R/Conc Column Bents 2 and 5										
	1	1	6	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Generally in Good condition. Some tight shrinakge cracks and some small spalls along the scrapes. Bent 2's middle column has a 6" x 6" spall on the back-Left corner. RZEV

06/16/2011 - Generally in Good condition. Same on small spall on center column at Bent 2. RMGH

06/30/2009 - Generally good condition. One small spall on center column at bent 2. ZZDZ

05/31/2007 - Same as past inspections and a couple of small surface spall from rebar chair feet. EZHZ

05/04/2005 - Tight surface shrinkage cracks on all of the columns. Some wider but still tight cracks at the cap to column construction joint area. FZMK

04/30/2003 - Tight surface shrinkage cracks. ZZEB

08/06/2001 - Bent #2 & 5. NHGO

01/14/1999 - None DCHF

04/01/1996 - _ YDNF

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692

Continue

********** Span : **Appr-1 - P/S CONC SPANS - 1,2,4,and 5** **(cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 6										
	1	1	35	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Generally in Good condition. Some small spalls at the backwall to cap connection area. RZEV

06/16/2011 - Same comments as the previous inspections. RMGH

06/30/2009 - Good condition. Small spalls along backwall/cap connection area. Tight cracking in both abutment caps. ZZDZ

05/31/2007 - Tight surface shrinakge cracks, but in generally Good condition. EZHZ

05/04/2005 - Both backwalls have tight cracks. Same on the erosion near the SE corner of Abutment 1. FZMK

04/30/2003 - Some minor and tight cracks in the backwalls. Very minor erosion near the SE corner that is allowing dirt/debris to get on the girder near the Abutment. ZZEB

08/06/2001 - (12.09 * 2) + (2.60 * 4) = 34.58m NHGO

01/14/1999 - None DCHF

04/01/1996 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bents 2 and 5										
	1	1	24	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Bird nests and debris on the tops of the caps. Small delamination on Bent 5's cap near the connections to the columns. Small surface spalls on the bottoms of the caps from rebar chair feet. RZEV

06/16/2011 - Unchanged and more bird debris on the caps. RMGH

06/30/2009 - 5 percent into state 3 for small delamination on bent 5 cap and along construction joints at columns. Several small surface spalls on exposed rusty rebar chair feet. Bird nests and debris on all caps. ZZDZ

05/31/2007 - Minor delamiantion on the Span 5 side of Bent 5's cap. Also some minor surface spalls on the bottom side of the older portion of the cap from exposed rebar chair feet. EZHZ

05/04/2005 - Unchanged from the last reports. FZMK

04/30/2003 - Tight crack at the new to old connection in the caps. Surface shrinkage cracks throughout. Some delamination noted at Bent 5 on the Span 5 side of it. ZZEB

08/06/2001 - 12.09 * 2 = 24.18m NHGO

01/14/1999 - _ DCHF

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 310 - Elastomeric Bearing Bent 3 and 5 - Under Newer Girder										
	1	1	2	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Good condition. Rubber is Good. Spot rust on the steel portions of the bearings with faded paint. RZEV

06/16/2011 - Spot rust on the steel portions. Rubber portions are Good. RMGH

06/30/2009 - Spot rust and staining on steel portions. Small tear on pad is unchanged and not a problem. ZZDZ

05/31/2007 - Spot rust on the steel portions. Minor tear on the outer edge of the pads as noted in last snooper inspection, but not a problem. Tears are minor and have not gotten any worse. EZHZ

05/04/2005 - Minor rust and paint loss with minor tears starting on a couple of the elastomeric pads. Lots of pigeon debris around them also. FZMK

04/30/2003 - Some rust and pitting with minor paint loss. ZZEB

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692
Continue

********** Span : **Appr-1 - P/S CONC SPANS - 1,2,4,and 5 (cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing										
	1	1	38	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Rust, scale, debris, and paint loss. RZEV

06/16/2011 - Rust, paint loss, scale, and debris. RMGH

06/30/2009 - Spot rust, paint fade, and some debris. The worst paint loss is on abutment bearings. ZZDZ

05/31/2007 - Spot rust, paint loss, and pigeon debris on the bearings. Left Abutment bearings in the quantity as (1) anchor bolt per bearing is visible. Blown off and spot overcoat painted if they were dry. EZHZ

05/04/2005 - Minor rust, paint loss, and pigeon debris. FZMK

04/30/2003 - Spot rust on the bearings. Some debris from birds, etc. ZZEB

08/06/2001 - Minor rust and pitting. NHGO

01/14/1999 - None DCHF

04/01/1996 - _ YDNF

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	94	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/17/2013 - Generally in Good condition. Small spalls on the backside of the barrier at bolt-ups to the W-Beam. Random shrinkage cracking. RZEV

06/16/2011 - Generally in Good condition. Random vertical cracks throughout. RMGH

06/30/2009 - Tight surface shrinkage cracks throughout. Small surface popouts and vertical cracking in all spans. Generally good condition. ZZDZ

05/31/2007 - Minor popouts and tight shrinkage cracks. EZHZ

05/04/2005 - Same as previous reports. (47.09 * 2 = 94.18) Nate. FZMK

04/30/2003 - Vertical cracks throughout both rails with some minor concrete popouts. ZZEB

08/06/2001 - 47.55 * 2 = 95.10m NHGO

01/14/1999 - None DCHF

04/01/1996 - _ YDNF

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00692

Continue

General Inspection Notes

06/17/2013 - End shoes at East Abutment, 6, are lapped against traffic flow. Homeless person living under Span 5. Wasn't happy about the intrusion during the inspection.	RZEV
06/16/2011 - End shoes on the W-Beam at the bridge ends are lapped against traffic on the East end of the structure. Homeless household along with a fire pit near Abutment 6.	RMGH
06/30/2009 - NBI 58, deck, rated at "5" due to increasing delaminations and spalling in deck surface. W-beam end shoes at abutment 6 are lapped against traffic flow.	ZZDZ
05/31/2007 - NBI 59, superstructure, rated a "6" due to rust, scale, and minor pitting of the steel girders in the main span. Areas under the joints were very wet from overnight rain and could not be cleaned and overcoat painted very well.	EZHZ
05/04/2005 - NBI 58, deck, rated at a "6" due to delamination, minor potholes, and wear to the surface. NBI 60, substructure, rated at a "7" due to minor cracking at the construction joints and small popouts in the bottoms of the caps from exposed rebar chairs.	FZMK
04/30/2003 - None	ZZEB
08/06/2001 - None	NHGO
01/14/1999 - None	DCHF
04/01/1996 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:05 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:15:35	YDNF
02/01/1994 -	REFI
08/01/1992 - Updated with tape 1994	NB94
01/01/1991 - Updated with tape 1992	NB92
03/01/1989 - Updated with tape 1991	NB91
04/01/1987 - Updated with tape 1989	NB89
09/01/1984 - Updated with tape 1986	NB86

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00693

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**
County Code, Location : **013 CASCADE**
Kind fo Hwy Code, Description : **8 8 Other (incl toll rds)**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **BNSF RAILROAD**
Structure on the State Highway System : [ ]
Structure on the National Highway System : [ ]
Str Meet or Exceed NBIS Bridge Length : [X]
Latitude : **47°29'18"**
Longitude : **111°20'06"**

MDT Maintenance Section : **31-01 Great Falls**
Division Code, Location : **31 GREAT FALLS**
City Code, Location : **00000 RURAL AREA**
Signed Route Number : **00315**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **1.71 km 1.06**

Construction Data

Construction Project Number : **IR 315-5(12)1F**
Construction Station Number : **6+55.00**
Construction Drawing Number : **15924**
Construction Year : **1996**
Reconstruction Year :

Traffic Data

Current ADT : **25,500** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**A LFD Assigned**
Operating Load, Design :	**32.6 mton**	**A LFD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**48.6**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **56.69 m**
Deck Area : **456.00 m sq**
Deck Roadway Width : **7.11 m**
Approach Roadway Width : **7.20 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **R Railroad beneath struc**
Vertical Clearance Under the Structure : **6.98 m**
Reference Feature for Lateral Underclearance : **R Railroad beneath struc**
Minimum Lateral Under Clearance Right : **1.70 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **5**
Material Type Code, Description : **5 Prestressed concrete**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**
Deck Protection Type : **1 Epoxy Coated Reinforcing**
Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **8.05 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **33°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure -315 AT EXIT 0-WB OFF RAM	I00315	West	99.99 m	7.11 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00693
Continue

Inspection Data

Sufficiency Rating : **94**
Structure Status : **Functionally Obsolete**

Inspection Due Date : 16 June 2015
(91) Inspection Frequency (months) : **48**

NBI Inspection Data

(90) Date of Last Inspection : 16 June 2011
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	6	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	8	(67) Structure Rating :	7	(36B) Transition Rating :	1	(61) Channel Rating :	N
(60) Substructure Rating :	7	(69) Under Clearance :	3	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	N
(72) App Rdwy Align :	7	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 2
Helper Hours : 0
Special Crew Hours : 0
Special Equipment Hours : 0
Snooper Required :
Snooper Hours for inspection : 0
Flagger Hours : 0

Inspection Work Candidates: Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States				
D31-FY2003-000401	**09 May 2003**	**Approved**	**High**	M Main	300 Strip Seal Exp Joint	Min Repair	X	X	X	X	X

Clean dirt and debris out of the joint at Abutment 1.
06/16/2011 Full of sanding material today.

Approved. DRC

Late Reason:
Inspection Date: 06/16/2011

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00693

Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 - Spans 1,2,3,4,&5** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 26 - Conc Deck/Coatd Bars										
	1	3	456	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Wear in the wheel paths from studded tires. Small and shallow surface spalls in the concrete past the edge of the joint steel.	RZGM
05/31/2007 - Minor stuudded tire wear. Good skid resistance. Wider cracks over the Bents; 0.5mm	EZHZ
05/04/2005 - Studded tire wear in the wheel paths. Small loose concrete along portions of the joint at Abutment 1. Wider cracks over all of the Bents.	EZFQ
04/30/2003 - Same comments as previous report and add studded tire wear in the wheel paths with exposed aggregate.	BDHZ
08/06/2001 - Transverse cracks at all (4) bents. Transverse cracks, mostly small & tight, in the west half with some minor efflorescence underneath.	NHGO
12/23/1998 - 56.69 * 8.05 = 456.35	AHBS

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	227	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Good condition.	RZGM
05/31/2007 - No problems observed.	EZHZ
05/04/2005 - No problems noted. (55.40 * 4 = 221.60 NMS)	EZFQ
04/30/2003 - No problems noted. Some graffiti on girders near the Abutments.	BDHZ
08/06/2001 - None	NHGO
12/23/1998 - 56.69 * 4 = 226.76m	AHBS

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bents 2, 3, 4, and 5										
	1	1	8	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - One small spall on the Left column at Bent 3 for Condition State 2. Several peeling sack patches at the construction joints.	RZGM
05/31/2007 - Tight surface shrinakge cracks. Placed 5 percent into Condition State 2 as sacked patches are delaminated or peeling where installed. None are a problem.	EZHZ
05/04/2005 - Minor surface shrinkage cracks.	EZFQ
04/30/2003 - Minor surface shrinkage cracks. No problems noted.	BDHZ
08/06/2001 - None	NHGO
12/23/1998 - None	AHBS

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00693

Continue

* * * * * * * * * * Span : **Main-0 - Spans 1,2,3,4,&5 (cont.)** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment 1 and 6										
	1	1	24	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Generally in Good condition. Some tight cracking in both Backwalls and one small spall on Abutment 1's backwall. RZGM

05/31/2007 - Same as prior inspection reports. EZHZ

05/04/2005 - Tight cracks in both of the backwalls. Worse crack is on the Right end of Abutment 1. Minor erosion and mostly on the Right side of Abutment 6. EZFQ

04/30/2003 - Some tight cracks in both Abutment backwalls. Still some minor erosion at the wingwalls. BDHZ

08/06/2001 - No change from the last report. NHGO

12/23/1998 - 11.58 + 12.34 = 23.92m
Some erosion around three(3) of the wingwalls. AHBS

Inspection Notes:

Element 234 - R/Conc Cap Bents 2, 3, 4, and 5										
	1	1	37	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Generally in Good condition. One small spall in sack patch at Bent 4. Some tight vertical cracks at steps in the caps. RZGM

05/31/2007 - Minor and tight cracks at the construction joint to the column. Placed 5 percent into Condition State 2 due to sacked patches showing minor delaminations and/or peeling. None are a problem. EZHZ

05/04/2005 - Minor and tight cracks at the cap to column connections. EZFQ

04/30/2003 - Minor surface shrinkage cracks. No problems noted. BDHZ

08/06/2001 - Dropped caps at the abutments. 9.14 * 4 = 36.56m NHGO

12/23/1998 - (9.14 * 4) + (2 * 8.69) = 53.94m AHBS

Inspection Notes:

Element 300 - Strip Seal Exp Joint										
	1	3	8	m.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Joint steel sounded solid when tapped on. Rubber gland is full of sanding material. Wet spot from apparent leaking near centerline. RZGM

05/31/2007 - Full of debris today. Damp near cneterline on the cap, so may have a slight leak there. Steel portions sound solid when tapped on. EZHZ

05/04/2005 - Same as previously reported. Full of sanding material today. EZFQ

04/30/2003 - Full of dirt/sanding material/ May be a small tear near centerline. Added cleaning as a work element. BDHZ

08/06/2001 - Full of dirt and sanding material. NHGO

12/23/1998 - 8.05 * 1 = 8.05m AHBS

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00693

Continue

********** Span : **Main-0 - Spans 1,2,3,4,&5** **(cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 310 - Elastomeric Bearing										
	1	1	4	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Good condition. Some fading of the paint on the steel portions. RZGM
05/31/2007 - No problems observed. EZHZ
05/04/2005 - Same as last report. EZFQ
04/30/2003 - Minor spot rust forming on painted surfaces. Spots rub off with some effort. Not a problem as of yet. BDHZ
08/06/2001 - At Abutment #6. NHGO
12/23/1998 - None AHBS

Inspection Notes:

Element Description										
Element 313 - Fixed Bearing										
	1	1	36	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Spot rust and some bird debris. RZGM
05/31/2007 - Minor spot rust on the bearings and bird nests/debris starting to build up. EZHZ
05/04/2005 - Minor spot rust and some bird nests/debris. EZFQ
04/30/2003 - Minor spot rust forming on painted surfaces. BDHZ
08/06/2001 - None NHGO
12/23/1998 - None AHBS

Inspection Notes:

Element Description										
Element 331 - Conc Bridge Railing										
	1	3	113	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

06/16/2011 - Minor popouts and scrapes on both barriers. Random vertical cracking throughout. RZGM
05/31/2007 - Minor popouts and tight surface shrinkage cracks. EZHZ
05/04/2005 - Same as last report. EZFQ
04/30/2003 - Vertical cracking throughout; mostly very tight. Some minor popouts on rails concrete surfaces. BDHZ
08/06/2001 - None NHGO
12/23/1998 - 56.69 * 2 = 113.38m AHBS

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

I00315001+00693
Continue

General Inspection Notes

06/16/2011 - Rail end shoes on the approach sections of the guardrail at the bridge ends are lapped against traffic.	RZGM
05/31/2007 - NBI 60, substructure, rated a "7" due to tight shrinkage cracks in the columns and caps.	EZHZ
05/04/2005 - Trasnsition rail at outlet doesn't have curb taper or doubled approach section, but probably doesn't warrant it either.	EZFQ
04/30/2003 - No major problems noted today.	BDHZ
08/06/2001 - None	NHGO
12/23/1998 - None	AHBS

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **2 2 U.S. Numbered Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **CITY ST, BNSF RAILROAD**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°30'28"**

Longitude : **111°20'26"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00103**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **0.26 km 0.16**

Traffic Data

Current ADT : **11,330** ADT Count Year : **2009** Percent Trucks : **2 %**

Construction Data

Construction Project Number : **IG 15-5(28)274**

Construction Station Number : **21+54.00**

Construction Drawing Number : **7789**

Construction Year : **1967**

Reconstruction Year :

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		5 MS 18 (HS 20)
Inventory Load, Design :	32.6 mton	B ASD Assigned
Operating Load, Design :	32.6 mton	B ASD Assigned
Posting :		5 At/Above Legal Loads

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	85		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **167.94 m**

Deck Area : **2,684.00 m sq**

Deck Roadway Width : **8.32 m**

Approach Roadway Width : **8.32 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **R Railroad beneath struc**

Vertical Clearance Under the Structure : **5.16 m**

Reference Feature for Lateral Underclearance : **R Railroad beneath struc**

Minimum Lateral Under Clearance Right : **1.52 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **4**

Material Type Code, Description : **4 Steel continuous**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **3 Latex Concrete or similar additive**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **2**

Material Type Code, Description : **3 Steel**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

(52) Out-to-Out Width : **15.98 m**

(50A) Curb Width : **0.00 m**

(50B) Curb Width : **1.52 m**

Skew Angle : **45°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under GAULT AVE.	-1	Both	5.16 m	7.32 m	N/A		
Route On Structure CENTRAL AVE WEST - EB	N00103	N/A			East	99.99 m	8.32 m

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601

Continue

Inspection Data

Sufficiency Rating : **91.4**
Structure Status : **Functionally Obsolete**

Inspection Due Date : 12 September 2014
(91) Inspection Frequency (months) : **24**

Next Other Insp Due Date : **23 Aug 2016**
Other Insp Type : **Pin and Hanger**

NBI Inspection Data

(90) Date of Last Inspection : 12 September 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	6	(68) Deck Geometry :	3	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	6	(67) Structure Rating :	6	(36B) Transition Rating :	1	(61) Channel Rating :	N
(60) Substructure Rating :	6	(69) Under Clearance :	3	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	N
(72) App Rdwy Align :	7	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	7	Snooper Required :	Y
Helper Hours :	0	Snooper Hours for inspection :	5
Special Crew Hours :	16	Flagger Hours :	0
Special Equipment Hours :	16		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2005-000060	**15 October 2004**	**Approved**	**Low**	All Spans	Bridge	Spot Paint (flex)	
Clean and paint bearings. 10-12-2006: Some spot overcoat painting of the bearings. Approved. DRC							
D31-FY2005-000061	**15 October 2004**	**Approved**	**High**	All Spans	301 Pourable Joint Seal	Min Repair	
Reseal the joints. Approved. DRC							
D31-FY2011-000150	**07 February 2011**	**Not Approved**	**Medium**	All Spans	107 Paint Stl Opn Girder	Min Repair	
Clean and paint girders. 10-12-2006: Some spot overcoat painting of the girders.							
D31-FY2011-000151	**07 February 2011**	**Not Approved**	**Medium**	All Spans	334 Metal Rail Coated	Repl Paint	
Clean and paint rail.							
D31-FY2012-000086	**13 September 2012**	**Not Approved**	**Medium**	All Spans	234 R/Conc Cap	Rehab Elem	
Repair spalls/delaminated areas on caps and columns, especially those on Bent 3.							

Late Reason:
Inspection Date: 09/12/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601
Continue

Element Inspection Data

* * * * * * * * * * Span : **Main-0 - Steel Girder over RR - Spans 3 thru 6** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck Latex Surface										
	1	3	2293	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Wear in wheel paths from studded tires. Cracking in all spans. Small delaminations and spalls along edges of joint steel. MWHP

09/20/2010 - Wear in the wheel paths has reduced depth of traction grooves to "0" in areas. Small surface delaminations and small spalls along joint steel. Lots of cracking in all Spans. WZBZ

09/24/2008 - Wear in the wheel paths. Small spalls and delaminations along edges of the joint steel. Transverse and mapping cracks in all of the Spans. YQCZ

07/25/2006 - Wear in the wheel paths. Small delamiantions along the expansion joint steel. Some mapping cracks in the latex in all of the spans. NZDN

09/29/2004 - Put deck into Condition State 2 due to small delaminations along the joints. ZZIO

10/21/2002 - (79.40 * 15.98) [(15.98 18.40)/2 * 32.8] (18.40 * 25.0) = 2292.6 Put deck back to a "12" as hydromilled and replace material with Latex concrete to original deck elevations. Also Class B repairs. Transverse cracking in all spans. May need to address the cracking on next inspection. VIKC

08/30/2000 - (79.40* 15.98) [(15.98 18.40) / 2 * 32.8])18.40 * 25.0) = 2292.6
Repair of delaminated areas in 1999 with hydrodemolition. Replaced with latex concrete and an overlay of the entire structure with latex concrete/ FILQ

06/03/1998 - Numerous small, tight transverse cracking thoughout the deck with some small areas of delamination when it was checked several years ago. Studded tires have left a fairly smooth wear surface. XKGJ

12/01/1995 - None YDNF

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder										
	1	2	607	m.		85	10	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Lower flange tops in areas that collect water are rusted and some surface pitting under rust blisters. Faded and chalking paint. diagonal bracing between G2 and G3 where removed in 2012 and intersecting welds drilled in reversal areas. Girders are dirty from train exhaust. MWHP

09/20/2010 - Crack on G3S4L Gusset is unchanged. Lots of debris and grime on the girders. Rust blisters with minor surface pitting. Lots of pigeon nests along the girder connections. WZBZ

09/24/2008 - G3S4L near pin connection has a crack on the gusset weld for the diagonal brace. Rusty spots, scale, paint loss, and minor surface pitting in areas where water can sit on the girders. YQCZ

07/25/2006 - Rust spots, pitting, some pack rust, and paint loss; especially under the joints. Left two(2) girders have some missing bolts in the bearings to girders connection. Outer girders have rust blisters on the lower flange tops and lower portion of the webs and near leaky joints. Bolts on a diagonal bracing was missing and replaced during snooper inspection. NZDN

09/29/2004 - Some rust spots, peeling paint and pitting of the girders, especially under the joints and on the lower portions of the web/lower flange. 2nd girder from the right in Span 3 is very rusty with paint peeling for 20 feet. ZZIO

10/21/2002 - Minor rusty spots under leaking joints and along the bottom flange/web area. VIKC

08/30/2000 - (4 * 137.20) + 32.8 + 25.0 = 606.6m
Some rust and pitting. FILQ

06/03/1998 - Some early signs of rust & pitting. XKGJ

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601

Continue

* * * * * * * * * * Span : **Main-0 - Steel Girder over RR - Spans 3 thru 6** **(cont.)** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 161 - Paint Stl Pin/Hanger (4) Pin and Hanger Assemblies plus (4) End Girder Connection Pins										
	1	3	8	ea.		95	5	0	0	0
						%	%	%	%	%

Element Description

Previous Inspection Notes :

09/12/2012 - Pins and hangers where UT tested in August 2012. No serious problems observed (see Collins Engineering report).	MWHP
09/20/2010 - Still Good paint where re-painted by UT inspectors. Refer to report by Collins Engineering. No "noteables" were fond in the UT inspection with little to no wear also noted.	WZBZ
09/24/2008 - Will be UT'd this Fall. Some minor rust on the pins and hangers.	YQCZ
07/25/2006 - Some spot rust showing through areas that were tested and re-painted. Testing in 2005 showed no significant wear or problems.	NZDN
09/29/2004 - Ends of the pins, nuts, and hangers showing some minor rust where they were cleaned in 2001 for UT testing.	ZZIO
10/21/2002 - See 2001 NDT report. Some minor wear of several pins.	VIKC
08/30/2000 - Some minor rust and pitting.	FILQ
06/03/1998 - Some minor rust & pitting. Eight(8) sets of the pins have been UDT'ed and were ok.	XKGJ
12/01/1995 - None	YDNF
02/01/1994 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column (2) at Bent 3, 4, 5, and (3) at 6										
	1	1	9	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Right column at Bent 5 has vertical cracking along corners and areas are delaminated. Some spall/scrapes on columns. Shallow tie wire has caused surface spalls and rust on some columns.	MWHP
09/20/2010 - Bent 3's Right column has a delaminated edge and cracking; photo. Some tight cracks and small surface spalls from shallow tie wire.	WZBZ
09/24/2008 - Some tight cracks and small spalls. Condition State 3 for delaminations on edges. Some painted areas to cover graffiti.	YQCZ
07/25/2006 - Same as past inspections with some small areas of delamination on the edges of the columns where cracked. Middle column at Bent 6 has some spalls from being hot from campfires.	NZDN
09/29/2004 - Much graffiti painted on the columns and smoke/soot from camp fires. Mapping surface shrinkage cracks. Vertical cracking on the Right column at Bent 3. Tight cracking at the construction joint to the cap.	ZZIO
10/21/2002 - Small, tight shrinkage cracks. Graffti and smoke from fires started by homeless people under the structure.	VIKC
08/30/2000 - No change.	FILQ
06/03/1998 - Some hairline, tight cracks in the concrete.	XKGJ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601

Continue

* * * * * * * * * * Span : **Main-0 - Steel Girder over RR - Spans 3 thru 6** (cont.) * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment East - Abutment 7										
	1	1	26	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Most of area was stacked full of homeless people's belongings. Today some tight cracks observed. Small spall near G3 embedment. Lots of soot from homeless campfires. MWHP

09/20/2010 - Unchanged from prior inspections. Lots of soot and graffiti by homeless people. Some tight cracks under a couple of the bearings. WZBZ

09/24/2008 - Tight cracks in backwall between girders as a couple of small spalls along the edges of the embedded girders. Tight cracks under a couple of the girders in the Abutment cap. YQCZ

07/25/2006 - Same on tight cracks. There is one small spall where girders is embedded on the backwall. NZDN

09/29/2004 - Tight cracks in the backwall concrete. Minor erosion on the right wingwall. ZZIO

10/21/2002 - Minor, tight cracks in backwall concrete. VIKC

08/30/2000 - 14.60 + 1.55 + 9.70 = 25.80 East abutment only.
No change. FILQ

06/03/1998 - Some minor erosion @ the wingwalls. XKGJ

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bents 3 thru 6										
	1	1	61	m.		85	10	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Undersides show surface spalls, staining, and exposed rusty chair feet. Face of Bent 3 cap on span 2 side has large delamination and spalls (photo). Those under leaky areas show staining. MWHP

09/20/2010 - Delaminated areas. Cracking and minor spalls; photo of Bent 3's cap. Surface spalls and delaminations due to rebar chair feet. Some staining from leaky joints. WZBZ

09/24/2008 - Unchanged. Some of the delaminations started to spall on the shallow tie wire and exposed rebar chair feet. YQCZ

07/25/2006 - Surface spalls on the underside of the caps from shallow rebar chairs. Bent 3's cap has some spalls on the Right half on Span 2 side with some staining in the area. NZDN

09/29/2004 - Minor rusty spots with small spalls from exposed and rusty rebar chairs on the bottom of the caps. Staining from leaking joints. Some pigeon debris/nests. ZZIO

10/21/2002 - Same as previous report. Add some staining of the concrete under leaking joints. VIKC

08/30/2000 - (3 * 14.60)+ 17.19 = 60.99m
No change plus also noted some rusty resteel chairs at a couple of spots. FILQ

06/03/1998 - Some sanding material on some of the caps. XKGJ

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601

Continue

* * * * * * * * * * Span : **Main-0 - Steel Girder over RR - Spans 3 thru 6** (cont.) * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 301 - Pourable Joint Seal

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	29	m.		60	25	15		
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Steel portion sounds solid when tapped on. More sealant has pulled out and failed. MWHP

09/20/2010 - Some missing sealant, some loose sealant, and steel portion sounds solid when tapped on. WZBZ

09/24/2008 - Steel portions are sound. Sealant has lost bond in several areas and debris is pushing sealant down. YQCZ

07/25/2006 - Unchanged from previous reports. NZDN

09/29/2004 - Several areas where the joint sealant has lost adhesion and is pulling away from the guard angles. Dirt/debris in portions of the joint. ZZIO

10/21/2002 - Dirt and debris in joints. Some material has been pushed out by the dirt and debris. Joints leaking in these areas. VIKC

08/30/2000 - 2 * 14.60 = 29.20 "Dow corning" sytle.
Some material is missing. FILQ

06/03/1998 - _ XKGJ

Inspection Notes:

Element 305 - Assm Jt w/o Seal

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	32	m.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Some spalling on underside of deck at joints. Top portions sound solid when tapped on. Finger alignment is good with some fingers touching slightly. MWHP

09/20/2010 - Good finger alignment and prior inspection comments on underside of the deck in this area still apply. WZBZ

09/24/2008 - Finger alignment is mostly Good with some edges slightly touching. Some spalling of the header concrete on the underside of the joint. Rusty and scale on the lower portions of the joint's steel. YQCZ

07/25/2006 - Finger alignment is Good. Steel sounds solid when tapped on. A couple of small delaminations/spalls along the joint's edge. NZDN

09/29/2004 - Joints are solid when tapped on. A couple of very small delaminated areas on the joint edges. Finger joint is in Good alignment. ZZIO

10/21/2002 - Rusty spots. Both joints leak as this is the nature of these types of joints. VIKC

08/30/2000 - 14.60 + 17.19 = 31.79m One finger and one(1) sliding plate joints.
Some rust and pitting and also leaking onto the girders and steel below them. FILQ

06/03/1998 - Some rust & pitting. One(1) finger & (1) Sliding Plate joint. XKGJ

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601

Continue

* * * * * * * * * * Span : **Main-0 - Steel Girder over RR - Spans 3 thru 6** **(cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 311 - Moveable Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	14	ea.		85	15	0		
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Bearings are towards expansion at 75 degrees F and tolerable. Lots of debris and spot rust on bearings. MWHP
09/20/2010 - Bearings are towards expansion today; 55F. Debris, rust, and paint loss. WZBZ
09/24/2008 - Some slight alignment towards expansion today; 40F. Some dirt and debris. Some overcoat painting done. YQCZ
07/25/2006 - Rusty spots, debris, scale and paint loss. Alignment is tolerable today. Blew off and spot overcoat painted during snooper inspection. NZDN
09/29/2004 - Rusty spots, scale, paint peel, and pitting on those under the leaking joints. Some pigeon debris/nests near some of the bearings. ZZIO
10/21/2002 - Rusty and pitting as these are under the leaking joints. VIKC
08/30/2000 - No change. FILQ
06/03/1998 - Some rust & pitting. XKGJ
12/01/1995 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

Element 313 - Fixed Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	14	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Dirt, debris, and spot rust on bearings. MWHP
09/20/2010 - Debris, dirt, spot rust, and faded paint. WZBZ
09/24/2008 - Some cleaning and overcoat painting done. Lots of debris and dirt. Rusty spots and paint loss. YQCZ
07/25/2006 - Same as past inspsections and blew off/spot overcoat painted during snooper inspection. NZDN
09/29/2004 - Spot rust, paint loss, and minor pitting. Some pigeon debris near some of the bearings. ZZIO
10/21/2002 - Minor rust and pitting. VIKC
08/30/2000 - No change. FILQ
06/03/1998 - Some rust & pitting. XKGJ
12/01/1995 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

* * * * * * * * * * Span : **Main-0 - Steel Girder over RR - Spans 3 thru 6 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	270	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Vertical cracks and some mapping cracks on backs of barriers. Spalls where top hand rail was removed. MWHP

09/20/2010 - Unchanged from prior inspections comments. WZBZ

09/24/2008 - Vertical cracks in the relief cuts. Small spalls in some areas on the Right rail where the handrail on top was removed. YQCZ

07/25/2006 - Same as past inspections. NZDN

09/29/2004 - Vertical cracking between the relief cuts. Surface shrinkage cracks. A couple of small areas of fracture concrete along the tops of the barrier where the handrail was removed. ZZIO

10/21/2002 - Pedestrian hand rail removed my Maintenance. Minor, vertical cracks and shrinkage cracks throughout. VIKC

08/30/2000 - Replaced steel rail with concrete barrier rail in 1999. FILQ

06/03/1998 - Some rust & pitting of the rail and posts. XKGJ

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated W-Beam, Pipe Handrail, and Guard Fence w\ Steel Posts										
	1	3	137	m.		80	20	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Rust, scale, and paint loss on rail posts and pipes. Gaurd fence and fabric has a bend where a luminare pole fell into it. MWHP

09/20/2010 - Rust, scale, and paint loss to the posts and pipe. Guard fence posts and fabric are in Good condition. WZBZ

09/24/2008 - Some rust, scale, and paint loss on the rail posts and pipes. The guard fence is in Good condition. YQCZ

07/25/2006 - Same as past inspections. NZDN

09/29/2004 - Rusty spots on the rail posts and pipes. Guard fence is in Good condition. ZZIO

10/21/2002 - Rusty spots and pitting throughout. Guard fence is in Good condition. VIKC

08/30/2000 - 137.2x1=137.2 Sidewalk has existing metal rail and guard fence was added during 1999 construction. Minor rust on existing rail and posts. FILQ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 357 - Sup Pack Rust SmFlag										
X	1	2	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Swelling and cracking of welds on diaphragms lower members where water can get to them. MWHP

09/20/2010 - Unchanged from prior inspections comments. WZBZ

09/24/2008 - Diaphragms under leaky joints show pack rust with swelling and cracking of welds. YQCZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601

Continue

********** Span : **Main-0 - Steel Girder over RR - Spans 3 thru 6** (cont.) **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Both size and density apply. MWHP
09/20/2010 - Unchanged from prior inspections comments. WZBZ
09/24/2008 - Lots of wider cracks, near 1.0mm, in all Spans and some areas were density comes into play. YQCZ

Inspection Notes:

********** Span : **Appr-1 - Steel Girder - Spans 1 and 2** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	491	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Studded tire wear in wheel paths. Spalls/delaminations along edges of joint steel. Random cracking in both spans. MWHP
09/20/2010 - Transverse and mapping cracks. Wear in the wheel paths. Small surface spalls and delaminations along the joint steel. WZBZ
09/24/2008 - Some transverse and mapping cracks. Small spalls and delaminations along the joint steel edges. Wear in the wheel paths. YQCZ
07/25/2006 - Same as past inspections. NZDN
09/29/2004 - Put into Condition State 2 due to small delaminations along the joints. Some mapping cracks in both spans. ZZIO
10/21/2002 - 15.98 * 30.74 = 491.23 Changed element back to a "12", as Latex concrete was placed to the same elevation it was prior to hydromilling and class B repair. Numerous, transverse cracks that may need to be re-evaluated at the next inspection; smart flag. VIKC

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder										
	1	2	123	m.		90	5	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Steel is in good condition. Some rust blisters with minor surface pitting on tops of bottom flange. Faded and chalky paint. Smoke on those near Abutment 1 from camp fires. MWHP
09/20/2010 - Some rust blisters on tops of the bottom flanges where moisture can collect. Minor surface pitting under the blisters. Dirty and chalky paint with some spot rust on the majority of area. WZBZ
09/24/2008 - Paint loss, rusty spots, surface pitting, and very dirty girders. Deicer drips in many areas. YQCZ
07/25/2006 - Rusty spots, paint loss and pitting in areas under leaky joints. Water runs back towards Abutment 1 on the lower flange of the girders. Lots of dirt/grime on the girders. Lower flanges are sticky from de-icer. NZDN
09/29/2004 - Lower flange/web portions show rusty spots, peeling paint, and pitting. ZZIO
10/21/2002 - Rusty and pitting under leaking joints. Rusty spots aling bottom flange/web area. VIKC
08/30/2000 - 4 * 30.74 = 122.96
Some areas of rust and pitting. FILQ
06/03/1998 - Some areas of rust & pitting. XKGJ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601

Continue

* * * * * * * * * * Span : **Appr-1 - Steel Girder - Spans 1 and 2 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 161 - Paint Stl Pin/Hanger Bent 3 - End Girder Connection Pins

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	4	ea.		95	5	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Pins were UT tested in August 2012 and no significant problems were observed (see Collins Engineering report). MWHP
09/20/2010 - Still Good paint where re-painted by UT inspectors. Refer to report by Collins Engineering. No "noteables" were fond in the UT inspection with little to no wear also noted. WZBZ
09/24/2008 - Ut'd recently. See report. Some minor rust showing. YQCZ
07/25/2006 - No problems found in 2005 UT inspection. Spot rust on the ends of the pins. Wired brushed and re-painted. NZDN
09/29/2004 - Paint is worn off the areas that were cleaned for UT inspections in 2001 with some surface rust. ZZIO
10/21/2002 - See NDT report from 2001. No problems noted. VIKC

Inspection Notes:

Element 205 - R/Conc Column Bent 2

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	2	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Tight surface shrinkage cracks and small surface spall from tie wire. MWHP
09/20/2010 - Tight surface shrinakge cracks. Some shallow surface staining and spalls from tie wire. WZBZ
09/24/2008 - Tight shrinake cracks in areas. Columns have been painted to cover graffiti. YQCZ
07/25/2006 - Same on tight cracks. Graffiti has been painted over. NZDN
09/29/2004 - Tight shrinkage surface cracks. Tight cracking on the construction joints. ZZIO
10/21/2002 - Some tight, shrinkage cracks throughout. VIKC
08/30/2000 - None FILQ
06/03/1998 - _ XKGJ

Inspection Notes:

Element 215 - R/Conc Abutment   1 - West

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	20	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Smokey and sooted from homeless campfires. Some tight cracks in backwall and a small spall near G2 embedded bearing. MWHP
09/20/2010 - Some tight vertical cracks near centerline of roadway and a small spalled area near G2's bearing. One tent and campfire going today. WZBZ
09/24/2008 - Same as past comments. Generally in Good condition. YQCZ
07/25/2006 - Same with one small area spalled where G2 is embedded. NZDN
09/29/2004 - Tight vertical cracks on the backwall concrete. Some cracks have minor efflorescence. ZZIO
10/21/2002 - Tight, vertical cracks in the backwall concrete. VIKC
08/30/2000 - 15.98 + 1.30 + 2.80 = 20.08m FILQ
06/03/1998 - None XKGJ

Inspection Notes:

********** Span : **Appr-1 - Steel Girder - Spans 1 and 2 (cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bent 2										
	1	1	16	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Spalled areas with exposed rusty rabar and chair feet. Shallow surface delamination.	MWHP
09/20/2010 - Same as previous inspection comments.	WZBZ
09/24/2008 - Condition State 3 due to delaminations. Cracks at the steps and lots of dirt/debris.	YQCZ
07/25/2006 - Surface spalls where rebar chairs are exposed on the bottom of the caps.	NZDN
09/29/2004 - Minor rust stains with small spalled sections on the areas where the rebar chairs are exposed; mainly on the bottom of the caps.	ZZIO
10/21/2002 - ok	VIKC
08/30/2000 - 15.98 * 1 = 15.98m	FILQ
06/03/1998 - None	XKGJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 305 - Assm Jt w/o Seal										
	1	3	16	m.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Steel portions sound solid when tapped on. Minor spalling on underside of deck at joint. Small spalls/delaminations along joint steel.	MWHP
09/20/2010 - Steel sounds solid when tapped on. Some small spalls and delaminations in the concrete along the joint's edge. Minor spalling and staining of the header concrete on the underside of the deck.	WZBZ
09/24/2008 - Steel sounds solid when tapped on. Small spalls and delaminations along the joint edges. Some spalling and staining of the header concrete on the underside of the deck in the header area.	YQCZ
07/25/2006 - Steel sounds solid when tapped on. Small delamiantion spalled area along the joint.	NZDN
09/29/2004 - Joint leaks. Small piece of delamination along the joint edge.	ZZIO
10/21/2002 - Minor rust spots. Some leaking as this is the nature of these joints.	VIKC
08/30/2000 - 15.98 * 1 = 15.98m Sliding plate. Leaking.	FILQ
06/03/1998 - _	XKGJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing Bent 2 and 3										
	1	3	8	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Bearings are towards epansion but tolerable 75 degrees F. Spot rust, stained, and debris.	MWHP
09/20/2010 - Bearings in slight to moderate expansion. Some spot rust, dirt, and debris on the bearings.	WZBZ
09/24/2008 - Slight rotation towards expansion; 55F when under the area. Some overcoat painting and cleaning done.	YQCZ
07/25/2006 - Same as past inspections and alignment is Good.	NZDN
09/29/2004 - Spot rust and pitting from leaking joint. Some pigeon debris/nests near bearings.	ZZIO
10/21/2002 - Rusty and pitting under leaking joints.	VIKC
08/30/2000 - Some rust and pitting.	FILQ
06/03/1998 - Some rust & pitting.	XKGJ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601
Continue

********** Span : **Appr-1 - Steel Girder - Spans 1 and 2 (cont.)** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing Abutment 1										
	1	2	4	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Spot rust, staining, faded paint, and some debris. MWHP
09/20/2010 - Spot rust, debris, and faded paint. WZBZ
09/24/2008 - No change. YQCZ
07/25/2006 - Same as past inspections. NZDN
09/29/2004 - Spot rust and pitting on the bearings. Some pigeon debris/nests on and around the bearings. ZZIO
10/21/2002 - Some rust and scale on Abutment bearings. VIKC
08/30/2000 - Some rust and pitting. FILQ
06/03/1998 - Some rust & pitting. XKGJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 321 - R/Conc Approach Slab										
	1	3	1	ea.		0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Bump onto bridge from settlement in approach slab and roadway. MWHP
09/20/2010 - Same as previous inspection comments. WZBZ
09/24/2008 - Settlement of the slab is allowing a big bump onto the structure. Sealant in the joint between the slab and bridge end is leaking and loose in areas. YQCZ
07/25/2006 - Put into condition State 2 due to settlement of the slab. NZDN
09/29/2004 - Minor settlement. Joint between the slab and the structure is leaking as adhesion of the sealant is broken. ZZIO
10/21/2002 - Minor settlement. VIKC
08/30/2000 - None FILQ
06/03/1998 - _ XKGJ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	61	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Vertical and mapping cracks. Spalls on tops of barrier where hand rail was removed. MWHP
09/20/2010 - Same as previous inspection comments. WZBZ
09/24/2008 - Vertical cracks at the relief cuts. Some spalls on the top where the Right handrail was removed. YQCZ
07/25/2006 - Same as last inspection. NZDN
09/29/2004 - Vertical cracking between the relief cuts. Some minor pieces of concrete were fracutured from when the metal handrail was removed from the top of the barrier. ZZIO
10/21/2002 - Vertical cracking and shrinkage cracks throughout. VIKC
08/30/2000 - 30.74 * 2 = 61.48m   New concrete rail in 1999. FILQ
06/03/1998 - 30.74 * 2 = 61.48
Some rust & pitting of the rail posts and bridge rail. XKGJ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01601
Continue

********** Span : **Appr-1 - Steel Girder - Spans 1 and 2 (cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated W-Beam, Pipe Handrail, and Guard Fence w\ Steel Posts										
	1	3	31	m.		80	20	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/12/2012 - Rust, scale, paint loss, and scrapes on pipe and posts. Gaurd fence is in good condition. MWHP

09/20/2010 - Rust, scale, paint loss, and minor surface pitting to the posts, W-Beam rail, and handrail. Guard fence posts and fabric are in Good condition. WZBZ

09/24/2008 - Rust, paint loss, scale, and fading of the coating system on the rail posts and pipes. guard fence is in Good condition. YQCZ

07/25/2006 - Same as last inspection. NZDN

09/29/2004 - Rail posts and pipes ave some spot rust throughout. The guard fence is in place and in Good condition. ZZIO

10/21/2002 - Rusty and pitting throughout. Guard fence is in Good condition. VIKC

08/30/2000 - 31.74x1=30.74 Sidewalk has existing metal rail and guard fence was added during 1999 construction. Minor rus on existing rail and posts. FILQ

Inspection Notes:

General Inspection Notes

09/12/2012 - Area under east abutment has a small village of homeless people. Lots of soot on underside in area from camp fires. MWHP

Non-destructive testing of the pin and hanger connections performed by Collins Engineers. CRH

09/20/2010 - Lots of campers beneath the bridge today. WZBZ

09/24/2008 - Showed 31-01B where bolts need to be installed in the bearings at Bent 6. YQCZ

07/25/2006 - NBI 58, deck, rated a "6" due to wear and delamiantions. NZDN
NBI 59, superstrucutre, rated a "6" due to rust, scale, and pitting in portions of the girders.
NBI 60, substructure, rated a "6" due to spalls in the columns and caps.

09/29/2004 - Deck cracking is about the same as the last inspection. ZZIO

10/21/2002 - Deck cracking appears to have gotten worse since the traffic control island was placed on the strucure. Unsure if extra dead load has caused cracks to get worse or if the deicer is causing some crack problems to worsen VIKC

08/30/2000 - Doubful that I can snooper this bridge anymore due to guard fence that was placed in 1999. FILQ

06/03/1998 - None XKGJ

12/01/1995 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:45 YDNF
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:25:13

02/01/1994 - REFI

08/01/1992 - Updated with tape 1994 NB94

01/01/1991 - Updated with tape 1992 NB92

04/01/1989 - Updated with tape 1991 NB91

04/01/1987 - Updated with tape 1989 NB89

09/01/1984 - Updated with tape 1986 NB86

07/01/1981 - Updated with tape 1984 NB84

04/01/1979 - Updated with tape 1980 NB80

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Location : GREAT FALLS Structure Name:

General Location Data

District Code, Number, Location : **03** **Dist 3** **GREAT FALLS**
County Code, Location : **013** **CASCADE**
Kind fo Hwy Code, Description : **3** **3 State Hwy**
Str Owner Code, Description : **1** **State Highway Agency**
Intersecting Feature : **CITY ST, BNSF RAILROAD**
Structure on the State Highway System : X
Structure on the National Highway System : X
Str Meet or Exceed NBIS Bridge Length : X
Latitude : **47°30'29"**
Longitude : **111°20'27"**

MDT Maintenance Section : **31-01 Great Falls**
Division Code, Location : **31** **GREAT FALLS**
City Code, Location : **32800** **GREAT FALLS**
Signed Route Number : **00103**
Maintained by Code, Description : **1** **State Highway Agency**
Kilometer Post, Mile Post : **0.26 km** **0.16**

Construction Data

Construction Project Number : **IG 15-5(28)274**
Construction Station Number : **21+54.00**
Construction Drawing Number : **7789**
Construction Year : **1967**
Reconstruction Year :

Traffic Data

Current ADT : **11,330** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**B ASD Assigned**
Operating Load, Design :	**32.6 mton**	**B ASD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**85**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **167.94 m**
Deck Area : **1,781.00 m sq**
Deck Roadway Width : **8.32 m**
Approach Roadway Width : **9.14 m**
Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**
Reference Feature for Vertical Clearance : **R Railroad beneath struc**
Vertical Clearance Under the Structure : **5.11 m**
Reference Feature for Lateral Underclearance : **R Railroad beneath struc**
Minimum Lateral Under Clearance Right : **1.50 m**
Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **4**
Material Type Code, Description : **4 Steel continuous**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**
Deck Surfacing Type : **3 Latex Concrete or similar additive**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **2**
Material Type Code, Description : **3 Steel**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

(52) Out-to-Out Width : **10.61 m**
(50A) Curb Width : **1.52 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **45°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under GUALT AVE	-1	N/A	5.11 m	7.32 m	N/A		
Route On Structure CENTRAL AVE. WEST - WB	N00103	Both	99.99 m	8.32 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602
Continue

Inspection Data

Sufficiency Rating : **76.3**
Structure Status : **Func Obs - Elg Rehab**

Inspection Due Date : 13 September 2014
(91) Inspection Frequency (months) : **24**

Next Other Insp Due Date : **22 Aug 2016**
Other Insp Type : **Pin and Hanger**

NBI Inspection Data

(90) Date of Last Inspection : 13 September 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	6	(68) Deck Geometry :	3	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	6	(67) Structure Rating :	6	(36B) Transition Rating :	1	(61) Channel Rating :	N
(60) Substructure Rating :	6	(69) Under Clearance :	3	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	N
(72) App Rdwy Align :	7	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	N

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	7	Snooper Required :	Y
Helper Hours :	0	Snooper Hours for inspection :	5
Special Crew Hours :	13.5	Flagger Hours :	0
Special Equipment Hours :	13.5		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2005-000058	**15 October 2004**	**Approved**	**Low**	All Spans	Bridge	Spot Paint (flex)	
Clean and paint Girders. 2006 - Some overcoat painting and cleaning done. Approved. DRC							
D31-FY2005-000059	**15 October 2004**	**Approved**	**High**	All Spans	301 Pourable Joint Seal	Min Repair	
Reaseal these joints. Approved. DRC							
D31-FY2011-000152	**07 February 2011**	**Not Approved**	**Medium**	All Spans	Bridge	Spot Paint (flex)	
Clean and paint Bearings. 2006 - Some overcoat painting and cleaning done.							
D31-FY2011-000153	**07 February 2011**	**Not Approved**	**Low**	All Spans	334 Metal Rail Coated	Repl Paint	
Clean and paint Rail Posts.							

Late Reason:
Inspection Date: 09/13/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

Element Inspection Data

********** Span : **Main-0 - Steel Girders over RR - Spans 3 thru 6** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	2003	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Studded tire wear in wheel paths. Spalls/Delaminations along edges of joint steel. Mapping cracks in all spans. NLGQ

09/21/2010 - Lots of tight mapping cracks. Wear in the wheel paths. Small spalls and delaminations along joint steel. WZBZ

09/23/2008 - Wear in the wheel paths. Transverse and mapping cracks in areas. Small spalls and surface delaminations along the joint edges. YZCZ

10/13/2006 - Wear in the wheel paths. Right lane has more mapping cracks in it. Spalls/Delaminations along the joint achorage's steel. NADO

09/29/2004 - Put the deck into Condition State 2 as there are some small areas of delamination along the joint edges. ZAIP

10/21/2002 - 14.60 * 137.20 = 2003.12 Deck element changed to a "12" as the Latex concrete was placed back to the original depths after the 1999 hydromill and Class B repair operations. Cracks in latex where sealed in 1999 with HMWM. Many tight transverse deck cracks. MDT Maintenance is spraying the deck with freeze guard. Cracks are soaking ip the freeze guard. VZKC

08/30/2000 - New Latex concrete overlay in 1999 with some transverse cracking(small and tight). Cracks sealed with HMWM before construction was completed. Delaminated areas were removed by hydrodemolition and replaced with latex concrete. FIKL

06/03/1998 - 14.60 * 137.20 = 2003.12. Numerous small, tight transverse cracking throughout with small areas of delamination when it was checked several years ago. Studded tires have left a fairly smooth wear surface. MHIL

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder										
	1	2	549	m.		80	15	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Rust blisters, minor surface pitting, and paint loss on tops of lower girder flanges where water and debris has collected. Diagonals between G2 and G3 were removed and intersecting welds in tension reversal zones were drilled early in 2012 under statewide steel rehab job. NLGQ

09/21/2010 - Dirty, grime, bird debris, and rust blisters on top of the bottom flanges. Some surface pitting under rust blsiters. Faded and chalky paint. WZBZ

09/23/2008 - Rust, scale, paint loss, and some surface pitting under rust blisters. Outer girders and areas under leaky joints are the worse. Very dirty from diesel smoke, bird debris, and de-icer. YZCZ

10/13/2006 - Rust, scale, pitting and paint loss. Most notiable under joints, outside girders, and where piegon nest/debris are built-up. Pulled most of this stuff off. NADO

09/29/2004 - Rusty, scale, peeling paint, and minor pitting; mostly under the joints and on the lower flange/web areas. ZAIP

10/21/2002 - Rusty spots throughout and some pitting. Mostly under leaking joints and on the bottom flange/lower web area. VZKC

08/30/2000 - No Change; mainly under the joints. FIKL

06/03/1998 - 4 * 137.20 = 548.80. Show some signs of early rust & pitting. MHIL

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

********** Span : **Main-0 - Steel Girders over RR - Spans 3 thru 6** **(cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 161 - Paint Stl Pin/Hanger (4) Pin and Hanger Assemblies plus (4) End Girder Connection Pins										
	1	3	12	ea.		95	5	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Pins and hangers were UT tested in August 2012 and no excessive wear was noted (see Collins Engineering reports). NLGQ

09/21/2010 - Still Good paint where re-painted by UT inspectors. Refer to report by Collins Engineering. No "noteables" were fond in the UT inspection with little to no wear also noted. WZBZ

09/23/2008 - 2005 UT showed no problems. Some minor rust on the pins and hangers. YZCZ

10/13/2006 - Showed ok in 2005 UT testing. NADO

09/29/2004 - Ends of the pins, nuts, and hangers are showing some minor rust where the paint was removed for UT testing. No major wear or problems noted in UT inspection in 2001. ZAIP

10/21/2002 - See Bills report from 2001. VZKC

08/30/2000 - No Change; mainly under the joints. FIKL

06/03/1998 - Some minor rusting and pitting. Eight(8) pins have been UDT'ed and are ok. MHIL

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bent 3, 4, 5, 6, and 7										
	1	1	8	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Shallow surface delaminations near tiewire or reinforcing chair feet. Some columns have tight vertical cracks near their corners. Scrapes and shallow spalls on some. NLGQ

09/21/2010 - Tight surface shrinkage cracks with some cracking on the edges. Some surface spalls from shallow tie wire. WZBZ

09/23/2008 - Tight cracking in most of the columns. Some surface spalls and small delaminations from shallow tie wire or exposed feet of the rebar chairs. Right column at Bent 3 has not gotten any worse. YZCZ

10/13/2006 - Same as past inspections with surface spalling where rebar chairs are exposed. Bent 3's Right column has a small spall on the edge with some staining. 5 percent in Condition State 3 is probably pushing it for the staining and spalls. NADO

09/29/2004 - Tight cracks and shrinkage cracks on most of the columns. Tight cracks near construction joints to the caps. Some rust stains from exposed rebar chairs and/or wire. ZAIP

10/21/2002 - Some tight cracks throughout. Graffti and smoked areas from homeless people under the structure. VZKC

08/30/2000 - No Change. FIKL

06/03/1998 - Some hairline, tight cracking in the concrete. MHIL

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

* * * * * * * * * * Span : **Main-0 - Steel Girders over RR - Spans 3 thru 6** **(cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment East Abutment (7)										
	1	2	26	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Some tight cracking in backwall and cap. Small spall near embedded bearings and along cap/backwall connection. Lots of belongings of homeless people stacked on backwalls. NLGQ
09/21/2010 - Tight cracks in the backwall and under G3. A couple of small spalls near bearing embedments. One camper between G2 and G3 today. WZBZ
09/23/2008 - Some tight cracks in the backwall and cap. Small spalls along the edges of the girders where they are embedded into the backwalls. YZCZ
10/13/2006 - Unchanged from previous inspections. NADO
09/29/2004 - Minor spalling and deteriorated concrete where the girders meet the backwalls. Minor erosion at the Left wingwall. ZAIP
10/21/2002 - (14.060 1.55 9.70 = 25.80m Minor erosion at wingwall. Some minor concrete deterioration where girders meet the backwalls. VZKC

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bent 3, 4, 5, 6, and 7										
	1	2	58	m.		85	10	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Bent 3 cap has a delamination on Span 2 face along with some spalling (photo). Surface spalls/delaminations on underside of caps from reinforcing chair feet. NLGQ
09/21/2010 - Staining from mositure and rebar chair feet. Delaminated and cracked areas on most of the caps. Some surface spalls and delaminations from shallow tie wire. WZBZ
09/23/2008 - Spalls, cracking, and delaminations in most of the caps. Underside of the caps show surface spalls/delaminations from exposed rebar chair feet. Some staining on the Right end of Bent 3's cap at delamination under G4S2 side. YZCZ
10/13/2006 - Caps show surface spalls from shallow rebar chairs. Some minor staining in delaminated areas. 5 percent in Condition State 3 is maybe alittle strong. NADO
09/29/2004 - Some minor spalled areas on bottoms of the caps where rebar chairs are exposed and rusting. Some minor cracking under the beam seats. ZAIP
10/21/2002 - Same as previous report. Some staining in areas where joints leak. VZKC
08/30/2000 - 4 * 14.60 = 58.40m Env. #2 as some under leaking joints. FIKL
06/03/1998 - 5 * 14.60. Some sanding material on some of the caps. MHIL
12/01/1995 - None YDNF
02/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

********** Span : **Main-0 - Steel Girders over RR - Spans 3 thru 6** **(cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 301 - Pourable Joint Seal										
	1	3	29	m.		60	25	15		
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Steel portions sound solid when tapped on. Minor spalling and deterioration on underside of deck and joints. Sealant is loose, torn, and missing in joints. Small delaminations/spalls along edge of joint steel. NLGQ

09/21/2010 - Several areas of loose and pushed down sealant. Some small areas of torn sealant. WZBZ

09/23/2008 - Leaky, sanding material pushed in, and loose sealant along the joints edges. Some small surface mortar spalls/delaminations along the steel edges. YZCZ

10/13/2006 - Unchanged from previous rpeorts. NADO

09/29/2004 - Several areas where the sealant has lost contact and is pulling away. Joints are leaking. Some debris/dirt in the joints and this is putting prressure on the sealant. ZAIP

10/21/2002 - Sanding material and debris in joints. Some areas where Dow Corning has pulled away or been forced open from debris in the joints. VZKC

08/30/2000 - 14.60 * 2 = 29.20m "Dow corning"
Some missing material and sanding material in the joint. FIKL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 305 - Assm Jt w/o Seal										
	1	3	29	m.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Steel sounds solid when tapped on and finger alignment is good. Small spalls/delaminations along edge of joint steel. Minor spalling and deterioration on underside of deck at joint area. NLGQ

09/21/2010 - Good alignment on the fingers. Small spalls and surface delaminations along the joint edges. Steel sounds solid when tapped on. Minor deterioration and spalling of the deck concrete on the bottom side under the steel. WZBZ

09/23/2008 - Steel sounds solid when tapped on. Finger alignment is Good. Some cracking and small spalls along the underside of the deck edges at the joints. YZCZ

10/13/2006 - Steel portions of the joints sound solid when tapped on. Some delaminations/spalls along the steel. Finger alignment is Good this summer. NADO

09/29/2004 - West most sliding plate has a small section of delamination on its' edge, 8 to 12". Finger joint alignment is Good. ZAIP

10/21/2002 - Minor rusty spots. Joints are in good alignment. VZKC

08/30/2000 - No Change. FIKL

06/03/1998 - 14.60 * 2. Some rust and pitting. (1) Finger & (1) Sliding Plate Joints. MHIL

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

********** Span : **Main-0 - Steel Girders over RR - Spans 3 thru 6** **(cont.)** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing										
	1	3	12	ea.		85	10	5		
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Minor bend on anchor bolts at Bent 3. Bearings near maximun expansion (70 degrees F). Rusty spots, scale, paint loss, and debris at bearings.	NLGQ
09/21/2010 - Near maximum movement in expansion at Bent 3; 50F. Rusty spots, dirt, and some peeling paint. Lots of pigeons nesting near the bearings.	WZBZ
09/23/2008 - Rusty spots, debris, and paint loss. Some overcoat painting done. Alignment of the bearings at Bent 2 are in expansion and near maximum movement; 48F for Condition State 3.	YZCZ
10/13/2006 - Rust, scale, paint loss and debris. 5 percent in Condition State 3 for the alignment of rockers at Bent 3; still tolerable. Clean and overcoat painted.	NADO
09/29/2004 - Rusty spots. Some scale, peeling paint, and pitting. Pigeon nest and debris near the bearings.	ZAIP
10/21/2002 - Minor rusting spots and debris.	VZKC
08/30/2000 - No Change.	FIKL
06/03/1998 - Some rust & pitting.	MHIL
12/01/1995 - None	YDNF
02/01/1994 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing										
	1	3	12	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Spot rust and fading paint.	NLGQ
09/21/2010 - Some dirt and grime. Paint still looks Good with only some spot rust.	WZBZ
09/23/2008 - Some spot rust. Cleaned and overcoat spot painted.	YZCZ
10/13/2006 - Same as previous reports. Clean and overcoat painted.	NADO
09/29/2004 - Rust spots and pitting. Pigeon nest around some of the bearings.	ZAIP
10/21/2002 - Minor rusting spots and pits.	VZKC
08/30/2000 - No change.	FIKL
06/03/1998 - Some rust & pitting.	MHIL
12/01/1995 - None	YDNF
02/01/1994 - None	REFI

Inspection Notes:

********** Span : **Main-0 - Steel Girders over RR - Spans 3 thru 6** **(cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	274	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Random shrinkage cracks. Top of barrier has some spalls where hand rail was removed. NLGQ

09/21/2010 - Unchanged from past inspection comments. WZBZ

09/23/2008 - Vertical cracks at relief cuts. Small surface spalls where hand rail was removed from the top of the Left rail. YZCZ

10/13/2006 - Same as past inspection reports. NADO

09/29/2004 - Minor vertical cracking between relief cuts. Some areas of fractured concrete where the hand rail was removed from the top of the barrier rail. ZAIP

10/21/2002 - Some vertical cracks and mapping/shrinkage cracks. VZKC

08/30/2000 - Changed from metal rail to concrete rail in 1999. FIKL

06/03/1998 - 137.20 * 2 = 274.4. Some rust & ptting of the rail & rail posts. MHIL

12/01/1995 - None YDNF

02/01/1994 - None REFI

Inspection Notes:

Element 334 - Metal Rail Coated W-Beam and Round Steel Pipe w\ Guard Fence and Steel Posts										
	1	3	137	m.		80	20	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Rust, scale, paint loss, and peeling paint on posts and pipe rail. Gaurd fence and fabric in good condition. NLGQ

09/21/2010 - Spot rust, scale, peeling paint, and faded paint on the posts and pipe rail. Guard fence posts and fabric are in Good condition. WZBZ

09/23/2008 - Same comments as past inspections. YZCZ

10/13/2006 - Paint system is pitted, flaking, and rusty throughout. W-Beam has some spot rust. Guard fence is in Good condition. NADO

09/29/2004 - Rust spots on the rail posts and pipe. Some spot rust on the W-Beam rail. Guard fence is in Good condition. ZAIP

10/21/2002 - Rusty spots with some pitting. Guard fence is in Good condition. VZKC

08/30/2000 - Rail along sidewalk is metal rail and new guard fence added during 1999 construction. Some minor rust on posts and existing w-beam. FIKL

Inspection Notes:

Element 357 - Sup Pack Rust SmFlag										
X	1	1	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Lower angles on diaphragms show spreading and cracked welds from pack rust. NLGQ

09/21/2010 - Unchanged from past inspection comments. WZBZ

09/23/2008 - Added due to pack rust at the diaphragms under leaky joints. Some swelling has cracked welds; photo. YZCZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

********** Span : **Main-0 - Steel Girders over RR - Spans 3 thru 6** (cont.) **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Due to size and density. NLGQ

09/21/2010 - Unchanged from past inspection comments and not yet in Condition State 3. WZBZ

09/23/2008 - Added due to the size of some of the cracks, 1.00mm, and density of the cracks in some areas. YZCZ

Inspection Notes:

********** Span : **Appr-1 - Steel Girders - Span 1 and 2** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	449	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Studded tire wear in wheel paths. Mapping cracks in both spans. Shallow spalls/delaminations along joint steel. NLGQ

09/21/2010 - Tight mapping cracks. Minor spalls and delaminations along joint edges. Wear in the wheel paths. WZBZ

09/23/2008 - Wear in the wheel paths. Transverse and mapping cracks in areas. Small spalls/delaminations along the joint edges. YZCZ

10/13/2006 - Same comments as past inspections. NADO

09/29/2004 - Had to move to Condition State 2 due to small delaminations along the joints. Some mapping cracks in the spans. ZAIP

10/21/2002 - 14.60 * 30.74 = 448.8 Changed Element to "12" as the Latexx concrete was only placed to the existing levels after hydromiliing and Class B repairs. VZKC

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder										
	1	2	123	m.		90	5	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Rust blisters with some surface pitting on tops of bottom flange where moisture collects. Girders are dirty and have faded paint. NLGQ

09/21/2010 - Dirty, grimey, and faded paint. Minor rust blisters with surface pitting. WZBZ

09/23/2008 - Rust, scale, minor surface pitting, and paint loss; worse in areas that the deicer and water collects. Girders are dirty. YZCZ

10/13/2006 - Rust, scale, peeling paint, paint loss, and pitting; mainly in areas under/near leaky joints. NADO

09/29/2004 - Unchanged from previous reports. ZAIP

10/21/2002 - Rusty spots with some minor pitting under joints and on the bottom flange/lower web area. VZKC

08/30/2000 - No Change. FIKL

06/03/1998 - 4 * 30.74 = 122.96. Some areas of rust & pitting. MHIL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

* * * * * * * * * * Span : **Appr-1 - Steel Girders - Span 1 and 2 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 161 - Paint Stl Pin/Hanger Bent 3 - Pins Only

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	4	ea.		100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Pins were UT tested in August 2012 and no significant wear was observed.	NLGQ
09/21/2010 - Still Good paint where re-painted by UT inspectors. Refer to report by Collins Engineering. No "noteables" were fond in the UT inspection with little to no wear also noted.	WZBZ
09/23/2008 - Cleaned and re-painted after UT testing this summer. See report for findings.	YZCZ
10/13/2006 - UT testing in 2005 showed no problems.	NADO
09/29/2004 - Minor rust where paint has weathered off of the pins from whre they were cleaned for UT inspection.	ZAIP
10/21/2002 - Girder to Girder connection. No problems noted when inspected/NDT'd in 2001.	VZKC

Inspection Notes:

Element 205 - R/Conc Column Bent 2

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	2	ea.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Tight surface shrinkage cracks and a small shallow spall from tie wire.	NLGQ
09/21/2010 - Some tight surface shrinkage cracks. Left column has tight cracks on the Left-Back corners of the column.	WZBZ
09/23/2008 - Both columns show tight shrinkage cracks. Generally in Good condition.	YZCZ
10/13/2006 - No change exept that the graffiti has been painted over.	NADO
09/29/2004 - Tight shrinkage cracks. Tight cracks at the construction joint near the caps. Graffiti on both columns.	ZAIP
10/21/2002 - Minor shrinkage cracks throughout. Some graffti from homeless village/camp under the structure.	VZKC
08/30/2000 - None	FIKL
06/03/1998 - _	MHIL

Inspection Notes:

Element 215 - R/Conc Abutment Abutnment 1 - West

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	19	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Generally good condition. Some tight cracks and few small spalls near cap/backwall connection and near embedded bearings.	NLGQ
09/21/2010 - Unchanged from past inspection comments. Good condition. Fence on the Left end of the Abutment is broken over by homeless traffic.	WZBZ
09/23/2008 - Tight cracks in the backwall and under a couple of the girders in the cap. Small spalls at a couple of the girders edges where embedded in the backwall.	YZCZ
10/13/2006 - Minor delaminations where the girdrs are embedded in the backwalls. Some tight cracks between the girders. Still minor erosion at the corners.	NADO
09/29/2004 - Same as previous report.	ZAIP
10/21/2002 - Minor concrete popouts and deterioration where girders are embedded in backwall. Minor erosion at wingwall.	VZKC
08/30/2000 - No change.	FIKL
06/03/1998 - 14.60 + 1.30 + 2.80 = 18.7. Some erosion @ the wingwalls.	MHIL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

* * * * * * * * * * Span : **Appr-1 - Steel Girders - Span 1 and 2 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 234 - R/Conc Cap Bent 2

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	15	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Spall with exposed rebar and some shallow surface delaminations. NLGQ

09/21/2010 - Small delaminations and spalls on the cap. Surface spall from tie wire and rebar chair feet. WZBZ

09/23/2008 - Shallow surface delaminations; Condition State 3. Some small surface spalls from shallow tie wire and rebar chair feet; Condition State 2. YZCZ

10/13/2006 - Surface spalls on the underside of the cap from shallow rebar chairs. Cap is stained from leaky joint above. NADO

09/29/2004 - Minor rust stains and spalling where chairs are exposed on the bottom side of the cap. Staining from leaking joint. ZAIP

10/21/2002 - ok VZKC

08/30/2000 - 14.60 * 1 = 14.60m FIKL

06/03/1998 - 14.60 * 2 = 29.2 MHIL

Inspection Notes:

Element 305 - Assm Jt w/o Seal

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	15	m.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Steel sounds solid when tapped on. Some delaminations/spalls along edges of joint steel. NLGQ

09/21/2010 - Small spalls along the joint steel edge. Steel sounds solid when tapped on. WZBZ

09/23/2008 - Steel sounds solid when tapped on. Some small surface spalls and delaminations along the joint edges. YZCZ

10/13/2006 - Steel all sounds solid when tapped on. Small spots of delaminated concrete and small spalls in a couple of areas along the joint's anchorage. NADO

09/29/2004 - Small spot of delamination on the joint edge, 4" . Leaky also. ZAIP

10/21/2002 - Minor rusty spots. Leaking as normal for a sliding plate joint. VZKC

08/30/2000 - Leaking. FIKL

06/03/1998 - Sliding Plate. MHIL

Inspection Notes:

Element 311 - Moveable Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	8	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Bearings are towards slight expansion (65 degeers F). Paint is faded, dirty, and has spot rust. NLGQ

09/21/2010 - Slight expansion; 50F. Some spot rust and debris. WZBZ

09/23/2008 - Good to Fair alignment today as slightly in expansion; 48F. Some cleaning and overcoat painting done. YZCZ

10/13/2006 - Rust, scale, and some paint loss. Alignment is Good. NADO

09/29/2004 - Spot rust and pitting from leaking joint. ZAIP

10/21/2002 - Minor rusty spots with some pitting under leaking joints. VZKC

08/30/2000 - No change. FIKL

06/03/1998 - Some rust & pitting. MHIL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

********** Span : **Appr-1 - Steel Girders - Span 1 and 2 (cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing Abutment 1										
	1	2	4	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Spot rust and faded paint. NLGQ
09/21/2010 - Spot rust and some soot from campfires on G1 and G2 bearing areas. WZBZ
09/23/2008 - Some overcoat painting has been done. YZCZ
10/13/2006 - Some rust, paint loss, amd flaking paint where visible. NADO
09/29/2004 - Same as previous report. ZAIP
10/21/2002 - Rusty spots where visible. VZKC
08/30/2000 - No change. FIKL
06/03/1998 - Some rust & ptting. MHIL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 321 - R/Conc Approach Slab West - Abutment 1										
	1	3	1	ea.		0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Slab shows settlement and a bump. Sealant between slab and bridge end is torn most of length. NLGQ
09/21/2010 - Torn and loose sealant in the joint between the slab and bridge end. Settlement in the slab and approach roadway. WZBZ
09/23/2008 - Same as past inspections. YZCZ
10/13/2006 - Put into Condition State 2 due to settlement. Joint between the slab and bridge is leaking into the approach fill. NADO
09/29/2004 - Big bump for the off going traffic. Joint between the slab and bridge is leaking. Some of the sealant has lost its' bond to the guard angles. ZAIP
10/21/2002 - Bump going off of the structure due to settlement of approach slab. VZKC
08/30/2000 - None FIKL
06/03/1998 - _ MHIL

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	61	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Tight shrinkage cracking. Small spalls where hand rail was removed. NLGQ
09/21/2010 - Unchanged from past inspection comments. WZBZ
09/23/2008 - Vertical cracking along the relief cuts. Small spalls where handrail was removed on the Left rail. YZCZ
10/13/2006 - Same as past reports. NADO
09/29/2004 - Vertical cracking between the relief cuts. Some fractured concrete where the hand rail was removed. ZAIP
10/21/2002 - Minor vertical cracks and some shrinkage cracks throughout. VZKC
08/30/2000 - Replaced matel rail with concrete barrier in 1999. FIKL
06/03/1998 - 30.74 * 2 = 61.48. Some rust & pitting of the rail posts & bridge rail. MHIL

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

U05210000+01602

Continue

*** * * * * * * * * * Span : Appr-1 - Steel Girders - Span 1 and 2 (cont.) * * * * * * * * * ***

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated W-Beam and Round Steel Pipe w\ Guard Fence and Steel Posts										
	1	3	31	m.		80	20	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/13/2012 - Rust, scale, and peeling paint on rail posts and pipes. Gaurd fence and fabric in good condition.	NLGQ
09/21/2010 - Spot rust, scale, and peeling paint on the posts and pipe. Guard fence posts and fabrics are in Good condition.	WZBZ
09/23/2008 - Unchanged.	YZCZ
10/13/2006 - Paint is pitted, flaking, and rusty spots throughout. Guard fence is in Good condition.	NADO
09/29/2004 - Minor rust spots on the rail posts and pipes. Guard fence is in Good condition.	ZAIP
10/21/2002 - Minor rusting and pitting throughout. The guard fence is in Good condition.	VZKC
08/30/2000 - 30.74x1=30.74 Rail along sidewalk is metal rail and new guard fence was added during 1999 construction. Minor rust on posts and existing w-beam.	FIKL

Inspection Notes:

General Inspection Notes

09/13/2012 - Big bump going off of bridge from approach slab settlement. Non-destructive pin and hanger testing performed by Collins Engineers. CRH	NLGQ
09/21/2010 - NBI 72, roadway alignmnet, rated a "7" as bridge is slightly narrower than the approach roadway. Several homeless people under the bridge today.	WZBZ
09/23/2008 - Lots of campers under the bridge today.	YZCZ
10/13/2006 - NBI 58, deck, rated a "6" due to wear and small delaminations along the joints. NBI 59, superstructure, rated a "6" due to rust, scale, and pitting of the girders. NBI 60, substructure, rated a "6" due to spalls and delaminations in the caps and columns.	NADO
09/29/2004 - Cleaning of the bearings and caps could be done with ladders and/or bucket truck from the underside of the structure. Cap on the electical is loose and one is missing.	ZAIP
10/21/2002 - Some of the caps that the electrical pull boxes are missing on the sidewalk allowing wires to be exposed.	VZKC
08/30/2000 - Doubtful if the snooper can be used anymore as new guard fence in 1999. 02-28 and 03-01-2001: Cleaning, UT inspection, and mag. particle inspection of the (4) pin & hanger assemblies and the (8) pins on th is structure. Nothing foundwith mag. particle inspection of note. Some minor wear on a couple of the pins was found and noted in the proper report.	FIKL
06/03/1998 - .48m curb on the right and a 1.52m sidewalk on the left with inside of curb to inside of sidewal as 8.61m.	MHIL
12/01/1995 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:45 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:25:13	YDNF
02/01/1994 -	REFI
08/01/1992 - Updated with tape 1994	NB94
01/01/1991 - Updated with tape 1992	NB92
04/01/1989 - Updated with tape 1991	NB91
04/01/1987 - Updated with tape 1989	NB89
09/01/1984 - Updated with tape 1986	NB86
07/01/1981 - Updated with tape 1984	NB84

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Location : GREAT FALLS Structure Name: GF Warden Br-WB

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **2 2 U.S. Numbered Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **MISSOURI RV, U5205, BNSF**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°29'37"**

Longitude : **111°18'41"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00089**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **152.60 km 94.82**

Construction Data

Construction Project Number : **F 60-2(5)92 1 2**

Construction Station Number : **46+06.00**

Construction Drawing Number : **12646**

Construction Year : **1983**

Reconstruction Year :

Traffic Data

Current ADT : **37,380** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**B ASD Assigned**
Operating Load, Design :	**32.6 mton**	**B ASD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**48.6**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **646.79 m**

Deck Area : **10,192.00 m sq**

Deck Roadway Width : **12.10 m**

Approach Roadway Width : **12.19 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **H Hwy beneath struct**

Vertical Clearance Under the Structure : **6.46 m**

Reference Feature for Lateral Underclearance : **H Hwy beneath struct**

Minimum Lateral Under Clearance Right : **7.40 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **6**

Material Type Code, Description : **4 Steel continuous**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Approach Span

Number of Spans : **14**

Material Type Code, Description : **5 Prestressed concrete**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **1 Monolithic concrete (concurrently placed with struct**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **15.76 m**

(50A) Curb Width : **0.00 m**

(50B) Curb Width : **2.74 m**

Skew Angle : **45°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under RIVER ROAD	U05205	Both	6.46 m	7.32 m	N/A		
Route On Structure 10TH AVE SOUTH WB	P00060	West	99.99 m	12.10 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281
Continue

Inspection Data

Sufficiency Rating : **96.3**
Structure Status : **Not Deficient**

Inspection Due Date : 19 September 2014
(91) Inspection Frequency (months) : **24**

Next Under Water Insp : **15 Nov 2016**
Under Water Insp Type : **Type II**

NBI Inspection Data

(90) Date of Last Inspection : 19 September 2012
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	6	(68) Deck Geometry :	7	(36A) Bridge Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	6	(67) Structure Rating :	6	(36B) Transition Rating :	1	(61) Channel Rating :	7
(60) Substructure Rating :	6	(69) Under Clearance :	7	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	5

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	15	Snooper Required :	Y
Helper Hours :	0	Snooper Hours for inspection :	12
Special Crew Hours :	0	Flagger Hours :	0
Special Equipment Hours :	0		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2004-000264	**02 February 2004**	**Approved**	**Low**	All Spans	Bridge	Spot Paint (flex)	
Clean and paint ice breakers. Approved. DRC							
D31-FY2004-000263	**02 February 2004**	**Approved**	**Low**	All Spans	12 Bare Concrete Deck	Min Repair	
Clean Drains throughout. 2003-08-05: Cleaned drains on the left roadway side. W.A.Lay Approved. DRC							
D31-FY2005-000076	**18 October 2004**	**Approved**	**Low**	All Spans	334 Metal Rail Coated	Rehab Elem	
Clean and spot paint the rail posts and rail tubes on the right barrier and Outside-Right edge of the structure. Approved. DRC							
D31-FY2008-000120	**14 July 2008**	**Approved**	**Low**	All Spans	12 Bare Concrete Deck	Min Repair	
Patch spalled areas. Approved. DRC							
D31-FY2011-000131	**07 February 2011**	**Not Approved**	**Low**	All Spans	12 Bare Concrete Deck	Min Repair	
Repair damaged downspouts.							
D31-FY2011-000132	**07 February 2011**	**Not Approved**	**High**	All Spans	305 Assm Jt w/o Seal	Rehab Elem	
Clean the finger joint troughs. 2003-08-05: Cleaned left half of the finger toughs today. W.A.Lay							

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						
D31-FY2013-000004	**02 October 2012**	**Not Approved**	**High**	A Approach	305 Assm Jt w/o Seal	Rehab Elem	
Repair the loose finger joint at Bent 8 on the Left side of the bridge.							
D31-FY2013-000005	**02 October 2012**	**Not Approved**	**High**	All Spans	Bridge	Rehab (flex)	
Repair the spalls along all of the joints.							

Late Reason:
Inspection Date: 09/19/2012

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281
Continue

Element Inspection Data

********** Span : **Main-0 - Steel Girder Spans 14 - 19** **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	4618	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Random spalled areas in most of the Spans and delaminations along the joint edges. Some cracked areas with delaminations in Spans 15 thru 17. Some spalls have been patched with the velocity patcher. ZZJO
09/27/2010 - Small spalls and delaminations along the joint edges. Steel sounds solid when tapped on. EZJZ
06/20/2008 - Same as past inspections and add some spalling and delamiantions along the joint edges. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Transverse cracking throughout with some cracks that are wider and open. Spalling along joint edges. Some areas of mapping cracks, mostly in the Left lane. Some wear in the wheel paths. GIDZ
10/21/2002 - Same as last report and add some minor delamination noted with a small spalled area at one joint. IZHX
08/23/2000 - 293 * 15.76 = 4617.68
No change from previous report plus some delaminations noted on spot checks near the joints. FIAS
12/11/1997 - Deck has mapping cracks throughout. FKAR
10/01/1995 - None YDNF
09/01/1992 - None REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder										
	1	2	1465	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Minor peeling paint in areas. Rust blisters with minor surface pitting near joints that leak. Faded and dirty paint throughout the girders. ZZJO
09/27/2010 - Rust blisters, scale, and minor paint loss on tops of the lower flanges of the outer girders. Wose areas are where water can leak onto the girders from joints or drains. EZJZ
06/20/2008 - Rust, scale, and paint loss on the lower web and bottom flanges; especially near leaky joints and downspouts. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Spot rust and some paint fade on the lower portions of the web and bottom flanges; especially near leaking joints. GIDZ
10/21/2002 - Some paint loss along the under side of the girders near drains, more so on G5. Some speckled rust starting on the left side of the web and bottom flange of G1. A 4" x 1"(h) 1' back of Pier 19 for G1S18R. IZHX
08/23/2000 - 293 * 5 = 1465.0m
Some rust and pitting. FIAS
12/11/1997 - None FKAR
10/01/1995 - None YDNF
09/01/1992 - None REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

* * * * * * * * * * Span : **Main-0 - Steel Girder Spans 14 - 19 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 205 - R/Conc Column   Pier 14 thru 20

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	27	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Right column at Pier 16 has a small delaminated area. ZZJO

09/27/2010 - Tight surface shrinkage cracks. A small surface spall from exposed rebar feet. Rust on lower portions of the ice breakers. EZJZ

06/20/2008 - Same as past inspections, but Underwater II may be different. OZKZ

08/17/2006 - None TZCZ

10/06/2004 - Rust on the lower portion of the ice breakers. Tight shrinkage cracks on most columns. Minor spot rust stains fron exposed rebar chair legs. Some scale below the normal waterline. GIDZ

10/21/2002 - Some minor and tight vertical shrinkage cracks throughout. Ice breakers need some paint. IZHX

08/23/2000 - Env. #3 as always wet. FIAS

12/11/1997 - (4) columns each at Piers 14 - 19 and (3) columns at Bent 20. FKAR

10/01/1995 - None YDNF

09/01/1992 - None REFI

Inspection Notes:

Element 220 - R/C Sub Pile Cap/Ftg   Pier 15 thru 19

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	4	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - None ZZJO

09/27/2010 - Per the 2011 underwater inspection by Infrastructure Engineers there is no change to the condition of this element. CRH EZJZ

06/20/2008 - See latest Underwater II report. OZKZ

08/17/2006 - Per Infrastructure Engineers August 24, 2006 underwater inspection, the pier 4 subfooting is partially exposed at the upstream nose. The pier 3 subfooting is now covered by sand and river rock. The pier 4 subfooting is exposed 10 inches high at the upstream nose and is in good condition. Timber formwork is still attached to the west face of the west face of the pier 5 footing. TZCZ

10/06/2004 - Unchanged, but check the lastest underwater report. GIDZ

10/21/2002 - None IZHX

08/23/2000 - LW -- underwater Inspection 7/15/98 (Guthrie Diving Co) -- All exposed footings in good condition. FIAS

Inspection Notes:

Element 227 - R/C Submerged Pile   Pier 15 thru 19

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	20	ea.		90	10	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - None ZZJO

09/27/2010 - Per the 2011 underwater inspection by Infrastructure Engineers there is no change in the condition of this element. CRH EZJZ

06/20/2008 - See latest Underwwater II report. OZKZ

08/17/2006 - Per Infrastructure Engineers August 24, 2006 underwater inspection, there is vertical cracking present on piers 4 thru 7. The vertical cracking is generally 1/32" to 1/16" wide and extends from the waterline to the cap. TZCZ

10/06/2004 - Unchanged, but check the lastest underwater report. GIDZ

10/21/2002 - None IZHX

08/23/2000 - LW -- Underwater Inspection 7/15/98 (Guthrie Diving Co) -- All have light scaling below waterline. Piers have 1/32" vertical cracks. No areas of significant deterioration or distress. FIAS

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

********** Span : **Main-0 - Steel Girder Spans 14 - 19 (cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Pier 14 thru 20										
	1	1	156	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Staining on the caps under leaking joints. Tight cracks at the steps in the caps. Shallow surface spalls and popouts from rebar chair feet on the underside of the caps. Caps at Pier 15 and 16 have small surface delaminations on their Right ends. ZZJO
09/27/2010 - Staining on caps under leaky joints. Some small surface spalls on the underside of the caps from exposed/rusty rebar chair feet. Tight cracks at steps in the caps. Dirt and debris in areas. EZJZ
06/20/2008 - Some dirt/debris on tops of the caps. Some tight vertical stress riser cracks at the steps in the caps. Underside of the caps show rusty rebar chair feet with minor surface spalls. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Dirt/debris on the caps. Bird nests on most of the caps on most of the caps. Stained concrete under leaky joints. Some tight vertical cracks under the bearings. GIDZ
10/21/2002 - Some small and tight shrinkage cracks throughout. Dirt and debris on top of the cap at Pier 17 under the finger joint. IZHX
08/23/2000 - 7 * 22.29 = 1563.03m FIAS
12/11/1997 - FKAR
10/01/1995 - None YDNF
09/01/1992 - None REFI

Inspection Notes:

Element 305 - Assm Jt w/o Seal Finger Joint at Pier 17 and Sliding Plate at Bent 14 and Pier 20										
	1	3	60	m.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Spalling along the edges of the steel. Steel sounds solid when tapped on. Troughs under the joints are full of dirt and debris with some areas of the troughs showing damage. ZZJO
09/27/2010 - Troughs are full of dirt/debris. Good alignment on fingers. Steel sounds solid when tapped on. Some small spalled areas along the joint edges. EZJZ
06/20/2008 - Finger joint alignment at Pier 17 is Good. Steel sounds solid when tapped on. Trough under the joint is full of sanding material and the downspouts are plugged. Small spalls/delaminations along the joint edges. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Troughs uinder the joints are full of dirt and sanding material. Finger joint alignment is Good. Minor spalled spots along the joint edges. GIDZ
10/21/2002 - No change but the finger joint is full of sanding material on both ends by the barrier rail. IZHX
08/23/2000 - 15.76 + (2 * 22.28) = 60.32m FIAS
12/11/1997 - Sliding plate joints at Pier 20 and Bent 14. Finger joint at Pier 17. The joints themselves are sound. FKAR
10/01/1995 - None YDNF
09/01/1992 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

********** Span : **Main-0 - Steel Girder Spans 14 - 19** **(cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing Pier 14, 15, 17(doubles), 18, and 20										
	1	2	30	ea.		85	10	5		
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Bearing for G4S17 for Span 17 has broken anchor bolts and is rocked over to its' limit; photo. Bearing anchor bolts for G5S17 are also broken. Spot rust, staining, and debris at the leaky joints.	ZZJO
09/27/2010 - Spot rust and debris on some of the bearings. Alignment is ok today. Same on previously reported broken anchor bolts.	EZJZ
06/20/2008 - Broken anchor bolts for both sides of G4S17 and G5S17 for Condition State 3; Bridge notified this date. Loose anchor bolts,, but still tight in their bearings as previously reported for Condition State 2. Some overcoat painting done, but still some rusty and paint loss on others.	OZKZ
08/17/2006 - None	TZCZ
10/06/2004 - Rust spots, pitting and some paint loss on the bearings. Unchanged from previous reports when viewed by binoculars.	GIDZ
10/21/2002 - Loose anchor bolts but tight in their holes at Pier 18 for G4L, G3L and R, and G2R. Some rust, pitting, minor paint loss and debris at all bearings.	IZHX
08/23/2000 - Env. #2 as under joints. Some rust and pitting.	FIAS
12/11/1997 - 5 shoes each at Pier 20, Pier 18, Pier 17 (two lines), Pier 15 and Bent 14	FKAR
10/01/1995 - None	YDNF
09/01/1992 - None	REFI

Inspection Notes:

Element 313 - Fixed Bearing Pier 16 and 19										
	1	1	10	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Spot rust, paint loss, and some debris.	ZZJO
09/27/2010 - Spot rust with some dirt/debris.	EZJZ
06/20/2008 - Overcoat painted some, but still some rust and paint loss to others.	OZKZ
08/17/2006 - None	TZCZ
10/06/2004 - Some rust spots on several bearings. Unchanged from previous reports when viewed by binoculars.	GIDZ
10/21/2002 - Some rust, pitting, minor paint loss and debris at all bearings.	IZHX
08/23/2000 - Some rust and pitting.	FIAS
12/11/1997 - Fixed shoes at Piers 16 and 19.	FKAR
10/01/1995 - None	YDNF
09/01/1992 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

********** Span : **Main-0 - Steel Girder Spans 14 - 19 (cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing										
	1	3	586	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Small spalls, delaminations, and popouts throughout. Barrier has lots of surface shrinkage cracks.	ZZJO
09/27/2010 - Some rubs and scrapes. Vertical cracking throughout with some small spalls and scaling along the cracks. Condition State 3 due to minor delaminations on barrier in spots.	EZJZ
06/20/2008 - Same on cracks every 3 to 4 ft. Many of the cracks have small delaminated and some spalled areas.	OZKZ
08/17/2006 - None	TZCZ
10/06/2004 - Tight vertical cracks every 3 to 4 feet.	GIDZ
10/21/2002 - Minor shrinkage cracks.	IZHX
08/23/2000 - 293 * 2 = 586m	FIAS
12/11/1997 - Traffic rail lt. and rt. ELEMENT WAS ADDED 6/16/2000. NEED TO VERIFY CONDITION STATE(S).	FKAR

Inspection Notes:

Element 334 - Metal Rail Coated										
	1	3	293	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Spot rust, exposed base coat, and faded paint throughout. Chainlink fabric is in Good condition.	ZZJO
09/27/2010 - Spot rust, exposed primer coat, and paint loss throughout.	EZJZ
06/20/2008 - Rsuty spots, paint loss, and visible prime coat throughout.	OZKZ
08/17/2006 - None	TZCZ
10/06/2004 - Rusty spots on the rail posts and tubes.	GIDZ
10/21/2002 - Add some scrapes and paint loss throughout.	IZHX
08/23/2000 - Some rust and pitting.	FIAS
12/11/1997 - Pedestrian rail on North side of bridge.	FKAR
10/01/1995 - None	YDNF
09/01/1992 - None	REFI

Inspection Notes:

Element 358 - Deck Cracking SmFlag										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Both size and density come into play.	ZZJO
09/27/2010 - Lots of cracking with some small delaminations in the worse areas.	EZJZ
06/20/2008 - Unchanged.	OZKZ
08/17/2006 - None	TZCZ
10/06/2004 - Numerous wider cracks in all spans. Cracks are mostly moderate in size, 0.50 to 1.00mm. There are a few cracks that are in the severe range of greater than 1.00mm.	GIDZ

Inspection Notes:

********** Span : **Appr-1 - P/S Concrete Spans 1 thru 13 and 20** **********

Element Description

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

* * * * * * * * * * Span : **Appr-1 - P/S Concrete Spans 1 thru 13 and 20 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	5576	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Spalls and delaminations along joint steel. Some random delaminations in most of the Spans with some potholes/spalls starting. ZZJO
09/27/2010 - Small spalls and delaminations along the joint steel. Small delaminations in the worse cracked areas. EZJZ
06/20/2008 - Wear is probably a little worse and the rest of the comments still apply. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Transverse cracking thropughout with some of the cracks wider and open; see photos. Spalling along joint edges. Some areas of mapping cracks; mainly in the left lane. Minor wear in the wheel paths. GIDZ
10/21/2002 - Minor delaminations and very small spalled areas at the joints; rest is unchanged from previous reports. IZHX
08/23/2000 - No change. FIAS
12/11/1997 - Deck has minor cracking throughout. FKAR
10/01/1995 - None YDNF
09/01/1992 - 353.79 * 15.76 = 5575.73 REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 109 - P/S Conc Open Girder										
	1	1	2209	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Minor cracks and surface spalls on ends of several of the girders. Mostly on those that get moisture on them. ZZJO
09/27/2010 - Generally Good condition. Some minor spalls and cracking on ends of several of the girders that have now exposed strands. EZJZ
06/20/2008 - No change. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Same on the girder ends at Bent 11 and left end of the left gurder at Bent 12. No other problems noted when viewed by binoculars. GIDZ
10/21/2002 - End of G2S12L at Bent 12 and several girder ends at Bent 11 have spalled concrete on their ends with exposed and rusted strand showing. IZHX
08/23/2000 - None FIAS
12/11/1997 - None FKAR
10/01/1995 - None YDNF
09/01/1992 - (6 * 321) (7 * 33) (3 * 17.25 Spans 2 and 3) = 2208.79m REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

********** Span : **Appr-1 - P/S Concrete Spans 1 thru 13 and 20** **(cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bents 2 thru 13										
	1	2	28	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Staining from joint leakage on some. Cracks on the columns of Bent 2 and 3 with a small delaminated area. Tight surface shrinkage cracks. ZZJO
09/27/2010 - Staining on those under leaky joints. Some small spalls and (1) delamination noted in the worse areas of cracking. Observed that most everything is superficial and probably caused by shallow rebar chairs. EZJZ
06/20/2008 - Same as previous report comments. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Sides of several columns have small spalling section with either rebar chair feet or shallow rebar; causing some rust stains. Small popouts on several columns. Worse areas on the columns are under leaky joints. GIDZ
10/21/2002 - Minor scrapes and spalled areas with some shrinkage cracks throughout. IZHX
08/23/2000 - None FIAS
12/11/1997 - None FKAR
10/01/1995 - None YDNF
09/01/1992 - (4) locations with 3 columns and (8) locations with 2 columns. REFI

Inspection Notes:

Element 215 - R/Conc Abutment Abutment 1 and 22										
	1	1	52	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Abutment 1 has a crack between the Right most (2) girders. Small spalls at the cap/backwall area and near the embedded bearings. Steel portion of the bearings are rusty. ZZJO
09/27/2010 - Generally Good condition. Same comments as previous inspections. EZJZ
06/20/2008 - Same as past inspections. Crack at Abutment 1 between thr Right (2) girders was leaking water in 2006. Some rust and paint loss noted on the visible portion of the bearings. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Both Abutment caps have tight vertical cracks with efflorescence near the structure's centerline. Minor cracks where girders are embedded in backwall concrete. Minor erosion on the Right wingwalls. GIDZ
10/21/2002 - ok IZHX
08/23/2000 - None FIAS
12/11/1997 - None FKAR
10/01/1995 - None YDNF
09/01/1992 - (22.92 2.05 1.65) = 51.98m REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

* * * * * * * * * * Span : **Appr-1 - P/S Concrete Spans 1 thru 13 and 20 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bents 2 thru 13										
	1	1	215	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Shallow surface spalls on the underside of the caps from rebar chair feet and the worse are those under leaky joints. Dirt and debris. Small delaminations on Bents 2, 3, and 8's caps. ZZJO

09/27/2010 - Tight cracks near steps on the caps. Lots of surface spalls on the underside of the caps from exposed rebar chair feet. Lots of pigeon nests and debris on tops of the caps. EZJZ

06/20/2008 - Tight vertical stress riser cracks at the steps in the caps. Undersides of the caps show surface spalls from exposed and rusty rebar chair feet. Worse rusty stains and spall are under the leaky joint caps. OZKZ

08/17/2006 - None TZCZ

10/06/2004 - Tight vertical cracks under several of the bearings. Pigeons and swallows are residing on the caps. Some staining under leaking joints. Undersides of several of the caps have spalled areas where rusty/exposed rebar chair legs are exposed. GIDZ

10/21/2002 - Some vertical shrikage cracks throughout. Dirt on the caps at Bent 11 from G2 to G6 and burying the bearings. IZHX

08/23/2000 - None FIAS

12/11/1997 - None FKAR

10/01/1995 - None YDNF

09/01/1992 - (8 * 15.76) (4 * 22.29) = 215.24m REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 305 - Assm Jt w/o Seal Finger Joints - 5, 8, and 11										
	1	3	67	m.		80	10	10		
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Joint at Bent 8 has a loose section in the Left lane; photo. Spalling and delamiantions along the edges of the joints. 09-26-2012. Fixed loose section of the joint at Bent 8 in the Left lane. ZZJO

09/27/2010 - Full and some damage to the troughs. Good alignment on fingers. Steel sounds solid when tapped on and some small spalls/delaminations along the joint steel. EZJZ

06/20/2008 - Same as past inspection comments. OZKZ

08/17/2006 - None TZCZ

10/06/2004 - Minor spalling along the joint edges. Finger alignment is Good. Troughs are either plugged or missing on all of the joints. GIDZ

10/21/2002 - Also add that both ends are full of sanding material. IZHX

08/23/2000 - No change. FIAS

12/11/1997 - Finger joints at Bents 5, 8, and 11. The expansion joints are sound. The rubber trough is gone and allows sanding material debris onto the caps. See photos. FKAR

10/01/1995 - None YDNF

09/01/1992 - Bents 5, 8, and 11. 22.29 * 3 - 66.87m REFI

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

* * * * * * * * * * Span : Appr-1 - P/S Concrete Spans 1 thru 13 and 20 (cont.) * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing Bents 5, 8, 11, 14, and Pier 20										
	1	2	49	ea.		80	20	0		
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Alignment was ok. Dirt, debris, and bird nest on the bearings. Rust, scale, paint loss, and staining. ZZJO
09/27/2010 - Fair to Good alignment. Lots of debris on the bearings. Staining from leaky joints above. Rust, scale, and paint loss. EZJZ
06/20/2008 - Rusty spots, paint loss, and debris. Alignment appeared to be Good. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Bent anchor bolts. Rusty spots, scale, and pitting on most of the bearings. Rest is from previous reports when viewed by binoculars. GIDZ
10/21/2002 - All have bent anchor bolts except at Pier 20. All show some rust and minor paint loss with those at Bent 11 buried in sanding material. IZHX
08/23/2000 - Env. State 2 as under leaky joints. Rust and pitting; rest is unchanged. FIAS
12/11/1997 - Debris is covering the bearing devices to some extent. The anchor bolts are bent over due to excessive movement - see photos. FKAR
10/01/1995 - None YDNF
09/01/1992 - (12) each at Bents 5, 8, and 11 plus (6) at Bent 14 plus (7) at Pier 20. REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing Bent 2, 3, 4, 6, 7, 9, 10, 12, and 13										
	1	1	120	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Spot rust, paint loss, scale, and debris. ZZJO
09/27/2010 - Rust, paint loss, scale, and lots of bird debris. EZJZ
06/20/2008 - Rusty spots, paint loss, and debris. Dropped Abutment bearings. OZKZ
08/17/2006 - None TZCZ
10/06/2004 - Rust spots and pitting. Some debris near the bearingss from bird debris when viewed by binoculars. GIDZ
10/21/2002 - Some rust, pitting, and minor paint loss throughout. IZHX
08/23/2000 - Some rust and pitting FIAS
12/11/1997 - None FKAR
10/01/1995 - None YDNF
09/01/1992 - (7) at Abutment 1, (7)at Abutment 21, plus (15) at Bent 2, (18) at Bent 3, (15) at Bent 4, (12) at Bent 6, 7, 9, 10, 12, and 13 REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

********** Span : **Appr-1 - P/S Concrete Spans 1 thru 13 and 20 (cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 331 - Conc Bridge Railing Left and Right vehicle rail										
	1	3	708	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Small spalls, delaminations, and popouts throughout. Barrier has a lot of surface shrinkage cracks.	ZZJO
09/27/2010 - Some rubs and scrapes. Vertical cracking throughout with small spalls and scaling along cracks. Condition State 3 due to small delaminations on barrier in spots.	EZJZ
06/20/2008 - Same on cracks every 3 to 4 ft with many of the cracks showing small spalls or delaminated areas.	OZKZ
08/17/2006 - None	TZCZ
10/06/2004 - Minor and tight vertical cracks every 3 to 4 feet.	GIDZ
10/21/2002 - Minor dings, scrapes, and shrinkage cracks.	IZHX
08/23/2000 - None	FIAS
12/11/1997 - None	FKAR
10/01/1995 - None	YDNF
09/01/1992 - 353.79 * 707.58m	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated Right Pedestrian Rail										
	1	3	354	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/19/2012 - Spot rust, exposed base coat, and faded paint throughout. Chainlink fabric is in Good condition.	ZZJO
09/27/2010 - Spot rust, exposed primer coat, and paint loss throughout.	EZJZ
06/20/2008 - Rusty spots, paint loss, and prime coat visible throughout.	OZKZ
08/17/2006 - None	TZCZ
10/06/2004 - Rail posts and box beams show rust spots. Hand rail on top of the barrier rail has rust spots.	GIDZ
10/21/2002 - Add some scrapes and minor paint loss.	IZHX
08/23/2000 - Some rust and pitting.	FIAS
12/11/1997 - None	FKAR
10/01/1995 - None	YDNF
09/01/1992 - Pedestrian rail on the right outside of the bridge. 353.79 * 1 = 353.79m	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08281

Continue

General Inspection Notes

09/19/2012 - David Crumley was notified about the finger joint failing at Bent 8 on 09-18-2012. He set up a check for 09-21-2012 in the am with 31-01 and Bill Lay. He and 31-01's crew with Charlie and Henry repaired the joint on 09-26-2012.	ZZJO
09/27/2010 - Deck cracks are more visible after a brief shower. From the 2011 underwater inspection by Infrastructure Engineers there is no change to the channel or scour conditions at this bridge. There is light timber debris at the upstream nose of Piers 3 and 4. CRH	EZJZ
06/20/2008 - NBI 59, superstructure, rated a "6" due to broken or loose anchor bolts in the Main span.	OZKZ
08/17/2006 - Per Infrastructure Engineers August 24, 2006 underwater inspection, There are no significant defects present below the high waterline. There is no significant local or general scour present at the bridge site. There are no significant restrictions in the channel that will adversely impact flow. There is a local scour cone 5 feet in diameter by 3 feet deep at the upstream nose of pier 6. Construction debris at the upstream nose of pier 5 and the downstream nose of pier 4. Debris consists of rebar protruding from the mudline 3 feet high with a 55 gallon barrel along side of it. ITEM 61 CHANGED PER INFRASTRUCTURE ENGINEERS UNDERWATER INSPECTION.	TZCZ
10/06/2004 - NBI 58, deck, rates at a "6" due to cracking in all spans and spalls along the joint edges. NBI 60, substructure, rated at a "6" due to minor spalls on the underside of some caps and minor/tight cracks in the columns.	GIDZ
10/21/2002 - None	IZHX
08/23/2000 - None	FIAS
12/11/1997 - None	FKAR
10/01/1995 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:22 Sufficiency Rating Calculation Accepted by ops$u5963 at 2/26/97 10:59:10 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:23:33	YDNF
09/01/1992 -	REFI
01/01/1991 - Updated with tape 1993	NB93
05/01/1989 - Updated with tape 1991	NB91
04/01/1987 - Updated with tape 1989	NB89
10/01/1984 - Updated with tape 1986	NB86

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Location : GREAT FALLS Structure Name: GF Warden-EB

General Location Data

District Code, Number, Location : **03 Dist 3 GREAT FALLS**

County Code, Location : **013 CASCADE**

Kind fo Hwy Code, Description : **2 2 U.S. Numbered Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **MISSOURI RV, U5205, BNSF**

Structure on the State Highway System : **X**

Structure on the National Highway System : **X**

Str Meet or Exceed NBIS Bridge Length : **X**

Latitude : **47°29'37"**

Longitude : **111°18'39"**

MDT Maintenance Section : **31-01 Great Falls**

Division Code, Location : **31 GREAT FALLS**

City Code, Location : **32800 GREAT FALLS**

Signed Route Number : **00089**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **152.60 km 94.82**

Construction Data

Construction Project Number : **FGU 388 1 2**

Construction Station Number : **45+89.00**

Construction Drawing Number : **2926**

Construction Year : **1951**

Reconstruction Year :

Traffic Data

Current ADT : **37,380** ADT Count Year : **2009** Percent Trucks : **2 %**

Structure Loading, Rating and Posting Data

Loading Data :

Design Loading :		**5 MS 18 (HS 20)**
Inventory Load, Design :	**32.6 mton**	**B ASD Assigned**
Operating Load, Design :	**32.6 mton**	**B ASD Assigned**
Posting :		**5 At/Above Legal Loads**

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :			
Truck 2 Type 3-S3 :			
Truck 3 Type 3-3 :	**86**		

Structure, Roadway and Clearance Data

Structure Deck, Roadway and Span Data :

Structure Length : **637.90 m**

Deck Area : **6,960.00 m sq**

Deck Roadway Width : **8.53 m**

Approach Roadway Width : **10.90 m**

Median Code, Description : **0 No median**

Structure Vertical and Horizontal Clearance Data :

Vertical Clearance Over the Structure : **99.99 m**

Reference Feature for Vertical Clearance : **H Hwy beneath struct**

Vertical Clearance Under the Structure : **5.49 m**

Reference Feature for Lateral Underclearance : **H Hwy beneath struct**

Minimum Lateral Under Clearance Right : **3.50 m**

Minimum Lateral Under Clearance Left : **0.00 m**

Span Data

Main Span

Number Spans : **6**

Material Type Code, Description : **4 Steel continuous**

Span Design Code, Description : **3 Girder and Floorbeam System**

Deck

Deck Structure Type : **1 Concrete Cast-in-Place**

Deck Surfacing Type : **3 Latex Concrete or similar additive**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

Approach Span

Number of Spans : **21**

Material Type Code, Description : **4 Steel continuous**

Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

(52) Out-to-Out Width : **10.91 m**

(50A) Curb Width : **1.19 m**

(50B) Curb Width : **1.19 m**

Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
One Route Under RIVER ROAD / U05205	U05205	Both	5.49 m	7.92 m	N/A		
Route On Structure 10TH AVE. SOUTH - EB	P00060	N/A	99.99 m	8.53 m	East		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

Inspection Data

Sufficiency Rating : **75.7**
Structure Status : **Func Obs - Elg Rehab**

Inspection Due Date : 05 September 2015
(91) Inspection Frequency (months) : **24**
Next Fracture Critical Due Date : **05 Sep 2015**
Fracture Critical Detail : **1 or 2 Stl-girder systms**

Next Under Water Insp : **15 Nov 2016**
Under Water Insp Type : **Type II**

NBI Inspection Data

(90) Date of Last Inspection : 05 September 2013
Last Inspected By : Charles Pepos - 107
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	3	(36A) Bridge Rail Rating :	0	(62) Culvert Rating :	N
(59) Superstructure Rating :	6	(67) Structure Rating :	6	(36B) Transition Rating :	0	(61) Channel Rating :	7
(60) Substructure Rating :	6	(69) Under Clearance :	7	(36C) Approach Rail Rating :	1	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	7	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	5

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 35
Helper Hours : 0
Special Crew Hours : 12
Special Equipment Hours : -1

Snooper Required : Y
Snooper Hours for inspection : 17
Flagger Hours : 0

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D31-FY2006-000012	**19 October 2005**	**Approved**	**Medium**	All Spans	Bridge	Spot Paint (flex)	
Clean and paint the bearings. 08/27/2007 Blew off and overcoat painted bearings on Main Span during snooper inspection. 09/06/2011 Did this again. Approved. DRC							
D31-FY2006-000014	**19 October 2005**	**Approved**	**High**	M Main	305 Assm Jt w/o Seal	Rehab Elem	
Repair the drain trough under the finger joint at Bent 21. Approved. DRC							
D31-FY2006-000011	**19 October 2005**	**Approved**	**Medium**	A Approach	205 R/Conc Column	Min Repair	
Repair spalling/delaminated concrete on Columns at Bents 3 and 4. Approved. DRC							
D31-FY2011-000135	**07 February 2011**	**Not Approved**	**Medium**	All Spans	107 Paint Stl Opn Girder	Min Repair	
Clean and paint the girders as needed.							
D31-FY2011-000134	**07 February 2011**	**Not Approved**	**Medium**	All Spans	334 Metal Rail Coated	Repl Paint	
Clean and paint the bridge rail.							

Late Reason:
Inspection Date: 09/05/2013

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

Element Inspection Data

********** Span : **Main-0 - Steel Girder - Spans 21 thru 26** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck 2011 Mill and Overlay w\ Silica Fume										
	1	3	3226	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Mapping cracks reflecting up through the 2011 overlay. No delaminations found during chaining in the closed Right lane.	FPDZ
09/06/2011 - Removed and replaced 2" of the existing surface with Silica Fume Concrete in June 2011.	GCCY
08/25/2009 - Mapping cracks in all spans. Delaminated and spalled concrete along the joints. Poor skid resistance remains. Deck was evaluated by Helena earlier this summer and their report is on file in Helena.	ZQDZ
08/27/2007 - Quick chain drag showed delaminations or spalls every 20 to 30 ft or less than 10 percent for Condition State 3; may be more with a more through evaluation. Delaimantions/spalls concrete at the joint anchorages. Rest of the previous comments still apply.	ZZBZ
06/28/2005 - Tight mapping cracks in all spans with some areas that are delaminated. Some areas of spalling along the edges of the joints. May be nearing the 2 percent limit for Condition State 2. Very little ski resistance remaining. (295.66 * 10.91 = 3225.65) Nate	SZMI
07/24/2003 - Same as previous report. Some delamination at the drain scuppers with exposed and rusty reinforcing on the undeside od the deck soffits. Also covered with deck soffit smart flag.	YADZ
09/27/2001 - 306.75 * 10.91 = 3346.64 Tight mapping cracks throughout the deck area. Minor spalling at all the joints. Some cracks are wide with efflorescence on the under side of the deck. Wear in the wheel paths.	NIBL
09/02/1998 - Small, tight cracks throughout the deck.	GKLH
09/01/1992 - None	REFI

Inspection Notes:

Element 107 - Paint Stl Opn Girder										
	1	2	591	m.		75	15	5	5	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Faded and dirty paint. Rust blisters w\ surface pitting under the blisters. Worst areas are under leaking joints. Not much leakage since the 2011 deck/joint rehab.	FPDZ
09/06/2011 - No change from previous inspections except alittle more paint loss and rust noted.	GCCY
08/25/2009 - Paint is faded, dirty, peeling, and scaling in areas that moisture can get to the girders. Lots of heavy rust blisters in areas with surface piting under the blisters. Bottom flange top side is stickey from the deicer placed on the deck.	ZQDZ
08/27/2007 - G2 at Pier 26 has some deep surface corrosion, 1/8 ", at the lower web longitudinal stiffner. Outside of the girders and under leaky joints show the worse paint loss and rust. Paint is very dirty in areas that mag. chloride/sanding material has accumulated.	ZZBZ
06/28/2005 - Rust, pack rust, pitting, paint loss, and paint peel; especially under or near leaky joints. Some area on the lower portions of the web have pack rust blisters, mostly still tight, on them. Mag chloride/dirt laying on the outside of the girders on the top of the bottom flange. (295.66 * 2 = 591.32) Nate.	SZMI
07/24/2003 - Rusty spots with pack rust and minor section loss on girder webs; especially under leaking joints. See photos from past FC inspections.	YADZ
09/27/2001 - 306.75 * 2 = 613.50m Rusty spots under all the joints and near the drains.	NIBL
09/02/1998 - None	GKLH
09/01/1992 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

* * * * * * * * * * Span : **Main-0 - Steel Girder - Spans 21 thru 26** **(cont.)** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 113 - Paint Stl Stringer										
	1	1	887	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Some paint loss and peeling paint in areas. Generally in Good paint system. Stringers are dirty. FPDZ

09/06/2011 - No change from previous inspections except alittle more paint loss and rust noted. GCCY

08/25/2009 - Paint is generally in good condition. Some rust and scale in area near joints. ZQDZ

08/27/2007 - Same as past comments on rust at the deck to stringer flange area. ZZBZ

06/28/2005 - Some rusty spots on the edges of the top flange where they meet the concrete deck. Some rusty spots and staining where the stringers are in the area of leaking joints. (295.66 * 3 = 886.98 SZMI

07/24/2003 - Minor rusty spots on the underside of the flanges; mainly near concrete connections under and near leaking joints. YADZ

09/27/2001 - 3 * 306.75 = 920.25m
Minor rust spots; mostly at the top flange to concrete connection and under the joints. NIBL

09/02/1998 - GKLH

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 152 - Paint Stl Floor Beam										
	1	2	458	m.		80	10	5	5	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Faded and dirty paint, rust blisters, and surface pitting in those areas of past leakage and where water can gather. FPDZ

09/06/2011 - No change from previous inspections except alittle more paint loss and rust noted. GCCY

08/25/2009 - Floorbeams show dirty paint, some peeling, and rust blisters on those under the leaky joints. No change on 3rd floorbeam back from pier 25 on loose rivet. ZQDZ

08/27/2007 - Floorbeams under leaky joints show rust blisters, pitting, paint loss, and minor section loss in open rust blisters. 3rd floorbeam back of Pier 25 in span 24 has (1) loose rivet; not a problem. ZZBZ

06/28/2005 - Same comments with paint loss, pitting and some tight pack rust also noted and mostly near the leaking joints. SZMI

07/24/2003 - Rusty spots throughout the floorbeams. Worse rust is in areas under leaking joints. Those floorbeams under leaking joints show some minor rust blisters and pack rust at connections. YADZ

09/27/2001 - 10.91 * 42 = 458.22m All are in contact with the steel stringers.
Rusty spots; especially under the joints. Need to verify number when snooper inspected. NIBL

09/02/1998 - None GKLH

Inspection Notes:

********** Span : **Main-0 - Steel Girder - Spans 21 thru 26** (cont.) **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 205 - R/Conc Column Pier 21 thru 26

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	8	ea.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Spalls and delamination along edges of the ice breaker's steel. Tight cracks from corners of ice breakers steel on Pier 22 and 23. FPDZ

09/06/2011 - No change from previous inspections. GCCY

08/25/2009 - Some tight cracking behind the ice breakers with small spalls and a couple of small delaminations. Some rust and scale on ice breaker steel. ZQDZ

08/27/2007 - Pier 23's column has a small spall with staining at the top-West corner of the ice breaker. Rusty spots throughout the ice breakers. ZZBZ

06/28/2005 - Unchanged from previous reports. Per Infrastructure Engineers August 24, 2006 underwater inspection, the steel ice breakers are separating from the concrete at piers 3 and 7. SZMI

07/24/2003 - Minor shrinkage cracks in columns 21 thru 26. Rusty steel on the upstream ice breaker. YADZ

09/27/2001 - Minor shrinkage cracks. Need to look at the columns closer when snoopered or with a boat to get closer to them. NIBL

09/02/1998 - Two columns at Bent 27(Tower Span). One column at Piers 21 - 26. GKLH

Inspection Notes:

Element 220 - R/C Sub Pile Cap/Ftg Pier 24 and 25

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	2	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Refer to UW INspection. FPDZ

09/06/2011 - Per the 2011 underwater inspection report by Infrastructure Engineers there is no change to this element since the 2006 inspection. CRH GCCY

08/25/2009 - Information is in latest underwater inspection. ZQDZ

08/27/2007 - Check on the latest Underwater II report. ZZBZ

06/28/2005 - Unchanged until the next underwater inspection. Per Infrastructure Engineers August 24, 2006 underwater inspection, there is insuffiecient clear cover exposing secondary rebar at the top of the footing on the west side of pier 5. SZMI

07/24/2003 - Information from Guthrie Diving Co.'s underwater report. YADZ

09/27/2001 - None NIBL

09/02/1998 - LW - Piers 4 & 5 Underwater Inspection 7/15/98 (Guthrie Diving Co) -- Exposed footings in good condition GKLH

Inspection Notes:

Element 227 - R/C Submerged Pile Pier 22 thru 26

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	5	ea.		90	10	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Refer to UW INspection. FPDZ

09/06/2011 - Per the 2011 underwater inspection by Infrastructure Engineers spalling is present at the concrete and steel ice breaker interfaces of the substructures. The steel Ice breakers are separating from the concrete at Piers 3 and 7. CRH GCCY

08/25/2009 - Information is on the past underwater inspection. ZQDZ

08/27/2007 - Check on the latest Underwater II report. ZZBZ

06/28/2005 - Unchanged until the next underwater inspection. Condition states changed Per Infrastructure Engineers August 24, 2006 underwater inspection. Spalling is present at the concrete/steel interfaces of the substructures. SZMI

07/24/2003 - Information from Guthrie Diving Co.'s underwater report. YADZ

09/27/2001 - None NIBL

09/02/1998 - LW -- Piers 3,4,5,6,&7 Underwater Inspection 7/15/98 (Guthrie Diving Co) -- All piers in good condition with light scaling below waterline. No areas o fsignificant deterioration or distress. GKLH

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

* * * * * * * * * * Span : **Main-0 - Steel Girder - Spans 21 thru 26 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Pier 21 thru 26										
	1	2	65	m.		90	5	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Spall with exposed rebar on centerline of Pier 23's cap. Some delaminations noted on all of the caps; mostly small surface type.	FPDZ
09/06/2011 - No change from previous inspections. Blown off during the snooper inspections.	GCCY
08/25/2009 - Same comments as the past inspection with a couple more of the caps showing some diagonal cracks. Caps also have some staining from leaking deck or bird debris.	ZQDZ
08/27/2007 - Cap at Pier 24 has a spall with exposed rebar on the Top-Left side on the underside of the cap. Cap at Pier 23 has a diagonal crack from G1 to the column connectiona area; digital photo 2115.	ZZBZ
06/28/2005 - Tight and minor cracks at ends of several caps.	SZMI
07/24/2003 - Unchanged from previous reports. Some staining of concrete under leaking joints.	YADZ
09/27/2001 - 6 * 10.91 = 65.46m Minor cracking on hammer heads. Need to be looked at with snooper.	NIBL
09/02/1998 - Some cracking, but minor at this time.	GKLH
09/01/1992 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 301 - Pourable Joint Seal Pier 22, 23, 25, and 26										
	1	3	44	m.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Sealant is generally in Good condition with a small area of Pier 23's where the sealant is loose. Steel portions sound solid when tapped on.	FPDZ
09/06/2011 - New sealant in June 2011.	GCCY
08/25/2009 - Torn and missing sealant in all joints. Some spalling and delamination along the edges of the joint steel.	ZQDZ
08/27/2007 - All have torn or missing sealant with leakage noted underneath. All have some delamiantions/spalls in the concrete along the anchorages. Some nicks to the guard angles.	ZZBZ
06/28/2005 - Loose and torn sealant in all (4) joints. Some dirt/debris in sealant areas. Minor delamination with some small spalls along the joint angle anchorages. Caps under the joints are wet from an overnight rain.	SZMI
07/24/2003 - Same as last report.	YADZ
09/27/2001 - 4 * 10.91 = 43.64m Double guard angle pourable joints. Some areas of loose sealant.	NIBL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

********** Span : **Main-0 - Steel Girder - Spans 21 thru 26 (cont.)** **********

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 303 - Assembly Joint/Seal Acme Joints - Pier 24 and Bent 27										
	1	3	22	m.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Small portion on the Left side of the joint at Pier 24's has broken off. Gland appears to be in Good condition.	FPDZ
09/06/2011 - New joints in June 2011.	GCCY
08/25/2009 - Tears in the gland in areas, leakage, and some minor damage to the joint system. Small delaminations and spalls along the edges.	ZQDZ
08/27/2007 - Tears and damage to the joints themselves. Anchorage concrete has delamiantions or spalls. Nicks to the metal anchorages also noted.	ZZBZ
06/28/2005 - Minor delaminations and spalling along the joint anchorages. Some areas where gland is pushed down. Leakage evident after last nights rain.	SZMI
07/24/2003 - Same as last report.	YADZ
09/27/2001 - 2 * 10.91 =21.82m Acme joints. Areas of loose anchorage plates. Concrete spalling along the anchorages.	NIBL

Inspection Notes:

Element 305 - Assm Jt w/o Seal Finger Joint at Pier 21										
	1	3	11	m.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Some spalling on the underside of the deck at the joint. Steel sounds solid when tapped on. Finger alignment looks Good.	FPDZ
09/06/2011 - No change from previous inspections.	GCCY
08/25/2009 - Good alignment on the fingers, steel sounds solid when tapped on, and some small spalls/delaminations along edges of joints. Trough under joint is torn up and needs some repair/modifications.	ZQDZ
08/27/2007 - No change from the previous reports.	ZZBZ
06/28/2005 - Minor spalling and delamination along the joint edges. Finger alignment is Good. Trough and drain system needs some work.	SZMI
07/24/2003 - Trough and drain system is in need of cleaning and repair.	YADZ
09/27/2001 - 10.91 * 1 = 10.91m Rusty areas. Some spalling of anchorage.	NIBL
09/02/1998 -	GKLH
09/01/1992 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282
Continue

********** Span : Main-0 - Steel Girder - Spans 21 thru 26 (cont.) **********

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 311 - Moveable Bearing										
	1	3	12	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Spot rust and paint loss. Bearing alignment was to expansion slightly today; 85F.	FPDZ
09/06/2011 - No change from previous inspections. Blown off and overcoat painted during the snooper inspection.	GCCY
08/25/2009 - Bearings were cleaned some and spot painted. Bearings at Bent 27 tower span, are rocked towards expansion. Remaining bearing allignments are good.	ZQDZ
08/27/2007 - Bearings were blown off and overcoat painted during the snooper inspection. Alignment was tolerable except for those at Bent 27/Tower Span. These are at maximum expansion/ahead on line. These have been that way for a long time also.	ZZBZ
06/28/2005 - Rusty, pitting, pack rust-tight, and paint loss.	SZMI
07/24/2003 - Rusty with some debris from bird nests and sanding material. Some cleaning done when snooper inspection was done.	YADZ
09/27/2001 - Env. State #3 due to leaking joints. Debris from bird nests and some sanding material where visible. Need to verify numbers and condition when snoopered.	NIBL
09/02/1998 - None	GKLH
09/01/1992 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 313 - Fixed Bearing										
	1	1	4	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Steel portion is Good. Some faded and missing paint with spot rust.	FPDZ
09/06/2011 - No change from previous inspections. Blown off and overcoat painted during the snooper inspection.	GCCY
08/25/2009 - Spot rost and scale. Bearings were spot painted where able to get at.	ZQDZ
08/27/2007 - Blown off and overcoat painted as needed.	ZZBZ
06/28/2005 - Some rust, pitting, and paint loss.	SZMI
07/24/2003 - Some minor rusty spots and minor debris near bearings. Some cleaning was done when snooper inpsection was done.	YADZ
09/27/2001 - Rusty spots. Need to verify numbers and conditions when snoopered.	NIBL
09/02/1998 - None	GKLH
09/01/1992 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

********** Span : **Main-0 - Steel Girder - Spans 21 thru 26** **(cont.)** **********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated										
	1	3	591	m.		60	25	10	5	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Rusty spots, thin paint, exposed base paint, rusted post webs at the curb line with section loss to the webs. On-going repairs to the rails. Delaminated and spalling on the curbs.	FPDZ
09/06/2011 - No change from previous inspections. Reapired some rail on the Left side in June 2011. Noted seveal posts and panels damaged over the Labor Day Weekend on the Rigth side near the West Abutment.	GCCY
08/25/2009 - Same comments as past inspections. Several post have been repaired where webs have been rotted away.	ZQDZ
08/27/2007 - 5th post from Pier 26 on the Right/Median side is broken loose from the concrete. One bent post in Span 23 on the Right side. Lots of rust in the lower rail post webs causing section loss. Posts have been hit and bent over as web crumples. Most of the top coat of paint is faded to the primer coat. 2007/09/10. Bent posts straightened and fixed today.	ZZBZ
06/28/2005 - Faded paint and rust spots where paint is chipped off. Red primer coat is coming through in most of the rail. A couple of areas rattle under traffic. (295.66 * 2 = 591.32) Nate	SZMI
07/24/2003 - Same as last report.	YADZ
09/27/2001 - 306.75 * 2 = 613.50m Paint is chaulky and pitted from sanding material. Rusty spots throughout. Rattling with some loose areas noted when traffic is crossing.	NIBL
09/02/1998 - Minor areas of rust throughout.	GKLH
09/01/1992 - None	REFI

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 357 - Sup Pack Rust SmFlag none										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Swelling between connection plates. No distress visible to the rivets.	FPDZ
09/06/2011 - No change from previous inspections.	GCCY
08/25/2009 - Minor swelling between some of the conection plates exists.	ZQDZ

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 358 - Deck Cracking SmFlag none										
X	1	3	1	ea.	X	0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Mapping cracks in all Spans. Condition State 2 due to quantity.	FPDZ
09/06/2011 - Removed and replaced 2" of the existing surface with Silica Fume Concrete in June 2011.	GCCY
08/25/2009 - Added due to the quantity and size of cracking in this deck.	ZQDZ

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

*********** Span : **Main-0 - Steel Girder - Spans 21 thru 26 (cont.)** ***********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 359 - Soffit Smart Flag										
X	1	1	1	ea.	X	0	0	0	100	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Spalling and deteriorated concrete throughout. Exposed and rusty rebar under post areas with delaminated concrete.	FPDZ
09/06/2011 - No change from previous inspections, but continueing to get worse.	GCCY
08/25/2009 - Outlets on the drains show deteriorated and crumbling concrete with exposed and rusty reiforcing steel. Spalling and delaminated areas throughout underside of the curbs.	ZQDZ
08/27/2007 - Same and lots of it throughout the bridge; see photos.	ZZBZ
06/28/2005 - Unchanged from last report or maybe slightly more deterioration/spalling.	SZMI
07/24/2003 - The outlets of the drain scuppers are deteriorating with some exposed and rusting reinforcing steel. Some deteriorating concrete is falling off and/or is loose.	YADZ

Inspection Notes:

*********** Span : **Appr-1 - Steel Girders - Spans 1 thru 20** ***********

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 12 - Bare Concrete Deck										
	1	3	3609	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - (1) small delamination found along Bent 5 and Bent 9's joints. Deck looks Good with minor wear in the wheel paths. Lots of mapping cracks.	FPDZ
09/06/2011 - Removed and replaced 2" of the existing surface with Silica Fume Concrete in June 2011.	GCCY
08/25/2009 - Poor skid resistance, and wear from studded tires. Helena did an indepth scan of delamination and spalling in the deck this past summer and their report is in Helena.	ZQDZ
08/27/2007 - Quick chain drag showed delaminations or spalls every 30 to 40 ft or less than 10 percent for Condition State 3; may be more with a more through evaluation. Delaimantions/spalls concrete at the joint anchorages. Rest of the previous comments still apply.	ZZBZ
06/28/2005 - Mapping cracks throughout all spans with some small areas of delamination and spalling; probably less than 2 percent. Very little skid resistance with wear in the wheel paths. (330.83 * 10.91 = 3609.36) Nate.	SZMI
07/24/2003 - Same on deck comments and on scuppers. Wear on deck with some exposed aggregate. Tight mapping cracks throughout the deck. Soffitt smart flag for popouts around scuppers.	YADZ
09/27/2001 - 331.12 * 10.91 = 3613.39 Cracking throughout. Some concrete is poping out under all drain scuppers with some exposed reinforcing steel. Some concrete popouts along the top flange of the main girders.	NIBL
09/02/1998 - minor cracking throughout.	GKLH

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

* * * * * * * * * * Span : **Appr-1 - Steel Girders - Spans 1 thru 20 (cont.)** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 107 - Paint Stl Opn Girder										
	1	2	1323	m.		80	10	5	5	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Bottom flanges have rust blisters and minor pitting on their tops. Areas near the joints have heavy rust and paint loss from past leakage. Faded and dirty paint. FPDZ

09/06/2011 - No change from previous inspections with a little more paint loss and rust noted. GCCY

08/25/2009 - Rust blisters with some minor surface pitting on the tops of the bottom flanges in areas that moisture is collecting. Rust and some cracking of the welds on the bottom cover plates in areas that water has gotten between the cover and bottom flange. ZQDZ

08/27/2007 - Spots of rust on the bottom flanges of the outside girders; especially where the drains are dumping water onto them. Rust blisters show surface pitting when cleaned off. Also the same as previous comments. ZZBZ

06/28/2005 - Rust and scale along the underside of the deck where the top flange is against the concrete. Areas under leaky joints are the worse. (4 * 330.83 = 1323.32) Nate. SZMI

07/24/2003 - Rusty spots along the upper flanges to concrete area. Ends of girders under leaking joints show some minor blistering rust. YADZ

09/27/2001 - 4 * 331.2m = 1324.8m
Rusty spots under the joints with some rust spots at the top flange to concrete connection. NIBL

09/02/1998 - GKLH

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 178 - Painted Trans Girder Bent 21										
	1	3	11	m.		80	15	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Heavy rust, scale, rust blisters, and surface pitting where water can sit. FPDZ

09/06/2011 - No change from previous inspections with a little more paint loss and rust noted. GCCY

08/25/2009 - Dirty. rust,scale and some acctive corrsion in areas that moisture is collecting. ZQDZ

08/27/2007 - Dirty, stained, and some rusty spots. ZZBZ

06/28/2005 - Same as last report. SZMI

07/24/2003 - Step up girder to make up difference in girder heights. (4) girders on top and supported by (2) bearings. Some areas of rust throughout. YADZ

09/27/2001 - 10.91 * 1 = 10.91m Env. State #3 as under an open joint.
Rusty spots at the connections. NIBL

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

* * * * * * * * * * Span : **Appr-1 - Steel Girders - Spans 1 thru 20 (cont.)** * * * * * * * * * *

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 205 - R/Conc Column Bent 2 thru 20										
	1	2	23	ea.		85	10	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Spalling and delaminations on Bent 5's. Vertical cracking along edges on some. Surface spalls from shallow tie wire. Staining on those under leaky areas. FPDZ
09/06/2011 - No change from previous inspections. GCCY
08/25/2009 - Delams and spalls on bent 5 about 6 feet up. Several with small spalls and staining on those that have some leakage from above. ZQDZ
08/27/2007 - 5 percent in Condition State 3 for exposed rebar chair feet. Also exposed rebar and rust at Bent 3 thru 5. Several have small delamianted areas. Bent 9's column has a spall on the Left corner. ZZBZ
06/28/2005 - Columns at Bents 3 thru 5 have some spalls on them. Rebar is rusted in these areas. Same on the shrinkage cracks. SZMI
07/24/2003 - Minor and tight shrinkage cracks on surface of concrete of most columns. Some scrapes on a couple of the columns from vehicle activity under the structure. YADZ
09/27/2001 - Minor cracking throughout. Minor shrinkage cracks. NIBL
09/02/1998 - 4 bents with 2 columns per (+) 15 bents with 1 column per = 23 GKLH

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment Abutment 1-East										
	1	2	15	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Generally Good condition. Some tight cracks in the backwall concrete. Water leaking through the backwall to cap areas. Small spall on the Left wignwall edge at the groundline. FPDZ
09/06/2011 - No change from previous inspections. GCCY
08/25/2009 - Tight cracks in abutment backwalls and wingwalls. Area is damp from leakage. All prior remarks still apply. ZQDZ
08/27/2007 - leaking at Abutment has area is damp. Lots of sanding material on the cap. Tight cracks in the Abutment's backwall and wingwalls. Some moderate erosion from under the Abutment towards Bent 2. ZZBZ
06/28/2005 - Same as last report and add some small spalls where the girders are embedded. SZMI
07/24/2003 - Minor and tight cracking in Abutment backwall. Some graffti painted on the backwall and girder ends. YADZ
09/27/2001 - 14.81 * 1 = 14.81m
Minor cracking in the Abutment backwalls. NIBL
09/02/1998 - _ GKLH

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

* * * * * * * * * * Span : **Appr-1 - Steel Girders - Spans 1 thru 20** **(cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 234 - R/Conc Cap Bents 2 thru 20										
	1	2	219	m.		85	10	5	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Staining on those that had leaking deck joints. Spalling from shallow rebar chairs and tie wire. Cracks with efflorescence on ends of some of the caps. Delaminations on Bent 6, 9, and 15. FPDZ

09/06/2011 - No change from previous inspections. GCCY

08/25/2009 - Same comments as prior inspections. ZQDZ

08/27/2007 - Bent 4 has delaminated area with some spalls and rusty rebar on its Left end and under G1. Bent 5's cap has a spall on the Span 4 side's Left corner. Bent 6 has a 2'(w) x 1'(h) delamination under G1S6. Bent 15's cap has a 1' x 1' spall on the underside of the Right end and a delamianted area near centerline on the Span 15 side. Lots of rusty rebar chair feet on the underside of some of the caps. Lots of staining under leaky joints also noted with some sanding material also. ZZBZ

06/28/2005 - Same as previous reports. Add that the Left end of the caps under the bearings at Bents 3 and 4 show some cracking and spalling starting. Staining from leaking joints. SZMI

07/24/2003 - Same as previous and add that the south end of the cap at Bent 2 is cracked with delaminated concrete. Some minor delaminations also noted at Bent 3 and 4 in the column to cap connection areas. YADZ

09/27/2001 - (5 * 10.91) + (4 * 13.84) = 219.01m
Minor cracks at ends of several caps. Need to look at with snooper for condition state. NIBL

09/02/1998 - Some cracking, but minor GKLH

Inspection Notes:

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 301 - Pourable Joint Seal Bents 3(skewed), 5(Skewed), 6, 9, 12, 15, and 18										
	1	3	82	m.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Generally in Good condition. A couple of small tears in the sealant at Bents 3, 6, and 12. Sealant looks adhered in most of the areas of the joints. FPDZ

09/06/2011 - New Silicone sealant and joints in June 2011. GCCY

08/25/2009 - Torn and missing joint material. Spalling and delaminations along edges of joint steel. Most of the steel sounded solid when it was tapped on. ZQDZ

08/27/2007 - Some loose or missing joint material. Some delaminated concrete along the joint anchorages, but the steel sounds solid when tapped on. ZZBZ

06/28/2005 - These joints could be compression joint glands. Same as previous reports with loose material and dealaminations along the joint edges. SZMI

07/24/2003 - Leaking. Areas of loose joint material. Minor spalling and delaminations along the joint anchorages. YADZ

09/27/2001 - (5 * 10.91) + (2 * 13.84) = 82.23m (2) joints skewed and (5) are perpendicular.
Glands are up & down with some tears in them. Leaking. Some concrete is spalled along both sides of the anchorages. NIBL

09/02/1998 - Sliding Plate Joints at Bents 11, 14, 17, 20, 23, 24 & 26. GKLH

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

* * * * * * * * * * Span : **Appr-1 - Steel Girders - Spans 1 thru 20** **(cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5

Element 311 - Moveable Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	56	ea.		80	15	5		
						%	%	%	%	%

Previous Inspection Notes :

Note	Inspector
09/05/2013 - Some of the bearings are at maximum movement with bending of the anchor bolts; 90F. Debris, faded paint, rust, and scale on the bearings.	FPDZ
09/06/2011 - No change from previous inspections.	GCCY
08/25/2009 - Some cleaning and spot painting was done during the snooper inspection. Left 5 percent in state 3 for allignment.	ZQDZ
08/27/2007 - Bearings at Bent 2 thru 6 and 19 thru 21 were blown off and overcoated painted. Several of the bearings are at maximum movement with bending of the pins at G1 and G4. Additional comments on attached paperwork.	ZZBZ
06/28/2005 - Areas of rust, paint losse, and debris.	SZMI
07/24/2003 - Still need to verify numbers with next snooper inspection.	YADZ
09/27/2001 - Rusty with some debris. Verify numbers and condition with snooper.	NIBL
09/02/1998 - _	GKLH

Inspection Notes:

Element 313 - Fixed Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	56	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

Note	Inspector
09/05/2013 - Dirty, rust, paint loss, and scale.	FPDZ
09/06/2011 - No change from previous inspections.	GCCY
08/25/2009 - Dirty, some rust, debris, and scale. Some cleaning and spot painting was done during the snooper inspection.	ZQDZ
08/27/2007 - 5 percent in Condition State 3 due to rust and pitting. Some dirt and debris also noted. Some blowing off and overcoat painting of some of the bearings.	ZZBZ
06/28/2005 - Areas of rust, paint loss, and debris.	SZMI
07/24/2003 - Still need to verify numbers with next snooper inspection.	YADZ
09/27/2001 - Rusty spots throughout. Need to verify numbers and condition with snooper.	NIBL
09/02/1998 - _	GKLH

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

* * * * * * * * * * Span : **Appr-1 - Steel Girders - Spans 1 thru 20 (cont.)** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 334 - Metal Rail Coated										
	1	3	662	m.		60	25	10	5	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Rusty spots, thin paint, exposed base paint, rusted post webs at the curb line with section loss to the webs. On-going repairs to the rails. Delaminated and spalling on the curbs. FPDZ

09/06/2011 - No change from previous inspections. Replaced rail posts and panels in (2) areas in June 2011. GCCY

08/25/2009 - Sanding material packed in the posts webs near the curbs has rusted and weakened the posts. This span is in the best condition, but still has rust, minor paint loss, and top coat worn down to a faded primer coat. Some posts that were bent over have been repaired by reinforcing the web in the rotted areas. ZQDZ

08/27/2007 - Lots of rust in the lower rail post webs causing section loss. Posts have been hit and bent over as web crumples. Most of the top coat of paint is faded to the primer coat. ZZBZ

06/28/2005 - Faded paint and rust where paint is chipped off. Red prime coat is coming through throughout. A rattle on the Right rail near Bent 2. (330.83 * 2 = 661.66) Nate. SZMI

07/24/2003 - Same as previous report. Rail is rattling on the North side of the structure bear Bent 2 under heavy loads in the left traffic lane. YADZ

09/27/2001 - 331.2 * 2 = 662.4m
Rusty spots. Chaulky paint with some chips in the paint system. NIBL

09/02/1998 - Some rusing throughout. GKLH

Inspection Notes:

* * * * * * * * * * Span : **Appr-2 - Tower Abutment - Span 27** * * * * * * * * * *

Element Description

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 62 - Bare Top Flang										
	1	3	123	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Generally in Good condition with some random mapping cracks. Wear in the wheel paths. FPDZ

09/06/2011 - Removed and then replaced top 2" with Silica Fume Concrete in June 2011. GCCY

08/25/2009 - Wear from studded tires. Small delaminated area near the guard angle. ZQDZ

08/27/2007 - 11.30 * 10.91 = 123.28 Some wear in the wheel paths with reduced skid resistance. Some delamianted concrete along the joint. Some tight mapping cracks throughout. ZZBZ

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

* * * * * * * * * * Span : **Appr-2 - Tower Abutment - Span 27 (cont.)** * * * * * * * * * *

Element Description										
Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
Element 215 - R/Conc Abutment Abutment 27										
	1	2	33	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Some tight cracking in areas near the end posts. Face of the backwall has some tight cracks. FPDZ

09/06/2011 - No change from previous inspections. GCCY

08/25/2009 - Minor and tight cracking in Abutment backwall. Some graffti painted on the backwall and girder ends. Some dirt and debris sitting area of the bearings. ZQDZ

08/27/2007 - No change with some sanding material around the bearings. ZZBZ

06/28/2005 - Same as previous reports. No major problems noted. SZMI

07/24/2003 - 11.38 11.50 11.50 = 33.38m Abutment face and u-style wingwalls. Tight shrinkage cracks on the Abutment backwall face. YADZ

09/27/2001 - 11.38 * 1 = 11.38m NIBL

09/02/1998 - None GKLH

09/01/1992 - None REFI

Inspection Notes:

Element 334 - Metal Rail Coated										
	1	3	22	m.		70	25	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

09/05/2013 - Rusty spots, thin paint, exposed base paint, rusted post webs at the curb line with section loss to the webs. Scrapes and dings from past traffic hits. FPDZ

09/06/2011 - No change from previous inspections. GCCY

08/25/2009 - Sanding material packed in the posts webs near the curbs. Concrete end posts are in good condition. ZQDZ

08/27/2007 - Sanding material packed in the posts webs near the curbs has rusted and weakened the posts. This span is in the best condition, but still has rust, minor paint loss, and top coat worn down to a faded primer coat. ZZBZ

06/28/2005 - Concrete end posts have tight shrinkage cracks. Rust and faded paint on steel. Some chips in the paint and primer coat is visible on the steel in areas. (10.82 * 2 = 21.64) Nate. SZMI

07/24/2003 - Same as previous report. YADZ

09/27/2001 - 11.3 * 2 = 22.6m
Rusty spots. Chips from sanding material and debris. Paint is chaulky. NIBL

09/02/1998 - _ GKLH

Inspection Notes:

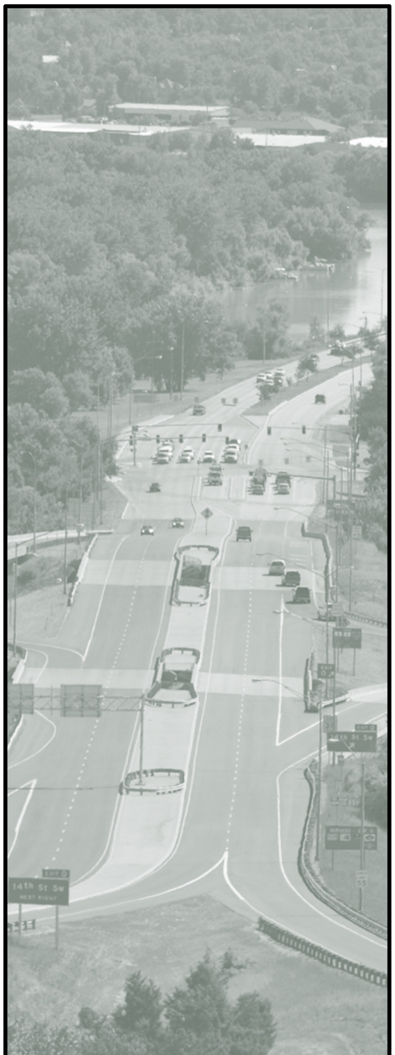
INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00060094+08282

Continue

General Inspection Notes

09/05/2013 - Snooper truck used on the River Spans and Havre bucket truck on the ground Spans.	FPDZ
09/06/2011 - None	GCCY
08/25/2009 - Paul from Helena Bridge and Crew checked this deck for delaminatin with groung penetrating radar and chain dragging this past summer. Watch the alignmnet or any more movement of the bearings on the West end as nearly touching the Tower Abutment wall.	ZQDZ
08/27/2007 - None	ZZBZ
06/28/2005 - NBI 58, deck, rated at a "5" due to delaminations and spalling of the deck surface; especially at the joints. NBI 60, substructure, rated at a "6" due to spalling and deteriorating concrete at columns for Bents 3 and 4. Also some spalling under bearings at Left-Outside of Bents 3 and 4. Per Infrastructure Engineers August 24, 2006 underwater inspection, the inspected substructure units are in satisfactory condition. There is no significant local or general scour present at the bridge site. There are no significant restrictions in the channel that will adversely impact flow. ITEM 61 CHANGED PER INFRASTRUCTURE ENGINEEERS UNDERWATER INSPECTION.	SZMI
07/24/2003 - Some photos of rust blisters and section loss on the main span girder webs taken during FC inspection.	YADZ
09/27/2001 - Studded tire wear in the wheel paths.	NIBL
09/02/1998 - None	GKLH
09/01/1992 - Sufficiency Rating Calculation Accepted by ops$u5963 at 2/26/97 11:10:39 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:23:34	REFI
01/01/1991 - Updated with tape 1994	NB94
05/01/1989 - Updated with tape 1991	NB91
04/01/1987 - Updated with tape 1989	NB89
10/01/1984 - Updated with tape 1986	NB86
02/01/1981 - Updated with tape 1984	NB84



Interstate 15 Gore Hill to Emerson Junction Corridor Planning Study

APPENDIX B

Traffic Data Collection

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 01-TriHillFrontage_AirportRd TMC
Site Code: TMC-01
Start Date: 07/16/2014
Page No: 1

Turning Movement Data

Start Time	Airport Rd Southbound				Tri Hill Frontage Northbound				Airport Rd Eastbound				
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
7:00 AM	15	13	0	28	4	41	0	45	11	2	0	13	86
7:15 AM	16	15	0	31	1	34	0	35	16	4	0	20	86
7:30 AM	22	29	0	51	2	54	0	56	20	10	0	30	137
7:45 AM	24	26	0	50	4	53	0	57	16	2	0	18	125
Hourly Total	77	83	0	160	11	182	0	193	63	18	0	81	434
8:00 AM	26	19	0	45	2	36	0	38	19	2	0	21	104
8:15 AM	25	14	0	39	1	46	0	47	28	5	0	33	119
8:30 AM	31	13	0	44	0	34	0	34	15	5	0	20	98
8:45 AM	26	6	0	32	0	50	0	50	8	2	0	10	92
Hourly Total	108	52	0	160	3	166	0	169	70	14	0	84	413
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	50	26	0	76	3	48	0	51	21	2	0	23	150
4:15 PM	37	16	0	53	1	43	0	44	11	5	0	16	113
4:30 PM	61	18	0	79	1	50	0	51	14	1	0	15	145
4:45 PM	45	12	0	57	2	41	0	43	16	1	0	17	117
Hourly Total	193	72	0	265	7	182	0	189	62	9	0	71	525
5:00 PM	46	21	0	67	3	31	0	34	33	1	0	34	135
5:15 PM	55	19	0	74	3	38	0	41	12	4	0	16	131
5:30 PM	57	16	0	73	4	38	0	42	12	2	0	14	129
5:45 PM	51	19	0	70	2	35	0	37	14	5	0	19	126
Hourly Total	209	75	0	284	12	142	0	154	71	12	0	83	521
Grand Total	587	282	0	869	33	672	0	705	266	53	0	319	1893
Approach %	67.5	32.5	-	-	4.7	95.3	-	-	83.4	16.6	-	-	-
Total %	31.0	14.9	-	45.9	1.7	35.5	-	37.2	14.1	2.8	-	16.9	-
Motorcycles	17	2	-	19	0	14	-	14	1	1	-	2	35
% Motorcycles	2.9	0.7	-	2.2	0.0	2.1	-	2.0	0.4	1.9	-	0.6	1.8
Cars	325	168	-	493	13	343	-	356	154	15	-	169	1018
% Cars	55.4	59.6	-	56.7	39.4	51.0	-	50.5	57.9	28.3	-	53.0	53.8
Light Goods Vehicles	102	87	-	189	11	112	-	123	80	25	-	105	417
% Light Goods Vehicles	17.4	30.9	-	21.7	33.3	16.7	-	17.4	30.1	47.2	-	32.9	22.0
Buses	4	1	-	5	0	5	-	5	0	2	-	2	12
% Buses	0.7	0.4	-	0.6	0.0	0.7	-	0.7	0.0	3.8	-	0.6	0.6
Single-Unit Trucks	33	19	-	52	6	45	-	51	29	7	-	36	139
% Single-Unit Trucks	5.6	6.7	-	6.0	18.2	6.7	-	7.2	10.9	13.2	-	11.3	7.3
Articulated Trucks	105	5	-	110	0	153	-	153	2	3	-	5	268
% Articulated Trucks	17.9	1.8	-	12.7	0.0	22.8	-	21.7	0.8	5.7	-	1.6	14.2
Bicycles on Road	1	0	-	1	3	0	-	3	0	0	-	0	4
% Bicycles on Road	0.2	0.0	-	0.1	9.1	0.0	-	0.4	0.0	0.0	-	0.0	0.2

Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Airport Rd [N]

Out	In	Total
15	19	34
497	493	990
192	189	381
5	5	10
229	163	392
938	**869**	**1807**

R	T	P
2	17	0
168	325	0
87	102	0
1	4	0
24	139	0
282	**587**	**0**

Airport Rd [W]

Out	In	Total
2	2	4
181	169	350
98	105	203
1	2	3
33	41	74
315	**319**	**634**

L	R	P
1	1	0
154	15	0
80	25	0
0	2	0
31	10	0
266	**53**	**0**

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
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	14	0
13	343	0
11	112	0
0	5	0
9	198	0
33	**672**	**0**

Out	In	Total
18	14	32
340	356	696
127	123	250
6	5	11
149	207	356
640	**705**	**1345**

Tri Hill Frontage [S]

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Airport Rd Southbound				Tri Hill Frontage Northbound				Airport Rd Eastbound				
	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
7:30 AM	22	29	0	51	2	54	0	56	20	10	0	30	137
7:45 AM	24	26	0	50	4	53	0	57	16	2	0	18	125
8:00 AM	26	19	0	45	2	36	0	38	19	2	0	21	104
8:15 AM	25	14	0	39	1	46	0	47	28	5	0	33	119
Total	97	88	0	185	9	189	0	198	83	19	0	102	485
Approach %	52.4	47.6	-	-	4.5	95.5	-	-	81.4	18.6	-	-	-
Total %	20.0	18.1	-	38.1	1.9	39.0	-	40.8	17.1	3.9	-	21.0	-
PHF	0.933	0.759	-	0.907	0.563	0.875	-	0.868	0.741	0.475	-	0.773	0.885
Motorcycles	1	0	-	1	0	0	-	0	0	0	-	0	1
% Motorcycles	1.0	0.0	-	0.5	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.2
Cars	56	56	-	112	3	91	-	94	34	5	-	39	245
% Cars	57.7	63.6	-	60.5	33.3	48.1	-	47.5	41.0	26.3	-	38.2	50.5
Light Goods Vehicles	15	26	-	41	4	44	-	48	31	9	-	40	129
% Light Goods Vehicles	15.5	29.5	-	22.2	44.4	23.3	-	24.2	37.3	47.4	-	39.2	26.6
Buses	0	1	-	1	0	0	-	0	0	1	-	1	2
% Buses	0.0	1.1	-	0.5	0.0	0.0	-	0.0	0.0	5.3	-	1.0	0.4
Single-Unit Trucks	8	3	-	11	2	14	-	16	17	3	-	20	47
% Single-Unit Trucks	8.2	3.4	-	5.9	22.2	7.4	-	8.1	20.5	15.8	-	19.6	9.7
Articulated Trucks	17	2	-	19	0	40	-	40	1	1	-	2	61
% Articulated Trucks	17.5	2.3	-	10.3	0.0	21.2	-	20.2	1.2	5.3	-	2.0	12.6
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	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 01-TriHillFrontage_AirportRd TMC
Site Code: TMC-01
Start Date: 07/16/2014

Peak Hour Data

07/16/2014 7:30 AM
Ending At
07/16/2014 8:30 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Airport Rd [N]

Out	In	Total
0	1	1
125	112	237
75	41	116
0	1	1
72	30	102
272	**185**	**457**

R	T	P
0	1	0
56	56	0
26	15	0
1	0	0
5	25	0
88	**97**	**0**

Airport Rd [W]

Out	In	Total
0	0	0
59	39	98
30	40	70
1	1	2
7	22	29
97	**102**	**199**

L	R	P
0	0	0
34	5	0
31	9	0
0	1	0
18	4	0
83	**19**	**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**

Tri Hill Frontage [S]

L	T	P
0	0	0
3	91	0
4	44	0
0	0	0
2	54	0
9	**189**	**0**

Out	In	Total
1	0	1
61	94	155
24	48	72
1	0	1
29	56	85
116	**198**	**314**

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Turning Movement Peak Hour Data (4:30 PM)

	Airport Rd Southbound				Tri Hill Frontage Northbound				Airport Rd Eastbound				
Start Time	Thru	Right	Peds	App. Total	Left	Thru	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
4:30 PM	61	18	0	79	1	50	0	51	14	1	0	15	145
4:45 PM	45	12	0	57	2	41	0	43	16	1	0	17	117
5:00 PM	46	21	0	67	3	31	0	34	33	1	0	34	135
5:15 PM	55	19	0	74	3	38	0	41	12	4	0	16	131
Total	207	70	0	277	9	160	0	169	75	7	0	82	528
Approach %	74.7	25.3	-	-	5.3	94.7	-	-	91.5	8.5	-	-	-
Total %	39.2	13.3	-	52.5	1.7	30.3	-	32.0	14.2	1.3	-	15.5	-
PHF	0.848	0.833	-	0.877	0.750	0.800	-	0.828	0.568	0.438	-	0.603	0.910
Motorcycles	10	0	-	10	0	3	-	3	0	0	-	0	13
% Motorcycles	4.8	0.0	-	3.6	0.0	1.9	-	1.8	0.0	0.0	-	0.0	2.5
Cars	115	42	-	157	5	88	-	93	53	3	-	56	306
% Cars	55.6	60.0	-	56.7	55.6	55.0	-	55.0	70.7	42.9	-	68.3	58.0
Light Goods Vehicles	42	17	-	59	2	14	-	16	20	4	-	24	99
% Light Goods Vehicles	20.3	24.3	-	21.3	22.2	8.8	-	9.5	26.7	57.1	-	29.3	18.8
Buses	1	0	-	1	0	1	-	1	0	0	-	0	2
% Buses	0.5	0.0	-	0.4	0.0	0.6	-	0.6	0.0	0.0	-	0.0	0.4
Single-Unit Trucks	8	9	-	17	2	14	-	16	2	0	-	2	35
% Single-Unit Trucks	3.9	12.9	-	6.1	22.2	8.8	-	9.5	2.7	0.0	-	2.4	6.6
Articulated Trucks	31	2	-	33	0	40	-	40	0	0	-	0	73
% Articulated Trucks	15.0	2.9	-	11.9	0.0	25.0	-	23.7	0.0	0.0	-	0.0	13.8
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
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Count Name: 01-TriHillFrontage_AirportRd TMC
Site Code: TMC-01
Start Date: 07/16/2014
Page No: 7

Peak Hour Data

07/16/2014 4:30 PM
Ending At
07/16/2014 5:30 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Airport Rd [N]

Out	In	Total
3	10	13
141	157	298
34	59	93
1	1	2
56	50	106
235	**277**	**512**

R	T	P
0	10	0
42	115	0
17	42	0
0	1	0
11	39	0
70	**207**	**0**

Airport Rd [W]

Out	In	Total
0	0	0
47	56	103
19	24	43
0	0	0
13	2	15
79	**82**	**161**

L	R	P
0	0	0
53	3	0
20	4	0
0	0	0
2	0	0
75	**7**	**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	3	0
5	88	0
2	14	0
0	1	0
2	54	0
9	**160**	**0**

Out	In	Total
10	3	13
118	93	211
46	16	62
1	1	2
39	56	95
214	**169**	**383**

Tri Hill Frontage [S]

Turning Movement Peak Hour Data Plot (4:30 PM)

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406-447-5000 scottr@rpa-hln.com

Count Name: 02-I15NB_AirportRd TMC
Site Code: TMC-02
Start Date: 07/16/2014

Turning Movement Data

Start Time	Southbound St. Southbound				Airport Rd Northbound				I-15 NB On Westbound		I-15 NB Off Eastbound					Int. Total
	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
7:00 AM	23	16	0	39	44	8	0	52	1	0	6	0	2	0	8	99
7:15 AM	28	16	0	44	42	8	0	50	0	0	2	1	1	0	4	98
7:30 AM	48	16	0	64	64	9	0	73	0	0	4	0	1	0	5	142
7:45 AM	47	12	0	59	54	15	0	69	0	0	3	0	2	0	5	133
Hourly Total	146	60	0	206	204	40	0	244	1	0	15	1	6	0	22	472
8:00 AM	43	28	0	71	47	8	0	55	0	0	2	0	0	0	2	128
8:15 AM	35	23	0	58	57	17	0	74	0	0	4	0	1	0	5	137
8:30 AM	33	17	0	50	40	10	0	50	0	0	8	0	1	0	9	109
8:45 AM	29	19	0	48	44	13	0	57	0	0	3	0	0	0	3	108
Hourly Total	140	87	0	227	188	48	0	236	0	0	17	0	2	0	19	482
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	68	107	0	175	60	8	0	68	0	0	8	0	0	0	8	251
4:15 PM	46	50	0	96	47	9	0	56	0	0	9	1	0	0	10	162
4:30 PM	68	111	0	179	47	17	0	64	0	0	10	1	1	0	12	255
4:45 PM	54	39	0	93	43	13	0	56	0	0	4	0	1	0	5	154
Hourly Total	236	307	0	543	197	47	0	244	0	0	31	2	2	0	35	822
5:00 PM	63	53	0	116	55	8	0	63	0	0	5	0	0	0	5	184
5:15 PM	66	44	0	110	39	12	0	51	0	0	7	0	1	0	8	169
5:30 PM	65	29	0	94	39	11	0	50	0	0	7	0	0	0	7	151
5:45 PM	59	21	0	80	38	12	0	50	0	0	12	0	0	0	12	142
Hourly Total	253	147	0	400	171	43	0	214	0	0	31	0	1	0	32	646
Grand Total	775	601	0	1376	760	178	0	938	1	0	94	3	11	0	108	2422
Approach %	56.3	43.7	-	-	81.0	19.0	-	-	-	-	87.0	2.8	10.2	-	-	-
Total %	32.0	24.8	-	56.8	31.4	7.3	-	38.7	-	0.0	3.9	0.1	0.5	-	4.5	-
Motorcycles	18	13	-	31	12	2	-	14	-	0	2	0	0	-	2	47
% Motorcycles	2.3	2.2	-	2.3	1.6	1.1	-	1.5	-	-	2.1	0.0	0.0	-	1.9	1.9
Cars	425	392	-	817	409	68	-	477	-	0	36	2	9	-	47	1341
% Cars	54.8	65.2	-	59.4	53.8	38.2	-	50.9	-	-	38.3	66.7	81.8	-	43.5	55.4
Light Goods Vehicles	208	175	-	383	165	36	-	201	-	0	17	1	2	-	20	604
% Light Goods Vehicles	26.8	29.1	-	27.8	21.7	20.2	-	21.4	-	-	18.1	33.3	18.2	-	18.5	24.9
Buses	5	0	-	5	2	2	-	4	-	0	0	0	0	-	0	9
% Buses	0.6	0.0	-	0.4	0.3	1.1	-	0.4	-	-	0.0	0.0	0.0	-	0.0	0.4
Single-Unit Trucks	45	13	-	58	78	17	-	95	-	0	8	0	0	-	8	161
% Single-Unit Trucks	5.8	2.2	-	4.2	10.3	9.6	-	10.1	-	-	8.5	0.0	0.0	-	7.4	6.6
Articulated Trucks	72	8	-	80	94	53	-	147	-	0	31	0	0	-	31	258
% Articulated Trucks	9.3	1.3	-	5.8	12.4	29.8	-	15.7	-	-	33.0	0.0	0.0	-	28.7	10.7
Bicycles on Road	2	0	-	2	0	0	-	0	-	0	0	0	0	-	0	2
% Bicycles on Road	0.3	0.0	-	0.1	0.0	0.0	-	0.0	-	-	0.0	0.0	0.0	-	0.0	0.1

Pedestrians	-	-	0	-	-	-	0	-	1	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-

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Count Name: 02-I15NB_AirportRd TMC
Site Code: TMC-02
Start Date: 07/16/2014
Page No: 3

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Southbound St. [N]

	Out	In	Total
Motorcycles	2	31	33
Cars	77	817	894
Light Goods Vehicles	38	383	421
Buses	2	5	7
Other	70	140	210
	189	**1376**	**1565**

	T	L	P
Motorcycles	18	13	0
Cars	425	392	0
Light Goods Vehicles	208	175	0
Buses	5	0	0
Other	119	21	0
	775	**601**	**0**

I-15 NB Off [W]

	Out	In	Total
Motorcycles	0	2	2
Cars	0	47	47
Light Goods Vehicles	0	20	20
Buses	0	0	0
Other	0	39	39
	0	**108**	**108**

	L	T	R	P
Motorcycles	0	0	2	0
Cars	9	2	36	0
Light Goods Vehicles	2	1	17	0
Buses	0	0	0	0
Other	0	0	39	0
	11	**3**	**94**	**0**

I-15 NB On [E]

	Out	In	Total
Motorcycles	25	0	25
Cars	803	0	803
Light Goods Vehicles	341	0	341
Buses	2	0	2
Other	193	0	193
	1364	**0**	**1364**

	P
Motorcycles	0
Cars	0
Light Goods Vehicles	0
Buses	0
Other	1
	1

Airport Rd [S]

	T	R	P
Motorcycles	2	12	0
Cars	68	409	0
Light Goods Vehicles	36	165	0
Buses	2	2	0
Other	70	172	0
	178	**760**	**0**

	Out	In	Total
Motorcycles	20	14	34
Cars	461	477	938
Light Goods Vehicles	225	201	426
Buses	5	4	9
Other	158	242	400
	869	**938**	**1807**

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
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Count Name: 02-I15NB_AirportRd TMC
Site Code: TMC-02
Start Date: 07/16/2014

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Southbound St. Southbound				Airport Rd Northbound				I-15 NB On Westbound		I-15 NB Off Eastbound					
	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:30 AM	48	16	0	64	64	9	0	73	0	0	4	0	1	0	5	142
7:45 AM	47	12	0	59	54	15	0	69	0	0	3	0	2	0	5	133
8:00 AM	43	28	0	71	47	8	0	55	0	0	2	0	0	0	2	128
8:15 AM	35	23	0	58	57	17	0	74	0	0	4	0	1	0	5	137
Total	173	79	0	252	222	49	0	271	0	0	13	0	4	0	17	540
Approach %	68.7	31.3	-	-	81.9	18.1	-	-	-	-	76.5	0.0	23.5	-	-	-
Total %	32.0	14.6	-	46.7	41.1	9.1	-	50.2	-	0.0	2.4	0.0	0.7	-	3.1	-
PHF	0.901	0.705	-	0.887	0.867	0.721	-	0.916	-	0.000	0.813	0.000	0.500	-	0.850	0.951
Motorcycles	1	0	-	1	0	0	-	0	-	0	0	0	0	-	0	1
% Motorcycles	0.6	0.0	-	0.4	0.0	0.0	-	0.0	-	-	0.0	-	0.0	-	0.0	0.2
Cars	93	38	-	131	114	17	-	131	-	0	4	0	4	-	8	270
% Cars	53.8	48.1	-	52.0	51.4	34.7	-	48.3	-	-	30.8	-	100.0	-	47.1	50.0
Light Goods Vehicles	59	31	-	90	49	12	-	61	-	0	3	0	0	-	3	154
% Light Goods Vehicles	34.1	39.2	-	35.7	22.1	24.5	-	22.5	-	-	23.1	-	0.0	-	17.6	28.5
Buses	1	0	-	1	0	1	-	1	-	0	0	0	0	-	0	2
% Buses	0.6	0.0	-	0.4	0.0	2.0	-	0.4	-	-	0.0	-	0.0	-	0.0	0.4
Single-Unit Trucks	12	4	-	16	33	5	-	38	-	0	1	0	0	-	1	55
% Single-Unit Trucks	6.9	5.1	-	6.3	14.9	10.2	-	14.0	-	-	7.7	-	0.0	-	5.9	10.2
Articulated Trucks	7	6	-	13	26	14	-	40	-	0	5	0	0	-	5	58
% Articulated Trucks	4.0	7.6	-	5.2	11.7	28.6	-	14.8	-	-	38.5	-	0.0	-	29.4	10.7
Bicycles on Road	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
Pedestrians	-	-	0	-	-	-	0	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RPA
Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
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Count Name: 02-I15NB_AirportRd TMC
Site Code: TMC-02
Start Date: 07/16/2014

Peak Hour Data

07/16/2014 7:30 AM
Ending At
07/16/2014 8:30 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Southbound St. [N]

Out	In	Total
0	1	1
21	131	152
12	90	102
1	1	2
19	29	48
53	**252**	**305**

T	L	P
1	0	0
93	38	0
59	31	0
1	0	0
19	10	0
173	**79**	**0**

I-15 NB Off [W]

Out	In	Total
0	0	0
0	8	8
0	3	3
0	0	0
0	6	6
0	**17**	**17**

L	T	R	P
0	0	0	0
4	0	4	0
0	0	3	0
0	0	0	0
0	0	6	0
4	**0**	**13**	**0**

I-15 NB On [E]

Out	In	Total
0	0	0
152	0	152
80	0	80
0	0	0
69	0	69
301	**0**	**301**

P
0
0
0
0
0
0

Airport Rd [S]

T	R	P
0	0	0
17	114	0
12	49	0
1	0	0
19	59	0
49	**222**	**0**

Out	In	Total
1	0	1
97	131	228
62	61	123
1	1	2
25	78	103
186	**271**	**457**

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
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Count Name: 02-I15NB_AirportRd TMC
Site Code: TMC-02
Start Date: 07/16/2014

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Southbound St.				Airport Rd				I-15 NB On		I-15 NB Off					
	Southbound				Northbound				Westbound		Eastbound					
	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
4:00 PM	68	107	0	175	60	8	0	68	0	0	8	0	0	0	8	251
4:15 PM	46	50	0	96	47	9	0	56	0	0	9	1	0	0	10	162
4:30 PM	68	111	0	179	47	17	0	64	0	0	10	1	1	0	12	255
4:45 PM	54	39	0	93	43	13	0	56	0	0	4	0	1	0	5	154
Total	236	307	0	543	197	47	0	244	0	0	31	2	2	0	35	822
Approach %	43.5	56.5	-	-	80.7	19.3	-	-	-	-	88.6	5.7	5.7	-	-	-
Total %	28.7	37.3	-	66.1	24.0	5.7	-	29.7	-	0.0	3.8	0.2	0.2	-	4.3	-
PHF	0.868	0.691	-	0.758	0.821	0.691	-	0.897	-	0.000	0.775	0.500	0.500	-	0.729	0.806
Motorcycles	8	8	-	16	7	1	-	8	-	0	1	0	0	-	1	25
% Motorcycles	3.4	2.6	-	2.9	3.6	2.1	-	3.3	-	-	3.2	0.0	0.0	-	2.9	3.0
Cars	112	211	-	323	100	19	-	119	-	0	8	1	0	-	9	451
% Cars	47.5	68.7	-	59.5	50.8	40.4	-	48.8	-	-	25.8	50.0	0.0	-	25.7	54.9
Light Goods Vehicles	74	86	-	160	48	8	-	56	-	0	7	1	2	-	10	226
% Light Goods Vehicles	31.4	28.0	-	29.5	24.4	17.0	-	23.0	-	-	22.6	50.0	100.0	-	28.6	27.5
Buses	0	0	-	0	1	0	-	1	-	0	0	0	0	-	0	1
% Buses	0.0	0.0	-	0.0	0.5	0.0	-	0.4	-	-	0.0	0.0	0.0	-	0.0	0.1
Single-Unit Trucks	12	2	-	14	13	5	-	18	-	0	2	0	0	-	2	34
% Single-Unit Trucks	5.1	0.7	-	2.6	6.6	10.6	-	7.4	-	-	6.5	0.0	0.0	-	5.7	4.1
Articulated Trucks	29	0	-	29	28	14	-	42	-	0	13	0	0	-	13	84
% Articulated Trucks	12.3	0.0	-	5.3	14.2	29.8	-	17.2	-	-	41.9	0.0	0.0	-	37.1	10.2
Bicycles on Road	1	0	-	1	0	0	-	0	-	0	0	0	0	-	0	1
% Bicycles on Road	0.4	0.0	-	0.2	0.0	0.0	-	0.0	-	-	0.0	0.0	0.0	-	0.0	0.1
Pedestrians	-	-	0	-	-	-	0	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 02-I15NB_AirportRd TMC
Site Code: TMC-02
Start Date: 07/16/2014
Page No: 7

Peak Hour Data

07/16/2014 4:00 PM
Ending At
07/16/2014 5:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Southbound St. [N]

Out	In	Total
1	16	17
19	323	342
10	160	170
0	0	0
19	44	63
49	**543**	**592**

T	L	P
8	8	0
112	211	0
74	86	0
0	0	0
42	2	0
236	**307**	**0**

I-15 NB Off [W]

Out	In	Total
0	1	1
0	9	9
0	10	10
0	0	0
0	15	15
0	**35**	**35**

L	T	R	P
0	0	1	0
0	1	8	0
2	1	7	0
0	0	0	0
0	0	15	0
2	**2**	**31**	**0**

I-15 NB On [E]

Out	In	Total
15	0	15
312	0	312
135	0	135
1	0	1
43	0	43
506	**0**	**506**

P
0
0
0
0
0
0

Airport Rd [S]

T	R	P
1	7	0
19	100	0
8	48	0
0	1	0
19	41	0
47	**197**	**0**

Out	In	Total
9	8	17
120	119	239
81	56	137
0	1	1
57	60	117
267	**244**	**511**

Turning Movement Peak Hour Data Plot (4:00 PM)

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Count Name: 03-I15SBOn_AirportRd TMC
Site Code: TMC-03
Start Date: 07/16/2014

Turning Movement Data

Start Time	Airport Rd Southbound					Airport Rd Northbound				I-15 SB On Eastbound		
	Right	Thru	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Peds	App. Total	Int. Total
7:00 AM	0	41	0	0	41	5	5	0	10	0	0	51
7:15 AM	1	44	0	0	45	4	5	0	9	0	0	54
7:30 AM	1	63	0	0	64	5	5	0	10	0	0	74
7:45 AM	1	61	0	0	62	9	9	0	18	0	0	80
Hourly Total	3	209	0	0	212	23	24	0	47	0	0	259
8:00 AM	0	72	0	0	72	2	6	0	8	0	0	80
8:15 AM	4	55	0	0	59	7	12	0	19	0	0	78
8:30 AM	1	55	1	0	57	6	5	0	11	0	0	68
8:45 AM	2	48	0	0	50	8	5	0	13	0	0	63
Hourly Total	7	230	1	0	238	23	28	0	51	0	0	289
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	5	175	0	0	180	4	3	0	7	0	0	187
4:15 PM	3	94	0	0	97	4	5	0	9	0	0	106
4:30 PM	2	182	0	0	184	6	10	0	16	0	0	200
4:45 PM	4	91	0	0	95	7	7	0	14	0	0	109
Hourly Total	14	542	0	0	556	21	25	0	46	0	0	602
5:00 PM	0	117	0	0	117	2	6	0	8	0	0	125
5:15 PM	2	108	0	0	110	4	9	0	13	0	0	123
5:30 PM	4	96	0	0	100	3	6	0	9	0	0	109
5:45 PM	1	78	0	0	79	2	9	0	11	0	0	90
Hourly Total	7	399	0	0	406	11	30	0	41	0	0	447
Grand Total	31	1380	1	0	1412	78	107	0	185	0	0	1597
Approach %	2.2	97.7	0.1	-	-	42.2	57.8	-	-	-	-	-
Total %	1.9	86.4	0.1	-	88.4	4.9	6.7	-	11.6	-	0.0	-
Motorcycles	0	32	0	-	32	1	1	-	2	-	0	34
% Motorcycles	0.0	2.3	0.0	-	2.3	1.3	0.9	-	1.1	-	-	2.1
Cars	20	765	1	-	786	43	25	-	68	-	0	854
% Cars	64.5	55.4	100.0	-	55.7	55.1	23.4	-	36.8	-	-	53.5
Light Goods Vehicles	9	432	0	-	441	22	21	-	43	-	0	484
% Light Goods Vehicles	29.0	31.3	0.0	-	31.2	28.2	19.6	-	23.2	-	-	30.3
Buses	0	2	0	-	2	0	0	-	0	-	0	2
% Buses	0.0	0.1	0.0	-	0.1	0.0	0.0	-	0.0	-	-	0.1
Single-Unit Trucks	1	61	0	-	62	5	10	-	15	-	0	77
% Single-Unit Trucks	3.2	4.4	0.0	-	4.4	6.4	9.3	-	8.1	-	-	4.8
Articulated Trucks	1	85	0	-	86	7	49	-	56	-	0	142
% Articulated Trucks	3.2	6.2	0.0	-	6.1	9.0	45.8	-	30.3	-	-	8.9
Bicycles on Road	0	3	0	-	3	0	1	-	1	-	0	4
% Bicycles on Road	0.0	0.2	0.0	-	0.2	0.0	0.9	-	0.5	-	-	0.3

Pedestrians	-	-	-	0	-	-	-	0	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

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Airport Rd [N]

Out	In	Total
1	32	33
43	786	829
22	441	463
0	2	2
12	151	163
78	**1412**	**1490**

R	T	L	P
0	32	0	0
20	765	1	0
9	432	0	0
0	2	0	0
2	149	0	0
31	**1380**	**1**	**0**

I-15 SB On [W]

Out	In	Total	P
1	0	1	0
45	0	45	0
30	0	30	0
0	0	0	0
62	0	62	0
138	**0**	**138**	**0**

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Fake Approach [E]

Out	In	Total
0	0	0
1	0	1
0	0	0
0	0	0
0	0	0
1	**0**	**1**

L	T	P
1	1	0
25	43	0
21	22	0
0	0	0
60	12	0
107	**78**	**0**

Out	In	Total
32	2	34
765	68	833
432	43	475
2	0	2
149	72	221
1380	**185**	**1565**

Airport Rd [S]

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

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406-447-5000 scottr@rpa-hln.com

Count Name: 03-I15SBOn_AirportRd TMC
Site Code: TMC-03
Start Date: 07/16/2014

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Airport Rd Southbound					Airport Rd Northbound				I-15 SB On Eastbound		
	Right	Thru	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Peds	App. Total	Int. Total
7:30 AM	1	63	0	0	64	5	5	0	10	0	0	74
7:45 AM	1	61	0	0	62	9	9	0	18	0	0	80
8:00 AM	0	72	0	0	72	2	6	0	8	0	0	80
8:15 AM	4	55	0	0	59	7	12	0	19	0	0	78
Total	6	251	0	0	257	23	32	0	55	0	0	312
Approach %	2.3	97.7	0.0	-	-	41.8	58.2	-	-	-	-	-
Total %	1.9	80.4	0.0	-	82.4	7.4	10.3	-	17.6	-	0.0	-
PHF	0.375	0.872	0.000	-	0.892	0.639	0.667	-	0.724	-	0.000	0.975
Motorcycles	0	1	0	-	1	0	0	-	0	-	0	1
% Motorcycles	0.0	0.4	-	-	0.4	0.0	0.0	-	0.0	-	-	0.3
Cars	4	102	0	-	106	13	7	-	20	-	0	126
% Cars	66.7	40.6	-	-	41.2	56.5	21.9	-	36.4	-	-	40.4
Light Goods Vehicles	1	113	0	-	114	5	10	-	15	-	0	129
% Light Goods Vehicles	16.7	45.0	-	-	44.4	21.7	31.3	-	27.3	-	-	41.3
Buses	0	0	0	-	0	0	0	-	0	-	0	0
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	0.0	-	-	0.0
Single-Unit Trucks	1	17	0	-	18	2	3	-	5	-	0	23
% Single-Unit Trucks	16.7	6.8	-	-	7.0	8.7	9.4	-	9.1	-	-	7.4
Articulated Trucks	0	18	0	-	18	3	11	-	14	-	0	32
% Articulated Trucks	0.0	7.2	-	-	7.0	13.0	34.4	-	25.5	-	-	10.3
Bicycles on Road	0	0	0	-	0	0	1	-	1	-	0	1
% Bicycles on Road	0.0	0.0	-	-	0.0	0.0	3.1	-	1.8	-	-	0.3
Pedestrians	-	-	-	0	-	-	-	0	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 03-I15SBOn_AirportRd TMC
Site Code: TMC-03
Start Date: 07/16/2014
Page No: 5

Airport Rd [N]

Out	In	Total
0	1	1
13	106	119
5	114	119
0	0	0
5	36	41
23	**257**	**280**

R	T	L	P
0	1	0	0
4	102	0	0
1	113	0	0
0	0	0	0
1	35	0	0
6	**251**	**0**	**0**

I-15 SB On [W]

Out	In	Total
0	0	0
11	0	11
11	0	11
0	0	0
16	0	16
38	**0**	**38**

P
0
0
0
0
0
0

Peak Hour Data

07/16/2014 7:30 AM
Ending At
07/16/2014 8:30 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
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
7	13	0
10	5	0
0	0	0
15	5	0
32	**23**	**0**

Airport Rd [S]

Out	In	Total
1	0	1
102	20	122
113	15	128
0	0	0
35	20	55
251	**55**	**306**

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
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Turning Movement Peak Hour Data (4:00 PM)

Start Time	Airport Rd Southbound					Airport Rd Northbound				I-15 SB On Eastbound		
	Right	Thru	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Peds	App. Total	Int. Total
4:00 PM	5	175	0	0	180	4	3	0	7	0	0	187
4:15 PM	3	94	0	0	97	4	5	0	9	0	0	106
4:30 PM	2	182	0	0	184	6	10	0	16	0	0	200
4:45 PM	4	91	0	0	95	7	7	0	14	0	0	109
Total	14	542	0	0	556	21	25	0	46	0	0	602
Approach %	2.5	97.5	0.0	-	-	45.7	54.3	-	-	-	-	-
Total %	2.3	90.0	0.0	-	92.4	3.5	4.2	-	7.6	-	0.0	-
PHF	0.700	0.745	0.000	-	0.755	0.750	0.625	-	0.719	-	0.000	0.753
Motorcycles	0	16	0	-	16	0	1	-	1	-	0	17
% Motorcycles	0.0	3.0	-	-	2.9	0.0	4.0	-	2.2	-	-	2.8
Cars	9	331	0	-	340	10	6	-	16	-	0	356
% Cars	64.3	61.1	-	-	61.2	47.6	24.0	-	34.8	-	-	59.1
Light Goods Vehicles	5	154	0	-	159	7	2	-	9	-	0	168
% Light Goods Vehicles	35.7	28.4	-	-	28.6	33.3	8.0	-	19.6	-	-	27.9
Buses	0	0	0	-	0	0	0	-	0	-	0	0
% Buses	0.0	0.0	-	-	0.0	0.0	0.0	-	0.0	-	-	0.0
Single-Unit Trucks	0	17	0	-	17	1	5	-	6	-	0	23
% Single-Unit Trucks	0.0	3.1	-	-	3.1	4.8	20.0	-	13.0	-	-	3.8
Articulated Trucks	0	23	0	-	23	3	11	-	14	-	0	37
% Articulated Trucks	0.0	4.2	-	-	4.1	14.3	44.0	-	30.4	-	-	6.1
Bicycles on Road	0	1	0	-	1	0	0	-	0	-	0	1
% Bicycles on Road	0.0	0.2	-	-	0.2	0.0	0.0	-	0.0	-	-	0.2
Pedestrians	-	-	-	0	-	-	-	0	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 03-I15SBOn_AirportRd TMC
Site Code: TMC-03
Start Date: 07/16/2014
Page No: 7

Airport Rd [N]

Out	In	Total
0	16	16
10	340	350
7	159	166
0	0	0
4	41	45
21	**556**	**577**

R	T	L	P
0	16	0	0
9	331	0	0
5	154	0	0
0	0	0	0
0	41	0	0
14	**542**	**0**	**0**

Peak Hour Data

07/16/2014 4:00 PM
Ending At
07/16/2014 5:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 SB On [W]

Out	In	Total	P
1	0	1	0
15	0	15	0
7	0	7	0
0	0	0	0
16	0	16	0
39	**0**	**39**	**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
1	0	0
6	10	0
2	7	0
0	0	0
16	4	0
25	**21**	**0**

Airport Rd [S]

Out	In	Total
16	1	17
331	16	347
154	9	163
0	0	0
41	20	61
542	**46**	**588**

Turning Movement Peak Hour Data Plot (4:00 PM)

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Count Name: 04-I15SBOff_AirportRd_Frontage TMC
Site Code: TMC-04
Start Date: 07/16/2014

Turning Movement Data

Start Time	Airport Rd Southbound				Airport Rd Northbound				I-15 SB Off Westbound					Frontage Rd Eastbound				
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
7:00 AM	0	13	0	13	5	0	0	5	47	4	22	0	73	5	0	0	5	96
7:15 AM	1	9	0	10	4	0	0	4	34	13	31	0	78	5	1	0	6	98
7:30 AM	0	9	0	9	3	2	0	5	18	13	43	0	74	12	0	0	12	100
7:45 AM	1	9	0	10	4	5	0	9	28	15	49	0	92	6	3	0	9	120
Hourly Total	2	40	0	42	16	7	0	23	127	45	145	0	317	28	4	0	32	414
8:00 AM	2	13	0	15	1	1	0	2	16	13	36	0	65	21	1	0	22	104
8:15 AM	0	12	0	12	3	4	0	7	8	13	33	0	54	15	1	0	16	89
8:30 AM	1	13	0	14	2	5	0	7	13	2	36	0	51	7	0	0	7	79
8:45 AM	1	11	0	12	6	2	0	8	17	10	23	0	50	16	2	0	18	88
Hourly Total	4	49	0	53	12	12	0	24	54	38	128	0	220	59	4	0	63	360
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	101	0	101	2	3	0	5	13	4	61	0	78	19	0	0	19	203
4:15 PM	0	44	0	44	3	1	0	4	10	7	37	0	54	14	0	0	14	116
4:30 PM	1	105	0	106	5	3	0	8	7	6	65	0	78	14	0	0	14	206
4:45 PM	0	36	0	36	5	1	0	6	17	9	54	0	80	8	0	0	8	130
Hourly Total	1	286	0	287	15	8	0	23	47	26	217	0	290	55	0	0	55	655
5:00 PM	0	40	0	40	2	0	0	2	8	13	57	0	78	21	0	0	21	141
5:15 PM	1	37	0	38	3	1	0	4	10	5	65	0	80	7	0	0	7	129
5:30 PM	0	25	0	25	3	1	0	4	7	4	65	0	76	11	0	0	11	116
5:45 PM	0	16	0	16	1	1	0	2	16	6	56	0	78	5	0	0	5	101
Hourly Total	1	118	0	119	9	3	0	12	41	28	243	0	312	44	0	0	44	487
Grand Total	8	493	0	501	52	30	0	82	269	137	733	0	1139	186	8	0	194	1916
Approach %	1.6	98.4	-	-	63.4	36.6	-	-	23.6	12.0	64.4	-	-	95.9	4.1	-	-	-
Total %	0.4	25.7	-	26.1	2.7	1.6	-	4.3	14.0	7.2	38.3	-	59.4	9.7	0.4	-	10.1	-
Motorcycles	0	11	-	11	0	0	-	0	6	2	15	-	23	4	0	-	4	38
% Motorcycles	0.0	2.2	-	2.2	0.0	0.0	-	0.0	2.2	1.5	2.0	-	2.0	2.2	0.0	-	2.1	2.0
Cars	5	320	-	325	41	10	-	51	173	87	363	-	623	90	4	-	94	1093
% Cars	62.5	64.9	-	64.9	78.8	33.3	-	62.2	64.3	63.5	49.5	-	54.7	48.4	50.0	-	48.5	57.0
Light Goods Vehicles	3	149	-	152	6	13	-	19	83	37	218	-	338	75	3	-	78	587
% Light Goods Vehicles	37.5	30.2	-	30.3	11.5	43.3	-	23.2	30.9	27.0	29.7	-	29.7	40.3	37.5	-	40.2	30.6
Buses	0	1	-	1	0	0	-	0	0	0	8	-	8	0	0	-	0	9
% Buses	0.0	0.2	-	0.2	0.0	0.0	-	0.0	0.0	0.0	1.1	-	0.7	0.0	0.0	-	0.0	0.5
Single-Unit Trucks	0	6	-	6	3	2	-	5	4	2	46	-	52	7	0	-	7	70
% Single-Unit Trucks	0.0	1.2	-	1.2	5.8	6.7	-	6.1	1.5	1.5	6.3	-	4.6	3.8	0.0	-	3.6	3.7
Articulated Trucks	0	3	-	3	2	5	-	7	3	7	83	-	93	10	1	-	11	114
% Articulated Trucks	0.0	0.6	-	0.6	3.8	16.7	-	8.5	1.1	5.1	11.3	-	8.2	5.4	12.5	-	5.7	5.9
Bicycles on Road	0	3	-	3	0	0	-	0	0	2	0	-	2	0	0	-	0	5
% Bicycles on Road	0.0	0.6	-	0.6	0.0	0.0	-	0.0	0.0	1.5	0.0	-	0.2	0.0	0.0	-	0.0	0.3

Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 04-I15SBOff_AirportRd_Frontage
TMC
Site Code: TMC-04
Start Date: 07/16/2014
Page No: 3

Airport Rd [N]

Out	In	Total
6	11	17
218	325	543
92	152	244
0	1	1
13	12	25
329	**501**	**830**

R	T	P
0	11	0
5	320	0
3	149	0
0	1	0
0	12	0
8	**493**	**0**

Frontage Rd [W]

Out	In	Total
2	4	6
102	94	196
53	78	131
0	0	0
18	18	36
175	**194**	**369**

L	R	P
0	4	0
4	90	0
3	75	0
0	0	0
1	17	0
8	**186**	**0**

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 SB Off [E]

Out	In	Total
0	23	23
0	623	623
0	338	338
0	8	8
0	147	147
0	**1139**	**1139**

R	T	L	P
6	2	15	0
173	87	363	0
83	37	218	0
0	0	8	0
7	11	129	0
269	**137**	**733**	**0**

Airport Rd [S]

L	T	P
0	0	0
10	41	0
13	6	0
0	0	0
7	5	0
30	**52**	**0**

Out	In	Total
30	0	30
773	51	824
442	19	461
9	0	9
158	12	170
1412	**82**	**1494**

Turning Movement Data Plot

Robert Peccia & Associates
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Helena, Montana, United States 59604
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Count Name: 04-I15SBOff_AirportRd_Frontage TMC
Site Code: TMC-04
Start Date: 07/16/2014
Page No: 4

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Airport Rd Southbound				Airport Rd Northbound				I-15 SB Off Westbound					Frontage Rd Eastbound				
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
7:15 AM	1	9	0	10	4	0	0	4	34	13	31	0	78	5	1	0	6	98
7:30 AM	0	9	0	9	3	2	0	5	18	13	43	0	74	12	0	0	12	100
7:45 AM	1	9	0	10	4	5	0	9	28	15	49	0	92	6	3	0	9	120
8:00 AM	2	13	0	15	1	1	0	2	16	13	36	0	65	21	1	0	22	104
Total	4	40	0	44	12	8	0	20	96	54	159	0	309	44	5	0	49	422
Approach %	9.1	90.9	-	-	60.0	40.0	-	-	31.1	17.5	51.5	-	-	89.8	10.2	-	-	-
Total %	0.9	9.5	-	10.4	2.8	1.9	-	4.7	22.7	12.8	37.7	-	73.2	10.4	1.2	-	11.6	-
PHF	0.500	0.769	-	0.733	0.750	0.400	-	0.556	0.706	0.900	0.811	-	0.840	0.524	0.417	-	0.557	0.879
Motorcycles	0	0	-	0	0	0	-	0	2	1	1	-	4	0	0	-	0	4
% Motorcycles	0.0	0.0	-	0.0	0.0	0.0	-	0.0	2.1	1.9	0.6	-	1.3	0.0	0.0	-	0.0	0.9
Cars	2	21	-	23	10	4	-	14	60	36	80	-	176	20	3	-	23	236
% Cars	50.0	52.5	-	52.3	83.3	50.0	-	70.0	62.5	66.7	50.3	-	57.0	45.5	60.0	-	46.9	55.9
Light Goods Vehicles	2	18	-	20	1	3	-	4	31	13	61	-	105	19	2	-	21	150
% Light Goods Vehicles	50.0	45.0	-	45.5	8.3	37.5	-	20.0	32.3	24.1	38.4	-	34.0	43.2	40.0	-	42.9	35.5
Buses	0	0	-	0	0	0	-	0	0	0	1	-	1	0	0	-	0	1
% Buses	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.6	-	0.3	0.0	0.0	-	0.0	0.2
Single-Unit Trucks	0	0	-	0	0	0	-	0	1	0	6	-	7	3	0	-	3	10
% Single-Unit Trucks	0.0	0.0	-	0.0	0.0	0.0	-	0.0	1.0	0.0	3.8	-	2.3	6.8	0.0	-	6.1	2.4
Articulated Trucks	0	1	-	1	1	1	-	2	2	4	10	-	16	2	0	-	2	21
% Articulated Trucks	0.0	2.5	-	2.3	8.3	12.5	-	10.0	2.1	7.4	6.3	-	5.2	4.5	0.0	-	4.1	5.0
Bicycles on Road	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
Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 04-I15SBOff_AirportRd_Frontage TMC
Site Code: TMC-04
Start Date: 07/16/2014

Peak Hour Data

07/16/2014 7:15 AM
Ending At
07/16/2014 8:15 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Airport Rd [N]

Out	In	Total
2	0	2
73	23	96
34	20	54
0	0	0
4	1	5
113	**44**	**157**

R	T	P
0	0	0
2	21	0
2	18	0
0	0	0
0	1	0
4	**40**	**0**

I-15 SB Off [E]

Out	In	Total
0	4	4
0	176	176
0	105	105
0	1	1
0	23	23
0	**309**	**309**

R	T	L	P
2	1	1	0
60	36	80	0
31	13	61	0
0	0	1	0
3	4	16	0
96	**54**	**159**	**0**

Airport Rd [S]

L	T	P
0	0	0
4	10	0
3	1	0
0	0	0
1	1	0
8	**12**	**0**

Out	In	Total
1	0	1
121	14	135
98	4	102
1	0	1
22	2	24
243	**20**	**263**

Frontage Rd [W]

Out	In	Total
1	0	1
42	23	65
18	21	39
0	0	0
5	5	10
66	**49**	**115**

L	R	P
0	0	0
3	20	0
2	19	0
0	0	0
0	5	0
5	**44**	**0**

Turning Movement Peak Hour Data Plot (7:15 AM)

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 04-I15SBOff_AirportRd_Frontage TMC
Site Code: TMC-04
Start Date: 07/16/2014

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Airport Rd Southbound				Airport Rd Northbound				I-15 SB Off Westbound					Frontage Rd Eastbound				
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
4:00 PM	0	101	0	101	2	3	0	5	13	4	61	0	78	19	0	0	19	203
4:15 PM	0	44	0	44	3	1	0	4	10	7	37	0	54	14	0	0	14	116
4:30 PM	1	105	0	106	5	3	0	8	7	6	65	0	78	14	0	0	14	206
4:45 PM	0	36	0	36	5	1	0	6	17	9	54	0	80	8	0	0	8	130
Total	1	286	0	287	15	8	0	23	47	26	217	0	290	55	0	0	55	655
Approach %	0.3	99.7	-	-	65.2	34.8	-	-	16.2	9.0	74.8	-	-	100.0	0.0	-	-	-
Total %	0.2	43.7	-	43.8	2.3	1.2	-	3.5	7.2	4.0	33.1	-	44.3	8.4	0.0	-	8.4	-
PHF	0.250	0.681	-	0.677	0.750	0.667	-	0.719	0.691	0.722	0.835	-	0.906	0.724	0.000	-	0.724	0.795
Motorcycles	0	8	-	8	0	0	-	0	0	1	6	-	7	1	0	-	1	16
% Motorcycles	0.0	2.8	-	2.8	0.0	0.0	-	0.0	0.0	3.8	2.8	-	2.4	1.8	-	-	1.8	2.4
Cars	1	195	-	196	14	1	-	15	36	16	104	-	156	27	0	-	27	394
% Cars	100.0	68.2	-	68.3	93.3	12.5	-	65.2	76.6	61.5	47.9	-	53.8	49.1	-	-	49.1	60.2
Light Goods Vehicles	0	79	-	79	0	4	-	4	10	6	66	-	82	26	0	-	26	191
% Light Goods Vehicles	0.0	27.6	-	27.5	0.0	50.0	-	17.4	21.3	23.1	30.4	-	28.3	47.3	-	-	47.3	29.2
Buses	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
Single-Unit Trucks	0	2	-	2	1	0	-	1	0	1	15	-	16	0	0	-	0	19
% Single-Unit Trucks	0.0	0.7	-	0.7	6.7	0.0	-	4.3	0.0	3.8	6.9	-	5.5	0.0	-	-	0.0	2.9
Articulated Trucks	0	1	-	1	0	3	-	3	1	2	26	-	29	1	0	-	1	34
% Articulated Trucks	0.0	0.3	-	0.3	0.0	37.5	-	13.0	2.1	7.7	12.0	-	10.0	1.8	-	-	1.8	5.2
Bicycles on Road	0	1	-	1	0	0	-	0	0	0	0	-	0	0	0	-	0	1
% Bicycles on Road	0.0	0.3	-	0.3	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	-	-	0.0	0.2
Pedestrians	-	-	0	-	-	-	0	-	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 04-I15SBOff_AirportRd_Frontage TMC
Site Code: TMC-04
Start Date: 07/16/2014

Peak Hour Data

07/16/2014 4:00 PM
Ending At
07/16/2014 5:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Airport Rd [N]

Out	In	Total
0	8	8
50	196	246
10	79	89
0	0	0
2	4	6
62	**287**	**349**

R	T	P
0	8	0
1	195	0
0	79	0
0	0	0
0	4	0
1	**286**	**0**

Frontage Rd [W]

Out	In	Total
1	1	2
18	27	45
10	26	36
0	0	0
6	1	7
35	**55**	**90**

L	R	P
0	1	0
0	27	0
0	26	0
0	0	0
0	1	0
0	**55**	**0**

I-15 SB Off [E]

Out	In	Total
0	7	7
0	156	156
0	82	82
0	0	0
0	45	45
0	**290**	**290**

R	T	L	P
0	1	6	0
36	16	104	0
10	6	66	0
0	0	0	0
1	3	41	0
47	**26**	**217**	**0**

Airport Rd [S]

L	T	P
0	0	0
1	14	0
4	0	0
0	0	0
3	1	0
8	**15**	**0**

Out	In	Total
15	0	15
326	15	341
171	4	175
0	0	0
46	4	50
558	**23**	**581**

Turning Movement Peak Hour Data Plot (4:00 PM)

Robert Peccia & Associates
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Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 05-14thStSW_I315EB TMC
Site Code: TMC-05
Start Date: 07/16/2014

Turning Movement Data

	14th St SW					14th St SW					I-315 EB					Marketplace					
	Southbound					Northbound					Westbound					Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	15	18	26	0	59	52	15	2	0	69	1	4	3	0	8	0	6	4	0	10	146
7:15 AM	15	15	31	0	61	66	15	1	0	82	2	5	9	1	16	0	15	6	0	21	180
7:30 AM	21	25	41	0	87	75	21	4	0	100	0	4	2	1	6	1	22	12	0	35	228
7:45 AM	14	27	46	0	87	90	21	0	0	111	2	9	5	0	16	1	17	16	0	34	248
Hourly Total	65	85	144	0	294	283	72	7	0	362	5	22	19	2	46	2	60	38	0	100	802
8:00 AM	10	24	24	0	58	55	9	2	0	66	1	12	4	0	17	1	15	10	0	26	167
8:15 AM	19	38	16	0	73	47	16	1	0	64	4	3	9	0	16	0	15	12	0	27	180
8:30 AM	25	36	19	0	80	59	19	1	0	79	6	9	10	0	25	0	13	8	0	21	205
8:45 AM	37	48	22	0	107	55	16	0	0	71	4	6	17	0	27	0	20	8	0	28	233
Hourly Total	91	146	81	0	318	216	60	4	0	280	15	30	40	0	85	1	63	38	0	102	785
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	51	80	11	0	142	79	17	2	1	98	3	22	23	0	48	3	46	26	0	75	363
4:15 PM	67	97	16	0	180	48	16	0	0	64	4	11	23	0	38	4	48	29	1	81	363
4:30 PM	69	92	26	0	187	75	24	5	1	104	7	17	27	0	51	2	37	22	0	61	403
4:45 PM	77	97	24	0	198	70	28	2	0	100	6	10	21	0	37	4	51	30	0	85	420
Hourly Total	264	366	77	0	707	272	85	9	2	366	20	60	94	0	174	13	182	107	1	302	1549
5:00 PM	58	90	26	0	174	46	11	3	0	60	12	7	36	0	55	2	47	26	0	75	364
5:15 PM	58	117	19	0	194	69	19	3	0	91	6	16	18	0	40	2	33	29	0	64	389
5:30 PM	56	104	26	0	186	72	15	1	0	88	3	18	21	0	42	2	42	32	0	76	392
5:45 PM	70	98	19	0	187	72	22	5	0	99	8	14	15	0	37	3	32	22	0	57	380
Hourly Total	242	409	90	0	741	259	67	12	0	338	29	55	90	0	174	9	154	109	0	272	1525
Grand Total	662	1006	392	0	2060	1030	284	32	2	1346	69	167	243	2	479	25	459	292	1	776	4661
Approach %	32.1	48.8	19.0	-	-	76.5	21.1	2.4	-	-	14.4	34.9	50.7	-	-	3.2	59.1	37.6	-	-	-
Total %	14.2	21.6	8.4	-	44.2	22.1	6.1	0.7	-	28.9	1.5	3.6	5.2	-	10.3	0.5	9.8	6.3	-	16.6	-
Motorcycles	6	4	4	-	14	7	5	0	-	12	0	1	2	-	3	0	2	4	-	6	35
% Motorcycles	0.9	0.4	1.0	-	0.7	0.7	1.8	0.0	-	0.9	0.0	0.6	0.8	-	0.6	0.0	0.4	1.4	-	0.8	0.8
Cars	489	746	301	-	1536	770	218	20	-	1008	38	131	159	-	328	23	362	220	-	605	3477
% Cars	73.9	74.2	76.8	-	74.6	74.8	76.8	62.5	-	74.9	55.1	78.4	65.4	-	68.5	92.0	78.9	75.3	-	78.0	74.6
Light Goods Vehicles	161	238	72	-	471	236	49	7	-	292	22	29	73	-	124	2	88	64	-	154	1041
% Light Goods Vehicles	24.3	23.7	18.4	-	22.9	22.9	17.3	21.9	-	21.7	31.9	17.4	30.0	-	25.9	8.0	19.2	21.9	-	19.8	22.3
Buses	0	2	1	-	3	1	0	3	-	4	0	1	1	-	2	0	0	0	-	0	9
% Buses	0.0	0.2	0.3	-	0.1	0.1	0.0	9.4	-	0.3	0.0	0.6	0.4	-	0.4	0.0	0.0	0.0	-	0.0	0.2
Single-Unit Trucks	6	14	10	-	30	9	8	2	-	19	8	4	5	-	17	0	7	3	-	10	76
% Single-Unit Trucks	0.9	1.4	2.6	-	1.5	0.9	2.8	6.3	-	1.4	11.6	2.4	2.1	-	3.5	0.0	1.5	1.0	-	1.3	1.6
Articulated Trucks	0	1	4	-	5	7	3	0	-	10	1	1	3	-	5	0	0	1	-	1	21
% Articulated Trucks	0.0	0.1	1.0	-	0.2	0.7	1.1	0.0	-	0.7	1.4	0.6	1.2	-	1.0	0.0	0.0	0.3	-	0.1	0.5
Bicycles on Road	0	1	0	-	1	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	2

% Bicycles on Road	0.0	0.1	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
Pedestrians	-	-	-	0	-	-	-	-	2	-	-	-	-	2	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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Count Name: 05-14thStSW_I315EB TMC
Site Code: TMC-05
Start Date: 07/16/2014
Page No: 3

14th St SW [N]		
Out	In	Total
9	14	23
476	1536	2012
135	471	606
0	3	3
25	36	61
645	**2060**	**2705**

6	4	4	0
489	746	301	0
161	238	72	0
0	2	1	0
6	16	14	0
662	**1006**	**392**	**0**
R	T	L	P

Marketplace [W]		
Out	In	Total
7	6	13
640	605	1245
197	154	351
4	0	4
13	11	24
861	**776**	**1637**

4	2	0	0
220	362	23	0
64	88	2	0
0	0	0	0
4	7	0	1
292	**459**	**25**	**1**
L	T	R	P

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

0	1	2	0
38	131	159	0
22	29	73	0
0	1	1	0
9	5	8	2
69	**167**	**243**	**2**
R	T	L	P

I-315 EB [E]		
Out	In	Total
13	3	16
1433	328	1761
396	124	520
2	2	4
37	22	59
1881	**479**	**2360**

L	T	R	P
0	5	7	0
20	218	770	0
7	49	236	0
3	0	1	0
2	12	16	2
32	**284**	**1030**	**2**

6	12	18
928	1008	1936
313	292	605
3	4	7
24	30	54
1274	**1346**	**2620**
Out	In	Total
14th St SW [S]		

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 05-14thStSW_I315EB TMC
Site Code: TMC-05
Start Date: 07/16/2014
Page No: 4

Turning Movement Peak Hour Data (7:15 AM)

Start Time	14th St SW					14th St SW					I-315 EB					Marketplace					
	Southbound					Northbound					Westbound					Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:15 AM	15	15	31	0	61	66	15	1	0	82	2	5	9	1	16	0	15	6	0	21	180
7:30 AM	21	25	41	0	87	75	21	4	0	100	0	4	2	1	6	1	22	12	0	35	228
7:45 AM	14	27	46	0	87	90	21	0	0	111	2	9	5	0	16	1	17	16	0	34	248
8:00 AM	10	24	24	0	58	55	9	2	0	66	1	12	4	0	17	1	15	10	0	26	167
Total	60	91	142	0	293	286	66	7	0	359	5	30	20	2	55	3	69	44	0	116	823
Approach %	20.5	31.1	48.5	-	-	79.7	18.4	1.9	-	-	9.1	54.5	36.4	-	-	2.6	59.5	37.9	-	-	-
Total %	7.3	11.1	17.3	-	35.6	34.8	8.0	0.9	-	43.6	0.6	3.6	2.4	-	6.7	0.4	8.4	5.3	-	14.1	-
PHF	0.714	0.843	0.772	-	0.842	0.794	0.786	0.438	-	0.809	0.625	0.625	0.556	-	0.809	0.750	0.784	0.688	-	0.829	0.830
Motorcycles	1	1	1	-	3	0	2	0	-	2	0	0	0	-	0	0	0	0	-	0	5
% Motorcycles	1.7	1.1	0.7	-	1.0	0.0	3.0	0.0	-	0.6	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.6
Cars	34	57	127	-	218	213	59	4	-	276	5	25	8	-	38	2	45	40	-	87	619
% Cars	56.7	62.6	89.4	-	74.4	74.5	89.4	57.1	-	76.9	100.0	83.3	40.0	-	69.1	66.7	65.2	90.9	-	75.0	75.2
Light Goods Vehicles	22	28	8	-	58	67	4	1	-	72	0	4	10	-	14	1	21	4	-	26	170
% Light Goods Vehicles	36.7	30.8	5.6	-	19.8	23.4	6.1	14.3	-	20.1	0.0	13.3	50.0	-	25.5	33.3	30.4	9.1	-	22.4	20.7
Buses	0	1	1	-	2	1	0	1	-	2	0	0	0	-	0	0	0	0	-	0	4
% Buses	0.0	1.1	0.7	-	0.7	0.3	0.0	14.3	-	0.6	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.5
Single-Unit Trucks	3	4	3	-	10	5	1	1	-	7	0	0	2	-	2	0	3	0	-	3	22
% Single-Unit Trucks	5.0	4.4	2.1	-	3.4	1.7	1.5	14.3	-	1.9	0.0	0.0	10.0	-	3.6	0.0	4.3	0.0	-	2.6	2.7
Articulated Trucks	0	0	2	-	2	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	3
% Articulated Trucks	0.0	0.0	1.4	-	0.7	0.0	0.0	0.0	-	0.0	0.0	3.3	0.0	-	1.8	0.0	0.0	0.0	-	0.0	0.4
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	-	-	-	-	2	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 05-14thStSW_I315EB TMC
Site Code: TMC-05
Start Date: 07/16/2014
Page No: 5

Peak Hour Data

07/16/2014 7:15 AM
Ending At
07/16/2014 8:15 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

14th St SW [N]

	Out	In	Total
Motorcycles	2	3	5
Cars	104	218	322
Light Goods Vehicles	8	58	66
Buses	0	2	2
Other	1	12	13
	115	**293**	**408**

	R	T	L	P
Motorcycles	1	1	1	0
Cars	34	57	127	0
Light Goods Vehicles	22	28	8	0
Buses	0	1	1	0
Other	3	4	5	0
	60	**91**	**142**	**0**

Marketplace [W]

	Out	In	Total
Motorcycles	1	0	1
Cars	63	87	150
Light Goods Vehicles	27	26	53
Buses	1	0	1
Other	5	3	8
	97	**116**	**213**

	L	T	R	P
Motorcycles	0	0	0	0
Cars	40	45	2	0
Light Goods Vehicles	4	21	1	0
Buses	0	0	0	0
Other	0	3	0	0
	44	**69**	**3**	**0**

I-315 EB [E]

	Out	In	Total
Motorcycles	1	0	1
Cars	385	38	423
Light Goods Vehicles	96	14	110
Buses	2	0	2
Other	13	3	16
	497	**55**	**552**

	R	T	L	P
Motorcycles	0	0	0	0
Cars	5	25	8	0
Light Goods Vehicles	0	4	10	0
Buses	0	0	0	0
Other	0	1	2	2
	5	**30**	**20**	**2**

14th St SW [S]

	L	T	R	P
Motorcycles	0	2	0	0
Cars	4	59	213	0
Light Goods Vehicles	1	4	67	0
Buses	1	0	1	0
Other	1	1	5	0
	7	**66**	**286**	**0**

	Out	In	Total
Motorcycles	1	2	3
Cars	67	276	343
Light Goods Vehicles	39	72	111
Buses	1	2	3
Other	6	7	13
	114	**359**	**473**

Turning Movement Peak Hour Data Plot (7:15 AM)

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 05-14thStSW_I315EB TMC
Site Code: TMC-05
Start Date: 07/16/2014

Turning Movement Peak Hour Data (4:30 PM)

Start Time	14th St SW Southbound					14th St SW Northbound					I-315 EB Westbound					Marketplace Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
4:30 PM	69	92	26	0	187	75	24	5	1	104	7	17	27	0	51	2	37	22	0	61	403
4:45 PM	77	97	24	0	198	70	28	2	0	100	6	10	21	0	37	4	51	30	0	85	420
5:00 PM	58	90	26	0	174	46	11	3	0	60	12	7	36	0	55	2	47	26	0	75	364
5:15 PM	58	117	19	0	194	69	19	3	0	91	6	16	18	0	40	2	33	29	0	64	389
Total	262	396	95	0	753	260	82	13	1	355	31	50	102	0	183	10	168	107	0	285	1576
Approach %	34.8	52.6	12.6	-	-	73.2	23.1	3.7	-	-	16.9	27.3	55.7	-	-	3.5	58.9	37.5	-	-	-
Total %	16.6	25.1	6.0	-	47.8	16.5	5.2	0.8	-	22.5	2.0	3.2	6.5	-	11.6	0.6	10.7	6.8	-	18.1	-
PHF	0.851	0.846	0.913	-	0.951	0.867	0.732	0.650	-	0.853	0.646	0.735	0.708	-	0.832	0.625	0.824	0.892	-	0.838	0.938
Motorcycles	3	0	2	-	5	1	1	0	-	2	0	0	0	-	0	0	0	2	-	2	9
% Motorcycles	1.1	0.0	2.1	-	0.7	0.4	1.2	0.0	-	0.6	0.0	0.0	0.0	-	0.0	0.0	0.0	1.9	-	0.7	0.6
Cars	194	297	64	-	555	189	59	8	-	256	18	38	69	-	125	9	136	76	-	221	1157
% Cars	74.0	75.0	67.4	-	73.7	72.7	72.0	61.5	-	72.1	58.1	76.0	67.6	-	68.3	90.0	81.0	71.0	-	77.5	73.4
Light Goods Vehicles	64	93	25	-	182	67	19	4	-	90	9	12	32	-	53	1	32	28	-	61	386
% Light Goods Vehicles	24.4	23.5	26.3	-	24.2	25.8	23.2	30.8	-	25.4	29.0	24.0	31.4	-	29.0	10.0	19.0	26.2	-	21.4	24.5
Buses	0	0	0	-	0	0	0	1	-	1	0	0	0	-	0	0	0	0	-	0	1
% Buses	0.0	0.0	0.0	-	0.0	0.0	0.0	7.7	-	0.3	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.1
Single-Unit Trucks	1	4	3	-	8	1	2	0	-	3	4	0	1	-	5	0	0	1	-	1	17
% Single-Unit Trucks	0.4	1.0	3.2	-	1.1	0.4	2.4	0.0	-	0.8	12.9	0.0	1.0	-	2.7	0.0	0.0	0.9	-	0.4	1.1
Articulated Trucks	0	1	1	-	2	2	0	0	-	2	0	0	0	-	0	0	0	0	-	0	4
% Articulated Trucks	0.0	0.3	1.1	-	0.3	0.8	0.0	0.0	-	0.6	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.3
Bicycles on Road	0	1	0	-	1	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	2
% Bicycles on Road	0.0	0.3	0.0	-	0.1	0.0	1.2	0.0	-	0.3	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.1
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 05-14thStSW_I315EB TMC
Site Code: TMC-05
Start Date: 07/16/2014
Page No: 7

Peak Hour Data

07/16/2014 4:30 PM
Ending At
07/16/2014 5:30 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

14th St SW [N]

Out	In	Total
3	5	8
153	555	708
56	182	238
0	0	0
8	11	19
220	**753**	**973**

R	T	L	P
3	0	2	0
194	297	64	0
64	93	25	0
0	0	0	0
1	6	4	0
262	**396**	**95**	**0**

Marketplace [W]

Out	In	Total
3	2	5
240	221	461
80	61	141
1	0	1
1	1	2
325	**285**	**610**

L	T	R	P
2	0	0	0
76	136	9	0
28	32	1	0
0	0	0	0
1	0	0	0
107	**168**	**10**	**0**

I-315 EB [E]

Out	In	Total
3	0	3
389	125	514
124	53	177
0	0	0
7	5	12
523	**183**	**706**

R	T	L	P
0	0	0	0
18	38	69	0
9	12	32	0
0	0	0	0
4	0	1	0
31	**50**	**102**	**0**

14th St SW [S]

L	T	R	P
0	1	1	0
8	59	189	0
4	19	67	0
1	0	0	0
0	3	3	1
13	**82**	**260**	**1**

Out	In	Total
0	2	2
375	256	631
126	90	216
0	1	1
7	6	13
508	**355**	**863**

Turning Movement Peak Hour Data Plot (4:30 PM)

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Count Name: 06-14thStSW_I315WB TMC
Site Code: TMC-06
Start Date: 07/16/2014
Page No: 1

Turning Movement Data

Start Time	14th St SW Southbound					14th St SW Northbound					I-315 WB Westbound					16th Ave SW Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	0	29	6	0	35	15	4	1	0	20	9	0	25	0	34	2	0	0	0	2	91
7:15 AM	0	31	7	0	38	19	5	1	0	25	12	1	28	1	41	3	0	0	0	3	107
7:30 AM	0	49	5	0	54	24	5	0	0	29	9	2	37	1	48	3	2	0	0	5	136
7:45 AM	0	45	13	0	58	28	5	7	0	40	13	5	38	0	56	5	2	0	0	7	161
Hourly Total	0	154	31	0	185	86	19	9	0	114	43	8	128	2	179	13	4	0	0	17	495
8:00 AM	0	24	7	0	31	14	6	1	0	21	10	5	31	0	46	2	1	0	0	3	101
8:15 AM	0	18	1	0	19	24	1	3	0	28	6	4	56	0	66	5	2	0	1	7	120
8:30 AM	0	23	6	0	29	24	11	0	0	35	6	0	53	0	59	4	1	1	0	6	129
8:45 AM	0	23	4	0	27	18	8	0	0	26	11	0	80	0	91	3	1	0	0	4	148
Hourly Total	0	88	18	0	106	80	26	4	0	110	33	9	220	0	262	14	5	1	1	20	498
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	18	4	0	22	33	10	2	0	45	20	3	121	0	144	1	1	0	0	2	213
4:15 PM	0	30	2	0	32	33	14	0	0	47	25	6	145	0	176	2	1	0	0	3	258
4:30 PM	0	37	5	0	42	29	21	2	0	52	24	3	156	0	183	2	0	1	0	3	280
4:45 PM	1	41	5	0	47	38	22	2	0	62	32	9	148	0	189	2	3	1	1	6	304
Hourly Total	1	126	16	0	143	133	67	6	0	206	101	21	570	0	692	7	5	2	1	14	1055
5:00 PM	0	28	3	0	31	37	20	2	0	59	41	1	161	0	203	6	1	0	0	7	300
5:15 PM	1	27	8	0	36	32	21	1	0	54	40	0	159	0	199	4	0	2	0	6	295
5:30 PM	0	35	6	0	41	39	13	0	0	52	29	2	170	0	201	7	1	0	0	8	302
5:45 PM	1	28	5	1	34	34	16	0	0	50	29	3	158	0	190	2	0	0	1	2	276
Hourly Total	2	118	22	1	142	142	70	3	0	215	139	6	648	0	793	19	2	2	1	23	1173
Grand Total	3	486	87	1	576	441	182	22	0	645	316	44	1566	2	1926	53	16	5	3	74	3221
Approach %	0.5	84.4	15.1	-	-	68.4	28.2	3.4	-	-	16.4	2.3	81.3	-	-	71.6	21.6	6.8	-	-	-
Total %	0.1	15.1	2.7	-	17.9	13.7	5.7	0.7	-	20.0	9.8	1.4	48.6	-	59.8	1.6	0.5	0.2	-	2.3	-
Motorcycles	0	6	0	-	6	8	0	1	-	9	2	2	8	-	12	0	0	0	-	0	27
% Motorcycles	0.0	1.2	0.0	-	1.0	1.8	0.0	4.5	-	1.4	0.6	4.5	0.5	-	0.6	0.0	0.0	0.0	-	0.0	0.8
Cars	2	329	54	-	385	315	129	15	-	459	232	31	1154	-	1417	38	10	1	-	49	2310
% Cars	66.7	67.7	62.1	-	66.8	71.4	70.9	68.2	-	71.2	73.4	70.5	73.7	-	73.6	71.7	62.5	20.0	-	66.2	71.7
Light Goods Vehicles	1	133	22	-	156	107	40	3	-	150	68	9	378	-	455	12	4	3	-	19	780
% Light Goods Vehicles	33.3	27.4	25.3	-	27.1	24.3	22.0	13.6	-	23.3	21.5	20.5	24.1	-	23.6	22.6	25.0	60.0	-	25.7	24.2
Buses	0	1	0	-	1	0	1	0	-	1	1	0	2	-	3	0	0	0	-	0	5
% Buses	0.0	0.2	0.0	-	0.2	0.0	0.5	0.0	-	0.2	0.3	0.0	0.1	-	0.2	0.0	0.0	0.0	-	0.0	0.2
Single-Unit Trucks	0	10	8	-	18	8	9	3	-	20	11	2	22	-	35	2	2	1	-	5	78
% Single-Unit Trucks	0.0	2.1	9.2	-	3.1	1.8	4.9	13.6	-	3.1	3.5	4.5	1.4	-	1.8	3.8	12.5	20.0	-	6.8	2.4
Articulated Trucks	0	5	1	-	6	3	2	0	-	5	2	0	2	-	4	1	0	0	-	1	16
% Articulated Trucks	0.0	1.0	1.1	-	1.0	0.7	1.1	0.0	-	0.8	0.6	0.0	0.1	-	0.2	1.9	0.0	0.0	-	1.4	0.5
Bicycles on Road	0	2	2	-	4	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	5

% Bicycles on Road	0.0	0.4	2.3	-	0.7	0.0	0.5	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.2
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	2	-	-	-	-	3	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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Count Name: 06-14thStSW_I315WB TMC
Site Code: TMC-06
Start Date: 07/16/2014
Page No: 3

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

14th St SW [N]

Out	In	Total
2	6	8
362	385	747
111	156	267
2	1	3
26	28	54
503	**576**	**1079**

R	T	L	P
0	6	0	0
2	329	54	0
1	133	22	0
0	1	0	0
0	17	11	1
3	**486**	**87**	**1**

16th Ave SW [W]

Out	In	Total
3	0	3
48	49	97
13	19	32
0	0	0
5	6	11
69	**74**	**143**

L	T	R	P
0	0	0	0
1	10	38	0
3	4	12	0
0	0	0	0
1	2	3	3
5	**16**	**53**	**3**

I-315 WB [E]

Out	In	Total
8	12	20
379	1417	1796
133	455	588
0	3	3
24	39	63
544	**1926**	**2470**

R	T	L	P
2	2	8	0
232	31	1154	0
68	9	378	0
1	0	2	0
13	2	24	2
316	**44**	**1566**	**2**

14th St SW [S]

L	T	R	P
1	0	8	0
15	129	315	0
3	40	107	0
0	1	0	0
3	12	11	0
22	**182**	**441**	**0**

Out	In	Total
14	9	23
1521	459	1980
523	150	673
3	1	4
44	26	70
2105	**645**	**2750**

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

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406-447-5000 scottr@rpa-hln.com

Count Name: 06-14thStSW_I315WB TMC
Site Code: TMC-06
Start Date: 07/16/2014

Turning Movement Peak Hour Data (7:30 AM)

	14th St SW					14th St SW					I-315 WB					16th Ave SW					
	Southbound					Northbound					Westbound					Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:30 AM	0	49	5	0	54	24	5	0	0	29	9	2	37	1	48	3	2	0	0	5	136
7:45 AM	0	45	13	0	58	28	5	7	0	40	13	5	38	0	56	5	2	0	0	7	161
8:00 AM	0	24	7	0	31	14	6	1	0	21	10	5	31	0	46	2	1	0	0	3	101
8:15 AM	0	18	1	0	19	24	1	3	0	28	6	4	56	0	66	5	2	0	1	7	120
Total	0	136	26	0	162	90	17	11	0	118	38	16	162	1	216	15	7	0	1	22	518
Approach %	0.0	84.0	16.0	-	-	76.3	14.4	9.3	-	-	17.6	7.4	75.0	-	-	68.2	31.8	0.0	-	-	-
Total %	0.0	26.3	5.0	-	31.3	17.4	3.3	2.1	-	22.8	7.3	3.1	31.3	-	41.7	2.9	1.4	0.0	-	4.2	-
PHF	0.000	0.694	0.500	-	0.698	0.804	0.708	0.393	-	0.738	0.731	0.800	0.723	-	0.818	0.750	0.875	0.000	-	0.786	0.804
Motorcycles	0	0	0	-	0	3	0	0	-	3	0	1	2	-	3	0	0	0	-	0	6
% Motorcycles	-	0.0	0.0	-	0.0	3.3	0.0	0.0	-	2.5	0.0	6.3	1.2	-	1.4	0.0	0.0	-	-	0.0	1.2
Cars	0	85	18	-	103	58	11	7	-	76	26	13	108	-	147	12	5	0	-	17	343
% Cars	-	62.5	69.2	-	63.6	64.4	64.7	63.6	-	64.4	68.4	81.3	66.7	-	68.1	80.0	71.4	-	-	77.3	66.2
Light Goods Vehicles	0	49	4	-	53	25	6	3	-	34	12	2	47	-	61	3	2	0	-	5	153
% Light Goods Vehicles	-	36.0	15.4	-	32.7	27.8	35.3	27.3	-	28.8	31.6	12.5	29.0	-	28.2	20.0	28.6	-	-	22.7	29.5
Buses	0	0	0	-	0	0	0	0	-	0	0	0	1	-	1	0	0	0	-	0	1
% Buses	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.6	-	0.5	0.0	0.0	-	-	0.0	0.2
Single-Unit Trucks	0	2	2	-	4	3	0	1	-	4	0	0	4	-	4	0	0	0	-	0	12
% Single-Unit Trucks	-	1.5	7.7	-	2.5	3.3	0.0	9.1	-	3.4	0.0	0.0	2.5	-	1.9	0.0	0.0	-	-	0.0	2.3
Articulated Trucks	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	0	0	0	-	0	1
% Articulated Trucks	-	0.0	0.0	-	0.0	1.1	0.0	0.0	-	0.8	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.2
Bicycles on Road	0	0	2	-	2	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	2
% Bicycles on Road	-	0.0	7.7	-	1.2	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	-	-	0.0	0.4
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 06-14thStSW_I315WB TMC
Site Code: TMC-06
Start Date: 07/16/2014
Page No: 5

Peak Hour Data

07/16/2014 7:30 AM
Ending At
07/16/2014 8:30 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

14th St SW [N]

Out	In	Total
0	0	0
37	103	140
18	53	71
0	0	0
0	6	6
55	**162**	**217**

R	T	L	P
0	0	0	0
0	85	18	0
0	49	4	0
0	0	0	0
0	2	4	0
0	**136**	**26**	**0**

16th Ave SW [W]

Out	In	Total
1	0	1
20	17	37
5	5	10
0	0	0
1	0	1
27	**22**	**49**

L	T	R	P
0	0	0	0
0	5	12	0
0	2	3	0
0	0	0	0
0	0	0	1
0	**7**	**15**	**1**

I-315 WB [E]

Out	In	Total
3	3	6
81	147	228
31	61	92
0	1	1
8	4	12
123	**216**	**339**

R	T	L	P
0	1	2	0
26	13	108	0
12	2	47	0
0	0	1	0
0	0	4	1
38	**16**	**162**	**1**

14th St SW [S]

L	T	R	P
0	0	3	0
7	11	58	0
3	6	25	0
0	0	0	0
1	0	4	0
11	**17**	**90**	**0**

Out	In	Total
2	3	5
205	76	281
99	34	133
1	0	1
6	5	11
313	**118**	**431**

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 06-14thStSW_I315WB TMC
Site Code: TMC-06
Start Date: 07/16/2014

Turning Movement Peak Hour Data (4:45 PM)

Start Time	14th St SW Southbound					14th St SW Northbound					I-315 WB Westbound					16th Ave SW Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
4:45 PM	1	41	5	0	47	38	22	2	0	62	32	9	148	0	189	2	3	1	1	6	304
5:00 PM	0	28	3	0	31	37	20	2	0	59	41	1	161	0	203	6	1	0	0	7	300
5:15 PM	1	27	8	0	36	32	21	1	0	54	40	0	159	0	199	4	0	2	0	6	295
5:30 PM	0	35	6	0	41	39	13	0	0	52	29	2	170	0	201	7	1	0	0	8	302
Total	2	131	22	0	155	146	76	5	0	227	142	12	638	0	792	19	5	3	1	27	1201
Approach %	1.3	84.5	14.2	-	-	64.3	33.5	2.2	-	-	17.9	1.5	80.6	-	-	70.4	18.5	11.1	-	-	-
Total %	0.2	10.9	1.8	-	12.9	12.2	6.3	0.4	-	18.9	11.8	1.0	53.1	-	65.9	1.6	0.4	0.2	-	2.2	-
PHF	0.500	0.799	0.688	-	0.824	0.936	0.864	0.625	-	0.915	0.866	0.333	0.938	-	0.975	0.679	0.417	0.375	-	0.844	0.988
Motorcycles	0	2	0	-	2	1	0	0	-	1	0	1	1	-	2	0	0	0	-	0	5
% Motorcycles	0.0	1.5	0.0	-	1.3	0.7	0.0	0.0	-	0.4	0.0	8.3	0.2	-	0.3	0.0	0.0	0.0	-	0.0	0.4
Cars	1	104	17	-	122	119	59	3	-	181	113	8	496	-	617	12	4	1	-	17	937
% Cars	50.0	79.4	77.3	-	78.7	81.5	77.6	60.0	-	79.7	79.6	66.7	77.7	-	77.9	63.2	80.0	33.3	-	63.0	78.0
Light Goods Vehicles	1	22	5	-	28	25	11	0	-	36	23	2	130	-	155	4	1	2	-	7	226
% Light Goods Vehicles	50.0	16.8	22.7	-	18.1	17.1	14.5	0.0	-	15.9	16.2	16.7	20.4	-	19.6	21.1	20.0	66.7	-	25.9	18.8
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	2	0	-	2	1	5	2	-	8	4	1	10	-	15	2	0	0	-	2	27
% Single-Unit Trucks	0.0	1.5	0.0	-	1.3	0.7	6.6	40.0	-	3.5	2.8	8.3	1.6	-	1.9	10.5	0.0	0.0	-	7.4	2.2
Articulated Trucks	0	1	0	-	1	0	0	0	-	0	2	0	1	-	3	1	0	0	-	1	5
% Articulated Trucks	0.0	0.8	0.0	-	0.6	0.0	0.0	0.0	-	0.0	1.4	0.0	0.2	-	0.4	5.3	0.0	0.0	-	3.7	0.4
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	1.3	0.0	-	0.4	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.1
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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Count Name: 06-14thStSW_I315WB TMC
Site Code: TMC-06
Start Date: 07/16/2014
Page No: 7

Peak Hour Data

07/16/2014 4:45 PM
Ending At
07/16/2014 5:45 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

14th St SW [N]

Out	In	Total
0	2	2
173	122	295
36	28	64
0	0	0
12	3	15
221	**155**	**376**

R	T	L	P
0	2	0	0
1	104	17	0
1	22	5	0
0	0	0	0
0	3	0	0
2	**131**	**22**	**0**

16th Ave SW [W]

Out	In	Total
1	0	1
12	17	29
3	7	10
0	0	0
3	3	6
19	**27**	**46**

L	T	R	P
0	0	0	0
1	4	12	0
2	1	4	0
0	0	0	0
0	0	3	1
3	**5**	**19**	**1**

I-315 WB [E]

Out	In	Total
1	2	3
140	617	757
31	155	186
0	0	0
1	18	19
173	**792**	**965**

R	T	L	P
0	1	1	0
113	8	496	0
23	2	130	0
0	0	0	0
6	1	11	0
142	**12**	**638**	**0**

14th St SW [S]

L	T	R	P
0	0	1	0
3	59	119	0
0	11	25	0
0	0	0	0
2	6	1	0
5	**76**	**146**	**0**

Out	In	Total
3	1	4
612	181	793
156	36	192
0	0	0
17	9	26
788	**227**	**1015**

Turning Movement Peak Hour Data Plot (4:45 PM)

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406-447-5000 scottr@rpa-hln.com

Count Name: 07-FoxFarm_I315 TMC
Site Code: TMC-07
Start Date: 07/16/2014

Turning Movement Data

Start Time	6th St SW					Fox Farm Rd					10th Ave S					I-315					
	Southbound					Northbound					Westbound					Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	17	15	21	0	53	79	33	12	0	124	20	78	14	0	112	8	140	32	0	180	469
7:15 AM	24	14	45	0	83	77	33	7	0	117	41	79	22	0	142	15	155	47	0	217	559
7:30 AM	22	15	36	0	73	103	58	16	0	177	28	99	21	0	148	15	211	45	0	271	669
7:45 AM	32	19	63	0	114	145	81	16	0	242	49	81	24	0	154	10	244	50	0	304	814
Hourly Total	95	63	165	0	323	404	205	51	0	660	138	337	81	0	556	48	750	174	0	972	2511
8:00 AM	26	33	37	0	96	93	38	5	0	136	26	70	24	0	120	9	128	43	0	180	532
8:15 AM	41	23	36	0	100	96	42	13	0	151	33	85	32	0	150	11	149	23	0	183	584
8:30 AM	36	22	37	0	95	82	45	15	0	142	26	97	25	0	148	15	147	30	0	192	577
8:45 AM	45	27	38	0	110	99	39	9	0	147	34	129	36	0	199	8	156	44	0	208	664
Hourly Total	148	105	148	0	401	370	164	42	0	576	119	381	117	0	617	43	580	140	0	763	2357
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	54	52	39	0	145	31	26	16	0	73	54	188	95	0	337	17	223	53	1	293	848
4:15 PM	77	68	43	0	188	63	24	26	1	113	64	164	85	0	313	21	160	52	0	233	847
4:30 PM	79	46	33	0	158	50	37	18	0	105	52	244	121	0	417	34	216	61	1	311	991
4:45 PM	101	64	38	0	203	49	36	15	1	100	55	166	95	0	316	23	163	69	0	255	874
Hourly Total	311	230	153	0	694	193	123	75	2	391	225	762	396	0	1383	95	762	235	2	1092	3560
5:00 PM	69	79	44	0	192	54	43	18	0	115	63	217	105	1	385	22	184	53	0	259	951
5:15 PM	76	85	38	0	199	74	39	20	0	133	80	247	165	0	492	24	143	59	0	226	1050
5:30 PM	84	74	40	0	198	58	34	18	0	110	60	217	94	1	371	13	166	53	0	232	911
5:45 PM	82	60	27	0	169	48	38	16	0	102	48	216	133	0	397	25	149	52	0	226	894
Hourly Total	311	298	149	0	758	234	154	72	0	460	251	897	497	2	1645	84	642	217	0	943	3806
Grand Total	865	696	615	0	2176	1201	646	240	2	2087	733	2377	1091	2	4201	270	2734	766	2	3770	12234
Approach %	39.8	32.0	28.3	-	-	57.5	31.0	11.5	-	-	17.4	56.6	26.0	-	-	7.2	72.5	20.3	-	-	-
Total %	7.1	5.7	5.0	-	17.8	9.8	5.3	2.0	-	17.1	6.0	19.4	8.9	-	34.3	2.2	22.3	6.3	-	30.8	-
Motorcycles	3	9	11	-	23	8	6	2	-	16	10	30	12	-	52	3	41	7	-	51	142
% Motorcycles	0.3	1.3	1.8	-	1.1	0.7	0.9	0.8	-	0.8	1.4	1.3	1.1	-	1.2	1.1	1.5	0.9	-	1.4	1.2
Cars	694	471	399	-	1564	1068	490	165	-	1723	461	1681	791	-	2933	177	1877	533	-	2587	8807
% Cars	80.2	67.7	64.9	-	71.9	88.9	75.9	68.8	-	82.6	62.9	70.7	72.5	-	69.8	65.6	68.7	69.6	-	68.6	72.0
Light Goods Vehicles	147	200	195	-	542	116	135	64	-	315	240	550	276	-	1066	81	680	196	-	957	2880
% Light Goods Vehicles	17.0	28.7	31.7	-	24.9	9.7	20.9	26.7	-	15.1	32.7	23.1	25.3	-	25.4	30.0	24.9	25.6	-	25.4	23.5
Buses	1	5	1	-	7	1	5	2	-	8	1	4	1	-	6	0	4	0	-	4	25
% Buses	0.1	0.7	0.2	-	0.3	0.1	0.8	0.8	-	0.4	0.1	0.2	0.1	-	0.1	0.0	0.1	0.0	-	0.1	0.2
Single-Unit Trucks	16	10	5	-	31	8	9	6	-	23	17	59	11	-	87	8	65	19	-	92	233
% Single-Unit Trucks	1.8	1.4	0.8	-	1.4	0.7	1.4	2.5	-	1.1	2.3	2.5	1.0	-	2.1	3.0	2.4	2.5	-	2.4	1.9
Articulated Trucks	4	1	4	-	9	0	0	1	-	1	4	53	0	-	57	0	67	11	-	78	145
% Articulated Trucks	0.5	0.1	0.7	-	0.4	0.0	0.0	0.4	-	0.0	0.5	2.2	0.0	-	1.4	0.0	2.5	1.4	-	2.1	1.2
Bicycles on Road	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	1	0	0	-	1	2

% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.2	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.4	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	2	-	-	-	-	2	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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Count Name: 07-FoxFarm_I315 TMC
Site Code: TMC-07
Start Date: 07/16/2014
Page No: 3

Turning Movement Data Plot

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

6th St SW [N]

Out	In	Total
23	23	46
1484	1564	3048
571	542	1113
6	7	13
61	40	101
2145	**2176**	**4321**

R	T	L	P
3	9	11	0
694	471	399	0
147	200	195	0
1	5	1	0
20	11	9	0
865	**696**	**615**	**0**

I-315 [W]

Out	In	Total
35	51	86
2540	2587	5127
761	957	1718
7	4	11
139	171	310
3482	**3770**	**7252**

L	T	R	P
7	41	3	0
533	1877	177	0
196	680	81	0
0	4	0	0
30	132	9	2
766	**2734**	**270**	**2**

10th Ave S [E]

Out	In	Total
60	52	112
3344	2933	6277
991	1066	2057
6	6	12
149	144	293
4550	**4201**	**8751**

R	T	L	P
10	30	12	0
461	1681	791	0
240	550	276	0
1	4	1	0
21	112	11	2
733	**2377**	**1091**	**2**

Fox Farm Rd [S]

L	T	R	P
2	6	8	0
165	490	1068	0
64	135	116	0
2	5	1	0
7	10	8	2
240	**646**	**1201**	**2**

Out	In	Total
24	16	40
1439	1723	3162
557	315	872
6	8	14
31	25	56
2057	**2087**	**4144**

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Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 07-FoxFarm_I315 TMC
Site Code: TMC-07
Start Date: 07/16/2014

Turning Movement Peak Hour Data (7:30 AM)

Start Time	6th St SW Southbound					Fox Farm Rd Northbound					10th Ave S Westbound					I-315 Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
7:30 AM	22	15	36	0	73	103	58	16	0	177	28	99	21	0	148	15	211	45	0	271	669
7:45 AM	32	19	63	0	114	145	81	16	0	242	49	81	24	0	154	10	244	50	0	304	814
8:00 AM	26	33	37	0	96	93	38	5	0	136	26	70	24	0	120	9	128	43	0	180	532
8:15 AM	41	23	36	0	100	96	42	13	0	151	33	85	32	0	150	11	149	23	0	183	584
Total	121	90	172	0	383	437	219	50	0	706	136	335	101	0	572	45	732	161	0	938	2599
Approach %	31.6	23.5	44.9	-	-	61.9	31.0	7.1	-	-	23.8	58.6	17.7	-	-	4.8	78.0	17.2	-	-	-
Total %	4.7	3.5	6.6	-	14.7	16.8	8.4	1.9	-	27.2	5.2	12.9	3.9	-	22.0	1.7	28.2	6.2	-	36.1	-
PHF	0.738	0.682	0.683	-	0.840	0.753	0.676	0.781	-	0.729	0.694	0.846	0.789	-	0.929	0.750	0.750	0.805	-	0.771	0.798
Motorcycles	0	2	4	-	6	5	1	0	-	6	2	5	0	-	7	0	3	0	-	3	22
% Motorcycles	0.0	2.2	2.3	-	1.6	1.1	0.5	0.0	-	0.8	1.5	1.5	0.0	-	1.2	0.0	0.4	0.0	-	0.3	0.8
Cars	79	62	114	-	255	391	185	30	-	606	76	238	66	-	380	32	493	120	-	645	1886
% Cars	65.3	68.9	66.3	-	66.6	89.5	84.5	60.0	-	85.8	55.9	71.0	65.3	-	66.4	71.1	67.3	74.5	-	68.8	72.6
Light Goods Vehicles	37	22	51	-	110	38	28	19	-	85	53	70	31	-	154	12	196	31	-	239	588
% Light Goods Vehicles	30.6	24.4	29.7	-	28.7	8.7	12.8	38.0	-	12.0	39.0	20.9	30.7	-	26.9	26.7	26.8	19.3	-	25.5	22.6
Buses	0	2	0	-	2	0	2	0	-	2	0	2	0	-	2	0	2	0	-	2	8
% Buses	0.0	2.2	0.0	-	0.5	0.0	0.9	0.0	-	0.3	0.0	0.6	0.0	-	0.3	0.0	0.3	0.0	-	0.2	0.3
Single-Unit Trucks	5	1	2	-	8	3	2	0	-	5	5	12	4	-	21	1	24	8	-	33	67
% Single-Unit Trucks	4.1	1.1	1.2	-	2.1	0.7	0.9	0.0	-	0.7	3.7	3.6	4.0	-	3.7	2.2	3.3	5.0	-	3.5	2.6
Articulated Trucks	0	1	1	-	2	0	0	1	-	1	0	8	0	-	8	0	14	2	-	16	27
% Articulated Trucks	0.0	1.1	0.6	-	0.5	0.0	0.0	2.0	-	0.1	0.0	2.4	0.0	-	1.4	0.0	1.9	1.2	-	1.7	1.0
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	0.5	0.0	-	0.1	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
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 07-FoxFarm_I315 TMC
Site Code: TMC-07
Start Date: 07/16/2014
Page No: 5

Peak Hour Data

07/16/2014 7:30 AM
Ending At
07/16/2014 8:30 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

6th St SW [N]

Out	In	Total
3	6	9
381	255	636
112	110	222
2	2	4
18	10	28
516	**383**	**899**

R	T	L	P
0	2	4	0
79	62	114	0
37	22	51	0
0	2	0	0
5	2	3	0
121	**90**	**172**	**0**

I-315 [W]

Out	In	Total
5	3	8
347	645	992
126	239	365
2	2	4
26	49	75
506	**938**	**1444**

L	T	R	P
0	3	0	0
120	493	32	0
31	196	12	0
0	2	0	0
10	38	1	0
161	**732**	**45**	**0**

10th Ave S [E]

Out	In	Total
12	7	19
998	380	1378
285	154	439
2	2	4
44	29	73
1341	**572**	**1913**

R	T	L	P
2	5	0	0
76	238	66	0
53	70	31	0
0	2	0	0
5	20	4	0
136	**335**	**101**	**0**

Fox Farm Rd [S]

L	T	R	P
0	1	5	0
30	185	391	0
19	28	38	0
0	2	0	0
1	3	3	0
50	**219**	**437**	**0**

Out	In	Total
2	6	8
160	606	766
65	85	150
2	2	4
7	7	14
236	**706**	**942**

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 07-FoxFarm_I315 TMC
Site Code: TMC-07
Start Date: 07/16/2014

Turning Movement Peak Hour Data (4:30 PM)

Start Time	6th St SW					Fox Farm Rd					10th Ave S					I-315					
	Southbound					Northbound					Westbound					Eastbound					
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
4:30 PM	79	46	33	0	158	50	37	18	0	105	52	244	121	0	417	34	216	61	1	311	991
4:45 PM	101	64	38	0	203	49	36	15	1	100	55	166	95	0	316	23	163	69	0	255	874
5:00 PM	69	79	44	0	192	54	43	18	0	115	63	217	105	1	385	22	184	53	0	259	951
5:15 PM	76	85	38	0	199	74	39	20	0	133	80	247	165	0	492	24	143	59	0	226	1050
Total	325	274	153	0	752	227	155	71	1	453	250	874	486	1	1610	103	706	242	1	1051	3866
Approach %	43.2	36.4	20.3	-	-	50.1	34.2	15.7	-	-	15.5	54.3	30.2	-	-	9.8	67.2	23.0	-	-	-
Total %	8.4	7.1	4.0	-	19.5	5.9	4.0	1.8	-	11.7	6.5	22.6	12.6	-	41.6	2.7	18.3	6.3	-	27.2	-
PHF	0.804	0.806	0.869	-	0.926	0.767	0.901	0.888	-	0.852	0.781	0.885	0.736	-	0.818	0.757	0.817	0.877	-	0.845	0.920
Motorcycles	1	3	3	-	7	1	2	1	-	4	4	11	9	-	24	2	13	6	-	21	56
% Motorcycles	0.3	1.1	2.0	-	0.9	0.4	1.3	1.4	-	0.9	1.6	1.3	1.9	-	1.5	1.9	1.8	2.5	-	2.0	1.4
Cars	279	186	98	-	563	202	113	53	-	368	178	612	344	-	1134	64	502	166	-	732	2797
% Cars	85.8	67.9	64.1	-	74.9	89.0	72.9	74.6	-	81.2	71.2	70.0	70.8	-	70.4	62.1	71.1	68.6	-	69.6	72.3
Light Goods Vehicles	38	82	50	-	170	23	36	15	-	74	64	217	130	-	411	33	164	64	-	261	916
% Light Goods Vehicles	11.7	29.9	32.7	-	22.6	10.1	23.2	21.1	-	16.3	25.6	24.8	26.7	-	25.5	32.0	23.2	26.4	-	24.8	23.7
Buses	0	1	0	-	1	0	1	0	-	1	0	0	1	-	1	0	1	0	-	1	4
% Buses	0.0	0.4	0.0	-	0.1	0.0	0.6	0.0	-	0.2	0.0	0.0	0.2	-	0.1	0.0	0.1	0.0	-	0.1	0.1
Single-Unit Trucks	4	2	0	-	6	1	3	2	-	6	3	19	2	-	24	3	13	4	-	20	56
% Single-Unit Trucks	1.2	0.7	0.0	-	0.8	0.4	1.9	2.8	-	1.3	1.2	2.2	0.4	-	1.5	2.9	1.8	1.7	-	1.9	1.4
Articulated Trucks	3	0	2	-	5	0	0	0	-	0	1	15	0	-	16	0	13	2	-	15	36
% Articulated Trucks	0.9	0.0	1.3	-	0.7	0.0	0.0	0.0	-	0.0	0.4	1.7	0.0	-	1.0	0.0	1.8	0.8	-	1.4	0.9
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1	0	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	1.0	0.0	0.0	-	0.1	0.0
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	1	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 07-FoxFarm_I315 TMC
Site Code: TMC-07
Start Date: 07/16/2014
Page No: 7

Peak Hour Data

07/16/2014 4:30 PM
Ending At
07/16/2014 5:30 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

6th St SW [N]

Out	In	Total
12	7	19
457	563	1020
164	170	334
1	1	2
13	11	24
647	**752**	**1399**

R	T	L	P
1	3	3	0
279	186	98	0
38	82	50	0
0	1	0	0
7	2	2	0
325	**274**	**153**	**0**

I-315 [W]

Out	In	Total
13	21	34
944	732	1676
270	261	531
0	1	1
43	36	79
1270	**1051**	**2321**

L	T	R	P
6	13	2	0
166	502	64	0
64	164	33	0
0	1	0	0
6	26	4	1
242	**706**	**103**	**1**

10th Ave S [E]

Out	In	Total
17	24	41
802	1134	1936
237	411	648
1	1	2
29	40	69
1086	**1610**	**2696**

R	T	L	P
4	11	9	0
178	612	344	0
64	217	130	0
0	0	1	0
4	34	2	1
250	**874**	**486**	**1**

Fox Farm Rd [S]

L	T	R	P
1	2	1	0
53	113	202	0
15	36	23	0
0	1	0	0
2	3	1	1
71	**155**	**227**	**1**

Out	In	Total
14	4	18
594	368	962
245	74	319
2	1	3
8	6	14
863	**453**	**1316**

Turning Movement Peak Hour Data Plot (4:30 PM)

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Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 08-CentralAve_I15SB TMC
Site Code: TMC-08
Start Date: 07/16/2014
Page No: 1

Turning Movement Data

Start Time	I-15 SB Off Southbound					I-15 SB On Northbound		Central Ave W Westbound				Central Ave W Eastbound				
	Right	Thru	Left	Peds	App. Total	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
7:00 AM	3	0	31	0	34	0	0	9	30	0	39	9	35	0	44	117
7:15 AM	1	0	37	0	38	0	0	19	28	0	47	13	33	0	46	131
7:30 AM	2	0	38	0	40	0	0	27	24	0	51	8	69	0	77	168
7:45 AM	1	0	35	0	36	0	0	22	40	0	62	12	47	0	59	157
Hourly Total	7	0	141	0	148	0	0	77	122	0	199	42	184	0	226	573
8:00 AM	2	0	20	0	22	0	0	20	31	0	51	6	42	0	48	121
8:15 AM	0	0	19	0	19	0	0	20	33	0	53	7	42	0	49	121
8:30 AM	0	0	20	0	20	0	0	23	28	0	51	6	29	0	35	106
8:45 AM	0	0	20	0	20	2	0	21	35	0	56	7	33	0	40	116
Hourly Total	2	0	79	0	81	2	0	84	127	0	211	26	146	0	172	464
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	1	1	26	0	28	0	0	59	46	0	105	10	44	0	54	187
4:15 PM	2	0	13	0	15	0	0	73	44	0	117	5	37	0	42	174
4:30 PM	0	0	23	0	23	0	0	68	53	0	121	7	49	0	56	200
4:45 PM	0	0	14	3	14	0	0	61	65	0	126	2	40	0	42	182
Hourly Total	3	1	76	3	80	0	0	261	208	0	469	24	170	0	194	743
5:00 PM	2	0	16	0	18	0	0	75	52	0	127	7	40	0	47	192
5:15 PM	1	0	17	1	18	1	0	86	64	0	150	5	49	0	54	222
5:30 PM	1	0	15	0	16	0	0	66	64	0	130	9	43	0	52	198
5:45 PM	2	0	18	1	20	0	0	72	50	0	122	9	34	0	43	185
Hourly Total	6	0	66	2	72	1	0	299	230	0	529	30	166	0	196	797
Grand Total	18	1	362	5	381	3	0	721	687	0	1408	122	666	0	788	2577
Approach %	4.7	0.3	95.0	-	-	-	-	51.2	48.8	-	-	15.5	84.5	-	-	-
Total %	0.7	0.0	14.0	-	14.8	-	0.0	28.0	26.7	-	54.6	4.7	25.8	-	30.6	-
Motorcycles	0	0	3	-	3	-	0	18	9	-	27	1	17	-	18	48
% Motorcycles	0.0	0.0	0.8	-	0.8	-	-	2.5	1.3	-	1.9	0.8	2.6	-	2.3	1.9
Cars	8	1	247	-	256	-	0	476	391	-	867	81	386	-	467	1590
% Cars	44.4	100.0	68.2	-	67.2	-	-	66.0	56.9	-	61.6	66.4	58.0	-	59.3	61.7
Light Goods Vehicles	10	0	95	-	105	-	0	200	225	-	425	36	240	-	276	806
% Light Goods Vehicles	55.6	0.0	26.2	-	27.6	-	-	27.7	32.8	-	30.2	29.5	36.0	-	35.0	31.3
Buses	0	0	0	-	0	-	0	1	1	-	2	0	1	-	1	3
% Buses	0.0	0.0	0.0	-	0.0	-	-	0.1	0.1	-	0.1	0.0	0.2	-	0.1	0.1
Single-Unit Trucks	0	0	7	-	7	-	0	13	28	-	41	4	10	-	14	62
% Single-Unit Trucks	0.0	0.0	1.9	-	1.8	-	-	1.8	4.1	-	2.9	3.3	1.5	-	1.8	2.4
Articulated Trucks	0	0	10	-	10	-	0	13	33	-	46	0	12	-	12	68
% Articulated Trucks	0.0	0.0	2.8	-	2.6	-	-	1.8	4.8	-	3.3	0.0	1.8	-	1.5	2.6
Bicycles on Road	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

Pedestrians	-	-	-	5	-	3	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	100.0	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 08-CentralAve_I15SB TMC
Site Code: TMC-08
Start Date: 07/16/2014
Page No: 3

I-15 SB Off [N]

Out	In	Total
0	3	3
0	256	256
0	105	105
0	0	0
0	17	17
0	**381**	**381**

R	T	L	P
0	0	3	0
8	1	247	0
10	0	95	0
0	0	0	0
0	0	17	5
18	**1**	**362**	**5**

Central Ave W [W]

Out	In	Total
18	18	36
484	467	951
210	276	486
1	1	2
26	26	52
739	**788**	**1527**

P	R	T
0	1	17
0	81	386
0	36	240
0	0	1
0	4	22
0	**122**	**666**

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

T	L	P
18	9	0
476	391	0
200	225	0
1	1	0
26	61	0
721	**687**	**0**

Central Ave W [E]

Out	In	Total
20	27	47
633	867	1500
335	425	760
1	2	3
39	87	126
1028	**1408**	**2436**

P
0
0
0
0
3
3

Out	In	Total
10	0	10
473	0	473
261	0	261
1	0	1
65	0	65
810	**0**	**810**

I-15 SB On [S]

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 08-CentralAve_I15SB TMC
Site Code: TMC-08
Start Date: 07/16/2014

Turning Movement Peak Hour Data (7:15 AM)

Start Time	I-15 SB Off Southbound					I-15 SB On Northbound		Central Ave W Westbound				Central Ave W Eastbound				
	Right	Thru	Left	Peds	App. Total	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
7:15 AM	1	0	37	0	38	0	0	19	28	0	47	13	33	0	46	131
7:30 AM	2	0	38	0	40	0	0	27	24	0	51	8	69	0	77	168
7:45 AM	1	0	35	0	36	0	0	22	40	0	62	12	47	0	59	157
8:00 AM	2	0	20	0	22	0	0	20	31	0	51	6	42	0	48	121
Total	6	0	130	0	136	0	0	88	123	0	211	39	191	0	230	577
Approach %	4.4	0.0	95.6	-	-	-	-	41.7	58.3	-	-	17.0	83.0	-	-	-
Total %	1.0	0.0	22.5	-	23.6	-	0.0	15.3	21.3	-	36.6	6.8	33.1	-	39.9	-
PHF	0.750	0.000	0.855	-	0.850	-	0.000	0.815	0.769	-	0.851	0.750	0.692	-	0.747	0.859
Motorcycles	0	0	1	-	1	-	0	1	0	-	1	1	4	-	5	7
% Motorcycles	0.0	-	0.8	-	0.7	-	-	1.1	0.0	-	0.5	2.6	2.1	-	2.2	1.2
Cars	3	0	96	-	99	-	0	47	63	-	110	26	109	-	135	344
% Cars	50.0	-	73.8	-	72.8	-	-	53.4	51.2	-	52.1	66.7	57.1	-	58.7	59.6
Light Goods Vehicles	3	0	30	-	33	-	0	29	52	-	81	12	71	-	83	197
% Light Goods Vehicles	50.0	-	23.1	-	24.3	-	-	33.0	42.3	-	38.4	30.8	37.2	-	36.1	34.1
Buses	0	0	0	-	0	-	0	1	0	-	1	0	1	-	1	2
% Buses	0.0	-	0.0	-	0.0	-	-	1.1	0.0	-	0.5	0.0	0.5	-	0.4	0.3
Single-Unit Trucks	0	0	1	-	1	-	0	1	5	-	6	0	2	-	2	9
% Single-Unit Trucks	0.0	-	0.8	-	0.7	-	-	1.1	4.1	-	2.8	0.0	1.0	-	0.9	1.6
Articulated Trucks	0	0	2	-	2	-	0	9	3	-	12	0	4	-	4	18
% Articulated Trucks	0.0	-	1.5	-	1.5	-	-	10.2	2.4	-	5.7	0.0	2.1	-	1.7	3.1
Bicycles on Road	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
Pedestrians	-	-	-	0	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 08-CentralAve_I15SB TMC
Site Code: TMC-08
Start Date: 07/16/2014
Page No: 5

Peak Hour Data

07/16/2014 7:15 AM
Ending At
07/16/2014 8:15 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 SB Off [N]

Out	In	Total
0	1	1
0	99	99
0	33	33
0	0	0
0	3	3
0	**136**	**136**

R	T	L	P
0	0	1	0
3	0	96	0
3	0	30	0
0	0	0	0
0	0	3	0
6	**0**	**130**	**0**

Central Ave W [W]

Out	In	Total
1	5	6
50	135	185
32	83	115
1	1	2
10	6	16
94	**230**	**324**

P	R	T
0	1	4
0	26	109
0	12	71
0	0	1
0	0	6
0	**39**	**191**

Central Ave W [E]

Out	In	Total
5	1	6
205	110	315
101	81	182
1	1	2
9	18	27
321	**211**	**532**

T	L	P
1	0	0
47	63	0
29	52	0
1	0	0
10	8	0
88	**123**	**0**

P
0
0
0
0
0
0

Out	In	Total
1	0	1
89	0	89
64	0	64
0	0	0
8	0	8
162	**0**	**162**

I-15 SB On [S]

Turning Movement Peak Hour Data Plot (7:15 AM)

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 08-CentralAve_I15SB TMC
Site Code: TMC-08
Start Date: 07/16/2014

Turning Movement Peak Hour Data (5:00 PM)

	I-15 SB Off					I-15 SB On		Central Ave W				Central Ave W				
	Southbound					Northbound		Westbound				Eastbound				
Start Time	Right	Thru	Left	Peds	App. Total	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
5:00 PM	2	0	16	0	18	0	0	75	52	0	127	7	40	0	47	192
5:15 PM	1	0	17	1	18	1	0	86	64	0	150	5	49	0	54	222
5:30 PM	1	0	15	0	16	0	0	66	64	0	130	9	43	0	52	198
5:45 PM	2	0	18	1	20	0	0	72	50	0	122	9	34	0	43	185
Total	6	0	66	2	72	1	0	299	230	0	529	30	166	0	196	797
Approach %	8.3	0.0	91.7	-	-	-	-	56.5	43.5	-	-	15.3	84.7	-	-	-
Total %	0.8	0.0	8.3	-	9.0	-	0.0	37.5	28.9	-	66.4	3.8	20.8	-	24.6	-
PHF	0.750	0.000	0.917	-	0.900	-	0.000	0.869	0.898	-	0.882	0.833	0.847	-	0.907	0.898
Motorcycles	0	0	2	-	2	-	0	11	4	-	15	0	9	-	9	26
% Motorcycles	0.0	-	3.0	-	2.8	-	-	3.7	1.7	-	2.8	0.0	5.4	-	4.6	3.3
Cars	2	0	38	-	40	-	0	230	132	-	362	20	98	-	118	520
% Cars	33.3	-	57.6	-	55.6	-	-	76.9	57.4	-	68.4	66.7	59.0	-	60.2	65.2
Light Goods Vehicles	4	0	22	-	26	-	0	55	78	-	133	10	58	-	68	227
% Light Goods Vehicles	66.7	-	33.3	-	36.1	-	-	18.4	33.9	-	25.1	33.3	34.9	-	34.7	28.5
Buses	0	0	0	-	0	-	0	0	1	-	1	0	0	-	0	1
% Buses	0.0	-	0.0	-	0.0	-	-	0.0	0.4	-	0.2	0.0	0.0	-	0.0	0.1
Single-Unit Trucks	0	0	1	-	1	-	0	3	9	-	12	0	1	-	1	14
% Single-Unit Trucks	0.0	-	1.5	-	1.4	-	-	1.0	3.9	-	2.3	0.0	0.6	-	0.5	1.8
Articulated Trucks	0	0	3	-	3	-	0	0	6	-	6	0	0	-	0	9
% Articulated Trucks	0.0	-	4.5	-	4.2	-	-	0.0	2.6	-	1.1	0.0	0.0	-	0.0	1.1
Bicycles on Road	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
Pedestrians	-	-	-	2	-	1	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	100.0	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 08-CentralAve_I15SB TMC
Site Code: TMC-08
Start Date: 07/16/2014

I-15 SB Off [N]

Out	In	Total
0	2	2
0	40	40
0	26	26
0	0	0
0	4	4
0	**72**	**72**

R	T	L	P
0	0	2	0
2	0	38	0
4	0	22	0
0	0	0	0
0	0	4	2
6	**0**	**66**	**2**

Central Ave W [W]

Out	In	Total
11	9	20
232	118	350
59	68	127
0	0	0
3	1	4
305	**196**	**501**

T	R	P
9	0	0
98	20	0
58	10	0
0	0	0
1	0	0
166	**30**	**0**

Peak Hour Data

07/16/2014 5:00 PM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Central Ave W [E]

Out	In	Total
11	15	26
136	362	498
80	133	213
0	1	1
5	18	23
232	**529**	**761**

T	L	P
11	4	0
230	132	0
55	78	0
0	1	0
3	15	0
299	**230**	**0**

I-15 SB On [S]

P
0
0
0
0
1
1

Out	In	Total
4	0	4
152	0	152
88	0	88
1	0	1
15	0	15
260	**0**	**260**

Turning Movement Peak Hour Data Plot (5:00 PM)

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Robert Peccia & Associates
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406-447-5000 scottr@rpa-hln.com

Count Name: 09-CentralAve_I15NB TMC
Site Code: TMC-09
Start Date: 07/16/2014
Page No: 1

Turning Movement Data

Start Time	I-15 NB On		I-15 NB Off					Central Ave W				Central Ave W				
	Southbound		Northbound					Westbound				Eastbound				
	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	0	0	31	1	0	0	32	8	39	0	47	64	3	0	67	146
7:15 AM	0	0	27	0	7	0	34	6	41	0	47	70	0	0	70	151
7:30 AM	0	0	52	0	7	0	59	7	42	0	49	106	2	0	108	216
7:45 AM	0	0	42	0	1	0	43	11	60	0	71	79	1	0	80	194
Hourly Total	0	0	152	1	15	0	168	32	182	0	214	319	6	0	325	707
8:00 AM	0	0	39	0	3	0	42	11	52	0	63	61	1	0	62	167
8:15 AM	0	0	44	0	4	0	48	15	48	0	63	59	2	0	61	172
8:30 AM	0	0	32	0	3	0	35	11	45	0	56	54	0	0	54	145
8:45 AM	0	0	34	0	9	0	43	4	49	0	53	50	0	0	50	146
Hourly Total	0	0	149	0	19	0	168	41	194	0	235	224	3	0	227	630
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	0	61	0	7	0	68	19	96	0	115	70	1	0	71	254
4:15 PM	0	0	44	0	16	0	60	18	99	0	117	48	1	0	49	226
4:30 PM	0	0	56	0	12	0	68	20	117	0	137	72	1	0	73	278
4:45 PM	0	0	36	0	10	0	46	28	110	0	138	55	0	0	55	239
Hourly Total	0	0	197	0	45	0	242	85	422	0	507	245	3	0	248	997
5:00 PM	0	0	35	0	15	0	50	34	118	0	152	58	1	0	59	261
5:15 PM	1	0	43	0	20	0	63	31	126	0	157	64	3	0	67	287
5:30 PM	0	0	47	0	8	0	55	30	124	0	154	60	1	0	61	270
5:45 PM	1	0	34	0	10	0	44	26	110	0	136	48	6	0	54	234
Hourly Total	2	0	159	0	53	0	212	121	478	0	599	230	11	0	241	1052
Grand Total	2	0	657	1	132	0	790	279	1276	0	1555	1018	23	0	1041	3386
Approach %	-	-	83.2	0.1	16.7	-	-	17.9	82.1	-	-	97.8	2.2	-	-	-
Total %	-	0.0	19.4	0.0	3.9	-	23.3	8.2	37.7	-	45.9	30.1	0.7	-	30.7	-
Motorcycles	-	0	8	0	1	-	9	6	24	-	30	17	0	-	17	56
% Motorcycles	-	-	1.2	0.0	0.8	-	1.1	2.2	1.9	-	1.9	1.7	0.0	-	1.6	1.7
Cars	-	0	382	1	92	-	475	201	822	-	1023	637	15	-	652	2150
% Cars	-	-	58.1	100.0	69.7	-	60.1	72.0	64.4	-	65.8	62.6	65.2	-	62.6	63.5
Light Goods Vehicles	-	0	205	0	34	-	239	60	337	-	397	325	6	-	331	967
% Light Goods Vehicles	-	-	31.2	0.0	25.8	-	30.3	21.5	26.4	-	25.5	31.9	26.1	-	31.8	28.6
Buses	-	0	1	0	0	-	1	0	2	-	2	1	0	-	1	4
% Buses	-	-	0.2	0.0	0.0	-	0.1	0.0	0.2	-	0.1	0.1	0.0	-	0.1	0.1
Single-Unit Trucks	-	0	25	0	5	-	30	8	43	-	51	16	2	-	18	99
% Single-Unit Trucks	-	-	3.8	0.0	3.8	-	3.8	2.9	3.4	-	3.3	1.6	8.7	-	1.7	2.9
Articulated Trucks	-	0	36	0	0	-	36	4	47	-	51	19	0	-	19	106
% Articulated Trucks	-	-	5.5	0.0	0.0	-	4.6	1.4	3.7	-	3.3	1.9	0.0	-	1.8	3.1
Bicycles on Road	-	0	0	0	0	-	0	0	1	-	1	3	0	-	3	4
% Bicycles on Road	-	-	0.0	0.0	0.0	-	0.0	0.0	0.1	-	0.1	0.3	0.0	-	0.3	0.1

Pedestrians	2	-	-	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
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Count Name: 09-CentralAve_I15NB TMC
Site Code: TMC-09
Start Date: 07/16/2014
Page No: 3

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 NB On [N]

Out	In	Total
6	0	6
217	0	217
66	0	66
0	0	0
14	0	14
303	**0**	**303**

P
0
0
0
0
2
2

Central Ave W [W]

Out	In	Total
25	17	42
914	652	1566
371	331	702
2	1	3
96	40	136
1408	**1041**	**2449**

L	T	P
0	17	0
15	637	0
6	325	0
0	1	0
2	38	0
23	**1018**	**0**

Central Ave W [E]

Out	In	Total
25	30	55
1019	1023	2042
530	397	927
2	2	4
99	103	202
1675	**1555**	**3230**

R	T	P
6	24	0
201	822	0
60	337	0
0	2	0
12	91	0
279	**1276**	**0**

I-15 NB Off [S]

L	T	R	P
1	0	8	0
92	1	382	0
34	0	205	0
0	0	1	0
5	0	61	0
132	**1**	**657**	**0**

Out	In	Total
0	9	9
0	475	475
0	239	239
0	1	1
0	66	66
0	**790**	**790**

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 09-CentralAve_I15NB TMC
Site Code: TMC-09
Start Date: 07/16/2014
Page No: 4

Turning Movement Peak Hour Data (7:30 AM)

Start Time	I-15 NB On Southbound		I-15 NB Off Northbound					Central Ave W Westbound				Central Ave W Eastbound				
	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
7:30 AM	0	0	52	0	7	0	59	7	42	0	49	106	2	0	108	216
7:45 AM	0	0	42	0	1	0	43	11	60	0	71	79	1	0	80	194
8:00 AM	0	0	39	0	3	0	42	11	52	0	63	61	1	0	62	167
8:15 AM	0	0	44	0	4	0	48	15	48	0	63	59	2	0	61	172
Total	0	0	177	0	15	0	192	44	202	0	246	305	6	0	311	749
Approach %	-	-	92.2	0.0	7.8	-	-	17.9	82.1	-	-	98.1	1.9	-	-	-
Total %	-	0.0	23.6	0.0	2.0	-	25.6	5.9	27.0	-	32.8	40.7	0.8	-	41.5	-
PHF	-	0.000	0.851	0.000	0.536	-	0.814	0.733	0.842	-	0.866	0.719	0.750	-	0.720	0.867
Motorcycles	-	0	0	0	0	-	0	1	0	-	1	2	0	-	2	3
% Motorcycles	-	-	0.0	-	0.0	-	0.0	2.3	0.0	-	0.4	0.7	0.0	-	0.6	0.4
Cars	-	0	89	0	11	-	100	23	120	-	143	185	3	-	188	431
% Cars	-	-	50.3	-	73.3	-	52.1	52.3	59.4	-	58.1	60.7	50.0	-	60.5	57.5
Light Goods Vehicles	-	0	69	0	4	-	73	14	57	-	71	108	2	-	110	254
% Light Goods Vehicles	-	-	39.0	-	26.7	-	38.0	31.8	28.2	-	28.9	35.4	33.3	-	35.4	33.9
Buses	-	0	0	0	0	-	0	0	1	-	1	1	0	-	1	2
% Buses	-	-	0.0	-	0.0	-	0.0	0.0	0.5	-	0.4	0.3	0.0	-	0.3	0.3
Single-Unit Trucks	-	0	7	0	0	-	7	3	10	-	13	2	1	-	3	23
% Single-Unit Trucks	-	-	4.0	-	0.0	-	3.6	6.8	5.0	-	5.3	0.7	16.7	-	1.0	3.1
Articulated Trucks	-	0	12	0	0	-	12	3	13	-	16	4	0	-	4	32
% Articulated Trucks	-	-	6.8	-	0.0	-	6.3	6.8	6.4	-	6.5	1.3	0.0	-	1.3	4.3
Bicycles on Road	-	0	0	0	0	-	0	0	1	-	1	3	0	-	3	4
% Bicycles on Road	-	-	0.0	-	0.0	-	0.0	0.0	0.5	-	0.4	1.0	0.0	-	1.0	0.5
Pedestrians	0	-	-	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 09-CentralAve_I15NB TMC
Site Code: TMC-09
Start Date: 07/16/2014
Page No: 5

Peak Hour Data

07/16/2014 7:30 AM
Ending At
07/16/2014 8:30 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 NB On [N]

Out	In	Total
1	0	1
26	0	26
16	0	16
0	0	0
7	0	7
50	**0**	**50**

P
0
0
0
0
0
0

Central Ave W [W]

Out	In	Total
0	2	2
131	188	319
61	110	171
1	1	2
24	10	34
217	**311**	**528**

L	T	P
0	2	0
3	185	0
2	108	0
0	1	0
1	9	0
6	**305**	**0**

Central Ave W [E]

R	T	P
1	0	0
23	120	0
14	57	0
0	1	0
6	24	0
44	**202**	**0**

Out	In	Total
2	1	3
274	143	417
177	71	248
1	1	2
28	30	58
482	**246**	**728**

I-15 NB Off [S]

L	T	R	P
0	0	0	0
11	0	89	0
4	0	69	0
0	0	0	0
0	0	19	0
15	**0**	**177**	**0**

Out	In	Total
0	0	0
0	100	100
0	73	73
0	0	0
0	19	19
0	**192**	**192**

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 09-CentralAve_I15NB TMC
Site Code: TMC-09
Start Date: 07/16/2014

Turning Movement Peak Hour Data (4:30 PM)

Start Time	I-15 NB On Southbound		I-15 NB Off Northbound					Central Ave W Westbound				Central Ave W Eastbound				
	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
4:30 PM	0	0	56	0	12	0	68	20	117	0	137	72	1	0	73	278
4:45 PM	0	0	36	0	10	0	46	28	110	0	138	55	0	0	55	239
5:00 PM	0	0	35	0	15	0	50	34	118	0	152	58	1	0	59	261
5:15 PM	1	0	43	0	20	0	63	31	126	0	157	64	3	0	67	287
Total	1	0	170	0	57	0	227	113	471	0	584	249	5	0	254	1065
Approach %	-	-	74.9	0.0	25.1	-	-	19.3	80.7	-	-	98.0	2.0	-	-	-
Total %	-	0.0	16.0	0.0	5.4	-	21.3	10.6	44.2	-	54.8	23.4	0.5	-	23.8	-
PHF	-	0.000	0.759	0.000	0.713	-	0.835	0.831	0.935	-	0.930	0.865	0.417	-	0.870	0.928
Motorcycles	-	0	3	0	0	-	3	3	15	-	18	6	0	-	6	27
% Motorcycles	-	-	1.8	-	0.0	-	1.3	2.7	3.2	-	3.1	2.4	0.0	-	2.4	2.5
Cars	-	0	106	0	43	-	149	92	315	-	407	156	4	-	160	716
% Cars	-	-	62.4	-	75.4	-	65.6	81.4	66.9	-	69.7	62.7	80.0	-	63.0	67.2
Light Goods Vehicles	-	0	49	0	13	-	62	17	119	-	136	82	1	-	83	281
% Light Goods Vehicles	-	-	28.8	-	22.8	-	27.3	15.0	25.3	-	23.3	32.9	20.0	-	32.7	26.4
Buses	-	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
Single-Unit Trucks	-	0	6	0	1	-	7	1	12	-	13	3	0	-	3	23
% Single-Unit Trucks	-	-	3.5	-	1.8	-	3.1	0.9	2.5	-	2.2	1.2	0.0	-	1.2	2.2
Articulated Trucks	-	0	6	0	0	-	6	0	10	-	10	2	0	-	2	18
% Articulated Trucks	-	-	3.5	-	0.0	-	2.6	0.0	2.1	-	1.7	0.8	0.0	-	0.8	1.7
Bicycles on Road	-	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
Pedestrians	1	-	-	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 09-CentralAve_I15NB TMC
Site Code: TMC-09
Start Date: 07/16/2014
Page No: 7

Peak Hour Data

07/16/2014 4:30 PM
Ending At
07/16/2014 5:30 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 NB On [N]

Out	In	Total
3	0	3
96	0	96
18	0	18
0	0	0
1	0	1
118	**0**	**118**

P
0
0
0
0
1
1

Central Ave W [W]

Out	In	Total
15	6	21
358	160	518
132	83	215
0	0	0
23	5	28
528	**254**	**782**

L	T	P
0	6	0
4	156	0
1	82	0
0	0	0
0	5	0
5	**249**	**0**

Central Ave W [E]

Out	In	Total
9	18	27
262	407	669
131	136	267
0	0	0
17	23	40
419	**584**	**1003**

R	T	P
3	15	0
92	315	0
17	119	0
0	0	0
1	22	0
113	**471**	**0**

L	T	R	P
0	0	3	0
43	0	106	0
13	0	49	0
0	0	0	0
1	0	12	0
57	**0**	**170**	**0**

Out	In	Total
0	3	3
0	149	149
0	62	62
0	0	0
0	13	13
0	**227**	**227**

I-15 NB Off [S]

Turning Movement Peak Hour Data Plot (4:30 PM)

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Robert Peccia & Associates
825 Custer Ave

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Count Name: 10-CentralAve_VaughnRd TMC
Site Code: TMC-10
Start Date: 07/16/2014

Turning Movement Data

Start Time	Vaughn Rd Southbound				Central Ave W Westbound				Central Ave W Eastbound				
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	10	17	0	27	9	39	0	48	73	13	0	86	161
7:15 AM	13	13	0	26	10	33	0	43	95	12	0	107	176
7:30 AM	14	19	0	33	17	35	0	52	128	20	0	148	233
7:45 AM	16	25	0	41	21	54	0	75	110	21	0	131	247
Hourly Total	53	74	0	127	57	161	0	218	406	66	0	472	817
8:00 AM	19	21	0	40	14	44	0	58	85	12	0	97	195
8:15 AM	11	12	0	23	13	51	0	64	87	18	0	105	192
8:30 AM	15	8	0	23	16	43	0	59	71	12	0	83	165
8:45 AM	10	13	0	23	18	41	0	59	70	15	0	85	167
Hourly Total	55	54	0	109	61	179	0	240	313	57	0	370	719
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	27	19	0	46	19	90	0	109	99	30	0	129	284
4:15 PM	24	18	0	42	25	96	0	121	77	15	0	92	255
4:30 PM	32	26	0	58	12	104	0	116	111	17	0	128	302
4:45 PM	30	13	1	43	17	106	0	123	74	22	0	96	262
Hourly Total	113	76	1	189	73	396	0	469	361	84	0	445	1103
5:00 PM	31	18	0	49	26	119	0	145	71	16	0	87	281
5:15 PM	28	11	0	39	21	133	0	154	95	11	0	106	299
5:30 PM	34	20	1	54	18	116	0	134	87	19	0	106	294
5:45 PM	33	11	0	44	15	101	0	116	62	14	0	76	236
Hourly Total	126	60	1	186	80	469	0	549	315	60	0	375	1110
Grand Total	347	264	2	611	271	1205	0	1476	1395	267	0	1662	3749
Approach %	56.8	43.2	-	-	18.4	81.6	-	-	83.9	16.1	-	-	-
Total %	9.3	7.0	-	16.3	7.2	32.1	-	39.4	37.2	7.1	-	44.3	-
Motorcycles	2	2	-	4	2	24	-	26	22	2	-	24	54
% Motorcycles	0.6	0.8	-	0.7	0.7	2.0	-	1.8	1.6	0.7	-	1.4	1.4
Cars	190	179	-	369	169	765	-	934	890	146	-	1036	2339
% Cars	54.8	67.8	-	60.4	62.4	63.5	-	63.3	63.8	54.7	-	62.3	62.4
Light Goods Vehicles	139	70	-	209	82	338	-	420	402	99	-	501	1130
% Light Goods Vehicles	40.1	26.5	-	34.2	30.3	28.0	-	28.5	28.8	37.1	-	30.1	30.1
Buses	0	1	-	1	2	3	-	5	2	0	-	2	8
% Buses	0.0	0.4	-	0.2	0.7	0.2	-	0.3	0.1	0.0	-	0.1	0.2
Single-Unit Trucks	10	11	-	21	10	26	-	36	40	10	-	50	107
% Single-Unit Trucks	2.9	4.2	-	3.4	3.7	2.2	-	2.4	2.9	3.7	-	3.0	2.9
Articulated Trucks	6	1	-	7	6	48	-	54	37	10	-	47	108
% Articulated Trucks	1.7	0.4	-	1.1	2.2	4.0	-	3.7	2.7	3.7	-	2.8	2.9
Bicycles on Road	0	0	-	0	0	1	-	1	2	0	-	2	3
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.1	-	0.1	0.1	0.0	-	0.1	0.1

Pedestrians	-	-	2	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 10-CentralAve_VaughnRd TMC
Site Code: TMC-10
Start Date: 07/16/2014
Page No: 3

Vaughn Rd [N]		
Out	In	Total
4	4	8
315	369	684
181	209	390
2	1	3
36	28	64
538	**611**	**1149**

2	2	0
190	179	0
139	70	0
0	1	0
16	12	2
347	**264**	**2**
R	L	P

Central Ave W [W]		
Out	In	Total
26	24	50
955	1036	1991
477	501	978
3	2	5
91	99	190
1552	**1662**	**3214**

0	22	2
0	890	146
0	402	99
0	2	0
0	79	20
0	**1395**	**267**
P	T	L

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

R	T	P
271	**1205**	**0**
16	75	0
2	3	0
82	338	0
169	765	0
2	24	0

Central Ave W [E]		
1659	**1476**	**3135**
91	91	182
3	5	8
472	420	892
1069	934	2003
24	26	50
Out	In	Total

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**
Out	In	Total
Fake Approach [S]		

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

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Count Name: 10-CentralAve_VaughnRd TMC
Site Code: TMC-10
Start Date: 07/16/2014

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Vaughn Rd Southbound				Central Ave W Westbound				Central Ave W Eastbound				
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
7:30 AM	14	19	0	33	17	35	0	52	128	20	0	148	233
7:45 AM	16	25	0	41	21	54	0	75	110	21	0	131	247
8:00 AM	19	21	0	40	14	44	0	58	85	12	0	97	195
8:15 AM	11	12	0	23	13	51	0	64	87	18	0	105	192
Total	60	77	0	137	65	184	0	249	410	71	0	481	867
Approach %	43.8	56.2	-	-	26.1	73.9	-	-	85.2	14.8	-	-	-
Total %	6.9	8.9	-	15.8	7.5	21.2	-	28.7	47.3	8.2	-	55.5	-
PHF	0.789	0.770	-	0.835	0.774	0.852	-	0.830	0.801	0.845	-	0.813	0.878
Motorcycles	0	0	-	0	1	1	-	2	3	0	-	3	5
% Motorcycles	0.0	0.0	-	0.0	1.5	0.5	-	0.8	0.7	0.0	-	0.6	0.6
Cars	29	49	-	78	36	92	-	128	255	35	-	290	496
% Cars	48.3	63.6	-	56.9	55.4	50.0	-	51.4	62.2	49.3	-	60.3	57.2
Light Goods Vehicles	27	21	-	48	23	67	-	90	129	31	-	160	298
% Light Goods Vehicles	45.0	27.3	-	35.0	35.4	36.4	-	36.1	31.5	43.7	-	33.3	34.4
Buses	0	0	-	0	1	2	-	3	1	0	-	1	4
% Buses	0.0	0.0	-	0.0	1.5	1.1	-	1.2	0.2	0.0	-	0.2	0.5
Single-Unit Trucks	3	6	-	9	2	3	-	5	10	2	-	12	26
% Single-Unit Trucks	5.0	7.8	-	6.6	3.1	1.6	-	2.0	2.4	2.8	-	2.5	3.0
Articulated Trucks	1	1	-	2	2	18	-	20	11	3	-	14	36
% Articulated Trucks	1.7	1.3	-	1.5	3.1	9.8	-	8.0	2.7	4.2	-	2.9	4.2
Bicycles on Road	0	0	-	0	0	1	-	1	1	0	-	1	2
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.5	-	0.4	0.2	0.0	-	0.2	0.2
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
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Count Name: 10-CentralAve_VaughnRd TMC
Site Code: TMC-10
Start Date: 07/16/2014
Page No: 5

Vaughn Rd [N]

Out	In	Total
1	0	1
71	78	149
54	48	102
1	0	1
9	11	20
136	**137**	**273**

0	0	0
29	49	0
27	21	0
0	0	0
4	7	0
60	**77**	**0**
R	L	P

Central Ave W [W]

Out	In	Total
1	3	4
121	290	411
94	160	254
2	1	3
26	27	53
244	**481**	**725**

0	3	0
0	255	35
0	129	31
0	1	0
0	22	5
0	**410**	**71**
P	T	L

Peak Hour Data

07/16/2014 7:30 AM
Ending At
07/16/2014 8:30 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Central Ave W [E]

Out	In	Total
3	2	5
304	128	432
150	90	240
1	3	4
29	26	55
487	**249**	**736**

1	1	0
36	92	0
23	67	0
1	2	0
4	22	0
65	**184**	**0**
R	T	P

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**
Out	In	Total

Fake Approach [S]

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 10-CentralAve_VaughnRd TMC
Site Code: TMC-10
Start Date: 07/16/2014

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Vaughn Rd Southbound				Central Ave W Westbound				Central Ave W Eastbound				
	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
4:30 PM	32	26	0	58	12	104	0	116	111	17	0	128	302
4:45 PM	30	13	1	43	17	106	0	123	74	22	0	96	262
5:00 PM	31	18	0	49	26	119	0	145	71	16	0	87	281
5:15 PM	28	11	0	39	21	133	0	154	95	11	0	106	299
Total	121	68	1	189	76	462	0	538	351	66	0	417	1144
Approach %	64.0	36.0	-	-	14.1	85.9	-	-	84.2	15.8	-	-	-
Total %	10.6	5.9	-	16.5	6.6	40.4	-	47.0	30.7	5.8	-	36.5	-
PHF	0.945	0.654	-	0.815	0.731	0.868	-	0.873	0.791	0.750	-	0.814	0.947
Motorcycles	1	1	-	2	1	13	-	14	11	2	-	13	29
% Motorcycles	0.8	1.5	-	1.1	1.3	2.8	-	2.6	3.1	3.0	-	3.1	2.5
Cars	68	50	-	118	54	319	-	373	239	40	-	279	770
% Cars	56.2	73.5	-	62.4	71.1	69.0	-	69.3	68.1	60.6	-	66.9	67.3
Light Goods Vehicles	50	15	-	65	19	114	-	133	86	23	-	109	307
% Light Goods Vehicles	41.3	22.1	-	34.4	25.0	24.7	-	24.7	24.5	34.8	-	26.1	26.8
Buses	0	0	-	0	0	0	-	0	1	0	-	1	1
% Buses	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.3	0.0	-	0.2	0.1
Single-Unit Trucks	1	2	-	3	1	7	-	8	7	1	-	8	19
% Single-Unit Trucks	0.8	2.9	-	1.6	1.3	1.5	-	1.5	2.0	1.5	-	1.9	1.7
Articulated Trucks	1	0	-	1	1	9	-	10	7	0	-	7	18
% Articulated Trucks	0.8	0.0	-	0.5	1.3	1.9	-	1.9	2.0	0.0	-	1.7	1.6
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	-	-	1	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
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Count Name: 10-CentralAve_VaughnRd TMC
Site Code: TMC-10
Start Date: 07/16/2014
Page No: 7

Vaughn Rd [N]		
Out	In	Total
3	2	5
94	118	212
42	65	107
0	0	0
3	4	7
142	**189**	**331**

1	1	0
68	50	0
50	15	0
0	0	0
2	2	1
121	**68**	**1**
R	L	P

Central Ave W [W]		
Out	In	Total
14	13	27
387	279	666
164	109	273
0	1	1
18	15	33
583	**417**	**1000**

2	11	0
40	239	0
23	86	0
0	1	0
1	14	0
66	**351**	**0**
L	T	P

Peak Hour Data

07/16/2014 4:30 PM
Ending At
07/16/2014 5:30 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

1	13	0
54	319	0
19	114	0
0	0	0
2	16	0
76	**462**	**0**
R	T	P

Central Ave W [E]		
Out	In	Total
12	14	26
289	373	662
101	133	234
1	0	1
16	18	34
419	**538**	**957**

0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**
Out	In	Total
Fake Approach [S]		

Turning Movement Peak Hour Data Plot (4:30 PM)

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Count Name: 11-VaughnRd_I15SB TMC
Site Code: TMC-11
Start Date: 07/16/2014

Turning Movement Data

Start Time	I-15 SB Off Southbound				Vaughn Rd Westbound				Frontage Rd Eastbound				
	Right	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	0	50	0	50	1	0	0	1	8	0	0	8	59
7:15 AM	0	50	0	50	4	0	0	4	6	0	0	6	60
7:30 AM	0	62	0	62	3	1	0	4	5	0	0	5	71
7:45 AM	1	57	0	58	4	0	0	4	8	0	0	8	70
Hourly Total	1	219	0	220	12	1	0	13	27	0	0	27	260
8:00 AM	0	37	0	37	7	0	0	7	7	0	0	7	51
8:15 AM	0	38	0	38	8	0	0	8	6	0	0	6	52
8:30 AM	0	37	0	37	13	0	0	13	7	0	0	7	57
8:45 AM	1	35	0	36	4	0	0	4	9	0	0	9	49
Hourly Total	1	147	0	148	32	0	0	32	29	0	0	29	209
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	32	0	32	9	1	0	10	12	0	0	12	54
4:15 PM	0	38	0	38	14	0	0	14	12	0	0	12	64
4:30 PM	0	35	0	35	13	0	0	13	12	0	0	12	60
4:45 PM	1	38	0	39	14	0	0	14	17	0	0	17	70
Hourly Total	1	143	0	144	50	1	0	51	53	0	0	53	248
5:00 PM	0	23	0	23	14	0	0	14	8	1	0	9	46
5:15 PM	0	29	0	29	16	0	0	16	7	0	0	7	52
5:30 PM	0	35	0	35	11	0	0	11	6	0	0	6	52
5:45 PM	0	33	0	33	12	0	0	12	12	0	0	12	57
Hourly Total	0	120	0	120	53	0	0	53	33	1	0	34	207
Grand Total	3	629	0	632	147	2	0	149	142	1	0	143	924
Approach %	0.5	99.5	-	-	98.7	1.3	-	-	99.3	0.7	-	-	-
Total %	0.3	68.1	-	68.4	15.9	0.2	-	16.1	15.4	0.1	-	15.5	-
Motorcycles	0	4	-	4	3	0	-	3	1	0	-	1	8
% Motorcycles	0.0	0.6	-	0.6	2.0	0.0	-	2.0	0.7	0.0	-	0.7	0.9
Cars	2	324	-	326	70	1	-	71	65	0	-	65	462
% Cars	66.7	51.5	-	51.6	47.6	50.0	-	47.7	45.8	0.0	-	45.5	50.0
Light Goods Vehicles	1	257	-	258	66	1	-	67	65	1	-	66	391
% Light Goods Vehicles	33.3	40.9	-	40.8	44.9	50.0	-	45.0	45.8	100.0	-	46.2	42.3
Buses	0	1	-	1	0	0	-	0	0	0	-	0	1
% Buses	0.0	0.2	-	0.2	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.1
Single-Unit Trucks	0	27	-	27	6	0	-	6	7	0	-	7	40
% Single-Unit Trucks	0.0	4.3	-	4.3	4.1	0.0	-	4.0	4.9	0.0	-	4.9	4.3
Articulated Trucks	0	16	-	16	2	0	-	2	4	0	-	4	22
% Articulated Trucks	0.0	2.5	-	2.5	1.4	0.0	-	1.3	2.8	0.0	-	2.8	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
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Count Name: 11-VaughnRd_I15SB TMC
Site Code: TMC-11
Start Date: 07/16/2014
Page No: 3

I-15 SB Off [N]

Out	In	Total
0	4	4
0	326	326
1	258	259
0	1	1
0	43	43
1	**632**	**633**

R	L	P
0	4	0
2	324	0
1	257	0
0	1	0
0	43	0
3	**629**	**0**

Frontage Rd [W]

Out	In	Total
3	1	4
72	65	137
67	66	133
0	0	0
8	11	19
150	**143**	**293**

L	T	P
0	1	0
0	65	0
1	65	0
0	0	0
0	11	0
1	**142**	**0**

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

T	L	P
3	0	0
70	1	0
66	1	0
0	0	0
8	0	0
147	**2**	**0**

Vaughn Rd [E]

Out	In	Total
5	3	8
389	71	460
322	67	389
1	0	1
54	8	62
771	**149**	**920**

Out	In	Total
0	0	0
1	0	1
1	0	1
0	0	0
0	0	0
2	**0**	**2**

Fake Approach [S]

Turning Movement Data Plot

Robert Peccia & Associates
825 Custer Ave

Helena, Montana, United States 59604
406-447-5000 scottr@rpa-hln.com

Count Name: 11-VaughnRd_I15SB TMC
Site Code: TMC-11
Start Date: 07/16/2014

Turning Movement Peak Hour Data (7:00 AM)

Start Time	I-15 SB Off Southbound				Vaughn Rd Westbound				Frontage Rd Eastbound				
	Right	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	0	50	0	50	1	0	0	1	8	0	0	8	59
7:15 AM	0	50	0	50	4	0	0	4	6	0	0	6	60
7:30 AM	0	62	0	62	3	1	0	4	5	0	0	5	71
7:45 AM	1	57	0	58	4	0	0	4	8	0	0	8	70
Total	1	219	0	220	12	1	0	13	27	0	0	27	260
Approach %	0.5	99.5	-	-	92.3	7.7	-	-	100.0	0.0	-	-	-
Total %	0.4	84.2	-	84.6	4.6	0.4	-	5.0	10.4	0.0	-	10.4	-
PHF	0.250	0.883	-	0.887	0.750	0.250	-	0.813	0.844	0.000	-	0.844	0.915
Motorcycles	0	1	-	1	0	0	-	0	0	0	-	0	1
% Motorcycles	0.0	0.5	-	0.5	0.0	0.0	-	0.0	0.0	-	-	0.0	0.4
Cars	1	128	-	129	6	0	-	6	14	0	-	14	149
% Cars	100.0	58.4	-	58.6	50.0	0.0	-	46.2	51.9	-	-	51.9	57.3
Light Goods Vehicles	0	79	-	79	5	1	-	6	10	0	-	10	95
% Light Goods Vehicles	0.0	36.1	-	35.9	41.7	100.0	-	46.2	37.0	-	-	37.0	36.5
Buses	0	1	-	1	0	0	-	0	0	0	-	0	1
% Buses	0.0	0.5	-	0.5	0.0	0.0	-	0.0	0.0	-	-	0.0	0.4
Single-Unit Trucks	0	5	-	5	1	0	-	1	2	0	-	2	8
% Single-Unit Trucks	0.0	2.3	-	2.3	8.3	0.0	-	7.7	7.4	-	-	7.4	3.1
Articulated Trucks	0	5	-	5	0	0	-	0	1	0	-	1	6
% Articulated Trucks	0.0	2.3	-	2.3	0.0	0.0	-	0.0	3.7	-	-	3.7	2.3
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
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
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Count Name: 11-VaughnRd_I15SB TMC
Site Code: TMC-11
Start Date: 07/16/2014
Page No: 5

Peak Hour Data

07/16/2014 7:00 AM
Ending At
07/16/2014 8:00 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 SB Off [N]

Out	In	Total
0	1	1
0	129	129
0	79	79
0	1	1
0	10	10
0	**220**	**220**

R	L	P
0	1	0
1	128	0
0	79	0
0	1	0
0	10	0
1	**219**	**0**

Frontage Rd [W]

Total	In	Out
0	0	0
21	14	7
15	10	5
0	0	0
4	3	1
40	**27**	**13**

L	T	P
0	0	0
0	14	0
0	10	0
0	0	0
0	3	0
0	**27**	**0**

Vaughn Rd [E]

Out	In	Total
1	0	1
142	6	148
89	6	95
1	0	1
13	1	14
246	**13**	**259**

T	L	P
0	0	0
6	0	0
5	1	0
0	0	0
1	0	0
12	**1**	**0**

Fake Approach [S]

Out	In	Total
0	0	0
0	0	0
1	0	1
0	0	0
0	0	0
1	**0**	**1**

Turning Movement Peak Hour Data Plot (7:00 AM)

Robert Peccia & Associates
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Turning Movement Peak Hour Data (4:00 PM)

Start Time	I-15 SB Off Southbound				Vaughn Rd Westbound				Frontage Rd Eastbound				
	Right	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
4:00 PM	0	32	0	32	9	1	0	10	12	0	0	12	54
4:15 PM	0	38	0	38	14	0	0	14	12	0	0	12	64
4:30 PM	0	35	0	35	13	0	0	13	12	0	0	12	60
4:45 PM	1	38	0	39	14	0	0	14	17	0	0	17	70
Total	1	143	0	144	50	1	0	51	53	0	0	53	248
Approach %	0.7	99.3	-	-	98.0	2.0	-	-	100.0	0.0	-	-	-
Total %	0.4	57.7	-	58.1	20.2	0.4	-	20.6	21.4	0.0	-	21.4	-
PHF	0.250	0.941	-	0.923	0.893	0.250	-	0.911	0.779	0.000	-	0.779	0.886
Motorcycles	0	1	-	1	1	0	-	1	1	0	-	1	3
% Motorcycles	0.0	0.7	-	0.7	2.0	0.0	-	2.0	1.9	-	-	1.9	1.2
Cars	1	68	-	69	27	1	-	28	23	0	-	23	120
% Cars	100.0	47.6	-	47.9	54.0	100.0	-	54.9	43.4	-	-	43.4	48.4
Light Goods Vehicles	0	64	-	64	20	0	-	20	25	0	-	25	109
% Light Goods Vehicles	0.0	44.8	-	44.4	40.0	0.0	-	39.2	47.2	-	-	47.2	44.0
Buses	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
Single-Unit Trucks	0	7	-	7	2	0	-	2	3	0	-	3	12
% Single-Unit Trucks	0.0	4.9	-	4.9	4.0	0.0	-	3.9	5.7	-	-	5.7	4.8
Articulated Trucks	0	3	-	3	0	0	-	0	1	0	-	1	4
% Articulated Trucks	0.0	2.1	-	2.1	0.0	0.0	-	0.0	1.9	-	-	1.9	1.6
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
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 11-VaughnRd_I15SB TMC
Site Code: TMC-11
Start Date: 07/16/2014
Page No: 7

Peak Hour Data

07/16/2014 4:00 PM
Ending At
07/16/2014 5:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 SB Off [N]

Out	In	Total
0	1	1
0	69	69
0	64	64
0	0	0
0	10	10
0	**144**	**144**

R	L	P
0	1	0
1	68	0
0	64	0
0	0	0
0	10	0
1	**143**	**0**

Frontage Rd [W]

Out	In	Total
1	1	2
28	23	51
20	25	45
0	0	0
2	4	6
51	**53**	**104**

L	T	P
0	1	0
0	23	0
0	25	0
0	0	0
0	4	0
0	**53**	**0**

Vaughn Rd [E]

Out	In	Total
2	1	3
91	28	119
89	20	109
0	0	0
14	2	16
196	**51**	**247**

T	L	P
1	0	0
27	1	0
20	0	0
0	0	0
2	0	0
50	**1**	**0**

Fake Approach [S]

Out	In	Total
0	0	0
1	0	1
0	0	0
0	0	0
0	0	0
1	**0**	**1**

Turning Movement Peak Hour Data Plot (4:00 PM)

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Robert Peccia & Associates
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Count Name: 12-VaughnRd_I15NB TMC
Site Code: TMC-12
Start Date: 07/16/2014
Page No: 1

Turning Movement Data

Start Time	I-15 NB On Southbound		Vaughn Rd Westbound				Vaughn Rd Eastbound				
	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
7:00 AM	1	0	16	1	0	17	53	0	0	53	70
7:15 AM	0	0	23	4	0	27	58	0	0	58	85
7:30 AM	0	0	14	4	0	18	67	0	0	67	85
7:45 AM	0	0	18	3	0	21	69	0	0	69	90
Hourly Total	1	0	71	12	0	83	247	0	0	247	330
8:00 AM	0	0	21	8	0	29	43	0	0	43	72
8:15 AM	0	0	19	8	0	27	43	0	0	43	70
8:30 AM	0	0	23	12	0	35	40	1	0	41	76
8:45 AM	0	0	31	5	0	36	47	0	0	47	83
Hourly Total	0	0	94	33	0	127	173	1	0	174	301
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	0	0	61	10	0	71	47	0	0	47	118
4:15 PM	0	0	51	14	0	65	47	0	0	47	112
4:30 PM	0	0	72	14	0	86	48	0	0	48	134
4:45 PM	0	0	73	14	0	87	55	0	0	55	142
Hourly Total	0	0	257	52	0	309	197	0	0	197	506
5:00 PM	0	0	84	13	0	97	35	0	0	35	132
5:15 PM	0	0	91	17	0	108	34	0	0	34	142
5:30 PM	0	0	86	11	0	97	41	0	0	41	138
5:45 PM	0	0	81	11	0	92	41	0	0	41	133
Hourly Total	0	0	342	52	0	394	151	0	0	151	545
Grand Total	1	0	764	149	0	913	768	1	0	769	1682
Approach %	-	-	83.7	16.3	-	-	99.9	0.1	-	-	-
Total %	-	0.0	45.4	8.9	-	54.3	45.7	0.1	-	45.7	-
Motorcycles	-	0	5	2	-	7	4	0	-	4	11
% Motorcycles	-	-	0.7	1.3	-	0.8	0.5	0.0	-	0.5	0.7
Cars	-	0	473	72	-	545	428	0	-	428	973
% Cars	-	-	61.9	48.3	-	59.7	55.7	0.0	-	55.7	57.8
Light Goods Vehicles	-	0	237	68	-	305	282	0	-	282	587
% Light Goods Vehicles	-	-	31.0	45.6	-	33.4	36.7	0.0	-	36.7	34.9
Buses	-	0	2	0	-	2	3	0	-	3	5
% Buses	-	-	0.3	0.0	-	0.2	0.4	0.0	-	0.4	0.3
Single-Unit Trucks	-	0	17	5	-	22	31	1	-	32	54
% Single-Unit Trucks	-	-	2.2	3.4	-	2.4	4.0	100.0	-	4.2	3.2
Articulated Trucks	-	0	30	2	-	32	20	0	-	20	52
% Articulated Trucks	-	-	3.9	1.3	-	3.5	2.6	0.0	-	2.6	3.1
Bicycles on Road	-	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

Pedestrians	1	-	-	-	0	-	-	-	0	-	-
% Pedestrians	100.0	-	-	-	-	-	-	-	-	-	-

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Count Name: 12-VaughnRd_I15NB TMC
Site Code: TMC-12
Start Date: 07/16/2014

07/16/2014 7:00 AM
Ending At
07/16/2014 6:00 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 NB On [N]

Out	In	Total
5	0	5
473	0	473
237	0	237
2	0	2
48	0	48
765	**0**	**765**

P
0
0
0
0
1
1

Vaughn Rd [W]

Out	In	Total
2	4	6
72	428	500
68	282	350
0	3	3
7	52	59
149	**769**	**918**

L	T	P
0	4	0
0	428	0
0	282	0
0	3	0
1	51	0
1	**768**	**0**

Vaughn Rd [E]

Out	In	Total
4	7	11
428	545	973
282	305	587
3	2	5
51	54	105
768	**913**	**1681**

R	T	P
5	2	0
473	72	0
237	68	0
2	0	0
47	7	0
764	**149**	**0**

Fake Approach [S]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Turning Movement Data Plot

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825 Custer Ave

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406-447-5000 scottr@rpa-hln.com

Count Name: 12-VaughnRd_I15NB TMC
Site Code: TMC-12
Start Date: 07/16/2014

Turning Movement Peak Hour Data (7:15 AM)

Start Time	I-15 NB On Southbound		Vaughn Rd Westbound				Vaughn Rd Eastbound				
	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
7:15 AM	0	0	23	4	0	27	58	0	0	58	85
7:30 AM	0	0	14	4	0	18	67	0	0	67	85
7:45 AM	0	0	18	3	0	21	69	0	0	69	90
8:00 AM	0	0	21	8	0	29	43	0	0	43	72
Total	0	0	76	19	0	95	237	0	0	237	332
Approach %	-	-	80.0	20.0	-	-	100.0	0.0	-	-	-
Total %	-	0.0	22.9	5.7	-	28.6	71.4	0.0	-	71.4	-
PHF	-	0.000	0.826	0.594	-	0.819	0.859	0.000	-	0.859	0.922
Motorcycles	-	0	0	0	-	0	0	0	-	0	0
% Motorcycles	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0
Cars	-	0	40	7	-	47	139	0	-	139	186
% Cars	-	-	52.6	36.8	-	49.5	58.6	-	-	58.6	56.0
Light Goods Vehicles	-	0	25	11	-	36	85	0	-	85	121
% Light Goods Vehicles	-	-	32.9	57.9	-	37.9	35.9	-	-	35.9	36.4
Buses	-	0	0	0	-	0	1	0	-	1	1
% Buses	-	-	0.0	0.0	-	0.0	0.4	-	-	0.4	0.3
Single-Unit Trucks	-	0	5	1	-	6	6	0	-	6	12
% Single-Unit Trucks	-	-	6.6	5.3	-	6.3	2.5	-	-	2.5	3.6
Articulated Trucks	-	0	6	0	-	6	6	0	-	6	12
% Articulated Trucks	-	-	7.9	0.0	-	6.3	2.5	-	-	2.5	3.6
Bicycles on Road	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0
Pedestrians	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 12-VaughnRd_I15NB TMC
Site Code: TMC-12
Start Date: 07/16/2014
Page No: 5

Peak Hour Data

07/16/2014 7:15 AM
Ending At
07/16/2014 8:15 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 NB On [N]

Out	In	Total
0	0	0
40	0	40
25	0	25
0	0	0
11	0	11
76	**0**	**76**

P
0
0
0
0
0
0

Vaughn Rd [W]

Out	In	Total
0	0	0
7	139	146
11	85	96
0	1	1
1	12	13
19	**237**	**256**

P	T	L
0	0	0
0	139	0
0	85	0
0	1	0
0	12	0
0	**237**	**0**

Vaughn Rd [E]

Out	In	Total
0	0	0
139	47	186
85	36	121
1	0	1
12	12	24
237	**95**	**332**

R	T	P
0	0	0
40	7	0
25	11	0
0	0	0
11	1	0
76	**19**	**0**

Fake Approach [S]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Turning Movement Peak Hour Data Plot (7:15 AM)

Robert Peccia & Associates
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Count Name: 12-VaughnRd_I15NB TMC
Site Code: TMC-12
Start Date: 07/16/2014

Turning Movement Peak Hour Data (4:45 PM)

Start Time	I-15 NB On Southbound		Vaughn Rd Westbound				Vaughn Rd Eastbound				
	Peds	App. Total	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Int. Total
4:45 PM	0	0	73	14	0	87	55	0	0	55	142
5:00 PM	0	0	84	13	0	97	35	0	0	35	132
5:15 PM	0	0	91	17	0	108	34	0	0	34	142
5:30 PM	0	0	86	11	0	97	41	0	0	41	138
Total	0	0	334	55	0	389	165	0	0	165	554
Approach %	-	-	85.9	14.1	-	-	100.0	0.0	-	-	-
Total %	-	0.0	60.3	9.9	-	70.2	29.8	0.0	-	29.8	-
PHF	-	0.000	0.918	0.809	-	0.900	0.750	0.000	-	0.750	0.975
Motorcycles	-	0	1	1	-	2	2	0	-	2	4
% Motorcycles	-	-	0.3	1.8	-	0.5	1.2	-	-	1.2	0.7
Cars	-	0	219	31	-	250	90	0	-	90	340
% Cars	-	-	65.6	56.4	-	64.3	54.5	-	-	54.5	61.4
Light Goods Vehicles	-	0	96	22	-	118	62	0	-	62	180
% Light Goods Vehicles	-	-	28.7	40.0	-	30.3	37.6	-	-	37.6	32.5
Buses	-	0	2	0	-	2	1	0	-	1	3
% Buses	-	-	0.6	0.0	-	0.5	0.6	-	-	0.6	0.5
Single-Unit Trucks	-	0	5	1	-	6	9	0	-	9	15
% Single-Unit Trucks	-	-	1.5	1.8	-	1.5	5.5	-	-	5.5	2.7
Articulated Trucks	-	0	11	0	-	11	1	0	-	1	12
% Articulated Trucks	-	-	3.3	0.0	-	2.8	0.6	-	-	0.6	2.2
Bicycles on Road	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	-	-	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0
Pedestrians	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-

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Count Name: 12-VaughnRd_I15NB TMC
Site Code: TMC-12
Start Date: 07/16/2014
Page No: 7

Peak Hour Data

07/16/2014 4:45 PM
Ending At
07/16/2014 5:45 PM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

I-15 NB On [N]

Out	In	Total
1	0	1
219	0	219
96	0	96
2	0	2
16	0	16
334	**0**	**334**

P
0
0
0
0
0
0

Vaughn Rd [W]

Out	In	Total
1	2	3
31	90	121
22	62	84
0	1	1
1	10	11
55	**165**	**220**

L	T	P
0	2	0
0	90	0
0	62	0
0	1	0
0	10	0
0	**165**	**0**

Vaughn Rd [E]

R	T	P
1	1	0
219	31	0
96	22	0
2	0	0
16	1	0
334	**55**	**0**

Out	In	Total
2	2	4
90	250	340
62	118	180
1	2	3
10	17	27
165	**389**	**554**

Fake Approach [S]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Turning Movement Peak Hour Data Plot (4:45 PM)

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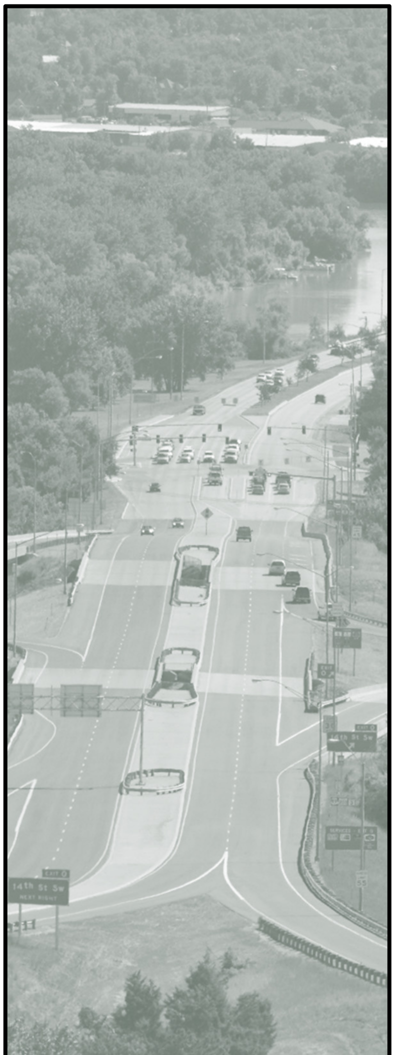
406-447-5000 scottr@rpa-hln.com



APPENDIX C

Existing Conditions Traffic Data Analysis

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-315 Eastbound*
Agency or Company		From/To	*I-15 to 14th Ave*
Date Performed	*9/15/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*530*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*314*	pc/h/ln
S	*55.0*	mph
$D = v_p / S$	*5.7*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
$D = v_p / S$		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-315 Westbound*
From/To	*I-15 to 14th Ave*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*454*	veh/h	Peak-Hour Factor, PHF	*0.76*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*308*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*5.6*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-315 Eastbound*
From/To	*I-15 to 14th Ave*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*675*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*415*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*7.5*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13
f_{LC} - Exhibit 11-9
f_p - Page 11-18
TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-315 Westbound*
Agency or Company		From/To	*I-15 to 14th Ave*
Date Performed	*9/15/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*646*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*55.0*	mph	FFS	*55.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*356*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*55.0*	mph	S	mph
D = v_p / S	*6.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13
f_{LC} - Exhibit 11-9
f_p - Page 11-18
TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-315 Eastbound*
From/To	*14th Ave to Fox Farm*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*979*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*602*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*10.9*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-315 Westbound*
From/To	*14th Ave to Fox Farm*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*528*	veh/h	Peak-Hour Factor, PHF	*0.82*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*330*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*6.0*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-315 Eastbound*
From/To	*14th Ave to Fox Farm*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1044*	veh/h	Peak-Hour Factor, PHF	*0.90*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*589*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*10.7*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-315 Westbound*
From/To	*14th Ave to Fox Farm*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1279*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*683*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*12.4*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*North of Central*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*334*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*209*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*3.2*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Central*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*200*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*21*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.905*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
			Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*133*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S	*65.0*	mph	S		mph
D = v_p / S	*2.0*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*8/7/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-15 NB*
From/To	*North of Central Ave*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*359*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*193*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*3.0*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Central Ave*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*309*	veh/h	Peak-Hour Factor, PHF	*0.79*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*210*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*3.2*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*North of Emerson Junction*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*288*	veh/h	Peak-Hour Factor, PHF	*0.89*
AADT		veh/day	%Trucks and Buses, P_T	*21*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.905*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*179*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*2.8*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Emerson Junction*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*548*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*323*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*5.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*North of Emerson Junction*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*696*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*383*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*5.9*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Emerson Junction*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*456*	veh/h	Peak-Hour Factor, PHF	*0.88*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*277*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*4.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*8/7/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-15 NB*
From/To	*North of Gore Hill*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*517*	veh/h	Peak-Hour Factor, PHF	*0.90*
AADT		veh/day	%Trucks and Buses, P_T	*16*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Grade*
DDHV = AADT x K x D		veh/h	Grade -5.00% Length	*0.69mi*
			Up/Down %	*-5.00*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.926*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*311*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*4.8*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Gore Hill*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*458*	veh/h	Peak-Hour Factor, PHF	*0.85*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Grade*
DDHV = AADT x K x D		veh/h	Grade 5.00% Length	*0.69mi*
			Up/Down %	*5.00*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*4.5*
E_T	*2.8*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.891*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)		
			Design (N)		
Operational (LOS)			Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*303*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S	*65.0*	mph	S		mph
D = v_p / S	*4.7*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*8/7/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-15 NB*
From/To	*North of Gore Hill*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*722*	veh/h	Peak-Hour Factor, PHF	*0.80*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Grade*
DDHV = AADT x K x D		veh/h	Grade -5.00% Length	*0.69mi*
			Up/Down %	*-5.00*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.952*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*473*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*7.3*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13
f_{LC} - Exhibit 11-9
f_p - Page 11-18
TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Gore Hill*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*630*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Grade*
DDHV = AADT x K x D		veh/h	Grade 5.00% Length	*0.69mi*
			Up/Down %	*5.00*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*4.5*
E_T	*2.5*	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.870*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
			Design (N)	
Operational (LOS)			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*391*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*6.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*South of Central*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*321*	veh/h	Peak-Hour Factor, PHF	*0.89*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*193*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*3.0*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*South of Central*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*352*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*196*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*3.0*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*8/7/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-15 NB*
From/To	*South of Central Ave*
Jurisdiction	
Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*490*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*11*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.948*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*298*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*4.6*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*South of Central Ave*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*491*	veh/h	Peak-Hour Factor, PHF	*0.90*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*293*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*4.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*South of Gore Hill*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*244*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.952*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
			Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*139*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S	*65.0*	mph	S		mph
D = v_p / S	*2.1*	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	*A*		Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*South of Gore Hill*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*235*	veh/h	Peak-Hour Factor, PHF	*0.79*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.909*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*70.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*70.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*163*	pc/h/ln
S	*70.0*	mph
D = v_p / S	*2.3*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*South of Gore Hill*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*249*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.943*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*138*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*2.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*South of Gore Hill*
Date Performed	*8/7/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2014*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*365*	veh/h	Peak-Hour Factor, PHF	*0.89*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*212*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*3.3*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

Factor Location

- E_R - Exhibits 11-10, 11-12
- E_T - Exhibits 11-10, 11-11, 11-13
- f_p - Page 11-18
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
- f_{LW} - Exhibit 11-8
- f_{LC} - Exhibit 11-9
- TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB Off-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	740
Freeway Volume, V_F	517
Ramp Volume, V_R	192
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	517	0.90	Level	16	0	0.926	1.00	622
Ramp	192	0.83	Level	3	0	0.985	1.00	236
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 622 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	622	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	386	Exhibit 13-8	4700	No
V_R	236	Exhibit 13-10	2200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	622	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 2.9 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.189 (Exhibit 13-12)

S_R= 60.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 60.6 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB On-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	590
Deceleration Lane Length L_D	
Freeway Volume, V_F	321
Ramp Volume, V_R	167
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	321	0.89	Level	14	0	0.935	1.00	385
Ramp	167	0.75	Level	7	0	0.966	1.00	232
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 385 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	617	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	617	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 6.5 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.287 (Exibit 13-11)

S_R= 58.4 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 58.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave SB Off-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	463	V_D = veh/h
	Freeway Volume, V_F	352	
	Ramp Volume, V_R	192	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	55.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	352	0.94	Level	8	0	0.962	1.00	391
Ramp	192	0.83	Level	3	0	0.985	1.00	236
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 391 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	391	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	155	Exhibit 13-8	4700	No
V_R	236	Exhibit 13-10	2200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	391	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 3.4 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.189 (Exhibit 13-12)

S_R= 60.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 60.6 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave SB On-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	458
Ramp Volume, V_R	287
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	458	0.85	Level	7	0	0.966	1.00	559
Ramp	287	0.77	Level	5	0	0.976	1.00	382
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 559 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	941	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	941	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\,v_R + 0.0078\,V_{12} - 0.00627\,L_A$$

D_R = 3.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.226 (Exibit 13-11)

S_R= 59.8 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\,V_{12} - 0.009\,L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB Off-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	740
Freeway Volume, V_F	722
Ramp Volume, V_R	436
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	722	0.80	Level	10	0	0.952	1.00	948
Ramp	436	0.83	Level	3	0	0.985	1.00	533
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 948 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	948	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	415	Exhibit 13-8	4700	No
V_R	533	Exhibit 13-10	2200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	948	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 5.7 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.216 (Exhibit 13-12)

S_R= 60.0 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 60.0 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB On-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	590
Deceleration Lane Length L_D	
Freeway Volume, V_F	490
Ramp Volume, V_R	262
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	490	0.87	Level	11	0	0.948	1.00	596
Ramp	262	0.92	Level	4	0	0.980	1.00	290
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 596 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	886	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	886	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 8.6 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.289 (Exibit 13-11)

S_R= 58.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 58.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave SB Off-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	463
Freeway Volume, V_F	491
Ramp Volume, V_R	239
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	491	0.90	Level	14	0	0.935	1.00	586
Ramp	239	0.83	Level	7	0	0.966	1.00	299
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 1.000 using Equation (Exhibit 13-7)
V_{12} = 586 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	586	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	287	Exhibit 13-8	4700	No
V_R	299	Exhibit 13-10	2200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	586	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 5.1 (pc/mi/ln)
LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.195 (Exhibit 13-12)
S_R= 60.5 mph (Exhibit 13-12)
S_0= N/A mph (Exhibit 13-12)
S = 60.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave SB On-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	630
Ramp Volume, V_R	384
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	630	0.93	Level	10	0	0.952	1.00	711
Ramp	384	0.94	Level	5	0	0.976	1.00	419
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 711 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1130	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1130	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 4.7 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.228 (Exibit 13-11)

S_R= 59.8 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th EB Off-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	503
Freeway Volume, V_F	530
Ramp Volume, V_R	55
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	530	0.87	Level	6	0	0.971	1.00	627
Ramp	55	0.83	Level	5	0	0.976	1.00	68
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 1.000 using Equation (Exhibit 13-7)
V_{12} = 627 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	627	Exhibit 13-8	4500	No
$V_{FO} = V_F - V_R$	559	Exhibit 13-8	4500	No
V_R	68	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	627	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 5.1 (pc/mi/ln)
LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.434 (Exhibit 13-12)
S_R= 49.4 mph (Exhibit 13-12)
S_0= N/A mph (Exhibit 13-12)
S = 49.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th St EB On-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	930
Deceleration Lane Length L_D	
Freeway Volume, V_F	979
Ramp Volume, V_R	497
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	979	0.83	Level	4	0	0.980	1.00	1205
Ramp	497	0.83	Level	3	0	0.985	1.00	608
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1205 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1813	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1813	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 13.5 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.280 (Exibit 13-11)

S_R= 51.4 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 51.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th WB Off-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	713
Freeway Volume, V_F	528
Ramp Volume, V_R	216
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	528	0.82	Level	1	0	0.995	1.00	645
Ramp	216	0.80	Level	0	0	1.000	1.00	269
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 645 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	645	Exhibit 13-8	4500	No
$V_{FO} = V_F - V_R$	376	Exhibit 13-8	4500	No
V_R	269	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	645	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = 3.4 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.452 (Exhibit 13-12)

S_R= 49.1 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 49.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th St WB On-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	505
Deceleration Lane Length L_D	
Freeway Volume, V_F	454
Ramp Volume, V_R	123
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	454	0.76	Level	6	0	0.971	1.00	614
Ramp	123	0.80	Level	5	0	0.976	1.00	157
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 614 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	771	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	771	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 8.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.294 (Exibit 13-11)

S_R= 51.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 51.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th EB Off-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	503
Freeway Volume, V_F	675
Ramp Volume, V_R	183
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	675	0.83	Level	4	0	0.980	1.00	830
Ramp	183	0.94	Level	3	0	0.985	1.00	198
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 830 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	830	Exhibit 13-8	4500	No
$V_{FO} = V_F - V_R$	632	Exhibit 13-8	4500	No
V_R	198	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	830	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 6.9 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.446 (Exhibit 13-12)

S_R= 49.2 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 49.2 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th St EB On-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	930
Deceleration Lane Length L_D	
Freeway Volume, V_F	1044
Ramp Volume, V_R	523
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1044	0.90	Level	3	0	0.985	1.00	1177
Ramp	523	0.94	Level	1	0	0.995	1.00	559
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1177 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1736	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1736	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 12.9 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.278 (Exibit 13-11)

S_R= 51.4 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 51.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th WB Off-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A		☑ No	☐ Off
L_{up} =	ft	Deceleration Lane Length L_D	713	L_{down} =	ft
V_u =	veh/h	Freeway Volume, V_F	1279	V_D =	veh/h
		Ramp Volume, V_R	792		
		Freeway Free-Flow Speed, S_{FF}	55.0		
		Ramp Free-Flow Speed, S_{FR}	35.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1279	0.91	Level	3	0	0.985	1.00	1427
Ramp	792	0.99	Level	2	0	0.990	1.00	810
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 1427 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	1427	Exhibit 13-8	4500	No
$V_{FO} = V_F - V_R$	617	Exhibit 13-8	4500	No
V_R	810	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1427	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 10.1 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.501 (Exhibit 13-12)

S_R= 48.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 48.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th St WB On-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	505
Deceleration Lane Length L_D	
Freeway Volume, V_F	646
Ramp Volume, V_R	173
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	646	0.93	Level	5	0	0.976	1.00	712
Ramp	173	0.99	Level	1	0	0.995	1.00	176
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 712 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	888	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	888	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 9.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.295 (Exibit 13-11)

S_R= 51.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 51.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

 HCS2010™ Version 6.41 Generated: 9/15/2014 9:39 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave NB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1388
Freeway Volume, V_F	321
Ramp Volume, V_R	192
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	321	0.89	Level	14	0	0.935	1.00	386
Ramp	192	0.83	Level	10	0	0.952	1.00	244
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 386 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	386	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	142	Exhibit 13-8	4700	No
V_R	244	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	386	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = -4.9 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.320 (Exhibit 13-12)

S_R= 57.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.6 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp		Freeway Number of Lanes, N	2	Downstream Adj Ramp	
☐ Yes	☐ On	Ramp Number of Lanes, N	1	☐ Yes	☐ On
☑ No	☐ Off	Acceleration Lane Length, L_A	1491	☑ No	☐ Off
		Deceleration Lane Length L_D			
		Freeway Volume, V_F	200		
L_{up} =	ft	Ramp Volume, V_R	50	L_{down} =	ft
V_u =	veh/h	Freeway Free-Flow Speed, S_{FF}	65.0	V_D =	veh/h
		Ramp Free-Flow Speed, S_{FR}	55.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	200	0.83	Level	7	0	0.966	1.00	249
Ramp	50	0.74	Level	40	0	0.833	1.00	82
UpStream								
DownStream								

Merge Areas	Diverge Areas

Estimation of v_{12} (Merge Areas)

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 249 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} (Diverge Areas)

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks (Merge Areas)

	Actual	Capacity		LOS F?
V_{FO}	331	Exhibit 13-8		No

Capacity Checks (Diverge Areas)

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	331	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F) (Merge Areas)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = -1.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Level of Service Determination (if not F) (Diverge Areas)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination (Merge Areas)

M_S = 0.162 (Exibit 13-11)

S_R= 61.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 61.3 mph (Exhibit 13-13)

Speed Determination (Diverge Areas)

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1144
Freeway Volume, V_F	334
Ramp Volume, V_R	136
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	334	0.83	Level	21	0	0.905	1.00	445
Ramp	136	0.85	Level	2	0	0.990	1.00	162
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 445 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	445	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	283	Exhibit 13-8	4700	No
V_R	162	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	445	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = -2.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.313 (Exhibit 13-12)

S_R= 57.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.8 mph (Exhibit 13-13)

 HCS2010[TM] Version 6.41 Generated: 9/9/2014 8:23 AM

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave SB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1379
Deceleration Lane Length L_D	
Freeway Volume, V_F	352
Ramp Volume, V_R	162
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	352	0.94	Level	8	0	0.962	1.00	389
Ramp	162	0.76	Level	5	0	0.976	1.00	217
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 389 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	606	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	606	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 1.5 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.204 (Exibit 13-11)

S_R= 60.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave NB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1388
Freeway Volume, V_F	490
Ramp Volume, V_R	227
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	490	0.87	Level	11	0	0.948	1.00	594
Ramp	227	0.75	Level	6	0	0.971	1.00	313
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 594 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	594	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	281	Exhibit 13-8	4700	No
V_R	313	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	594	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = -3.1 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.326 (Exhibit 13-12)

S_R= 57.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Centrall NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Site Information

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1491
Deceleration Lane Length L_D	
Freeway Volume, V_F	359
Ramp Volume, V_R	118
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	359	0.97	Level	8	0	0.962	1.00	385
Ramp	118	0.81	Level	1	0	0.995	1.00	146
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 385 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	531	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	531	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 0.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.164 (Exibit 13-11)

S_R= 61.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 61.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h	Freeway Number of Lanes, N	2	Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h
	Ramp Number of Lanes, N	1	
	Acceleration Lane Length, L_A		
	Deceleration Lane Length L_D	1144	
	Freeway Volume, V_F	309	
	Ramp Volume, V_R	72	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	309	0.79	Level	14	0	0.935	1.00	419
Ramp	72	0.90	Level	6	0	0.971	1.00	82
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 419 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	419	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	337	Exhibit 13-8	4700	No
V_R	82	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	419	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = -2.4 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.305 (Exhibit 13-12)

S_R= 58.0 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.0 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst	Shane Forsythe
Agency or Company	
Date Performed	9/9/2014
Analysis Time Period	PM Peak

Site Information

Freeway/Dir of Travel	Centrall SB On
Junction	
Jurisdiction	
Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1379
Deceleration Lane Length L_D	
Freeway Volume, V_F	491
Ramp Volume, V_R	260
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	491	0.90	Level	14	0	0.935	1.00	584
Ramp	260	0.89	Level	6	0	0.971	1.00	301
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 584 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	885	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	885	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = 3.6 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.206 (Exibit 13-11)

S_R= 60.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Emerson Junction NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	980
Deceleration Lane Length L_D	
Freeway Volume, V_F	288
Ramp Volume, V_R	76
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	288	0.89	Level	21	0	0.905	1.00	358
Ramp	76	0.83	Level	15	0	0.930	1.00	99
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F$ (P_{FM})

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 358 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	457	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	457	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 2.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.219 (Exibit 13-11)

S_R= 60.0 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Emerson Junction SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	340
Freeway Volume, V_F	548
Ramp Volume, V_R	220
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	548	0.87	Level	6	0	0.971	1.00	649
Ramp	220	0.88	Level	5	0	0.976	1.00	256
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 649 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	649	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	393	Exhibit 13-8	4700	No
V_R	256	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	649	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 6.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.256 (Exhibit 13-12)

S_R= 59.1 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 59.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Emerson Junction NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	980
Deceleration Lane Length L_D	
Freeway Volume, V_F	696
Ramp Volume, V_R	334
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	696	0.94	Level	6	0	0.971	1.00	763
Ramp	334	0.92	Level	5	0	0.976	1.00	373
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\ (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 763 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1136	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1136	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 8.0 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.225 (Exibit 13-11)

S_R= 59.8 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shane Forsythe	Freeway/Dir of Travel	Emerson Junction SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	340	V_D = veh/h
	Freeway Volume, V_F	456	
	Ramp Volume, V_R	144	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	456	0.88	Level	13	0	0.939	1.00	552
Ramp	144	0.94	Level	7	0	0.966	1.00	159
UpStream								
DownStream								

Merge Areas	Diverge Areas

Estimation of v_{12} (Merge Areas)

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} (Diverge Areas)

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 552 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks (Merge)

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks (Diverge)

	Actual	Capacity		LOS F?
V_F	552	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	393	Exhibit 13-8	4700	No
V_R	159	Exhibit 13-10	2100	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	552	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F) (Merge)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F) (Diverge)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 5.9 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination (Merge)

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination (Diverge)

D_s = 0.247 (Exhibit 13-12)

S_R= 59.3 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 59.3 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	323
Freeway Volume, V_F	244
Ramp Volume, V_R	17
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	244	0.92	Level	10	0	0.952	1.00	278
Ramp	17	0.74	Level	35	0	0.851	1.00	27
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 278 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	278	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	251	Exhibit 13-8	4700	No
V_R	27	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	278	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 3.7 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.235 (Exhibit 13-12)

S_R= 59.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 59.6 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	

Project Description

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 1500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 517	
	Ramp Volume, V_R: 301	
	Freeway Free-Flow Speed, S_{FF}: 65.0	
	Ramp Free-Flow Speed, S_{FR}: 50.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	517	0.90	Grade	16	0	0.926	1.00	620
Ramp	301	0.82	Level	23	0	0.897	1.00	407
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 620 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1027	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1027	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 3.9 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.182 (Exibit 13-11)

S_R= 60.8 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.8 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	358
Freeway Volume, V_F	458
Ramp Volume, V_R	309
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	458	0.85	Grade	7	0	0.891	1.00	605
Ramp	309	0.79	Level	7	0	0.966	1.00	403
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 605 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	605	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	202	Exhibit 13-8	4700	No
V_R	403	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	605	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 6.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.269 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	235
Ramp Volume, V_R	38
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	235	0.79	Level	20	0	0.909	1.00	327
Ramp	38	0.62	Level	40	0	0.833	1.00	73
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 327 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	400	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	400	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = -0.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.177 (Exibit 13-11)

S_R= 60.9 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	323
Freeway Volume, V_F	249
Ramp Volume, V_R	35
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	249	0.96	Level	12	0	0.943	1.00	275
Ramp	35	0.74	Level	42	0	0.826	1.00	57
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 1.000 using Equation (Exhibit 13-7)
V_{12} = 275 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	275	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	218	Exhibit 13-8	4700	No
V_R	57	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	275	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 3.7 (pc/mi/ln)
LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.238 (Exhibit 13-12)
S_R= 59.5 mph (Exhibit 13-12)
S_0= N/A mph (Exhibit 13-12)
S = 59.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	722
Ramp Volume, V_R	506
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	722	0.80	Grade	10	0	0.952	1.00	948
Ramp	506	0.74	Level	9	0	0.957	1.00	714
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 948 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1662	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1662	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 8.7 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.192 (Exibit 13-11)

S_R= 60.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	358
Freeway Volume, V_F	630
Ramp Volume, V_R	290
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	630	0.93	Grade	10	0	0.952	1.00	711
Ramp	290	0.80	Level	16	0	0.926	1.00	391
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\,v_R + 0.0078\,V_{12} - 0.00627\,L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 711 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	711	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	320	Exhibit 13-8	4700	No
V_R	391	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	711	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\,V_{12} - 0.009\,L_D$

D_R = 7.1 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.268 (Exhibit 13-12)

S_R= 58.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill SB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	365
Ramp Volume, V_R	39
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	365	0.93	Level	6	0	0.971	1.00	404
Ramp	39	0.65	Level	41	0	0.830	1.00	72
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 404 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	476	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	476	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = -0.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.177 (Exibit 13-11)

S_R= 60.9 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

I-15 Corridor Study

Vistro File: F:\...\I-15 Corridor.vistropdb
Report File: F:\...\LOS_Report_AM.pdf

Scenario 1: AM Scenario
9/15/2014

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Tri Hill and Frontage Airport Rd	Two-way stop	HCM2010	NEBL	0.202	13.5	B
2	I-15 NB and Airport Rd	Two-way stop	HCM2010	NEBT	0.000	16.9	C
3	I-15 SB On and Airport RD	Two-way stop	HCM2010	NWBL	0.046	8.6	A
4	I-15 SB Off and Airport RD Frontage	Two-way stop	HCM2010	SWBL	0.272	12.7	B
5	14th St SW and I-315 EB	Signalized	HCM2010	SBL	0.175	14.4	B
6	14th St SW and I-315 WB	Signalized	HCM2010	EBR	0.254	23.0	C
7	Fox Farm and I-315	Signalized	HCM2010	NEBL	0.687	45.3	D
8	Central Ave and I15 SB	Two-way stop	HCM2010	SBL	0.499	28.0	D
9	Central Ave and I-15 NB	Two-way stop	HCM2010	NBL	0.080	19.9	C
10	Central Ave and Vaughn Rd	Two-way stop	HCM2010	SBL	0.377	27.1	D
11	Vaughn Rd and I-15 SB	Two-way stop	HCM2010	SBL	0.260	10.1	B
12	Vaughn Rd and I-15 NB	Two-way stop	HCM2010	EBL	0.000	7.3	A

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
#1: Tri Hill and Frontage Airport Rd

Control Type:	Two-way stop	Delay (sec / veh):	13.5
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.202

Intersection Setup

Name						
Approach	Northeastbound		Northwestbound		Southeastbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	83	19	9	189	97	88
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	21.70	31.10	22.20	28.60	25.70	5.70
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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
Total Hourly Volume [veh/h]	83	19	9	189	97	88
Peak Hour Factor	0.7410	0.4750	0.5630	0.8750	0.9330	0.7590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	28	10	4	54	26	29
Total Analysis Volume [veh/h]	112	40	16	216	104	116
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.20	0.05	0.01	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	13.48	11.42	7.94	0.00	0.00	0.00
Movement LOS	B	B	A	A	A	A
95th-Percentile Queue Length [veh]	0.99	0.99	0.04	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	24.73	24.73	0.98	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	12.93		0.55		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	3.47					
Intersection LOS	B					

Intersection Level Of Service Report
#2: I-15 NB and Airport Rd

Control Type:	Two-way stop	Delay (sec / veh):	16.9
Analysis Method:	HCM2010	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name												
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	4	0	13	0	0	0	0	49	222	79	173	0
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	0.00	46.20	2.00	2.00	2.00	2.00	38.80	26.60	12.70	10.90	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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]	4	0	13	0	0	0	0	49	222	79	173	0
Peak Hour Factor	0.5000	1.0000	0.8130	1.0000	1.0000	1.0000	1.0000	0.7210	0.8670	0.7050	0.9010	1.0000
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	0	4	0	0	0	0	17	64	28	48	0
Total Analysis Volume [veh/h]	8	0	16	0	0	0	0	68	256	112	192	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	no			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	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	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
d_M, Delay for Movement [s/veh]	14.89	16.91	10.09	0.00	0.00	0.00	0.00	0.00	0.00	8.38	0.00	0.00
Movement LOS	B	C	B					A	A	A	A	
95th-Percentile Queue Length [veh]	0.13	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	1.03	1.03	0.00
95th-Percentile Queue Length [ft]	3.34	3.34	3.34	0.00	0.00	0.00	0.00	0.00	0.00	25.85	25.85	0.00
d_A, Approach Delay [s/veh]	11.69			0.00			0.00			3.09		
Approach LOS	B			A			A			A		
d_I, Intersection Delay [s/veh]	1.87											
Intersection LOS	C											

Intersection Level Of Service Report
#3: I-15 SB On and Airport RD

Control Type:	Two-way stop	Delay (sec / veh):	8.6
Analysis Method:	HCM2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.046

Intersection Setup

Name						
Approach	Northeastbound		Northwestbound		Southeastbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	0	0	32	23	251	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	43.80	21.70	14.00	16.70
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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
Total Hourly Volume [veh/h]	0	0	32	23	251	6
Peak Hour Factor	1.0000	1.0000	0.6670	0.6390	0.8720	0.3750
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	12	9	72	4
Total Analysis Volume [veh/h]	0	0	48	36	288	16
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.05	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	8.58	0.00	0.00	0.00
Movement LOS			A	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.26	0.26	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	0.00	6.49	6.49	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		4.90		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.06					
Intersection LOS	A					

Intersection Level Of Service Report
#4: I-15 SB Off and Airport RD Frontage

Control Type:	Two-way stop	Delay (sec / veh):	12.7
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.272

Intersection Setup

Name												
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	5	0	44	159	54	96	8	12	0	0	40	4
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	2.00	11.30	10.10	7.40	3.10	12.50	8.30	2.00	2.00	2.50	0.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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	0	44	159	54	96	8	12	0	0	40	4
Peak Hour Factor	0.4170	1.0000	0.5240	0.8110	0.9000	0.7060	0.4000	0.7500	1.0000	1.0000	0.7690	0.5000
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	0	21	49	15	34	5	4	0	0	13	2
Total Analysis Volume [veh/h]	12	0	84	196	60	136	20	16	0	0	52	8
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.09	0.27	0.08	0.13	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.78	0.00	9.10	12.67	12.44	8.90	7.47	0.00	0.00	0.00	0.00	0.00
Movement LOS	B		A	B	B	A	A	A			A	A
95th-Percentile Queue Length [veh]	0.34	0.00	0.34	1.59	1.59	0.44	0.07	0.07	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	8.59	0.00	8.59	39.68	39.68	11.00	1.87	1.87	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	9.31			11.33			4.15			0.00		
Approach LOS	A			B			A			A		
d_I, Intersection Delay [s/veh]	9.39											
Intersection LOS	B											

Intersection Level Of Service Report
#5: 14th St SW and I-315 EB

Control Type:	Signalized	Delay (sec / veh):	14.4
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.175

Intersection Setup

Name												
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	7	66	286	142	91	60	44	69	3	20	30	5
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 [%]	14.30	1.50	1.70	3.50	4.40	5.00	0.00	4.30	0.00	10.00	3.30	0.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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]	7	66	286	142	91	60	44	69	3	20	30	5
Peak Hour Factor	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300
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	20	86	43	27	18	13	21	1	6	9	2
Total Analysis Volume [veh/h]	8	80	345	171	110	72	53	83	4	24	36	6
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
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]	60
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Overlap	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	2	3	0	6	7	7	4	0	3	8	0
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	15	0	5	15	15	5	0	15	15	0
Maximum Green [s]	0	50	20	0	50	20	20	60	0	20	60	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	22	18	0	22	18	18	20	0	18	20	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	5	0	5	0	0	5	0	5	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0	0	10	0	10	10	0
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	3.0	1.0	0.0	3.0	1.0	1.0	3.0	0.0	1.0	3.0	0.0
Minimum Recall		no	no		no	no	no	no		no	no	
Maximum Recall		no	no		no	no	no	no		no	no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	3.00	5.00	5.00	3.00	5.00	5.00	5.00	4.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	0.00	0.00	3.00	3.00	0.00	3.00	3.00
g_i, Effective Green Time [s]	15	15	34	15	15	33	28	12	12	28	10	10
g / C, Green / Cycle	0.24	0.24	0.57	0.24	0.24	0.54	0.47	0.20	0.20	0.47	0.17	0.17
(v / s)_i Volume / Saturation Flow Rate	0.01	0.04	0.22	0.13	0.06	0.05	0.03	0.05	0.00	0.02	0.02	0.00
s, saturation flow rate [veh/h]	1140	1872	1588	1294	1820	1538	1631	1822	1615	1432	1839	1615
c, Capacity [veh/h]	299	452	912	342	439	836	920	360	319	797	307	270
d1, Uniform Delay [s]	21.49	18.04	6.95	23.72	18.38	6.55	8.80	20.24	19.36	8.71	21.23	20.89
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]	0.04	0.19	0.26	1.13	0.30	0.04	0.03	0.32	0.02	0.02	0.17	0.03
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

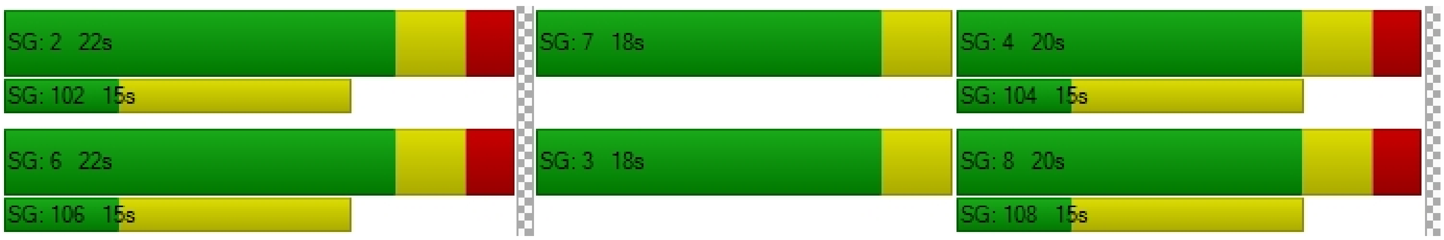
X, volume / capacity	0.03	0.18	0.38	0.50	0.25	0.09	0.06	0.23	0.01	0.03	0.12	0.02
d, Delay for Lane Group [s/veh]	21.52	18.22	7.21	24.85	18.67	6.60	8.83	20.56	19.38	8.72	21.39	20.92
Lane Group LOS	C	B	A	C	B	A	A	C	B	A	C	C
Critical Lane Group	no	no	yes	no	no	no	no	no	no	no	yes	no
50th-Percentile Queue Length [veh]	0.09	0.84	1.92	2.26	1.18	0.37	0.33	0.94	0.04	0.15	0.42	0.07
50th-Percentile Queue Length [ft]	2.32	20.94	47.91	56.41	29.43	9.15	8.37	23.62	1.09	3.74	10.46	1.72
95th-Percentile Queue Length [veh]	0.17	1.51	3.45	4.06	2.12	0.66	0.60	1.70	0.08	0.27	0.75	0.12
95th-Percentile Queue Length [ft]	4.18	37.70	86.24	101.54	52.97	16.46	15.06	42.51	1.95	6.74	18.82	3.09

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	21.52	18.22	7.21	24.85	18.67	6.60	8.83	20.56	19.38	8.72	21.39	20.92
Movement LOS	C	B	A	C	B	A	A	C	B	A	C	C
d_A, Approach Delay [s/veh]	9.51			19.20			16.09			16.74		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	14.37											
Intersection LOS	B											
Intersection V/C	0.175											

Sequence

Ring 1	2	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	3	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
#6: 14th St SW and I-315 WB

Control Type:	Signalized	Delay (sec / veh):	23.0
Analysis Method:	HCM2010	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.254

Intersection Setup

Name												
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	11	17	90	26	136	0	0	7	15	162	16	38
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 [%]	9.10	0.00	4.40	7.70	1.50	0.00	0.00	0.00	0.00	2.50	0.00	0.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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]	11	17	90	26	136	0	0	7	15	162	16	38
Peak Hour Factor	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040
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	5	28	8	42	0	0	2	5	50	5	12
Total Analysis Volume [veh/h]	14	21	112	32	169	0	0	9	19	201	20	47
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
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]	60
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	0	1	2	0	1	0	0	3	0	0	2	0
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	5	5	0	5	0	0	5	0	0	5	0
Maximum Green [s]	0	35	40	0	35	0	0	25	0	0	40	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	25	19	0	25	0	0	16	0	0	19	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	9	7	0	9	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	11	7	0	11	0	0	0	0	0	7	0
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		no	no		no			no			no	
Maximum Recall		no	no		no			no			no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	L	C	R	L	C	C	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	11	11	27	11	11	2	11	11
g / C, Green / Cycle	0.19	0.19	0.45	0.19	0.19	0.03	0.18	0.18
(v / s)_i Volume / Saturation Flow Rate	0.01	0.01	0.08	0.03	0.10	0.02	0.14	0.03
s, saturation flow rate [veh/h]	1019	1710	1392	1181	1685	1527	1636	1454
c, Capacity [veh/h]	178	321	624	283	316	48	290	257
d1, Uniform Delay [s]	27.05	20.04	9.94	22.89	22.00	28.67	23.49	20.99
k, delay calibration	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
d2, Incremental Delay [s]	0.19	0.08	0.14	0.17	1.40	10.79	4.15	0.34
d3, Initial Queue Delay [s]	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
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.08	0.07	0.18	0.11	0.53	0.58	0.76	0.18
d, Delay for Lane Group [s/veh]	27.24	20.13	10.07	23.06	23.41	39.47	27.64	21.33
Lane Group LOS	C	C	B	C	C	D	C	C
Critical Lane Group	no	no	no	no	yes	yes	yes	no
50th-Percentile Queue Length [veh]	0.19	0.23	0.79	0.39	2.12	0.52	3.10	0.55
50th-Percentile Queue Length [ft]	4.78	5.84	19.74	9.76	53.01	13.05	77.54	13.75
95th-Percentile Queue Length [veh]	0.34	0.42	1.42	0.70	3.82	0.94	5.58	0.99
95th-Percentile Queue Length [ft]	8.60	10.51	35.54	17.57	95.41	23.49	139.58	24.76

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	27.24	20.13	10.07	23.06	23.41	23.41	39.47	39.47	39.47	27.64	27.64	21.33
Movement LOS	C	C	B	C	C	C	D	D	D	C	C	C
d_A, Approach Delay [s/veh]	13.14			23.35			39.47			26.53		
Approach LOS	B			C			D			C		
d_I, Intersection Delay [s/veh]	23.05											
Intersection LOS	C											
Intersection V/C	0.254											

Sequence

Ring 1	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
#7: Fox Farm and I-315

Control Type:	Signalized	Delay (sec / veh):	45.3
Analysis Method:	HCM2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.687

Intersection Setup

Name												
Approach	Northbound			Southbound			Northeastbound			Southwestbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	50	219	437	172	90	121	161	732	45	101	335	136
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 [%]	2.00	0.90	0.70	1.80	2.20	4.10	6.20	5.20	2.20	4.00	6.00	3.70
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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]	50	219	437	172	90	121	161	732	45	101	335	136
Peak Hour Factor	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980
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	69	137	54	28	38	50	229	14	32	105	43
Total Analysis Volume [veh/h]	63	274	548	216	113	152	202	917	56	127	420	170
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
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]	150
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Overlap	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	1	8	0	3	6	6	4	0	8	2	5
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	5	0	5	5	5	5	0	5	5	0
Maximum Green [s]	0	60	60	0	60	60	60	60	0	60	60	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	21	47	0	28	76	76	54	0	47	25	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	3.0	1.0	0.0	3.0	1.0	1.0	3.0	0.0	1.0	3.0	0.0
Minimum Recall		no	no		no	no	no	no		no	no	
Maximum Recall		no	no		no	no	no	no		no	no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R	L	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	3.00	5.00	5.00	3.00	3.00	5.00	5.00	3.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	0.00	1.00	3.00	3.00	1.00	3.00	3.00
g_i, Effective Green Time [s]	31	31	99	27	27	53	20	44	44	31	54	54
g / C, Green / Cycle	0.21	0.21	0.66	0.18	0.18	0.35	0.14	0.29	0.29	0.20	0.36	0.36
(v / s)_i Volume / Saturation Flow Rate	0.04	0.16	0.34	0.15	0.03	0.10	0.12	0.27	0.04	0.04	0.12	0.11
s, saturation flow rate [veh/h]	1793	1714	1604	1414	3540	1551	1704	3439	1580	3379	3413	1557
c, Capacity [veh/h]	370	353	1058	290	649	547	231	997	458	688	1222	557
d1, Uniform Delay [s]	48.99	56.26	13.19	60.81	51.67	34.87	63.55	51.55	39.19	49.42	35.26	34.71
k, delay calibration	0.11	0.11	0.35	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]	0.22	3.68	1.29	3.78	0.13	0.27	9.88	4.00	0.12	0.13	0.17	0.31
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	0.17	0.78	0.52	0.74	0.17	0.28	0.87	0.92	0.12	0.18	0.34	0.30
d, Delay for Lane Group [s/veh]	49.21	59.94	14.48	64.59	51.80	35.14	73.43	55.55	39.31	49.55	35.42	35.01
Lane Group LOS	D	E	B	E	D	D	E	E	D	D	D	D
Critical Lane Group	no	no	yes	yes	no	no	no	yes	no	no	no	no
50th-Percentile Queue Length [veh]	1.99	10.20	9.77	8.38	1.83	4.11	8.23	17.25	1.56	2.01	5.74	4.60
50th-Percentile Queue Length [ft]	49.82	255.07	244.37	209.46	45.76	102.67	205.68	431.14	39.12	50.27	143.52	114.99
95th-Percentile Queue Length [veh]	3.59	15.44	14.90	13.13	3.29	7.39	12.93	24.06	2.82	3.62	9.67	8.12
95th-Percentile Queue Length [ft]	89.67	386.04	372.56	328.14	82.36	184.80	323.28	601.41	70.42	90.48	241.76	202.92

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	49.21	59.94	14.48	64.59	51.80	35.14	73.43	55.55	39.31	49.55	35.42	35.01
Movement LOS	D	E	B	E	D	D	E	E	D	D	D	D
d_A, Approach Delay [s/veh]	31.02			52.28			57.85			37.83		
Approach LOS	C			D			E			D		
d_I, Intersection Delay [s/veh]	45.33											
Intersection LOS	D											
Intersection V/C	0.687											

Sequence

Ring 1	1	3	8	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	6	2	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
#8: Central Ave and I15 SB

Control Type:	Two-way stop	Delay (sec / veh):	28.0
Analysis Method:	HCM2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.499

Intersection Setup

Name												
Approach	Southbound			Eastbound			Westbound			Northwestbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	130	0	6	0	191	39	123	88	0	0	0	0
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 [%]	2.30	0.00	0.00	2.00	3.10	0.00	6.50	11.30	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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]	130	0	6	0	191	39	123	88	0	0	0	0
Peak Hour Factor	0.8550	1.0000	0.7500	1.0000	0.6920	0.7500	0.7690	0.8150	1.0000	1.0000	1.0000	1.0000
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]	38	0	2	0	69	13	40	27	0	0	0	0
Total Analysis Volume [veh/h]	152	0	8	0	276	52	160	108	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Free	Free	Stop
Flared Lane				
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.50	0.00	0.01	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	28.03	27.54	8.82	0.00	0.00	0.00	8.27	0.00	0.00	0.00	0.00	0.00
Movement LOS	D	D	A		A	A	A	A				
95th-Percentile Queue Length [veh]	2.63	2.63	0.03	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	65.65	65.65	0.64	0.00	0.00	0.00	10.86	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	27.07			0.00			4.94			0.00		
Approach LOS	D			A			A			A		
d_I, Intersection Delay [s/veh]	7.48											
Intersection LOS	D											

Intersection Level Of Service Report
#9: Central Ave and I-15 NB

Control Type:	Two-way stop	Delay (sec / veh):	19.9
Analysis Method:	HCM2010	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.080

Intersection Setup

Name												
Approach	Northbound			Eastbound			Westbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	15	0	177	6	305	0	0	202	44	0	0	0
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	0.00	10.80	16.70	2.00	2.00	2.00	11.40	13.60	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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	0	177	6	305	0	0	202	44	0	0	0
Peak Hour Factor	0.5360	1.0000	0.8510	0.7500	0.7190	1.0000	1.0000	0.8420	0.7330	1.0000	1.0000	1.0000
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]	7	0	52	2	106	0	0	60	15	0	0	0
Total Analysis Volume [veh/h]	28	0	208	8	424	0	0	240	60	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Free	Free	Stop
Flared Lane	no			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.08	0.00	0.34	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	19.87	19.21	15.45	7.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Movement LOS	C	C	C	A	A			A	A			
95th-Percentile Queue Length [veh]	2.07	2.07	2.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	51.73	51.73	51.73	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	15.98			0.15			0.00			0.00		
Approach LOS	C			A			A			A		
d_I, Intersection Delay [s/veh]	3.96											
Intersection LOS	C											

Intersection Level Of Service Report
#10: Central Ave and Vaughn Rd

Control Type:	Two-way stop	Delay (sec / veh):	27.1
Analysis Method:	HCM2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.377

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	77	60	71	410	184	65
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	9.10	6.70	7.00	5.10	11.40	6.20
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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
Total Hourly Volume [veh/h]	77	60	71	410	184	65
Peak Hour Factor	0.7700	0.7890	0.8450	0.8010	0.8520	0.7740
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	25	19	21	128	54	21
Total Analysis Volume [veh/h]	100	76	84	512	216	84
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.38	0.10	0.07	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	27.07	18.19	8.13	0.00	0.00	0.00
Movement LOS	D	C	A	A	A	A
95th-Percentile Queue Length [veh]	2.47	2.47	0.22	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	61.70	61.70	5.47	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	23.23		1.15		0.00	
Approach LOS	C		A		A	
d_I, Intersection Delay [s/veh]	4.45					
Intersection LOS	D					

Intersection Level Of Service Report
#11: Vaughn Rd and I-15 SB

Control Type:	Two-way stop	Delay (sec / veh):	10.1
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.260

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	219	1	0	27	12	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.60	0.00	2.00	11.10	8.30	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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
Total Hourly Volume [veh/h]	219	1	0	27	12	0
Peak Hour Factor	0.8830	0.2500	1.0000	0.8440	0.7500	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	62	1	0	8	4	0
Total Analysis Volume [veh/h]	248	4	0	32	16	0
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.26	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.11	9.71	0.00	0.00	0.00	0.00
Movement LOS	B	A		A	A	
95th-Percentile Queue Length [veh]	1.06	1.06	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	26.50	26.50	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	10.10		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	8.49					
Intersection LOS	B					

Intersection Level Of Service Report
#12: Vaughn Rd and I-15 NB

Control Type:	Two-way stop	Delay (sec / veh):	7.3
Analysis Method:	HCM2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name						
Approach	Eastbound		Westbound		Southeastbound	
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	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	0	237	19	76	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	5.00	5.30	14.50	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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
Total Hourly Volume [veh/h]	0	237	19	76	0	0
Peak Hour Factor	1.0000	0.8590	0.5940	0.8260	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	69	8	23	0	0
Total Analysis Volume [veh/h]	0	276	32	92	0	0
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

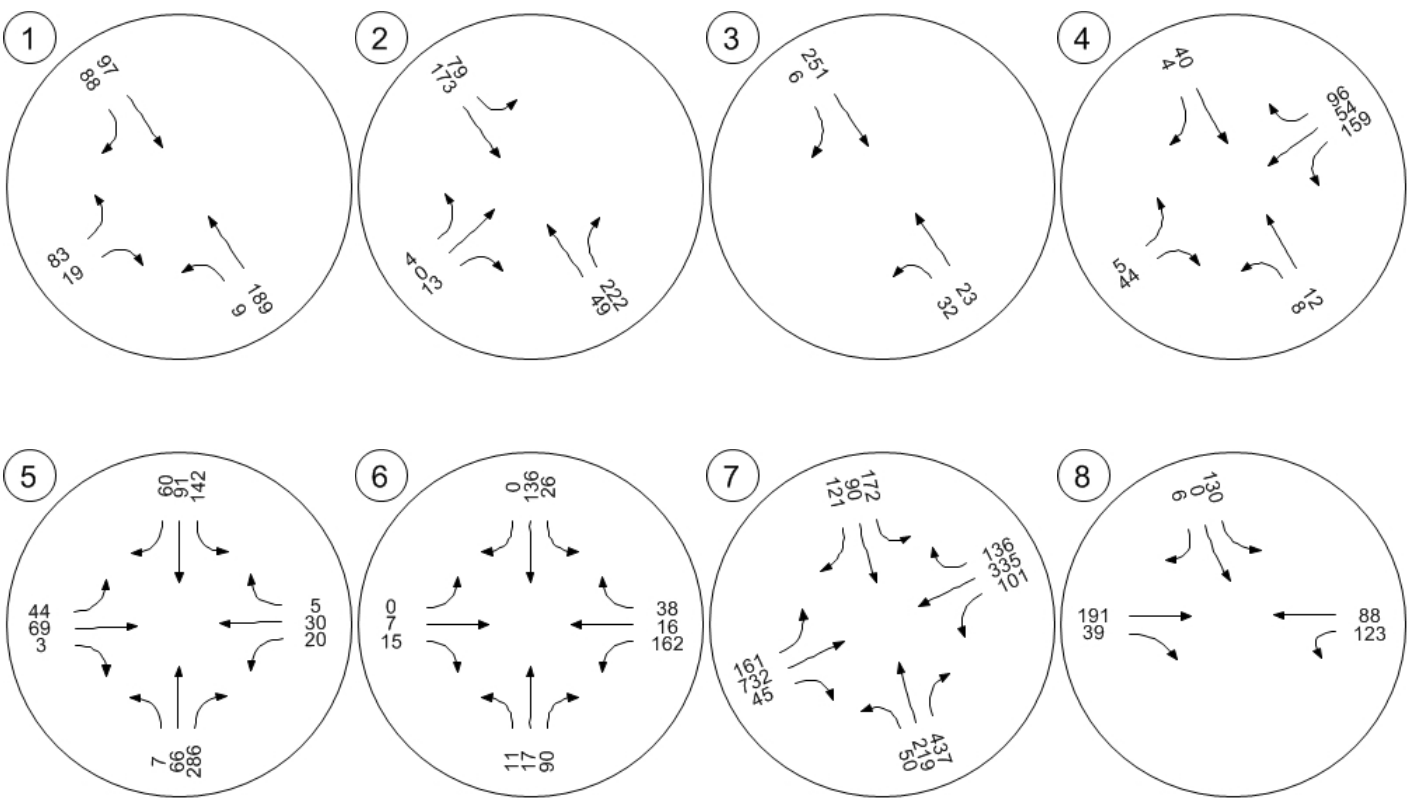
Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	0	0	0

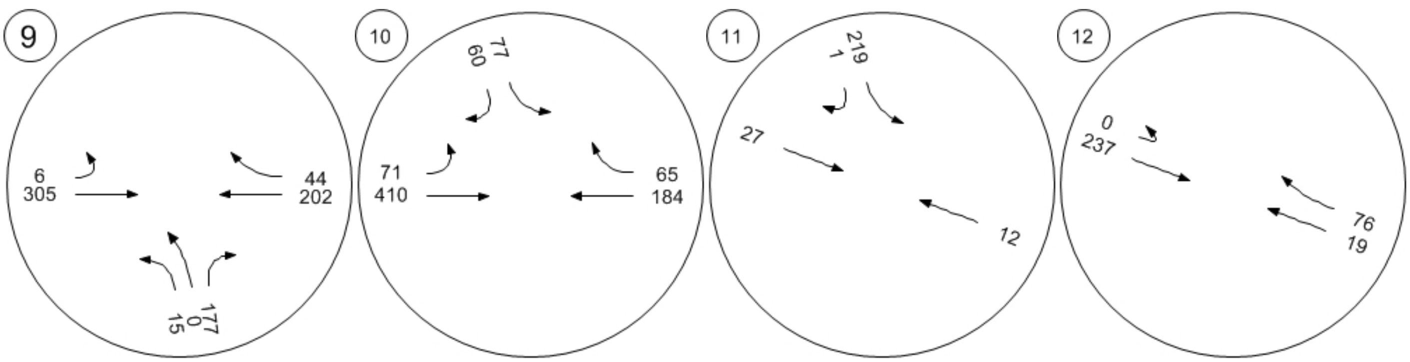
Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	7.26	0.00	0.00	0.00	0.00	0.00
Movement LOS	A	A	A	A		
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		0.00		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.00					
Intersection LOS	A					

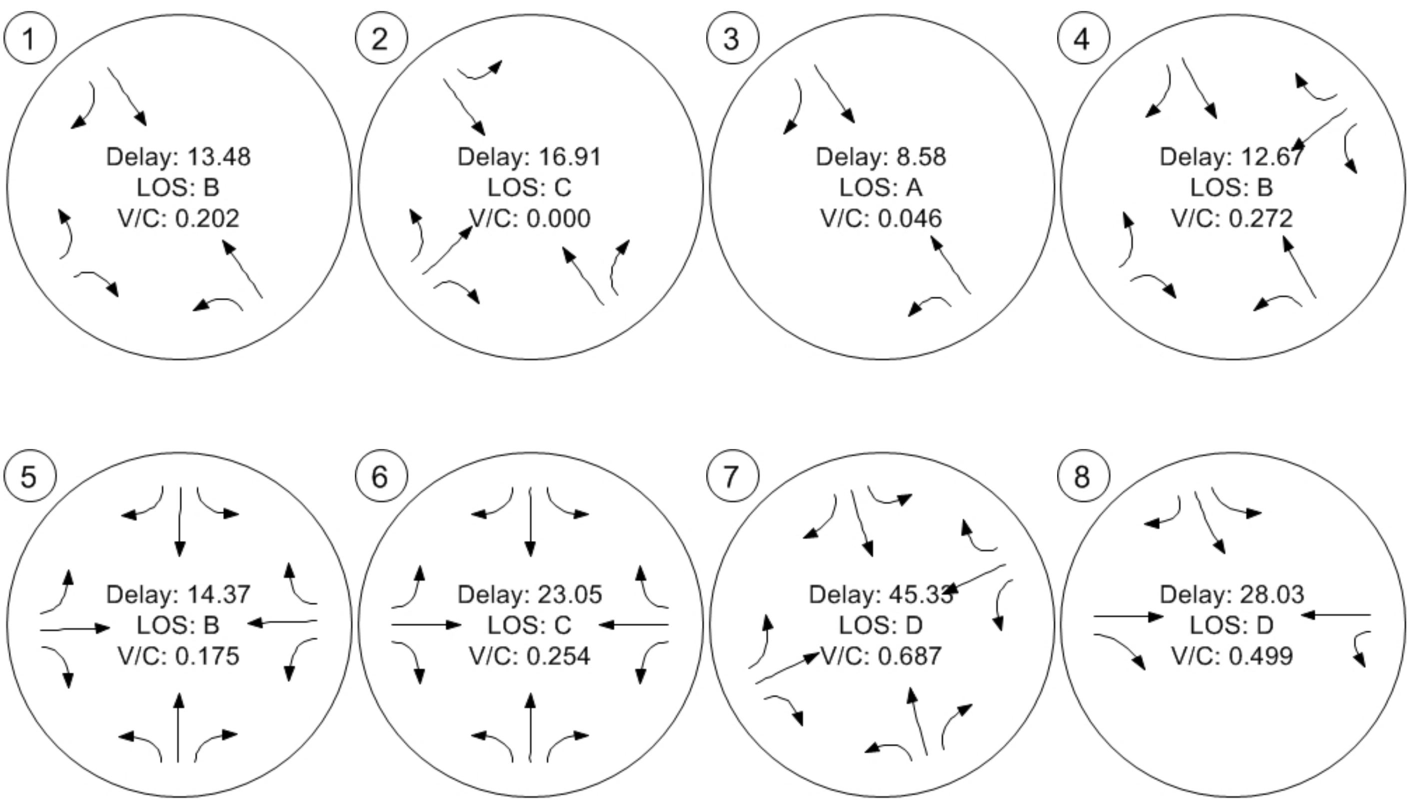
Traffic Volume - Base Volume



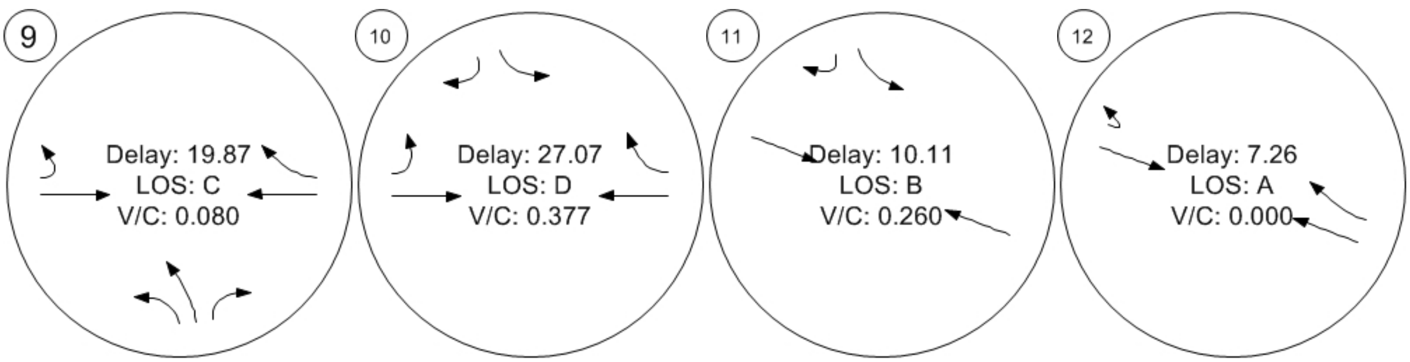
Traffic Volume - Base Volume



Traffic Conditions



Traffic Conditions



I-15 Corridor Study

Vistro File: F:\...\I-15 Corridor.vistropdb Scenario 2: PM Scenario
Report File: F:\...\LOS_Report_PM.pdf 9/15/2014

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Tri Hill and Frontage Airport Rd	Two-way stop	HCM2010	NEBL	0.256	14.5	B
2	I-15 NB and Airport Rd	Two-way stop	HCM2010	NEBT	0.053	55.4	F
3	I-15 SB On and Airport RD	Two-way stop	HCM2010	NWBL	0.063	11.0	B
4	I-15 SB Off and Airport RD Frontage	Two-way stop	HCM2010	SWBL	0.660	35.3	E
5	14th St SW and I-315 EB	Signalized	HCM2010	NBL	0.368	13.0	B
6	14th St SW and I-315 WB	Signalized	HCM2010	EBR	0.536	19.4	B
7	Fox Farm and I-315	Signalized	HCM2010	NBT	0.795	38.5	D
8	Central Ave and I15 SB	Two-way stop	HCM2010	SBL	0.432	42.0	E
9	Central Ave and I-15 NB	Two-way stop	HCM2010	NBL	0.303	29.1	D
10	Central Ave and Vaughn Rd	Two-way stop	HCM2010	SBL	0.576	65.0	F
11	Vaughn Rd and I-15 SB	Two-way stop	HCM2010	SBL	0.177	10.1	B
12	Vaughn Rd and I-15 NB	Two-way stop	HCM2010	EBL	0.000	7.3	A

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
#1: Tri Hill and Frontage Airport Rd

Control Type:	Two-way stop	Delay (sec / veh):	14.5
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.256

Intersection Setup

Name						
Approach	Northeastbound		Northwestbound		Southeastbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	75	7	9	160	207	70
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.70	0.00	22.20	33.80	18.90	15.80
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	75	7	9	160	207	70
Peak Hour Factor	0.5680	0.4380	0.7500	0.8000	0.8480	0.8330
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	33	4	3	50	61	21
Total Analysis Volume [veh/h]	132	16	12	200	244	84
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.26	0.02	0.01	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	14.52	12.30	8.23	0.00	0.00	0.00
Movement LOS	B	B	A	A	A	A
95th-Percentile Queue Length [veh]	1.12	1.12	0.03	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	28.04	28.04	0.81	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	14.28		0.47		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	3.22					
Intersection LOS	B					

Intersection Level Of Service Report
#2: I-15 NB and Airport Rd

Control Type:	Two-way stop	Delay (sec / veh):	55.4
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.053

Intersection Setup

Name												
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	2	2	31	0	0	0	0	47	197	307	236	0
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	0.00	47.40	2.00	2.00	2.00	2.00	40.40	20.80	0.70	17.40	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	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]	2	2	31	0	0	0	0	47	197	307	236	0
Peak Hour Factor	0.5000	0.5000	0.7750	1.0000	1.0000	1.0000	1.0000	0.6910	0.8210	0.6910	0.8680	1.0000
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	1	10	0	0	0	0	17	60	111	68	0
Total Analysis Volume [veh/h]	4	4	40	0	0	0	0	68	240	444	272	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	no			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.05	0.05	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00
d_M, Delay for Movement [s/veh]	48.66	55.37	12.63	0.00	0.00	0.00	0.00	0.00	0.00	9.40	0.00	0.00
Movement LOS	E	F	B					A	A	A	A	
95th-Percentile Queue Length [veh]	0.56	0.56	0.56	0.00	0.00	0.00	0.00	0.00	0.00	3.74	3.74	0.00
95th-Percentile Queue Length [ft]	13.96	13.96	13.96	0.00	0.00	0.00	0.00	0.00	0.00	93.56	93.56	0.00
d_A, Approach Delay [s/veh]	19.19			0.00			0.00			5.83		
Approach LOS	C			A			A			A		
d_I, Intersection Delay [s/veh]	4.75											
Intersection LOS	F											

Intersection Level Of Service Report
#3: I-15 SB On and Airport RD

Control Type:	Two-way stop	Delay (sec / veh):	11.0
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.063

Intersection Setup

Name						
Approach	Northeastbound		Northwestbound		Southeastbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	0	0	25	21	542	14
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	64.00	19.10	7.30	0.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	25	21	542	14
Peak Hour Factor	1.0000	1.0000	0.6250	0.7500	0.7450	0.7000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	10	7	182	5
Total Analysis Volume [veh/h]	0	0	40	28	728	20
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.06	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	11.03	0.00	0.00	0.00
Movement LOS			B	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.36	0.36	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	0.00	8.91	8.91	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		6.49		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.54					
Intersection LOS	B					

Intersection Level Of Service Report
#4: I-15 SB Off and Airport RD Frontage

Control Type:	Two-way stop	Delay (sec / veh):	35.3
Analysis Method:	HCM2010	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.660

Intersection Setup

Name												
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	0	0	55	217	26	47	8	15	0	0	286	1
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	2.00	1.80	18.90	11.50	2.10	37.50	6.70	2.00	2.00	1.00	0.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	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]	0	0	55	217	26	47	8	15	0	0	286	1
Peak Hour Factor	1.0000	1.0000	0.7240	0.8350	0.7220	0.6910	0.6670	0.7500	1.0000	1.0000	0.6810	0.2500
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]	0	0	19	65	9	17	3	5	0	0	105	1
Total Analysis Volume [veh/h]	0	0	76	260	36	68	12	20	0	0	420	4
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.12	0.66	0.08	0.06	0.01	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	14.08	0.00	11.47	35.33	33.80	8.64	8.76	0.00	0.00	0.00	0.00	0.00
Movement LOS	B		B	E	D	A	A	A			A	A
95th-Percentile Queue Length [veh]	0.41	0.00	0.41	5.82	5.82	0.21	0.10	0.10	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	10.19	0.00	10.19	145.42	145.42	5.15	2.56	2.56	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	11.47			30.19			3.29			0.00		
Approach LOS	B			D			A			A		
d_I, Intersection Delay [s/veh]	13.35											
Intersection LOS	E											

Intersection Level Of Service Report
#5: 14th St SW and I-315 EB

Control Type:	Signalized	Delay (sec / veh):	13.0
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.368

Intersection Setup

Name												
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	13	82	260	95	396	262	107	168	10	102	50	31
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	2.40	1.20	4.30	1.30	0.40	0.90	0.00	0.00	1.00	0.00	12.90
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	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]	13	82	260	95	396	262	107	168	10	102	50	31
Peak Hour Factor	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380
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	22	69	25	106	70	29	45	3	27	13	8
Total Analysis Volume [veh/h]	14	87	277	101	422	279	114	179	11	109	53	33
Presence of On-Street Parking	no		no	no		no	no		no	no		no
On-Street Parking Maneuver Rate [/	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
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]	60
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Overlap	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	2	3	0	6	7	7	4	0	3	8	0
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	15	0	5	15	15	5	0	15	15	0
Maximum Green [s]	0	50	20	0	50	20	20	45	0	20	45	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	22	18	0	22	18	18	20	0	18	20	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	5	0	5	0	0	5	0	5	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0	0	10	0	10	10	0
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	1.0	0.0	3.0	1.0	1.0	3.0	0.0	1.0	3.0	0.0
Minimum Recall		no	no		no	no	no	no		no	no	
Maximum Recall		no	no		no	no	no	no		no	no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	3.00	5.00	5.00	3.00	3.00	5.00	5.00	4.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	0.00	0.00	3.00	3.00	0.00	3.00	3.00
g_i, Effective Green Time [s]	18	18	38	18	18	38	32	14	14	32	14	14
g / C, Green / Cycle	0.31	0.31	0.64	0.31	0.31	0.64	0.54	0.24	0.24	0.54	0.24	0.24
(v / s)_i Volume / Saturation Flow Rate	0.01	0.05	0.17	0.08	0.22	0.17	0.07	0.09	0.01	0.07	0.03	0.02
s, saturation flow rate [veh/h]	980	1855	1596	1276	1876	1609	1573	1900	1615	1497	1900	1430
c, Capacity [veh/h]	181	566	1018	416	572	1027	1004	459	390	897	459	345
d1, Uniform Delay [s]	26.77	15.19	4.75	19.22	18.69	4.75	6.76	19.06	17.38	6.92	17.75	17.67
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]	0.18	0.12	0.14	0.30	1.88	0.14	0.05	0.54	0.03	0.06	0.11	0.12
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	0.08	0.15	0.27	0.24	0.74	0.27	0.11	0.39	0.03	0.12	0.12	0.10
d, Delay for Lane Group [s/veh]	26.95	15.32	4.89	19.52	20.56	4.89	6.81	19.60	17.41	6.98	17.86	17.79
Lane Group LOS	C	B	A	B	C	A	A	B	B	A	B	B
Critical Lane Group	no	no	no	no	yes	yes	no	yes	no	no	no	no
50th-Percentile Queue Length [veh]	0.19	0.81	1.09	1.12	5.03	1.10	0.59	2.00	0.11	0.57	0.55	0.34
50th-Percentile Queue Length [ft]	4.75	20.31	27.29	28.03	125.69	27.47	14.87	49.98	2.78	14.22	13.67	8.53
95th-Percentile Queue Length [veh]	0.34	1.46	1.96	2.02	8.70	1.98	1.07	3.60	0.20	1.02	0.98	0.61
95th-Percentile Queue Length [ft]	8.55	36.56	49.12	50.46	217.62	49.44	26.77	89.97	5.01	25.60	24.60	15.36

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.95	15.32	4.89	19.52	20.56	4.89	6.81	19.60	17.41	6.98	17.86	17.79
Movement LOS	C	B	A	B	C	A	A	B	B	A	B	B
d_A, Approach Delay [s/veh]	8.11			14.98			14.72			11.77		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	13.01											
Intersection LOS	B											
Intersection V/C	0.368											

Sequence

Ring 1	2	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	3	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
#6: 14th St SW and I-315 WB

Control Type:	Signalized	Delay (sec / veh):	19.4
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.536

Intersection Setup

Name												
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	5	76	146	22	131	2	3	5	19	638	12	142
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 [%]	40.00	6.60	0.70	0.00	2.30	0.00	0.00	0.00	15.80	1.80	8.30	4.20
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	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]	5	76	146	22	131	2	3	5	19	638	12	142
Peak Hour Factor	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880
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	19	37	6	33	1	1	1	5	161	3	36
Total Analysis Volume [veh/h]	5	77	148	22	133	2	3	5	19	646	12	144
Presence of On-Street Parking	no		no	no		no	no		no	no		no
On-Street Parking Maneuver Rate [/	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
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]	60
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	0	1	2	0	1	0	0	3	0	0	2	0
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	5	5	0	5	0	0	5	0	0	5	0
Maximum Green [s]	0	35	40	0	35	0	0	25	0	0	40	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	25	19	0	25	0	0	16	0	0	19	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	9	7	0	9	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	11	7	0	11	0	0	0	0	0	7	0
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		no	no		no			no			no	
Maximum Recall		no	no		no			no			no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	L	C	R	L	C	C	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	10	10	44	10	10	2	29	29
g / C, Green / Cycle	0.17	0.17	0.73	0.17	0.17	0.03	0.48	0.48
(v / s)_i Volume / Saturation Flow Rate	0.01	0.05	0.10	0.02	0.08	0.02	0.44	0.10
s, saturation flow rate [veh/h]	819	1604	1443	1209	1667	1514	1505	1395
c, Capacity [veh/h]	164	265	1050	223	275	46	721	668
d1, Uniform Delay [s]	27.03	21.97	2.49	25.56	22.75	28.72	14.48	9.09
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.19	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.07	0.60	0.06	0.19	1.35	11.38	8.39	0.16
d3, Initial Queue Delay [s]	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
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.03	0.29	0.14	0.10	0.49	0.59	0.91	0.22
d, Delay for Lane Group [s/veh]	27.10	22.57	2.55	25.75	24.11	40.09	22.87	9.25
Lane Group LOS	C	C	A	C	C	D	C	A
Critical Lane Group	no	no	no	no	yes	yes	yes	no
50th-Percentile Queue Length [veh]	0.07	0.94	0.29	0.29	1.72	0.51	8.46	0.96
50th-Percentile Queue Length [ft]	1.71	23.40	7.27	7.21	43.07	12.75	211.56	24.03
95th-Percentile Queue Length [veh]	0.12	1.68	0.52	0.52	3.10	0.92	13.23	1.73
95th-Percentile Queue Length [ft]	3.07	42.12	13.09	12.99	77.53	22.96	330.84	43.26

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	27.10	22.57	2.55	25.75	24.11	24.11	40.09	40.09	40.09	22.87	22.87	9.25
Movement LOS	C	C	A	C	C	C	D	D	D	C	C	A
d_A, Approach Delay [s/veh]	9.78			24.34			40.09			20.42		
Approach LOS	A			C			D			C		
d_I, Intersection Delay [s/veh]	19.35											
Intersection LOS	B											
Intersection V/C	0.536											

Sequence

Ring 1	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
#7: Fox Farm and I-315

Control Type:	Signalized	Delay (sec / veh):	38.5
Analysis Method:	HCM2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.795

Intersection Setup

Name												
Approach		Northbound			Southbound			Northeastbound			Southwestbound	
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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		yes			yes			yes			yes	

Volumes

Name												
Base Volume Input [veh/h]	71	155	227	153	274	325	242	706	103	486	874	250
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 [%]	2.80	1.90	0.40	1.30	0.70	2.10	2.50	3.60	2.90	0.40	3.90	1.60
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	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]	71	155	227	153	274	325	242	706	103	486	874	250
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	42	62	42	74	88	66	192	28	132	238	68
Total Analysis Volume [veh/h]	77	168	247	166	298	353	263	767	112	528	950	272
Presence of On-Street Parking	no		no	no		no	no		no	no		no
On-Street Parking Maneuver Rate [/	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
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]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Overlap	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	1	8	0	3	6	6	4	0	8	2	5
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	5	0	5	5	5	5	0	5	5	0
Maximum Green [s]	0	60	60	0	60	60	60	60	0	60	60	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	31	28	0	20	25	25	41	0	28	44	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	3.0	1.0	0.0	3.0	1.0	1.0	3.0	0.0	1.0	3.0	0.0
Minimum Recall		no	no		no	no	no	no		no	no	
Maximum Recall		no	no		no	no	no	no		no	no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R	L	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	3.00	5.00	5.00	3.00	3.00	5.00	5.00	3.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	0.00	1.00	3.00	3.00	1.00	3.00	3.00
g_i, Effective Green Time [s]	16	16	75	25	25	55	25	42	42	24	40	40
g / C, Green / Cycle	0.13	0.13	0.62	0.21	0.21	0.46	0.21	0.35	0.35	0.20	0.34	0.34
(v / s)_i Volume / Saturation Flow Rate	0.05	0.11	0.17	0.13	0.09	0.25	0.17	0.24	0.08	0.17	0.30	0.19
s, saturation flow rate [veh/h]	1604	1527	1448	1279	3233	1424	1589	3143	1413	3150	3134	1431
c, Capacity [veh/h]	211	201	903	303	682	657	332	1093	491	624	1055	482
d1, Uniform Delay [s]	47.76	50.63	10.25	45.27	41.14	23.11	44.98	33.77	27.73	46.37	37.89	32.60
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]	1.21	7.40	0.16	1.55	0.44	0.68	4.26	0.83	0.23	3.29	3.12	1.04
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

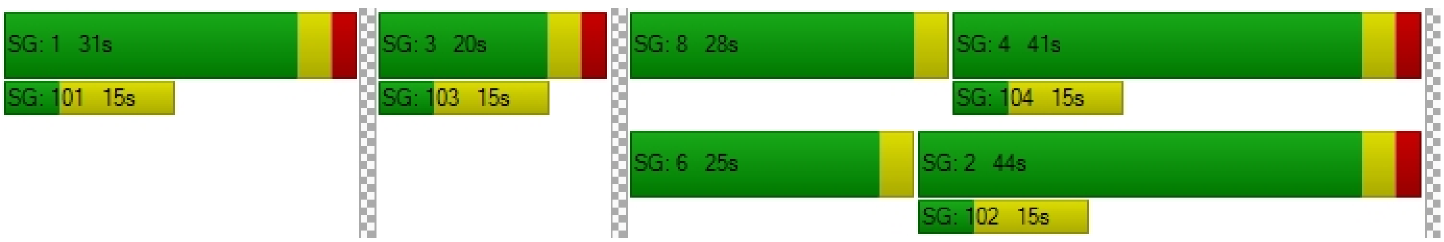
X, volume / capacity	0.40	0.81	0.27	0.55	0.44	0.54	0.79	0.70	0.23	0.85	0.90	0.56
d, Delay for Lane Group [s/veh]	48.97	58.03	10.41	46.82	41.59	23.80	49.23	34.60	27.96	49.65	41.02	33.65
Lane Group LOS	D	E	B	D	D	C	D	C	C	D	D	C
Critical Lane Group	no	no	yes	no	no	yes	yes	no	no	no	yes	no
50th-Percentile Queue Length [veh]	2.37	5.13	2.92	4.73	3.88	7.19	7.80	9.70	2.33	7.85	13.56	6.60
50th-Percentile Queue Length [ft]	59.22	128.16	73.04	118.23	97.06	179.81	194.94	242.50	58.19	196.24	339.12	164.94
95th-Percentile Queue Length [veh]	4.26	8.84	5.26	8.30	6.99	11.59	12.38	14.81	4.19	12.44	19.60	10.81
95th-Percentile Queue Length [ft]	106.59	220.99	131.48	207.39	174.71	289.77	309.43	370.20	104.74	311.11	490.12	270.25

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	48.97	57.68	10.41	46.82	41.59	23.80	49.23	34.60	27.96	49.65	41.02	33.65
Movement LOS	D	E	B	D	D	C	D	C	C	D	D	C
d_A, Approach Delay [s/veh]	32.58			34.96			37.32			42.48		
Approach LOS	C			C			D			D		
d_I, Intersection Delay [s/veh]	38.46											
Intersection LOS	D											
Intersection V/C	0.795											

Sequence

Ring 1	1	3	8	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	6	2	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
#8: Central Ave and I15 SB

Control Type:	Two-way stop	Delay (sec / veh):	42.0
Analysis Method:	HCM2010	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.432

Intersection Setup

Name												
Approach	Southbound			Eastbound			Westbound			Northwestbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	66	0	6	0	166	30	230	299	0	0	0	0
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 [%]	6.00	0.00	0.00	2.00	0.60	0.00	6.50	1.00	2.00	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	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]	66	0	6	0	166	30	230	299	0	0	0	0
Peak Hour Factor	0.9170	1.0000	0.7500	1.0000	0.8470	0.8330	0.8980	0.8690	1.0000	1.0000	1.0000	1.0000
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	0	2	0	49	9	64	86	0	0	0	0
Total Analysis Volume [veh/h]	72	0	8	0	196	36	256	344	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Free	Free	Stop
Flared Lane				
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.43	0.00	0.01	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	42.03	39.90	10.18	0.00	0.00	0.00	8.29	0.00	0.00	0.00	0.00	0.00
Movement LOS	E	E	B		A	A	A	A				
95th-Percentile Queue Length [veh]	1.96	1.96	0.03	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	48.88	48.88	0.86	0.00	0.00	0.00	17.46	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	38.84			0.00			3.54			0.00		
Approach LOS	E			A			A			A		
d_I, Intersection Delay [s/veh]	5.73											
Intersection LOS	E											

Intersection Level Of Service Report
#9: Central Ave and I-15 NB

Control Type:	Two-way stop	Delay (sec / veh):	29.1
Analysis Method:	HCM2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.303

Intersection Setup

Name												
Approach	Northbound			Eastbound			Westbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	57	0	170	5	249	0	0	471	113	0	0	0
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	0.00	7.00	0.00	2.00	2.00	2.00	4.60	0.90	2.00	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	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]	57	0	170	5	249	0	0	471	113	0	0	0
Peak Hour Factor	0.7130	1.0000	0.7590	0.4170	0.8650	1.0000	1.0000	0.9350	0.8310	1.0000	1.0000	1.0000
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	0	56	3	72	0	0	126	34	0	0	0
Total Analysis Volume [veh/h]	80	0	224	12	288	0	0	504	136	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Free	Free	Stop
Flared Lane	no			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.30	0.00	0.30	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	29.07	27.04	20.30	8.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Movement LOS	D	D	C	A	A			A	A			
95th-Percentile Queue Length [veh]	3.98	3.98	3.98	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	99.39	99.39	99.39	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	22.61			0.34			0.00			0.00		
Approach LOS	C			A			A			A		
d_I, Intersection Delay [s/veh]	5.61											
Intersection LOS	D											

Intersection Level Of Service Report
#10: Central Ave and Vaughn Rd

Control Type:	Two-way stop	Delay (sec / veh):	65.0
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.576

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	68	121	66	361	462	76
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.90	1.60	1.50	4.00	3.40	2.60
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	68	121	66	361	462	76
Peak Hour Factor	0.6540	0.9450	0.7500	0.7910	0.8680	0.7310
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	32	22	114	133	26
Total Analysis Volume [veh/h]	104	128	88	456	532	104
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.58	0.25	0.09	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	65.02	52.12	9.18	0.00	0.00	0.00
Movement LOS	F	F	A	A	A	A
95th-Percentile Queue Length [veh]	6.75	6.75	0.31	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	168.80	168.80	7.64	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	57.91		1.48		0.00	
Approach LOS	F		A		A	
d_I, Intersection Delay [s/veh]	10.09					
Intersection LOS	F					

Intersection Level Of Service Report
#11: Vaughn Rd and I-15 SB

Control Type:	Two-way stop	Delay (sec / veh):	10.1
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.177

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	143	1	0	53	50	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	7.00	0.00	2.00	7.60	4.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	143	1	0	53	50	0
Peak Hour Factor	0.9410	0.2500	1.0000	0.7790	0.8930	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	38	1	0	17	14	0
Total Analysis Volume [veh/h]	152	4	0	68	56	0
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.18	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.11	9.46	0.00	0.00	0.00	0.00
Movement LOS	B	A		A	A	
95th-Percentile Queue Length [veh]	0.66	0.66	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	16.44	16.44	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	10.09		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	5.62					
Intersection LOS	B					

Intersection Level Of Service Report
#12: Vaughn Rd and I-15 NB

Control Type:	Two-way stop	Delay (sec / veh):	7.3
Analysis Method:	HCM2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name						
Approach	Eastbound		Westbound		Southeastbound	
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	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	0	165	55	334	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.10	1.80	4.80	2.00	2.00
Growth Rate	1.00	1.00	1.00	1.00	1.00	1.00
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	165	55	334	0	0
Peak Hour Factor	1.0000	0.7500	0.8090	0.9180	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	55	17	91	0	0
Total Analysis Volume [veh/h]	0	220	68	364	0	0
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

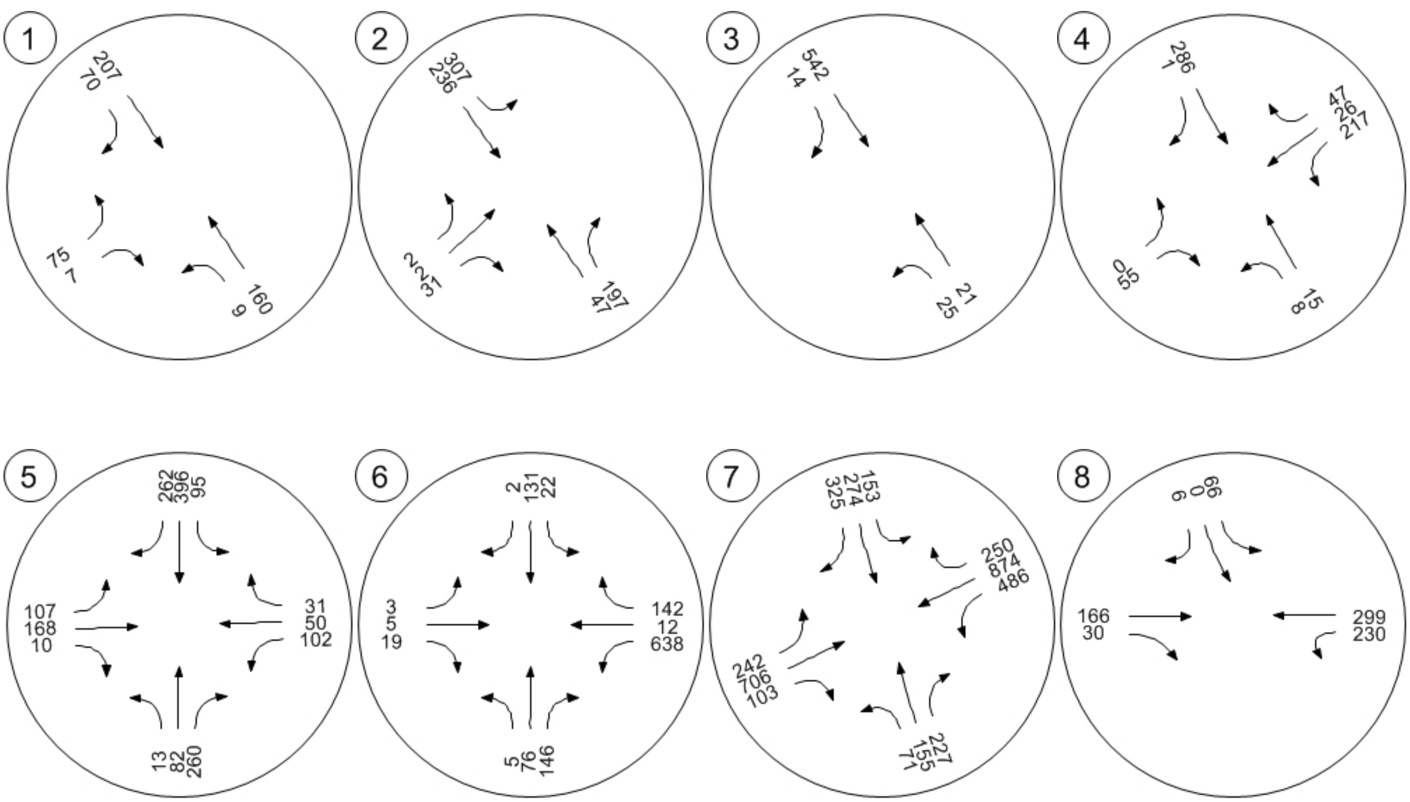
Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	0	0	0

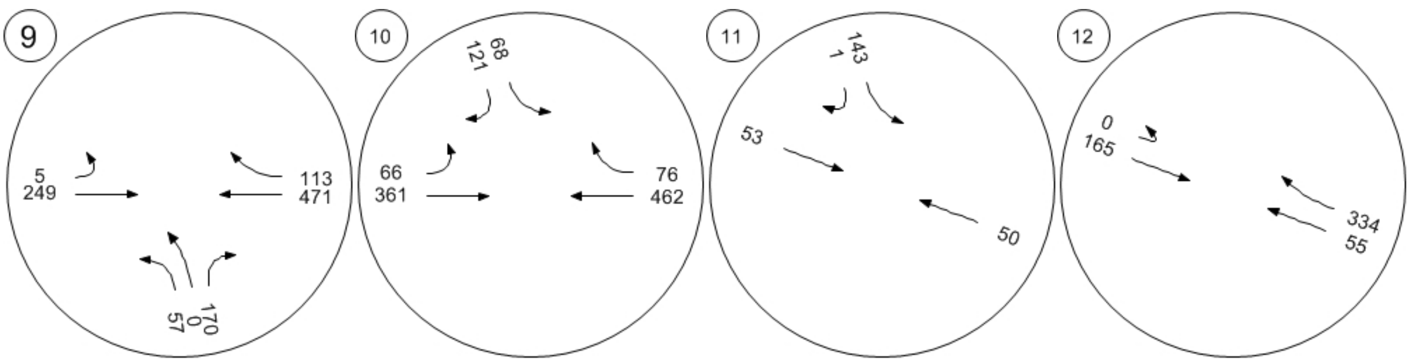
Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	7.33	0.00	0.00	0.00	0.00	0.00
Movement LOS	A	A	A	A		
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		0.00		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.00					
Intersection LOS	A					

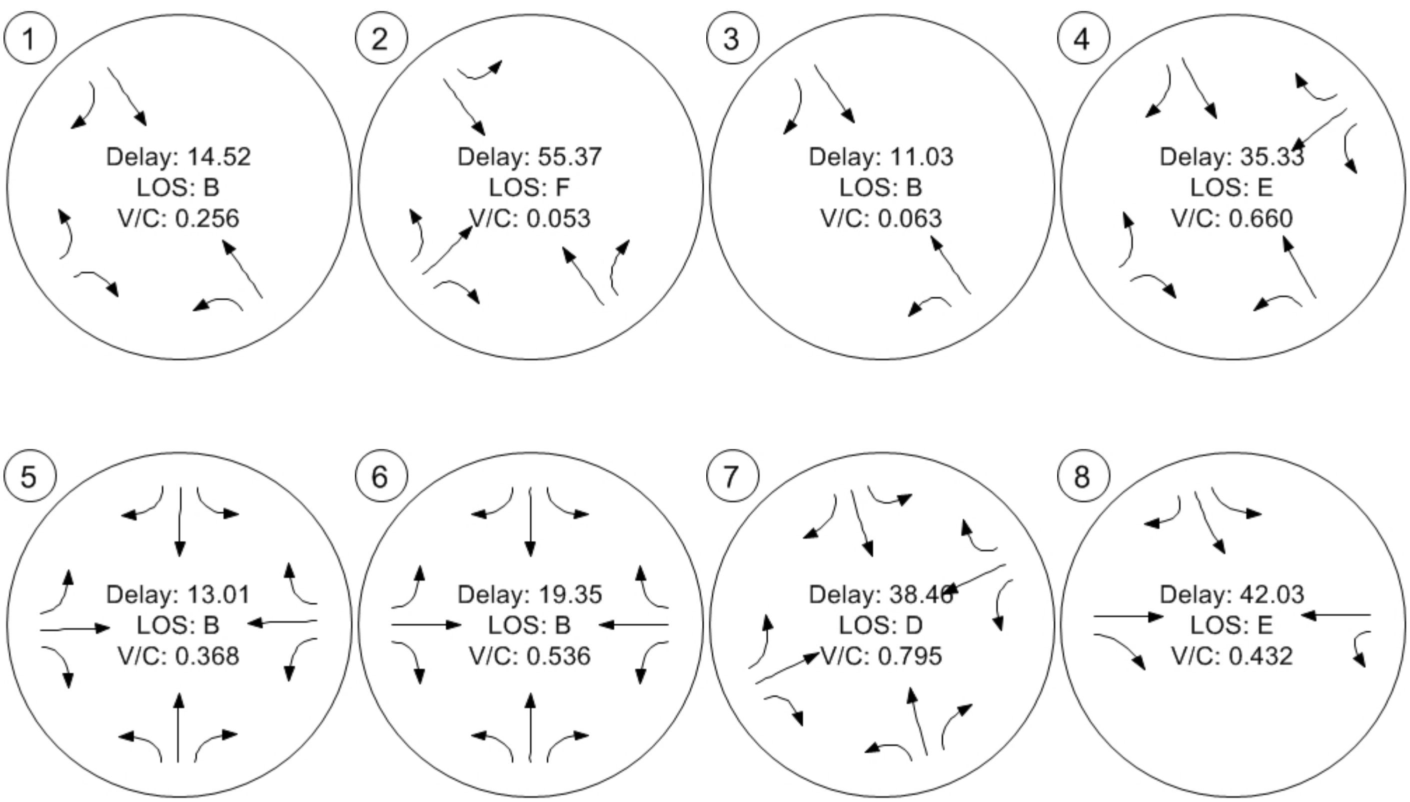
Traffic Volume - Base Volume



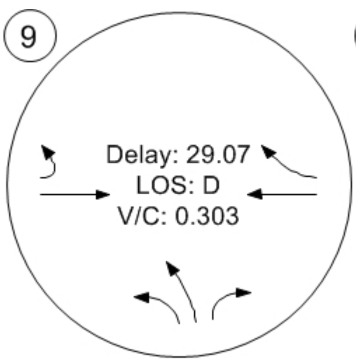
Traffic Volume - Base Volume

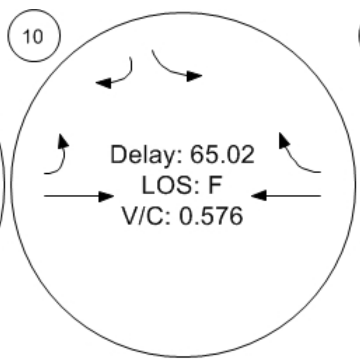


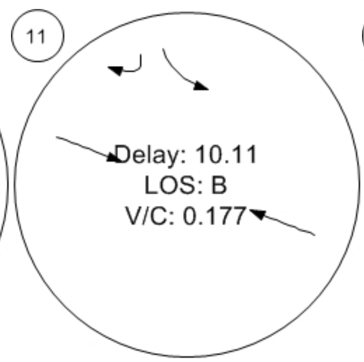
Traffic Conditions

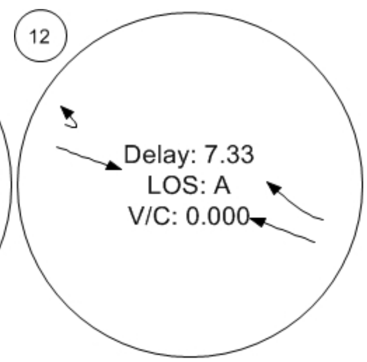


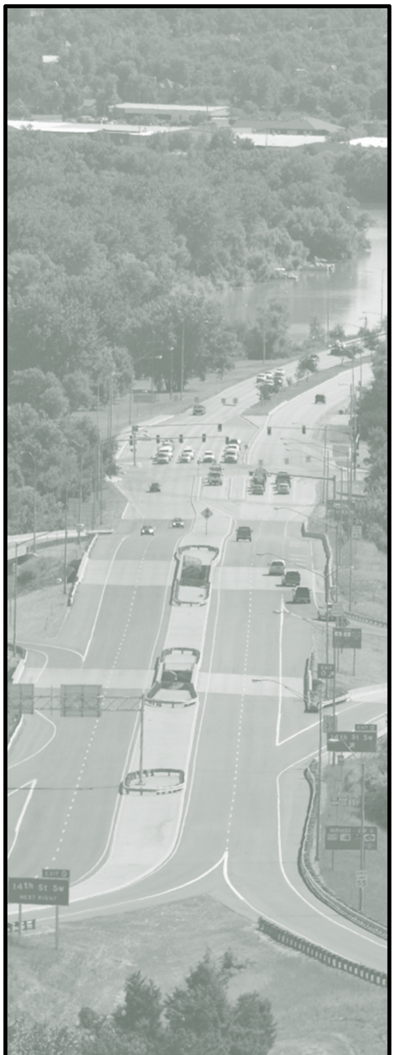
Traffic Conditions











INTERSTATE 15 GORE HILL to EMERSON JUNCTION
Corridor Planning Study

APPENDIX D

Projected Conditions Traffic Data Analysis

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-315 Eastbound*
From/To	
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*627*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*371*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*6.7*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-315 Westbound*
From/To	*I-15 to 14th Ave*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*514*	veh/h	Peak-Hour Factor, PHF	*0.76*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*348*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*6.3*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-315 Eastbound*
From/To	*I-15 to 14th Ave*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*799*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*491*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*8.9*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-315 Westbound*
Agency or Company		From/To	*I-15 to 14th Ave*
Date Performed	*9/15/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*728*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*401*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*7.3*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-315 Eastbound*
Agency or Company		From/To	*14th Ave to Fox Farm*
Date Performed	*9/15/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*979*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*4*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.980*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*602*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*10.9*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-315 Westbound*
From/To	*14th Ave to Fox Farm*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*585*	veh/h	Peak-Hour Factor, PHF	*0.82*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*366*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*6.7*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-315 Eastbound*
Agency or Company		From/To	*14th Ave to Fox Farm*
Date Performed	*9/15/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1216*	veh/h	Peak-Hour Factor, PHF	*0.90*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*55.0*	mph	FFS	*55.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*686*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*55.0*	mph	S	mph
D = v_p / S	*12.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/15/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-315 Westbound*
From/To	*14th Ave to Fox Farm*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1418*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*3*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.985*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*55.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*55.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*758*	pc/h/ln
S	*55.0*	mph
D = v_p / S	*13.8*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		***Site Information***	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*North of Central*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*384*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.966*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width		ft	f_{LW}		mph
Rt-Side Lat. Clearance		ft	f_{LC}		mph
Number of Lanes, N	*2*		TRD Adjustment		mph
Total Ramp Density, TRD		ramps/mi	FFS	*65.0*	mph
FFS (measured)	*65.0*	mph			
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*239*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*3.7*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/8/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-15 SB*
From/To	*North of Central*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*230*	veh/h	Peak-Hour Factor, PHF	*0.83*
AADT		veh/day	%Trucks and Buses, P_T	*21*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	mi

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.905*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*153*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*2.4*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/8/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-15 NB*
From/To	*North of Central*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*413*	veh/h	Peak-Hour Factor, PHF	*0.97*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*221*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*3.4*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/8/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-15 SB*
From/To	*North of Central*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*356*	veh/h	Peak-Hour Factor, PHF	*0.79*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*241*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*3.7*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*North of Emerson Junction*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*351*	veh/h	Peak-Hour Factor, PHF	*0.89*
AADT		veh/day	%Trucks and Buses, P_T	*21*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.905*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*218*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*3.4*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Emerson Junction*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*669*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*396*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*6.1*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/8/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-15 NB*
From/To	*North of Emerson Junction*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*776*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*425*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*6.5*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/8/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-15 SB*
From/To	*North of Emerson Junction*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*557*	veh/h	Peak-Hour Factor, PHF	*0.88*
AADT		veh/day	%Trucks and Buses, P_T	*13*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.939*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*337*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*5.2*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/8/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-15 NB*
From/To	*North of Gore Hill*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*803*	veh/h	Peak-Hour Factor, PHF	*0.90*
AADT		veh/day	%Trucks and Buses, P_T	*16*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Grade*
DDHV = AADT x K x D		veh/h	Grade -5.00% Length	*0.69mi*
			Up/Down %	*-5.00*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.926*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*482*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*7.4*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Gore Hill*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*712*	veh/h	Peak-Hour Factor, PHF	*0.85*
AADT		veh/day	%Trucks and Buses, P_T	*7*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Grade*
DDHV = AADT x K x D		veh/h	Grade 5.00% Length	*0.69mi*
			Up/Down %	*5.00*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*4.5*
E_T	*2.8*	f_{HV} = $1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.891*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*470*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*7.2*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*North of Gore Hill*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*1122*	veh/h	Peak-Hour Factor, PHF	*0.80*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Grade*
DDHV = AADT x K x D		veh/h	Grade -5.00% Length	*0.69mi*
			Up/Down %	*-5.00*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.952*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*736*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*11.3*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13
f_{LC} - Exhibit 11-9
f_p - Page 11-18
TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*North of Gore Hill*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*979*	veh/h	Peak-Hour Factor, PHF	*0.93*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Grade*
DDHV = AADT x K x D		veh/h	Grade 5.00% Length	*0.69mi*
			Up/Down %	*5.00*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*4.5*
E_T	*2.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.870*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*605*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*9.3*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/8/2014*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*I-15 NB*
From/To	*South of Central*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*519*	veh/h	Peak-Hour Factor, PHF	*0.89*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*312*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*4.8*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*South of Central*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*569*	veh/h	Peak-Hour Factor, PHF	*0.94*
AADT		veh/day	%Trucks and Buses, P_T	*8*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.962*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*315*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*4.8*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*South of Central*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*792*	veh/h	Peak-Hour Factor, PHF	*0.87*
AADT		veh/day	%Trucks and Buses, P_T	*11*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.948*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*480*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*7.4*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13
f_{LC} - Exhibit 11-9
f_p - Page 11-18
TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*South of Central*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*793*	veh/h	Peak-Hour Factor, PHF	*0.90*
AADT		veh/day	%Trucks and Buses, P_T	*14*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.935*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*471*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*7.2*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*South of Gore Hill*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*297*	veh/h	Peak-Hour Factor, PHF	*0.92*
AADT		veh/day	%Trucks and Buses, P_T	*10*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.952*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*169*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*2.6*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 SB*
Agency or Company		From/To	*South of Gore Hill*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*286*	veh/h	Peak-Hour Factor, PHF	*0.79*
AADT		veh/day	%Trucks and Buses, P_T	*20*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.909*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width		ft			
Rt-Side Lat. Clearance		ft	f_{LW}		mph
Number of Lanes, N	*2*		f_{LC}		mph
Total Ramp Density, TRD		ramps/mi	TRD Adjustment		mph
FFS (measured)	*65.0*	mph	FFS	*65.0*	mph
Base free-flow Speed, BFFS		mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*199*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*65.0*	mph	S	mph
D = v_p / S	*3.1*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*A*		Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*Shane Forsythe*	Highway/Direction of Travel	*I-15 NB*
Agency or Company		From/To	*South of Gore Hill*
Date Performed	*9/8/2014*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*303*	veh/h	Peak-Hour Factor, PHF	*0.96*
AADT		veh/day	%Trucks and Buses, P_T	*12*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.943*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*167*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*2.6*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*Shane Forsythe*
Agency or Company	
Date Performed	*9/8/2014*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*I-15 SB*
From/To	*South of Gore Hill*
Jurisdiction	
Analysis Year	*2035*

Project Description *I-15 Corridor Study*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

Flow Inputs

Volume, V	*444*	veh/h	Peak-Hour Factor, PHF	*0.89*
AADT		veh/day	%Trucks and Buses, P_T	*6*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.971*

Speed Inputs

Lane Width		ft
Rt-Side Lat. Clearance		ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD		ramps/mi
FFS (measured)	*65.0*	mph
Base free-flow Speed, BFFS		mph

Calc Speed Adj and FFS

f_{LW}		mph
f_{LC}		mph
TRD Adjustment		mph
FFS	*65.0*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*257*	pc/h/ln
S	*65.0*	mph
D = v_p / S	*4.0*	pc/mi/ln
LOS	*A*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

Factor Location

- E_R - Exhibits 11-10, 11-12
- E_T - Exhibits 11-10, 11-11, 11-13
- f_p - Page 11-18
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
- f_{LW} - Exhibit 11-8
- f_{LC} - Exhibit 11-9
- TRD - Page 11-11

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB Off-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035
Project Description			

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	740	V_D = veh/h
	Freeway Volume, V_F	803	
	Ramp Volume, V_R	206	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	55.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	803	0.90	Level	16	0	0.926	1.00	967
Ramp	206	0.83	Level	3	0	0.985	1.00	253
UpStream								
DownStream								

Merge Areas	Diverge Areas

Estimation of v_{12}

Merge Areas

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 967 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

Merge Areas

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Diverge Areas

	Actual	Capacity		LOS F?
V_F	967	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	714	Exhibit 13-8	4700	No
V_R	253	Exhibit 13-10	2200	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	967	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

Merge Areas

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Diverge Areas

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 5.9 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

Merge Areas

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

D_s = 0.191 (Exhibit 13-12)

S_R= 60.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 60.6 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB On-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	590
Deceleration Lane Length L_D	
Freeway Volume, V_F	519
Ramp Volume, V_R	175
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	519	0.89	Level	14	0	0.935	1.00	623
Ramp	175	0.75	Level	7	0	0.966	1.00	243
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 623 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	866	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	866	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 8.4 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.289 (Exibit 13-11)

S_R= 58.4 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 58.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave SB Off-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	463
Freeway Volume, V_F	671
Ramp Volume, V_R	206
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	671	0.94	Level	8	0	0.962	1.00	746
Ramp	206	0.83	Level	3	0	0.985	1.00	253
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 746 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	746	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	493	Exhibit 13-8	4700	No
V_R	253	Exhibit 13-10	2200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	746	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 6.5 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.191 (Exhibit 13-12)

S_R= 60.6 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 60.6 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave SB On-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035
Project Description			

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A	1500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D		V_D = veh/h
	Freeway Volume, V_F	713	
	Ramp Volume, V_R	339	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	713	0.85	Level	7	0	0.966	1.00	870
Ramp	339	0.77	Level	5	0	0.976	1.00	451
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 870 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1321	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1321	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 6.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.231 (Exibit 13-11)

S_R= 59.7 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB Off-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	740
Freeway Volume, V_F	1122
Ramp Volume, V_R	543
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1122	0.80	Level	10	0	0.952	1.00	1473
Ramp	543	0.83	Level	3	0	0.985	1.00	664
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 1473 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	1473	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	809	Exhibit 13-8	4700	No
V_R	664	Exhibit 13-10	2200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1473	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 10.3 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.228 (Exhibit 13-12)

S_R= 59.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 59.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB On-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	20

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	590
Deceleration Lane Length L_D	
Freeway Volume, V_F	792
Ramp Volume, V_R	274
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	792	0.87	Level	11	0	0.948	1.00	963
Ramp	274	0.92	Level	4	0	0.980	1.00	304
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 963 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1267	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1267	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\,v_R + 0.0078\,V_{12} - 0.00627\,L_A$$

D_R = 11.5 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.294 (Exibit 13-11)

S_R= 58.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 58.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\,V_{12} - 0.009\,L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave NB Off-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	463	V_D = veh/h
	Freeway Volume, V_F	936	
	Ramp Volume, V_R	256	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	55.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	936	0.90	Level	14	0	0.935	1.00	1118
Ramp	256	0.83	Level	7	0	0.966	1.00	320
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 1118 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	1118	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	798	Exhibit 13-8	4700	No
V_R	320	Exhibit 13-10	2200	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1118	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 9.7 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.197 (Exhibit 13-12)

S_R= 60.5 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 60.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	10th Ave SB On-ramp
Agency or Company		Junction	I-15 and I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	981
Ramp Volume, V_R	453
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	981	0.93	Level	10	0	0.952	1.00	1108
Ramp	453	0.94	Level	5	0	0.976	1.00	494
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1108 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1602	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1602	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = 8.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.235 (Exibit 13-11)

S_R= 59.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th EB Off-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	503
Freeway Volume, V_F	627
Ramp Volume, V_R	68
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	627	0.87	Level	6	0	0.971	1.00	742
Ramp	68	0.83	Level	5	0	0.976	1.00	84
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\ (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 742 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	742	Exhibit 13-8	4500	No
$V_{FO} = V_F - V_R$	658	Exhibit 13-8	4500	No
V_R	84	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	742	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 6.1 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.436 (Exhibit 13-12)

S_R= 49.3 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 49.3 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th St EB On-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	930
Deceleration Lane Length L_D	
Freeway Volume, V_F	1140
Ramp Volume, V_R	617
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1140	0.83	Level	4	0	0.980	1.00	1403
Ramp	617	0.83	Level	3	0	0.985	1.00	755
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1403 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2158	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2158	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 16.1 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.290 (Exibit 13-11)

S_R= 51.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 51.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th WB Off-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	713
Freeway Volume, V_F	585
Ramp Volume, V_R	251
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	585	0.82	Level	1	0	0.995	1.00	714
Ramp	251	0.80	Level	0	0	1.000	1.00	312
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 714 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	714	Exhibit 13-8	4500	No
$V_{FO} = V_F - V_R$	402	Exhibit 13-8	4500	No
V_R	312	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	714	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 4.0 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.456 (Exhibit 13-12)

S_R= 49.1 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 49.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th St WB On-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	505
Deceleration Lane Length L_D	
Freeway Volume, V_F	514
Ramp Volume, V_R	142
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	514	0.76	Level	6	0	0.971	1.00	696
Ramp	142	0.80	Level	5	0	0.976	1.00	181
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = 1.000 using Equation (Exhibit 13-6)
V_{12} = 696 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	877	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	877	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = 9.1 (pc/mi/ln)
LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.295 (Exibit 13-11)
S_R= 51.2 mph (Exhibit 13-11)
S_0= N/A mph (Exhibit 13-11)
S = 51.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = using Equation (Exhibit 13-7)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)
S_R= mph (Exhibit 13-12)
S_0= mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th EB Off-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	503
Freeway Volume, V_F	799
Ramp Volume, V_R	226
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	799	0.83	Level	4	0	0.980	1.00	982
Ramp	226	0.94	Level	3	0	0.985	1.00	244
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 982 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	982	Exhibit 13-8	4500	No
$V_{FO} = V_F - V_R$	738	Exhibit 13-8	4500	No
V_R	244	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	982	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 8.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.450 (Exhibit 13-12)

S_R= 49.2 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 49.2 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th St EB On-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2014

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	930
Deceleration Lane Length L_D	
Freeway Volume, V_F	1216
Ramp Volume, V_R	648
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1216	0.90	Level	3	0	0.985	1.00	1371
Ramp	648	0.94	Level	1	0	0.995	1.00	693
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1371 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2064	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2064	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 15.4 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.287 (Exibit 13-11)

S_R= 51.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 51.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	14th WB Off-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	713
Freeway Volume, V_F	1418
Ramp Volume, V_R	919
Freeway Free-Flow Speed, S_{FF}	55.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1418	0.91	Level	3	0	0.985	1.00	1582
Ramp	919	0.99	Level	2	0	0.990	1.00	939
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 1582 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	1582	Exhibit 13-8	4500	No
$V_{FO} = V_F - V_R$	643	Exhibit 13-8	4500	No
V_R	939	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1582	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = 11.4 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.513 (Exhibit 13-12)

S_R= 48.3 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 48.3 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shane Forsythe	Freeway/Dir of Travel	14th St WB On-ramp
Agency or Company		Junction	I-315
Date Performed	9/15/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description I-15 Corridor Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N: 2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N: 1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A: 505	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 728	
	Ramp Volume, V_R: 201	
	Freeway Free-Flow Speed, S_{FF}: 55.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	728	0.93	Level	5	0	0.976	1.00	802
Ramp	201	0.99	Level	1	0	0.995	1.00	204
UpStream								
DownStream								

Merge Areas	Diverge Areas
Estimation of v_{12}	**Estimation of v_{12}**
$V_{12} = V_F\,(P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$
L_{EQ} = (Equation 13-6 or 13-7)	L_{EQ} = (Equation 13-12 or 13-13)
P_{FM} = 1.000 using Equation (Exhibit 13-6)	P_{FD} = using Equation (Exhibit 13-7)
V_{12} = 802 pc/h	V_{12} = pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)	V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No	Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No	Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)	If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1006	Exhibit 13-8		No

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1006	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

Merge	Diverge
$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$	$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$
D_R = 10.1 (pc/mi/ln)	D_R = (pc/mi/ln)
LOS = B (Exhibit 13-2)	LOS = (Exhibit 13-2)

Speed Determination

Merge	Diverge
M_S = 0.296 (Exibit 13-11)	D_s = (Exhibit 13-12)
S_R= 51.1 mph (Exhibit 13-11)	S_R= mph (Exhibit 13-12)
S_0= N/A mph (Exhibit 13-11)	S_0= mph (Exhibit 13-12)
S = 51.1 mph (Exhibit 13-13)	S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave NB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1388
Freeway Volume, V_F	519
Ramp Volume, V_R	315
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	519	0.89	Level	14	0	0.935	1.00	624
Ramp	315	0.83	Level	10	0	0.952	1.00	400
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 1.000 using Equation (Exhibit 13-7)
V_{12} = 624 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	624	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	224	Exhibit 13-8	4700	No
V_R	400	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	624	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = -2.9 (pc/mi/ln)
LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.334 (Exhibit 13-12)
S_R= 57.3 mph (Exhibit 13-12)
S_0= N/A mph (Exhibit 13-12)
S = 57.3 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	Shane Forsythe	Freeway/Dir of Travel	Central NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035
Project Description			

Inputs

Upstream Adj Ramp				Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2		
☑ No ☐ Off	Ramp Number of Lanes, N	1		☐ Yes ☐ On
	Acceleration Lane Length, L_A	1491		☑ No ☐ Off
	Deceleration Lane Length L_D			
L_{up} = ft	Freeway Volume, V_F	230		L_{down} = ft
	Ramp Volume, V_R	82		
V_u = veh/h	Freeway Free-Flow Speed, S_{FF}	65.0		V_D = veh/h
	Ramp Free-Flow Speed, S_{FR}	55.0		

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	230	0.83	Level	7	0	0.966	1.00	287
Ramp	82	0.74	Level	14	0	0.935	1.00	119
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 287 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	406	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	406	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = -0.8 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.163 (Exibit 13-11)

S_R= 61.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 61.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1144
Freeway Volume, V_F	376
Ramp Volume, V_R	191
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	376	0.83	Level	21	0	0.905	1.00	501
Ramp	191	0.85	Level	2	0	0.990	1.00	227
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 501 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	501	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	274	Exhibit 13-8	4700	No
V_R	227	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	501	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = -1.7 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.318 (Exhibit 13-12)

S_R= 57.7 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.7 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central SB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1144
Deceleration Lane Length L_D	
Freeway Volume, V_F	671
Ramp Volume, V_R	228
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	671	0.94	Level	8	0	0.962	1.00	742
Ramp	228	0.76	Level	5	0	0.976	1.00	306
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 742 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1048	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1048	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 6.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.229 (Exibit 13-11)

S_R= 59.7 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave NB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1388
Freeway Volume, V_F	792
Ramp Volume, V_R	372
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	792	0.87	Level	11	0	0.948	1.00	960
Ramp	372	0.75	Level	6	0	0.971	1.00	513
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 960 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	960	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	447	Exhibit 13-8	4700	No
V_R	513	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	960	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = 0.0 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.344 (Exhibit 13-12)

S_R= 57.1 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.1 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1491
Deceleration Lane Length L_D	
Freeway Volume, V_F	413
Ramp Volume, V_R	193
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	413	0.97	Level	8	0	0.962	1.00	443
Ramp	193	0.81	Level	1	0	0.995	1.00	239
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 443 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	682	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	682	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = 1.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.165 (Exibit 13-11)

S_R= 61.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 61.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central Ave SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	1144
Freeway Volume, V_F	348
Ramp Volume, V_R	101
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	45.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	348	0.79	Level	14	0	0.935	1.00	471
Ramp	101	0.90	Level	6	0	0.971	1.00	115
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 1.000 using Equation (Exhibit 13-7)
V_{12} = 471 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	471	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	356	Exhibit 13-8	4700	No
V_R	115	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	471	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = -2.0 (pc/mi/ln)
LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.308 (Exhibit 13-12)
S_R= 57.9 mph (Exhibit 13-12)
S_0= N/A mph (Exhibit 13-12)
S = 57.9 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Central SB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035
Project Description			

Inputs

Upstream Adj Ramp	Freeway Number of Lanes, N	2	Downstream Adj Ramp
☐ Yes ☐ On	Ramp Number of Lanes, N	1	☐ Yes ☐ On
☑ No ☐ Off	Acceleration Lane Length, L_A	1144	☑ No ☐ Off
	Deceleration Lane Length L_D		
L_{up} = ft	Freeway Volume, V_F	936	L_{down} = ft
	Ramp Volume, V_R	366	
V_u = veh/h	Freeway Free-Flow Speed, S_{FF}	65.0	V_D = veh/h
	Ramp Free-Flow Speed, S_{FR}	45.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	v = V/PHF x f_{HV} x f_p
Freeway	936	0.90	Level	14	0	0.935	1.00	1113
Ramp	366	0.89	Level	6	0	0.971	1.00	423
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\ (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1113 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1536	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1536	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = 10.1 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.236 (Exibit 13-11)

S_R= 59.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Emerson Junction NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
☐ Yes ☐ On	Freeway Number of Lanes, N	2	☐ Yes ☐ On
☑ No ☐ Off	Ramp Number of Lanes, N	1	☑ No ☐ Off
L_{up} = ft	Acceleration Lane Length, L_A	980	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D		V_D = veh/h
	Freeway Volume, V_F	351	
	Ramp Volume, V_R	104	
	Freeway Free-Flow Speed, S_{FF}	65.0	
	Ramp Free-Flow Speed, S_{FR}	55.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	351	0.89	Level	21	0	0.905	1.00	436
Ramp	104	0.83	Level	15	0	0.930	1.00	135
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 436 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	571	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	571	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 3.7 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.220 (Exibit 13-11)

S_R= 59.9 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Emerson Junction SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	340
Freeway Volume, V_F	673
Ramp Volume, V_R	299
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	673	0.87	Level	6	0	0.971	1.00	797
Ramp	299	0.88	Level	5	0	0.976	1.00	348
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 797 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	797	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	449	Exhibit 13-8	4700	No
V_R	348	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	797	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = 8.0 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.264 (Exhibit 13-12)

S_R= 58.9 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 58.9 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Emerson Junction NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	980
Deceleration Lane Length L_D	
Freeway Volume, V_F	849
Ramp Volume, V_R	458
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	55.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	849	0.94	Level	6	0	0.971	1.00	930
Ramp	458	0.92	Level	5	0	0.976	1.00	511
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 930 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1441	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1441	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 10.3 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.230 (Exibit 13-11)

S_R= 59.7 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.7 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Emerson Junction SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	340
Freeway Volume, V_F	560
Ramp Volume, V_R	195
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	560	0.88	Level	13	0	0.939	1.00	678
Ramp	195	0.94	Level	7	0	0.966	1.00	216
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 678 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	678	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	462	Exhibit 13-8	4700	No
V_R	216	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	678	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 7.0 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.252 (Exhibit 13-12)

S_R= 59.2 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 59.2 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	323
Freeway Volume, V_F	442
Ramp Volume, V_R	33
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	442	0.92	Level	10	0	0.952	1.00	504
Ramp	33	0.74	Level	35	0	0.851	1.00	52
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 1.000 using Equation (Exhibit 13-7)
V_{12} = 504 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	504	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	452	Exhibit 13-8	4700	No
V_R	52	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	504	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

D_R = 5.7 (pc/mi/ln)
LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.238 (Exhibit 13-12)
S_R= 59.5 mph (Exhibit 13-12)
S_0= N/A mph (Exhibit 13-12)
S = 59.5 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035
Project Description			

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	803
Ramp Volume, V_R	572
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	803	0.90	Grade	16	0	0.926	1.00	964
Ramp	572	0.82	Level	23	0	0.897	1.00	774
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 964 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	1738	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	1738	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 9.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.193 (Exibit 13-11)

S_R= 60.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	358
Freeway Volume, V_F	713
Ramp Volume, V_R	686
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	713	0.85	Grade	7	0	0.891	1.00	942
Ramp	686	0.79	Level	7	0	0.966	1.00	894
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 942 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	942	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	48	Exhibit 13-8	4700	No
V_R	894	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	942	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = 9.1 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.313 (Exhibit 13-12)

S_R= 57.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill SB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	286
Ramp Volume, V_R	81
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	286	0.79	Level	20	0	0.909	1.00	398
Ramp	81	0.62	Level	40	0	0.833	1.00	157
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 398 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	555	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	555	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 0.3 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.178 (Exibit 13-11)

S_R= 60.9 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	323
Freeway Volume, V_F	451
Ramp Volume, V_R	67
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	451	0.96	Level	12	0	0.943	1.00	498
Ramp	67	0.74	Level	42	0	0.826	1.00	109
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = using Equation (Exhibit 13-6)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$
D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)
S_R= mph (Exhibit 13-11)
S_0= mph (Exhibit 13-11)
S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = 1.000 using Equation (Exhibit 13-7)
V_{12} = 498 pc/h
V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	498	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	389	Exhibit 13-8	4700	No
V_R	109	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	498	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$
D_R = 5.6 (pc/mi/ln)
LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.243 (Exhibit 13-12)
S_R= 59.4 mph (Exhibit 13-12)
S_0= N/A mph (Exhibit 13-12)
S = 59.4 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill NB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	1122
Ramp Volume, V_R	961
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp

☐ Yes ☐ On

☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	1122	0.80	Grade	10	0	0.952	1.00	1473
Ramp	961	0.74	Level	9	0	0.957	1.00	1357
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 1473 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	2830	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2830	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 17.5 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

M_S = 0.237 (Exibit 13-11)

S_R= 59.5 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.5 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill SB Off
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	
Deceleration Lane Length L_D	358
Freeway Volume, V_F	981
Ramp Volume, V_R	644
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	981	0.93	Grade	10	0	0.870	1.00	1213
Ramp	644	0.80	Level	16	0	0.926	1.00	867
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 1213 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	1213	Exhibit 13-8	4700	No
$V_{FO} = V_F - V_R$	346	Exhibit 13-8	4700	No
V_R	867	Exhibit 13-10	2100	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1213	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 11.5 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.311 (Exhibit 13-12)

S_R= 57.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.8 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	Shane Forsythe	Freeway/Dir of Travel	Gore Hill SB On
Agency or Company		Junction	
Date Performed	9/9/2014	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2035

Project Description

Inputs

Upstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	1500
Deceleration Lane Length L_D	
Freeway Volume, V_F	444
Ramp Volume, V_R	83
Freeway Free-Flow Speed, S_{FF}	65.0
Ramp Free-Flow Speed, S_{FR}	50.0

Downstream Adj Ramp: ☐ Yes ☐ On ☑ No ☐ Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	444	0.89	Level	6	0	0.971	1.00	514
Ramp	83	0.65	Level	41	0	0.830	1.00	153
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 514 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☑ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☑ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	667	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	667	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = 1.2 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

M_S = 0.179 (Exibit 13-11)

S_R= 60.9 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 60.9 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ☐ Yes ☐ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ☐ Yes ☐ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

 HCS2010[TM] Version 6.41 Generated: 9/9/2014 9:40 AM

Vistro File: F:\...\I-15 Corridor.vistropdb
Report File: F:\...\Future_LOS_Report_AM.pdf

Scenario 3: Future AM Scenario
8/19/2014

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Tri Hill and Frontage Airport Rd	Two-way stop	HCM2010	NEBL	0.514	27.3	D
2	I-15 NB and Airport Rd	Two-way stop	HCM2010	NEBT	0.000	44.2	E
3	I-15 SB On and Airport RD	Two-way stop	HCM2010	NWBL	0.133	10.4	B
4	I-15 SB Off and Airport RD Frontage	Two-way stop	HCM2010	SWBL	0.947	121.8	F
5	14th St SW and I-315 EB	Signalized	HCM2010	SBL	0.218	13.3	B
6	14th St SW and I-315 WB	Signalized	HCM2010	EBR	0.295	22.2	C
7	Fox Farm and I-315	Signalized	HCM2010	NEBL	0.760	39.0	D
8	Central Ave and I15 SB	Two-way stop	HCM2010	SBL	1.188	178.9	F
9	Central Ave and I-15 NB	Two-way stop	HCM2010	NBL	0.274	113.1	F
10	Central Ave and Vaughn Rd	Two-way stop	HCM2010	SBL	1.518	406.0	F
11	Vaughn Rd and I-15 SB	Two-way stop	HCM2010	SBL	0.361	11.0	B
12	Vaughn Rd and I-15 NB	Two-way stop	HCM2010	EBL	0.000	7.3	A

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
#1: Tri Hill and Frontage Airport Rd

Control Type:	Two-way stop	Delay (sec / veh):	27.3
Analysis Method:	HCM2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.514

Intersection Setup

Name						
Approach	Northeastbound		Northwestbound		Southeastbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	83	19	9	189	97	88
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	21.70	31.10	22.20	28.60	25.70	5.70
Growth Rate	1.70	1.70	1.70	1.70	1.70	1.70
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
Total Hourly Volume [veh/h]	141	32	15	321	165	150
Peak Hour Factor	0.7410	0.4750	0.5630	0.8750	0.9330	0.7590
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	48	17	7	92	44	49
Total Analysis Volume [veh/h]	190	67	27	367	177	198
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.51	0.10	0.02	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	27.25	22.66	8.42	0.00	0.00	0.00
Movement LOS	D	C	A	A	A	A
95th-Percentile Queue Length [veh]	3.94	3.94	0.08	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	98.56	98.56	1.92	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	26.06		0.58		0.00	
Approach LOS	D		A		A	
d_I, Intersection Delay [s/veh]	6.75					
Intersection LOS	D					

Intersection Level Of Service Report
#2: I-15 NB and Airport Rd

Control Type:	Two-way stop	Delay (sec / veh):	44.2
Analysis Method:	HCM2010	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name												
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	4	0	13	0	0	0	0	49	222	79	173	0
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	0.00	46.20	2.00	2.00	2.00	2.00	38.80	26.60	12.70	10.90	2.00
Growth Rate	1.90	1.90	1.90	1.00	1.00	1.00	1.00	1.90	1.90	1.90	1.90	1.00
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	0	25	0	0	0	0	93	422	150	329	0
Peak Hour Factor	0.5000	1.0000	0.8130	1.0000	1.0000	1.0000	1.0000	0.7210	0.8670	0.7050	0.9010	1.0000
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	0	8	0	0	0	0	32	122	53	91	0
Total Analysis Volume [veh/h]	16	0	31	0	0	0	0	129	487	213	365	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	no			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.12	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00
d_M, Delay for Movement [s/veh]	34.72	44.22	13.81	0.00	0.00	0.00	0.00	0.00	0.00	10.13	0.00	0.00
Movement LOS	D	E	B					A	A	B	A	
95th-Percentile Queue Length [veh]	0.61	0.61	0.61	0.00	0.00	0.00	0.00	0.00	0.00	4.65	4.65	0.00
95th-Percentile Queue Length [ft]	15.29	15.29	15.29	0.00	0.00	0.00	0.00	0.00	0.00	116.18	116.18	0.00
d_A, Approach Delay [s/veh]	20.93			0.00			0.00			3.73		
Approach LOS	C			A			A			A		
d_I, Intersection Delay [s/veh]	2.53											
Intersection LOS	E											

Intersection Level Of Service Report
#3: I-15 SB On and Airport RD

Control Type:	Two-way stop	Delay (sec / veh):	10.4
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.133

Intersection Setup

Name						
Approach	Northeastbound		Northwestbound		Southeastbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	0	0	32	23	251	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	43.80	21.70	14.00	16.70
Growth Rate	1.00	1.00	2.12	2.12	2.12	2.12
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
Total Hourly Volume [veh/h]	0	0	68	49	532	13
Peak Hour Factor	1.0000	1.0000	0.6670	0.6390	0.8720	0.3750
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	25	19	153	9
Total Analysis Volume [veh/h]	0	0	102	77	610	35
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.13	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	10.39	0.00	0.00	0.00
Movement LOS			B	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	0.90	0.90	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	0.00	22.46	22.46	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		5.92		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	1.29					
Intersection LOS	B					

Intersection Level Of Service Report
#4: I-15 SB Off and Airport RD Frontage

Control Type:	Two-way stop	Delay (sec / veh):	121.8
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.947

Intersection Setup

Name												
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	5	0	44	159	54	96	8	12	0	0	40	4
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	2.00	11.30	10.10	7.40	3.10	12.50	8.30	2.00	2.00	2.50	0.00
Growth Rate	2.22	1.00	2.22	2.22	2.22	2.22	2.22	2.22	1.00	1.00	2.22	2.22
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]	11	0	98	353	120	213	18	27	0	0	89	9
Peak Hour Factor	0.4170	1.0000	0.5240	0.8110	0.9000	0.7060	0.4000	0.7500	1.0000	1.0000	0.7690	0.5000
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]	7	0	47	109	33	75	11	9	0	0	29	5
Total Analysis Volume [veh/h]	26	0	187	435	133	302	45	36	0	0	116	18
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.00	0.21	0.95	0.22	0.29	0.03	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	16.59	0.00	10.80	121.78	119.80	9.92	7.68	0.00	0.00	0.00	0.00	0.00
Movement LOS	C		B	F	F	A	A	A			A	A
95th-Percentile Queue Length [veh]	1.14	0.00	1.14	20.41	20.41	1.22	0.19	0.19	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	28.44	0.00	28.44	510.19	510.19	30.56	4.64	4.64	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	11.50			82.65			4.27			0.00		
Approach LOS	B			F			A			A		
d_I, Intersection Delay [s/veh]	57.55											
Intersection LOS	F											

Intersection Level Of Service Report

#5: 14th St SW and I-315 EB

Control Type:	Signalized	Delay (sec / veh):	13.3
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.218

Intersection Setup

Name												
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	7	66	286	142	91	60	44	69	3	20	30	5
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 [%]	14.30	1.50	1.70	3.50	4.40	5.00	0.00	4.30	0.00	10.00	3.30	0.00
Growth Rate	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
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]	9	82	355	176	113	74	55	86	4	25	37	6
Peak Hour Factor	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300	0.8300
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	25	107	53	34	22	17	26	1	8	11	2
Total Analysis Volume [veh/h]	11	99	428	212	136	89	66	104	5	30	45	7
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
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]	60
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Overlap	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	2	3	0	6	7	7	4	0	3	8	0
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	15	0	5	15	15	5	0	15	15	0
Maximum Green [s]	0	50	20	0	50	20	20	60	0	20	60	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	22	18	0	22	18	18	20	0	18	20	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	5	0	5	0	0	5	0	5	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0	0	10	0	10	10	0
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	3.0	1.0	0.0	3.0	1.0	1.0	3.0	0.0	1.0	3.0	0.0
Minimum Recall		no	no		no	no	no	no		no	no	
Maximum Recall		no	no		no	no	no	no		no	no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	3.00	5.00	5.00	3.00	5.00	5.00	5.00	4.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	0.00	0.00	3.00	3.00	0.00	3.00	3.00
g_i, Effective Green Time [s]	17	17	37	17	17	36	29	12	12	29	11	11
g / C, Green / Cycle	0.28	0.28	0.62	0.28	0.28	0.60	0.49	0.21	0.21	0.49	0.19	0.19
(v / s)_i Volume / Saturation Flow Rate	0.01	0.05	0.27	0.17	0.07	0.06	0.04	0.06	0.00	0.02	0.02	0.00
s, saturation flow rate [veh/h]	1114	1872	1588	1272	1820	1538	1616	1822	1615	1422	1839	1615
c, Capacity [veh/h]	334	530	979	387	515	920	948	376	333	816	346	304
d1, Uniform Delay [s]	19.78	16.28	6.04	22.47	16.66	5.14	8.16	20.04	18.95	8.07	20.26	19.85
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]	0.04	0.17	0.31	1.21	0.27	0.05	0.03	0.39	0.02	0.02	0.17	0.03
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

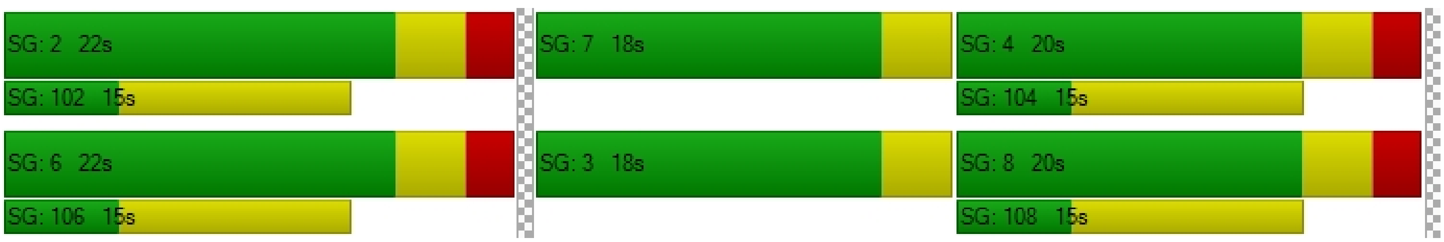
X, volume / capacity	0.03	0.19	0.44	0.55	0.26	0.10	0.07	0.28	0.01	0.04	0.13	0.02
d, Delay for Lane Group [s/veh]	19.82	16.44	6.35	23.68	16.93	5.19	8.20	20.43	18.97	8.08	20.43	19.88
Lane Group LOS	B	B	A	C	B	A	A	C	B	A	C	B
Critical Lane Group	no	no	yes	no	no	no	no	no	no	no	yes	no
50th-Percentile Queue Length [veh]	0.12	0.97	2.14	2.75	1.37	0.37	0.40	1.18	0.05	0.18	0.51	0.08
50th-Percentile Queue Length [ft]	3.03	24.30	53.51	68.66	34.27	9.31	9.90	29.58	1.34	4.43	12.70	1.94
95th-Percentile Queue Length [veh]	0.22	1.75	3.85	4.94	2.47	0.67	0.71	2.13	0.10	0.32	0.91	0.14
95th-Percentile Queue Length [ft]	5.46	43.75	96.31	123.59	61.69	16.75	17.82	53.25	2.41	7.97	22.86	3.49

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	19.82	16.44	6.35	23.68	16.93	5.19	8.20	20.43	18.97	8.08	20.43	19.88
Movement LOS	B	B	A	C	B	A	A	C	B	A	C	B
d_A, Approach Delay [s/veh]	8.48			17.81			15.78			15.87		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	13.32											
Intersection LOS	B											
Intersection V/C	0.218											

Sequence

Ring 1	2	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	3	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
#6: 14th St SW and I-315 WB

Control Type:	Signalized	Delay (sec / veh):	22.2
Analysis Method:	HCM2010	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.295

Intersection Setup

Name												
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	11	17	90	26	136	0	0	7	15	162	16	38
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 [%]	9.10	0.00	4.40	7.70	1.50	0.00	0.00	0.00	0.00	2.50	0.00	0.00
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
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]	13	20	104	30	158	0	0	8	17	188	19	44
Peak Hour Factor	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040	0.8040
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	6	32	9	49	0	0	2	5	58	6	14
Total Analysis Volume [veh/h]	16	25	129	37	197	0	0	10	21	234	24	55
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
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]	60
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	0	1	2	0	1	0	0	3	0	0	2	0
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	5	5	0	5	0	0	5	0	0	5	0
Maximum Green [s]	0	35	40	0	35	0	0	25	0	0	40	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	25	19	0	25	0	0	16	0	0	19	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	9	7	0	9	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	11	7	0	11	0	0	0	0	0	7	0
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		no	no		no			no			no	
Maximum Recall		no	no		no			no			no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	L	C	R	L	C	C	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	13	13	30	13	13	2	12	12
g / C, Green / Cycle	0.21	0.21	0.49	0.21	0.21	0.03	0.20	0.20
(v / s)_i Volume / Saturation Flow Rate	0.02	0.01	0.09	0.03	0.12	0.02	0.16	0.04
s, saturation flow rate [veh/h]	994	1710	1392	1176	1685	1527	1636	1454
c, Capacity [veh/h]	183	356	686	305	350	52	329	292
d1, Uniform Delay [s]	26.76	19.09	8.52	21.98	21.31	28.58	22.73	19.90
k, delay calibration	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
d2, Incremental Delay [s]	0.20	0.08	0.13	0.18	1.41	10.57	4.12	0.31
d3, Initial Queue Delay [s]	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
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.09	0.07	0.19	0.12	0.56	0.60	0.78	0.19
d, Delay for Lane Group [s/veh]	26.96	19.18	8.65	22.16	22.72	39.15	26.86	20.21
Lane Group LOS	C	B	A	C	C	D	C	C
Critical Lane Group	no	no	no	no	yes	yes	yes	no
50th-Percentile Queue Length [veh]	0.22	0.27	0.82	0.44	2.44	0.57	3.57	0.62
50th-Percentile Queue Length [ft]	5.43	6.74	20.40	11.02	60.90	14.26	89.30	15.53
95th-Percentile Queue Length [veh]	0.39	0.49	1.47	0.79	4.38	1.03	6.43	1.12
95th-Percentile Queue Length [ft]	9.77	12.13	36.71	19.83	109.62	25.67	160.74	27.96

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.96	19.18	8.65	22.16	22.72	22.72	39.15	39.15	39.15	26.86	26.86	20.21
Movement LOS	C	B	A	C	C	C	D	D	D	C	C	C
d_A, Approach Delay [s/veh]	11.92			22.63			39.15			25.69		
Approach LOS	B			C			D			C		
d_I, Intersection Delay [s/veh]	22.16											
Intersection LOS	C											
Intersection V/C	0.295											

Sequence

Ring 1	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
#7: Fox Farm and I-315

Control Type:	Signalized	Delay (sec / veh):	39.0
Analysis Method:	HCM2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.760

Intersection Setup

Name												
Approach	Northbound			Southbound			Northeastbound			Southwestbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	50	219	437	172	90	121	161	732	45	101	335	136
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 [%]	2.00	0.90	0.70	1.80	2.20	4.10	6.20	5.20	2.20	4.00	6.00	3.70
Growth Rate	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
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]	59	256	511	201	105	142	188	856	53	118	392	159
Peak Hour Factor	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980	0.7980
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	80	160	63	33	44	59	268	17	37	123	50
Total Analysis Volume [veh/h]	74	321	640	252	132	178	236	1073	66	148	491	199
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
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]	140
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Overlap	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	1	8	0	3	6	6	4	0	8	2	5
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	5	0	5	5	5	5	0	5	5	0
Maximum Green [s]	0	60	60	0	60	60	60	60	0	60	60	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	20	41	0	33	67	67	46	0	41	20	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	1.0	0.0	3.0	1.0	1.0	3.0	0.0	1.0	3.0	0.0
Minimum Recall		no	no		no	no	no	no		no	no	
Maximum Recall		no	no		no	no	no	no		no	no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R	L	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	3.00	5.00	5.00	3.00	3.00	5.00	5.00	3.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	0.00	1.00	3.00	3.00	1.00	3.00	3.00
g_i, Effective Green Time [s]	31	31	97	25	25	52	22	47	47	31	56	56
g / C, Green / Cycle	0.22	0.22	0.69	0.18	0.18	0.37	0.16	0.34	0.34	0.22	0.40	0.40
(v / s)_i Volume / Saturation Flow Rate	0.04	0.19	0.40	0.14	0.04	0.11	0.14	0.31	0.04	0.04	0.14	0.13
s, saturation flow rate [veh/h]	1793	1714	1604	1778	3540	1551	1704	3439	1580	3379	3413	1557
c, Capacity [veh/h]	405	387	1160	365	727	618	268	1167	536	750	1378	629
d1, Uniform Delay [s]	43.76	51.63	8.93	51.50	45.91	28.61	57.70	44.43	31.90	44.32	29.06	28.52
k, delay calibration	0.11	0.11	0.41	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]	0.21	4.62	1.56	2.33	0.12	0.25	9.13	3.49	0.10	0.13	0.16	0.29
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

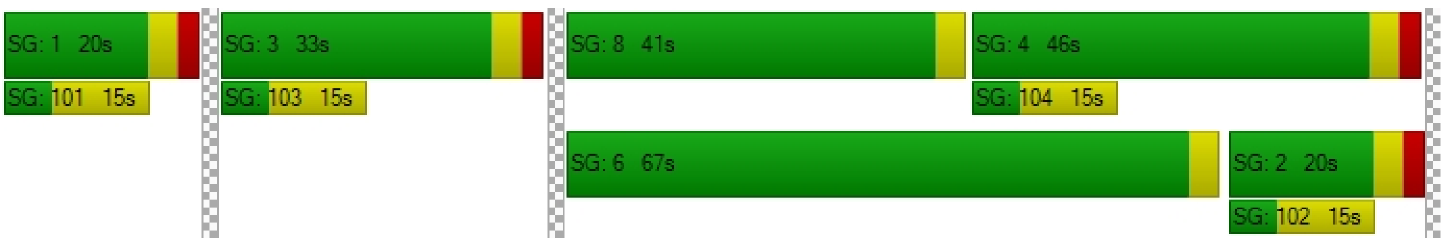
X, volume / capacity	0.18	0.83	0.55	0.69	0.18	0.29	0.88	0.92	0.12	0.20	0.36	0.32
d, Delay for Lane Group [s/veh]	43.98	56.25	10.49	53.83	46.03	28.87	66.82	47.91	32.00	44.45	29.22	28.81
Lane Group LOS	D	E	B	D	D	C	E	D	C	D	C	C
Critical Lane Group	no	no	yes	yes	no	no	no	yes	no	no	no	no
50th-Percentile Queue Length [veh]	2.13	11.29	10.10	9.13	2.00	4.36	8.87	18.35	1.59	2.14	5.88	4.71
50th-Percentile Queue Length [ft]	53.34	282.26	252.44	228.16	49.99	109.09	221.67	458.87	39.66	53.49	147.02	117.63
95th-Percentile Queue Length [veh]	3.84	16.80	15.31	14.08	3.60	7.79	13.75	25.38	2.86	3.85	9.86	8.26
95th-Percentile Queue Length [ft]	96.01	420.02	382.72	352.03	89.98	194.73	343.76	634.52	71.39	96.29	246.44	206.56

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	43.98	56.25	10.49	53.83	46.03	28.87	66.82	47.91	32.00	44.45	29.22	28.81
Movement LOS	D	E	B	D	D	C	E	D	C	D	C	C
d_A, Approach Delay [s/veh]	27.07			44.09			50.39			31.81		
Approach LOS	C			D			D			C		
d_I, Intersection Delay [s/veh]	39.04											
Intersection LOS	D											
Intersection V/C	0.760											

Sequence

Ring 1	1	3	8	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	6	2	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
#8: Central Ave and I15 SB

Control Type:	Two-way stop	Delay (sec / veh):	178.9
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.188

Intersection Setup

Name												
Approach	Southbound			Eastbound			Westbound			Northwestbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	130	0	6	0	191	39	123	88	0	0	0	0
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 [%]	2.30	0.00	0.00	2.00	3.10	0.00	6.50	11.30	2.00	2.00	2.00	2.00
Growth Rate	1.41	1.41	1.41	1.00	1.41	1.41	1.41	1.41	1.00	1.00	1.00	1.00
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]	183	0	8	0	269	55	173	124	0	0	0	0
Peak Hour Factor	0.8550	1.0000	0.7500	1.0000	0.6920	0.7500	0.7690	0.8150	1.0000	1.0000	1.0000	1.0000
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]	54	0	3	0	97	18	56	38	0	0	0	0
Total Analysis Volume [veh/h]	214	0	11	0	389	73	225	152	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Free	Free	Stop
Flared Lane				
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	1.19	0.00	0.01	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	178.88	176.96	9.05	0.00	0.00	0.00	8.91	0.00	0.00	0.00	0.00	0.00
Movement LOS	F	F	A		A	A	A	A				
95th-Percentile Queue Length [veh]	11.32	11.32	0.04	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	282.97	282.97	0.93	0.00	0.00	0.00	18.22	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	170.57			0.00			5.32			0.00		
Approach LOS	F			A			A			A		
d_I, Intersection Delay [s/veh]	37.95											
Intersection LOS	F											

Intersection Level Of Service Report
#9: Central Ave and I-15 NB

Control Type:	Two-way stop	Delay (sec / veh):	113.1
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.274

Intersection Setup

Name												
Approach	Northbound			Eastbound			Westbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	15	0	177	6	305	0	0	202	44	0	0	0
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	0.00	10.80	16.70	2.00	2.00	2.00	11.40	13.60	2.00	2.00	2.00
Growth Rate	1.64	1.64	1.64	1.64	1.64	1.00	1.00	1.64	1.64	1.00	1.00	1.00
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]	25	0	290	10	500	0	0	331	72	0	0	0
Peak Hour Factor	0.5360	1.0000	0.8510	0.7500	0.7190	1.0000	1.0000	0.8420	0.7330	1.0000	1.0000	1.0000
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	0	85	3	174	0	0	98	25	0	0	0
Total Analysis Volume [veh/h]	47	0	341	13	695	0	0	393	98	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Free	Free	Stop
Flared Lane	no			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.27	0.00	0.80	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	113.09	109.47	100.54	8.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Movement LOS	F	F	F	A	A			A	A			
95th-Percentile Queue Length [veh]	13.79	13.79	13.79	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	344.63	344.63	344.63	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	102.06			0.15			0.00			0.00		
Approach LOS	F			A			A			A		
d_I, Intersection Delay [s/veh]	25.02											
Intersection LOS	F											

Intersection Level Of Service Report
#10: Central Ave and Vaughn Rd

Control Type:	Two-way stop	Delay (sec / veh):	406.0
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.518

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	77	60	71	410	184	65
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	9.10	6.70	7.00	5.10	11.40	6.20
Growth Rate	1.63	1.63	1.63	1.63	1.63	1.63
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
Total Hourly Volume [veh/h]	126	98	116	668	300	106
Peak Hour Factor	0.7700	0.7890	0.8450	0.8010	0.8520	0.7740
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	41	31	34	208	88	34
Total Analysis Volume [veh/h]	164	124	137	834	352	137
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	1.52	0.20	0.13	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	405.95	378.42	8.95	0.00	0.00	0.00
Movement LOS	F	F	A	A	A	A
95th-Percentile Queue Length [veh]	20.34	20.34	0.45	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	508.50	508.50	11.23	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	394.10		1.26		0.00	
Approach LOS	F		A		A	
d_I, Intersection Delay [s/veh]	65.63					
Intersection LOS	F					

Intersection Level Of Service Report
#11: Vaughn Rd and I-15 SB

Control Type:	Two-way stop	Delay (sec / veh):	11.0
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.361

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	219	1	0	27	12	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.60	0.00	2.00	11.10	8.30	2.00
Growth Rate	1.36	1.36	1.00	1.36	1.36	1.00
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
Total Hourly Volume [veh/h]	298	1	0	37	16	0
Peak Hour Factor	0.8830	0.2500	1.0000	0.8440	0.7500	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	84	1	0	11	5	0
Total Analysis Volume [veh/h]	337	4	0	44	21	0
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.36	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	11.04	10.58	0.00	0.00	0.00	0.00
Movement LOS	B	B		A	A	
95th-Percentile Queue Length [veh]	1.68	1.68	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	42.07	42.07	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	11.04		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	9.27					
Intersection LOS	B					

Intersection Level Of Service Report
#12: Vaughn Rd and I-15 NB

Control Type:	Two-way stop	Delay (sec / veh):	7.3
Analysis Method:	HCM2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name						
Approach	Eastbound		Westbound		Southeastbound	
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	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	0	237	19	76	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	5.00	5.30	14.50	2.00	2.00
Growth Rate	1.37	1.37	1.37	1.37	1.00	1.00
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
Total Hourly Volume [veh/h]	0	325	26	104	0	0
Peak Hour Factor	1.0000	0.8590	0.5940	0.8260	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	95	11	31	0	0
Total Analysis Volume [veh/h]	0	378	44	126	0	0
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

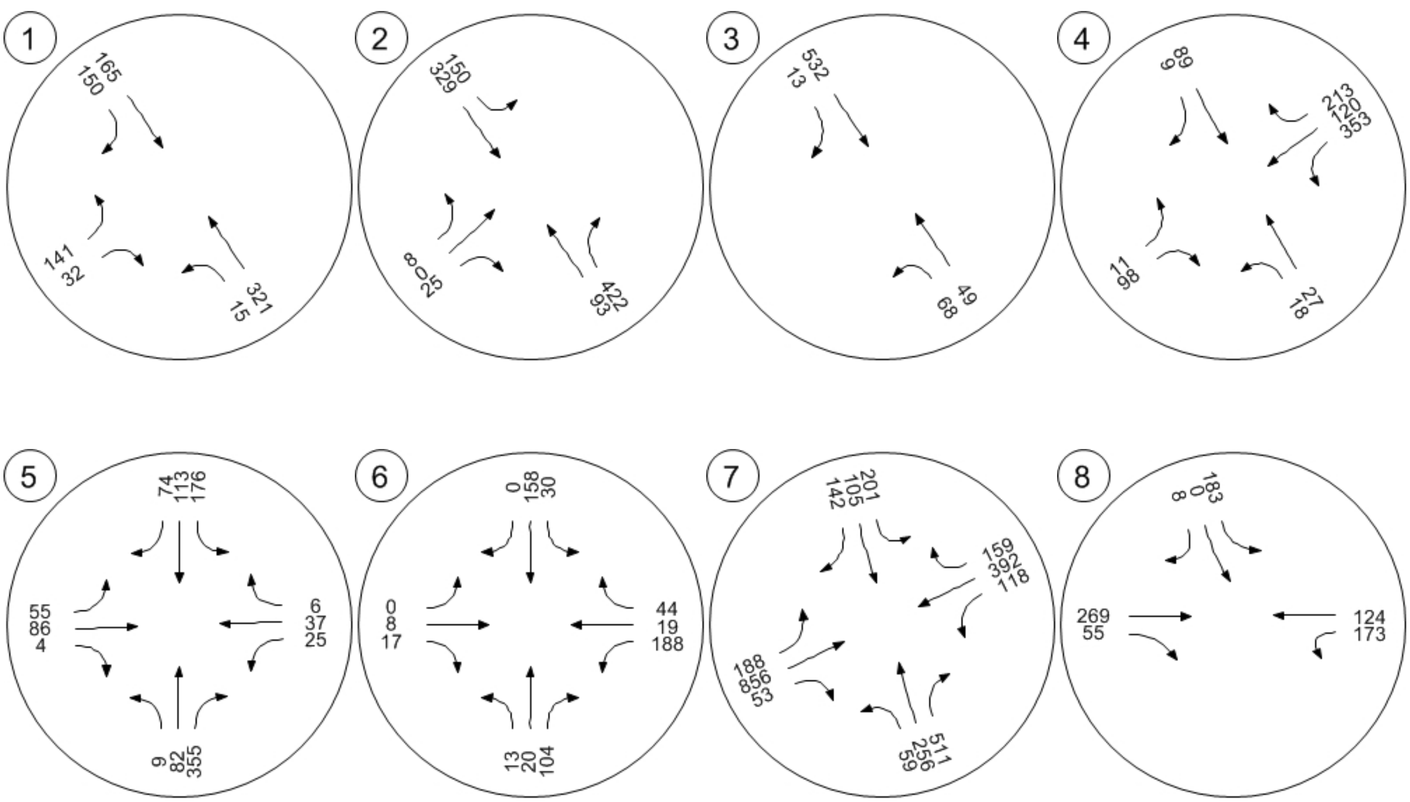
Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	0	0	0

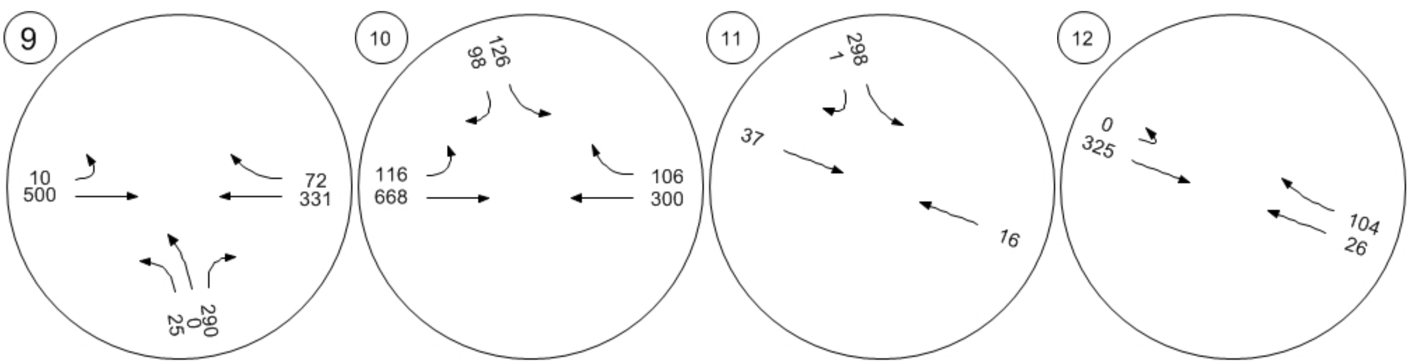
Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	7.28	0.00	0.00	0.00	0.00	0.00
Movement LOS	A	A	A	A		
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		0.00		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.00					
Intersection LOS	A					

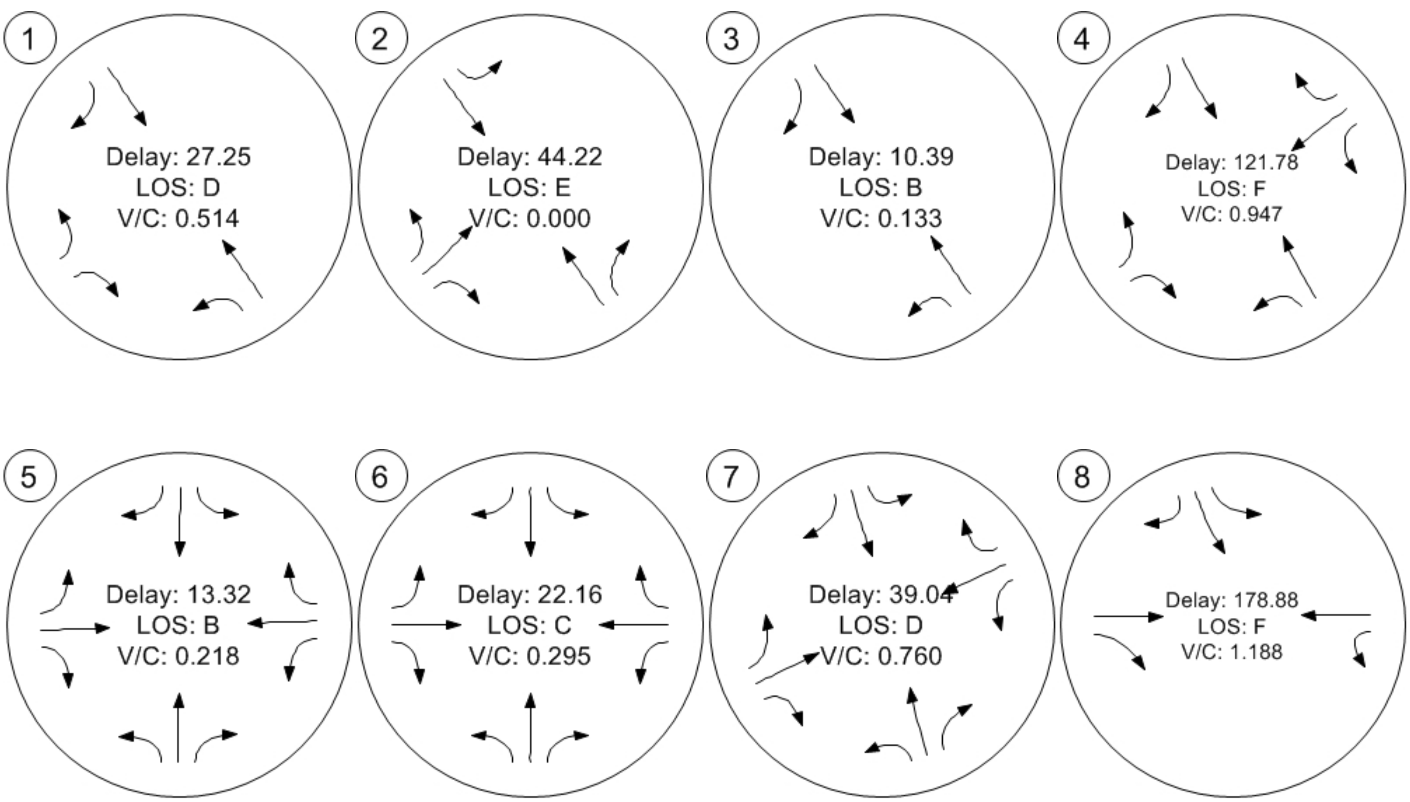
Traffic Volume - Future Total Volume



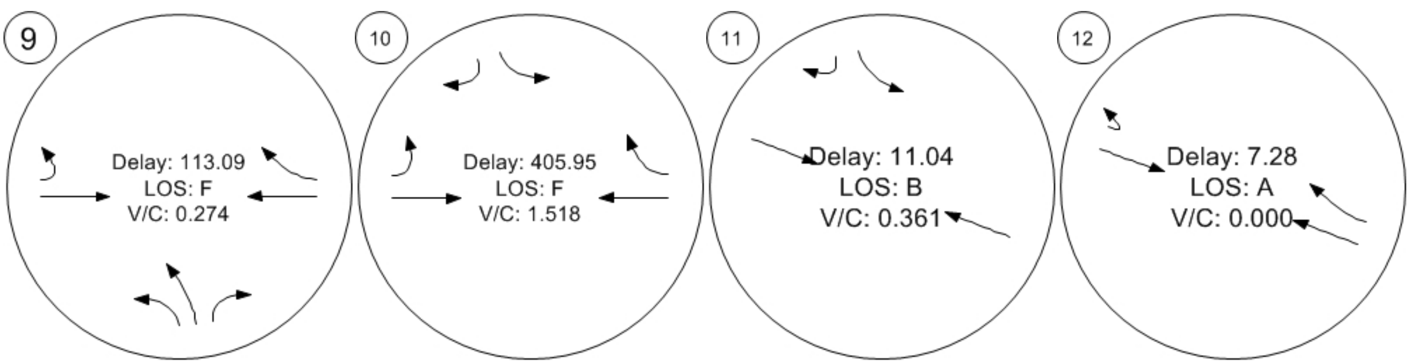
Traffic Volume - Future Total Volume



Traffic Conditions



Traffic Conditions



I-15 Corridor Study

Vistro File: F:\...\I-15 Corridor.vistropdb
Scenario 4: Future PM Scenario

Report File: F:\...\Future_LOS_Report_PM.pdf
9/15/2014

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	Tri Hill and Frontage Airport Rd	Two-way stop	HCM2010	NEBL	0.713	43.7	E
2	I-15 NB and Airport Rd	Two-way stop	HCM2010	NEBR	0.159	10,000.0	F
3	I-15 SB On and Airport RD	Two-way stop	HCM2010	NWBL	0.305	23.5	C
4	I-15 SB Off and Airport RD Frontage	Two-way stop	HCM2010	SWBL	7.378	3,138.9	F
5	14th St SW and I-315 EB	Signalized	HCM2010	NBL	0.457	12.4	B
6	14th St SW and I-315 WB	Signalized	HCM2010	EBR	0.621	19.6	B
7	Fox Farm and I-315	Signalized	HCM2010	NBT	0.891	35.6	D
8	Central Ave and I15 SB	Two-way stop	HCM2010	SBL	1.339	314.9	F
9	Central Ave and I-15 NB	Two-way stop	HCM2010	NBL	1.211	445.2	F
10	Central Ave and Vaughn Rd	Two-way stop	HCM2010	SBL	3.231	1,422.7	F
11	Vaughn Rd and I-15 SB	Two-way stop	HCM2010	SBL	0.254	11.0	B
12	Vaughn Rd and I-15 NB	Two-way stop	HCM2010	EBL	0.000	7.4	A

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
#1: Tri Hill and Frontage Airport Rd

Control Type:	Two-way stop	Delay (sec / veh):	43.7
Analysis Method:	HCM2010	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.713

Intersection Setup

Name						
Approach	Northeastbound		Northwestbound		Southeastbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	75	7	9	160	207	70
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.70	0.00	22.20	33.80	18.90	15.80
Growth Rate	1.70	1.70	1.70	1.70	1.70	1.70
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	128	12	15	272	352	119
Peak Hour Factor	0.5680	0.4380	0.7500	0.8000	0.8480	0.8330
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	56	7	5	85	104	36
Total Analysis Volume [veh/h]	225	27	20	340	415	143
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.71	0.05	0.02	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	43.71	38.46	9.00	0.00	0.00	0.00
Movement LOS	E	E	A	A	A	A
95th-Percentile Queue Length [veh]	5.93	5.93	0.07	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	148.33	148.33	1.67	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	43.15		0.50		0.00	
Approach LOS	E		A		A	
d_I, Intersection Delay [s/veh]	9.45					
Intersection LOS	E					

Intersection Level Of Service Report

#2: I-15 NB and Airport Rd

Control Type:	Two-way stop	Delay (sec / veh):	10,000.0
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.159

Intersection Setup

Name												
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	2	2	31	0	0	0	0	47	197	307	236	0
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	0.00	47.40	2.00	2.00	2.00	2.00	40.40	20.80	0.70	17.40	2.00
Growth Rate	1.90	1.90	1.90	1.00	1.00	1.00	1.00	1.90	1.90	1.90	1.90	1.00
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 [ve	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]	4	4	59	0	0	0	0	89	374	583	448	0
Peak Hour Factor	0.5000	0.5000	0.7750	1.0000	1.0000	1.0000	1.0000	0.6910	0.8210	0.6910	0.8680	1.0000
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	2	19	0	0	0	0	32	114	211	129	0
Total Analysis Volume [veh/h]	8	8	76	0	0	0	0	129	456	844	516	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	no			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	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	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.85	0.01	0.00
d_M, Delay for Movement [s/veh]	10000.0	10000.0	10000.0	0.00	0.00	0.00	0.00	0.00	0.00	24.83	0.00	0.00
Movement LOS	F	F	F					A	A	C	A	
95th-Percentile Queue Length [veh]	13.97	13.97	13.97	0.00	0.00	0.00	0.00	0.00	0.00	54.79	54.79	0.00
95th-Percentile Queue Length [ft]	349.24	349.24	349.24	0.00	0.00	0.00	0.00	0.00	0.00	1369.74	1369.74	0.00
d_A, Approach Delay [s/veh]	10000.00			0.00			0.00			15.41		
Approach LOS	F			A			A			F		
d_I, Intersection Delay [s/veh]	461.93											
Intersection LOS	F											

Intersection Level Of Service Report
#3: I-15 SB On and Airport RD

Control Type:	Two-way stop	Delay (sec / veh):	23.5
Analysis Method:	HCM2010	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.305

Intersection Setup

Name						
Approach	Northeastbound		Northwestbound		Southeastbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	0	0	25	21	542	14
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.00	2.00	64.00	19.10	7.30	0.00
Growth Rate	1.00	1.00	2.12	2.12	2.12	2.12
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	0	53	45	1149	30
Peak Hour Factor	1.0000	1.0000	0.6250	0.7500	0.7450	0.7000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	0	21	15	386	11
Total Analysis Volume [veh/h]	0	0	85	60	1542	43
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.30	0.00	0.02	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	23.48	0.00	0.00	0.00
Movement LOS			C	A	A	A
95th-Percentile Queue Length [veh]	0.00	0.00	2.79	2.79	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	0.00	69.68	69.68	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		13.76		0.00	
Approach LOS	A		B		A	
d_I, Intersection Delay [s/veh]	1.15					
Intersection LOS	C					

Intersection Level Of Service Report
#4: I-15 SB Off and Airport RD Frontage

Control Type:	Two-way stop	Delay (sec / veh):	3,138.9
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	7.378

Intersection Setup

Name												
Approach	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	0	0	55	217	26	47	8	15	0	0	286	1
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	2.00	1.80	18.90	11.50	2.10	37.50	6.70	2.00	2.00	1.00	0.00
Growth Rate	2.22	1.00	2.22	2.22	2.22	2.22	2.22	2.22	1.00	1.00	2.22	2.22
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 [ve	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]	0	0	122	482	58	104	18	33	0	0	635	2
Peak Hour Factor	1.0000	1.0000	0.7240	0.8350	0.7220	0.6910	0.6670	0.7500	1.0000	1.0000	0.6810	0.2500
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]	0	0	42	144	20	38	7	11	0	0	233	2
Total Analysis Volume [veh/h]	0	0	169	577	80	151	27	44	0	0	932	8
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	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	0.53	7.38	0.38	0.15	0.04	0.00	0.00	0.00	0.01	0.00
d_M, Delay for Movement [s/veh]	47.75	0.00	27.94	3138.95	3109.90	9.11	11.25	0.00	0.00	0.00	0.00	0.00
Movement LOS	E		D	F	F	A	B	A			A	A
95th-Percentile Queue Length [veh]	2.88	0.00	2.88	74.83	74.83	0.52	0.40	0.40	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	72.12	0.00	72.12	1870.70	1870.70	12.88	9.95	9.95	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	27.94			2551.16			4.28			0.00		
Approach LOS	D			F			A			A		
d_I, Intersection Delay [s/veh]	1039.42											
Intersection LOS	F											

Intersection Level Of Service Report
#5: 14th St SW and I-315 EB

Control Type:	Signalized	Delay (sec / veh):	12.4
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.457

Intersection Setup

Name												
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	13	82	260	95	396	262	107	168	10	102	50	31
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	2.40	1.20	4.30	1.30	0.40	0.90	0.00	0.00	1.00	0.00	12.90
Growth Rate	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
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 [ve	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]	16	102	322	118	491	325	133	208	12	126	62	38
Peak Hour Factor	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380	0.9380
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	27	86	31	131	87	35	55	3	34	17	10
Total Analysis Volume [veh/h]	17	109	343	126	523	346	142	222	13	134	66	41
Presence of On-Street Parking	no		no	no		no	no		no	no		no
On-Street Parking Maneuver Rate [/	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
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]	60
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Overlap	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	2	3	0	6	7	7	4	0	3	8	0
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	15	0	5	15	15	5	0	15	15	0
Maximum Green [s]	0	50	20	0	50	20	20	45	0	20	45	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	22	18	0	22	18	18	20	0	18	20	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	5	0	5	0	0	5	0	5	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0	0	10	0	10	10	0
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	3.0	1.0	0.0	3.0	1.0	1.0	3.0	0.0	1.0	3.0	0.0
Minimum Recall		no	no		no	no	no	no		no	no	
Maximum Recall		no	no		no	no	no	no		no	no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	L	C	R	L	C	R	L	C	R	L	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	3.00	5.00	5.00	3.00	3.00	5.00	5.00	4.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	0.00	0.00	3.00	3.00	0.00	3.00	3.00
g_i, Effective Green Time [s]	21	21	41	21	21	41	33	15	15	33	15	15
g / C, Green / Cycle	0.35	0.35	0.68	0.35	0.35	0.68	0.55	0.25	0.25	0.55	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.02	0.06	0.21	0.10	0.28	0.22	0.09	0.12	0.01	0.09	0.03	0.03
s, saturation flow rate [veh/h]	893	1855	1596	1251	1876	1609	1564	1900	1615	1472	1900	1430
c, Capacity [veh/h]	183	647	1089	469	654	1097	998	466	396	872	466	351
d1, Uniform Delay [s]	26.40	13.51	3.86	17.33	17.64	3.86	6.75	19.34	17.22	7.01	17.69	17.58
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.20	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]	0.22	0.12	0.16	0.30	2.31	0.30	0.06	0.75	0.03	0.08	0.14	0.15
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

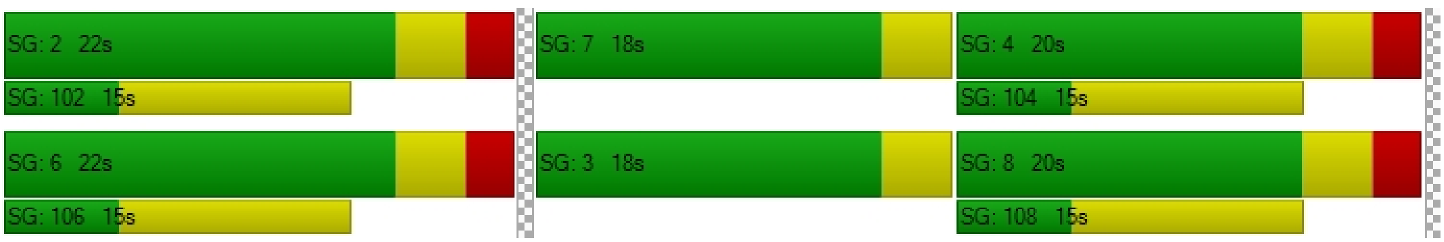
X, volume / capacity	0.09	0.17	0.32	0.27	0.80	0.32	0.14	0.48	0.03	0.15	0.14	0.12
d, Delay for Lane Group [s/veh]	26.62	13.63	4.03	17.63	19.95	4.16	6.82	20.09	17.25	7.09	17.83	17.73
Lane Group LOS	C	B	A	B	B	A	A	C	B	A	B	B
Critical Lane Group	no	no	no	no	yes	yes	no	yes	no	no	no	no
50th-Percentile Queue Length [veh]	0.23	0.94	1.10	1.32	6.19	1.15	0.74	2.53	0.13	0.70	0.68	0.42
50th-Percentile Queue Length [ft]	5.73	23.57	27.43	32.90	154.65	28.69	18.54	63.35	3.27	17.48	17.01	10.58
95th-Percentile Queue Length [veh]	0.41	1.70	1.97	2.37	10.26	2.07	1.33	4.56	0.24	1.26	1.22	0.76
95th-Percentile Queue Length [ft]	10.31	42.42	49.37	59.22	256.62	51.65	33.37	114.02	5.88	31.46	30.62	19.05

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.62	13.63	4.03	17.63	19.95	4.16	6.82	20.09	17.25	7.09	17.83	17.73
Movement LOS	C	B	A	B	B	A	A	C	B	A	B	B
d_A, Approach Delay [s/veh]	7.08			14.16			15.00			11.84		
Approach LOS	A			B			B			B		
d_I, Intersection Delay [s/veh]	12.45											
Intersection LOS	B											
Intersection V/C	0.457											

Sequence

Ring 1	2	7	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	6	3	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
#6: 14th St SW and I-315 WB

Control Type:	Signalized	Delay (sec / veh):	19.6
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.621

Intersection Setup

Name												
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	5	76	146	22	131	2	3	5	19	638	12	142
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 [%]	40.00	6.60	0.70	0.00	2.30	0.00	0.00	0.00	15.80	1.80	8.30	4.20
Growth Rate	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
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 [ve	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]	6	88	169	26	152	2	3	6	22	740	14	165
Peak Hour Factor	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880	0.9880
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	22	43	7	38	1	1	2	6	187	4	42
Total Analysis Volume [veh/h]	6	89	171	26	154	2	3	6	22	749	14	167
Presence of On-Street Parking	no		no	no		no	no		no	no		no
On-Street Parking Maneuver Rate [/	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
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]	60
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss	Permiss
Signal Group	0	1	2	0	1	0	0	3	0	0	2	0
Lead / Lag	-	-	-	-	-	-	-	-	-	-	-	-
Minimum Green [s]	0	5	5	0	5	0	0	5	0	0	5	0
Maximum Green [s]	0	35	40	0	35	0	0	25	0	0	40	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
All red [s]	0.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	25	19	0	25	0	0	16	0	0	19	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Walk [s]	0	9	7	0	9	0	0	0	0	0	7	0
Pedestrian Clearance [s]	0	11	7	0	11	0	0	0	0	0	7	0
l1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
l2, Clearance Lost Time [s]	0.0	3.0	3.0	0.0	3.0	0.0	0.0	3.0	0.0	0.0	3.0	0.0
Minimum Recall		no	no		no			no			no	
Maximum Recall		no	no		no			no			no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	L	C	R	L	C	C	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	3.00	3.00	0.00	3.00	3.00	3.00	3.00	3.00
g_i, Effective Green Time [s]	11	11	49	11	11	2	33	33
g / C, Green / Cycle	0.18	0.18	0.81	0.18	0.18	0.03	0.54	0.54
(v / s)_i Volume / Saturation Flow Rate	0.01	0.06	0.12	0.02	0.09	0.02	0.51	0.12
s, saturation flow rate [veh/h]	804	1604	1443	1196	1668	1513	1505	1395
c, Capacity [veh/h]	167	290	1168	234	301	51	820	760
d1, Uniform Delay [s]	26.79	21.32	1.24	25.10	22.21	28.59	12.61	7.06
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.27	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.09	0.59	0.06	0.21	1.37	11.05	11.60	0.14
d3, Initial Queue Delay [s]	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
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.04	0.31	0.15	0.11	0.52	0.61	0.93	0.22
d, Delay for Lane Group [s/veh]	26.88	21.91	1.30	25.31	23.59	39.64	24.21	7.20
Lane Group LOS	C	C	A	C	C	D	C	A
Critical Lane Group	no	no	no	no	yes	yes	yes	no
50th-Percentile Queue Length [veh]	0.08	1.06	0.08	0.34	1.97	0.58	9.92	0.92
50th-Percentile Queue Length [ft]	2.04	26.57	1.93	8.44	49.22	14.38	247.97	23.06
95th-Percentile Queue Length [veh]	0.15	1.91	0.14	0.61	3.54	1.04	15.08	1.66
95th-Percentile Queue Length [ft]	3.67	47.82	3.47	15.19	88.60	25.89	377.09	41.51

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	26.88	21.91	1.30	25.31	23.59	23.59	39.64	39.64	39.64	24.21	24.21	7.20
Movement LOS	C	C	A	C	C	C	D	D	D	C	C	A
d_A, Approach Delay [s/veh]	8.77			23.83			39.64			21.15		
Approach LOS	A			C			D			C		
d_I, Intersection Delay [s/veh]	19.57											
Intersection LOS	B											
Intersection V/C	0.621											

Sequence

Ring 1	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Intersection Level Of Service Report
#7: Fox Farm and I-315

Control Type:	Signalized	Delay (sec / veh):	35.6
Analysis Method:	HCM2010	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.891

Intersection Setup

Name												
Approach	Northbound			Southbound			Northeastbound			Southwestbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	71	155	227	153	274	325	242	706	103	486	874	250
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 [%]	2.80	1.90	0.40	1.30	0.70	2.10	2.50	3.60	2.90	0.40	3.90	1.60
Growth Rate	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
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 [ve	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]	83	181	266	179	321	380	283	826	121	569	1023	293
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200	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	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	23	49	72	49	87	103	77	224	33	155	278	80
Total Analysis Volume [veh/h]	90	197	289	195	349	413	308	898	132	618	1112	318
Presence of On-Street Parking	no		no	no		no	no		no	no		no
On-Street Parking Maneuver Rate [/	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
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]	120
Coordination Type	Time of Day Pattern Coordinated
Actuation Type	Semi-actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permiss	Permiss	Overlap	Permiss	Permiss	Overlap	Protecte	Permiss	Permiss	Protecte	Permiss	Permiss
Signal Group	0	1	8	0	3	6	6	4	0	8	2	5
Lead / Lag	-	-	-	-	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	0	5	5	0	5	5	5	5	0	5	5	0
Maximum Green [s]	0	60	60	0	60	60	60	60	0	60	60	0
Amber [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
All red [s]	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0
Split [s]	0	35	26	0	20	23	23	39	0	26	42	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0
Walk [s]	0	5	0	0	5	0	0	5	0	0	5	0
Pedestrian Clearance [s]	0	10	0	0	10	0	0	10	0	0	10	0
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	3.0	1.0	0.0	3.0	1.0	1.0	3.0	0.0	1.0	3.0	0.0
Minimum Recall		no	no		no	no	no	no		no	no	
Maximum Recall		no	no		no	no	no	no		no	no	
Pedestrian Recall		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

Lane Group Calculations

Lane Group	C	C	R	L	C	R	L	C	R	L	C	R
L, Total Lost Time per Cycle [s]	5.00	5.00	5.00	5.00	5.00	3.00	3.00	5.00	5.00	3.00	5.00	5.00
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]	3.00	3.00	0.00	3.00	3.00	0.00	1.00	3.00	3.00	1.00	3.00	3.00
g_i, Effective Green Time [s]	18	18	82	28	28	61	28	47	47	27	47	47
g / C, Green / Cycle	0.15	0.15	0.68	0.24	0.24	0.51	0.23	0.40	0.40	0.23	0.39	0.39
(v / s)_i Volume / Saturation Flow Rate	0.06	0.12	0.20	0.12	0.11	0.29	0.19	0.29	0.09	0.20	0.35	0.22
s, saturation flow rate [veh/h]	1604	1527	1448	1608	3233	1424	1589	3143	1413	3150	3134	1431
c, Capacity [veh/h]	243	231	985	380	764	729	371	1245	559	719	1224	559
d1, Uniform Delay [s]	46.00	49.37	7.66	39.82	39.22	20.15	43.70	30.64	24.14	44.46	34.54	28.65
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.15	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]	1.06	7.18	0.16	1.07	0.43	0.96	4.79	0.80	0.21	3.15	2.94	0.91
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

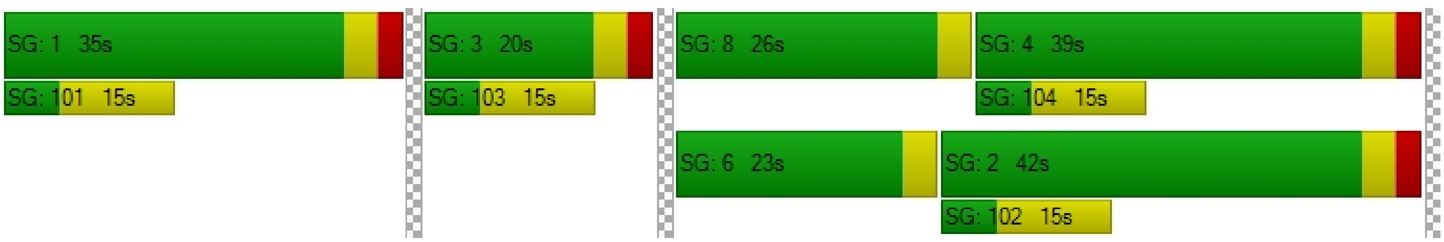
X, volume / capacity	0.40	0.82	0.29	0.51	0.46	0.57	0.83	0.72	0.24	0.86	0.91	0.57
d, Delay for Lane Group [s/veh]	47.07	56.55	7.83	40.89	39.65	21.11	48.50	31.44	24.35	47.61	37.48	29.57
Lane Group LOS	D	E	A	D	D	C	D	C	C	D	D	C
Critical Lane Group	no	yes	no	no	no	yes	yes	no	no	no	yes	no
50th-Percentile Queue Length [veh]	2.70	5.98	2.86	5.12	4.46	7.98	9.16	10.99	2.55	9.09	15.51	7.26
50th-Percentile Queue Length [ft]	67.38	149.57	71.39	127.98	111.45	199.62	228.90	274.66	63.65	227.31	387.83	181.61
95th-Percentile Queue Length [veh]	4.85	9.99	5.14	8.83	7.92	12.62	14.12	16.42	4.58	14.04	21.97	11.68
95th-Percentile Queue Length [ft]	121.29	249.86	128.51	220.75	198.02	315.47	352.97	410.56	114.57	350.95	549.31	292.12

Movement, Approach, & Intersection Results

d_M, Delay for Movement [s/veh]	47.07	56.22	7.83	40.89	39.65	21.11	48.50	31.44	24.35	47.61	37.48	29.57
Movement LOS	D	E	A	D	D	C	D	C	C	D	D	C
d_A, Approach Delay [s/veh]	30.51			31.90			34.67			39.31		
Approach LOS	C			C			C			D		
d_I, Intersection Delay [s/veh]	35.58											
Intersection LOS	D											
Intersection V/C	0.891											

Sequence

Ring 1	1	3	8	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	6	2	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
#8: Central Ave and I15 SB

Control Type:	Two-way stop	Delay (sec / veh):	314.9
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.339

Intersection Setup

Name												
Approach	Southbound			Eastbound			Westbound			Northwestbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	66	0	6	0	166	30	230	299	0	0	0	0
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 [%]	6.00	0.00	0.00	2.00	0.60	0.00	6.50	1.00	2.00	2.00	2.00	2.00
Growth Rate	1.41	1.41	1.41	1.00	1.41	1.41	1.41	1.41	1.00	1.00	1.00	1.00
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 [ve	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]	93	0	8	0	234	42	324	422	0	0	0	0
Peak Hour Factor	0.9170	1.0000	0.7500	1.0000	0.8470	0.8330	0.8980	0.8690	1.0000	1.0000	1.0000	1.0000
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	0	3	0	69	13	90	121	0	0	0	0
Total Analysis Volume [veh/h]	101	0	11	0	276	50	361	486	0	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Free	Free	Stop
Flared Lane				
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	1.34	0.00	0.02	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	314.89	307.18	11.27	0.00	0.00	0.00	8.99	0.00	0.00	0.00	0.00	0.00
Movement LOS	F	F	B		A	A	A	A				
95th-Percentile Queue Length [veh]	7.96	7.96	0.06	0.00	0.00	0.00	1.19	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	198.90	198.90	1.44	0.00	0.00	0.00	29.75	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	285.07			0.00			3.83			0.00		
Approach LOS	F			A			A			A		
d_I, Intersection Delay [s/veh]	27.37											
Intersection LOS	F											

Intersection Level Of Service Report
#9: Central Ave and I-15 NB

Control Type:	Two-way stop	Delay (sec / veh):	445.2
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.211

Intersection Setup

Name												
Approach	Northbound			Eastbound			Westbound			Southeastbound		
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	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	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	yes			yes			yes			yes		

Volumes

Name												
Base Volume Input [veh/h]	57	0	170	5	249	0	0	471	113	0	0	0
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	0.00	7.00	0.00	2.00	2.00	2.00	4.60	0.90	2.00	2.00	2.00
Growth Rate	1.64	1.64	1.64	1.64	1.64	1.00	1.00	1.64	1.64	1.00	1.00	1.00
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 [ve	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]	93	0	279	8	408	0	0	772	185	0	0	0
Peak Hour Factor	0.7130	1.0000	0.7590	0.4170	0.8650	1.0000	1.0000	0.9350	0.8310	1.0000	1.0000	1.0000
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]	33	0	92	5	118	0	0	206	56	0	0	0
Total Analysis Volume [veh/h]	130	0	368	19	472	0	0	826	223	0	0	0
Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Stop	Free	Free	Stop
Flared Lane	no			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	no			
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	1.21	0.00	0.63	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	445.19	435.47	417.85	9.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Movement LOS	F	F	F	A	A			A	A			
95th-Percentile Queue Length [veh]	33.98	33.98	33.98	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	849.39	849.39	849.39	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	424.99			0.37			0.00			0.00		
Approach LOS	F			A			A			A		
d_I, Intersection Delay [s/veh]	103.94											
Intersection LOS	F											

Intersection Level Of Service Report
#10: Central Ave and Vaughn Rd

Control Type:	Two-way stop	Delay (sec / veh):	1,422.7
Analysis Method:	HCM2010	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	3.231

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	68	121	66	361	462	76
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.90	1.60	1.50	4.00	3.40	2.60
Growth Rate	1.63	1.63	1.63	1.63	1.63	1.63
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	111	197	108	588	753	124
Peak Hour Factor	0.6540	0.9450	0.7500	0.7910	0.8680	0.7310
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	42	52	36	186	217	42
Total Analysis Volume [veh/h]	170	208	144	743	868	170
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	3.23	0.66	0.21	0.01	0.01	0.00
d_M, Delay for Movement [s/veh]	1422.75	1365.77	11.82	0.00	0.00	0.00
Movement LOS	F	F	B	A	A	A
95th-Percentile Queue Length [veh]	38.77	38.77	0.81	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	969.13	969.13	20.22	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	1391.39		1.92		0.00	
Approach LOS	F		A		A	
d_I, Intersection Delay [s/veh]	229.11					
Intersection LOS	F					

Intersection Level Of Service Report
#11: Vaughn Rd and I-15 SB

Control Type:	Two-way stop	Delay (sec / veh):	11.0
Analysis Method:	HCM2010	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.254

Intersection Setup

Name						
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	143	1	0	53	50	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	7.00	0.00	2.00	7.60	4.00	2.00
Growth Rate	1.36	1.36	1.00	1.36	1.36	1.00
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	194	1	0	72	68	0
Peak Hour Factor	0.9410	0.2500	1.0000	0.7790	0.8930	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	52	1	0	23	19	0
Total Analysis Volume [veh/h]	206	4	0	92	76	0
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	no		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	no		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.25	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	10.97	10.17	0.00	0.00	0.00	0.00
Movement LOS	B	B		A	A	
95th-Percentile Queue Length [veh]	1.03	1.03	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	25.74	25.74	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	10.96		0.00		0.00	
Approach LOS	B		A		A	
d_I, Intersection Delay [s/veh]	6.09					
Intersection LOS	B					

Intersection Level Of Service Report
#12: Vaughn Rd and I-15 NB

Control Type:	Two-way stop	Delay (sec / veh):	7.4
Analysis Method:	HCM2010	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.000

Intersection Setup

Name						
Approach	Eastbound		Westbound		Southeastbound	
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	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	yes		yes		yes	

Volumes

Name						
Base Volume Input [veh/h]	0	165	55	334	0	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	6.10	1.80	4.80	2.00	2.00
Growth Rate	1.37	1.37	1.37	1.37	1.00	1.00
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 [ve	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	0	226	75	458	0	0
Peak Hour Factor	1.0000	0.7500	0.8090	0.9180	1.0000	1.0000
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	0	75	23	125	0	0
Total Analysis Volume [veh/h]	0	301	93	499	0	0
Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

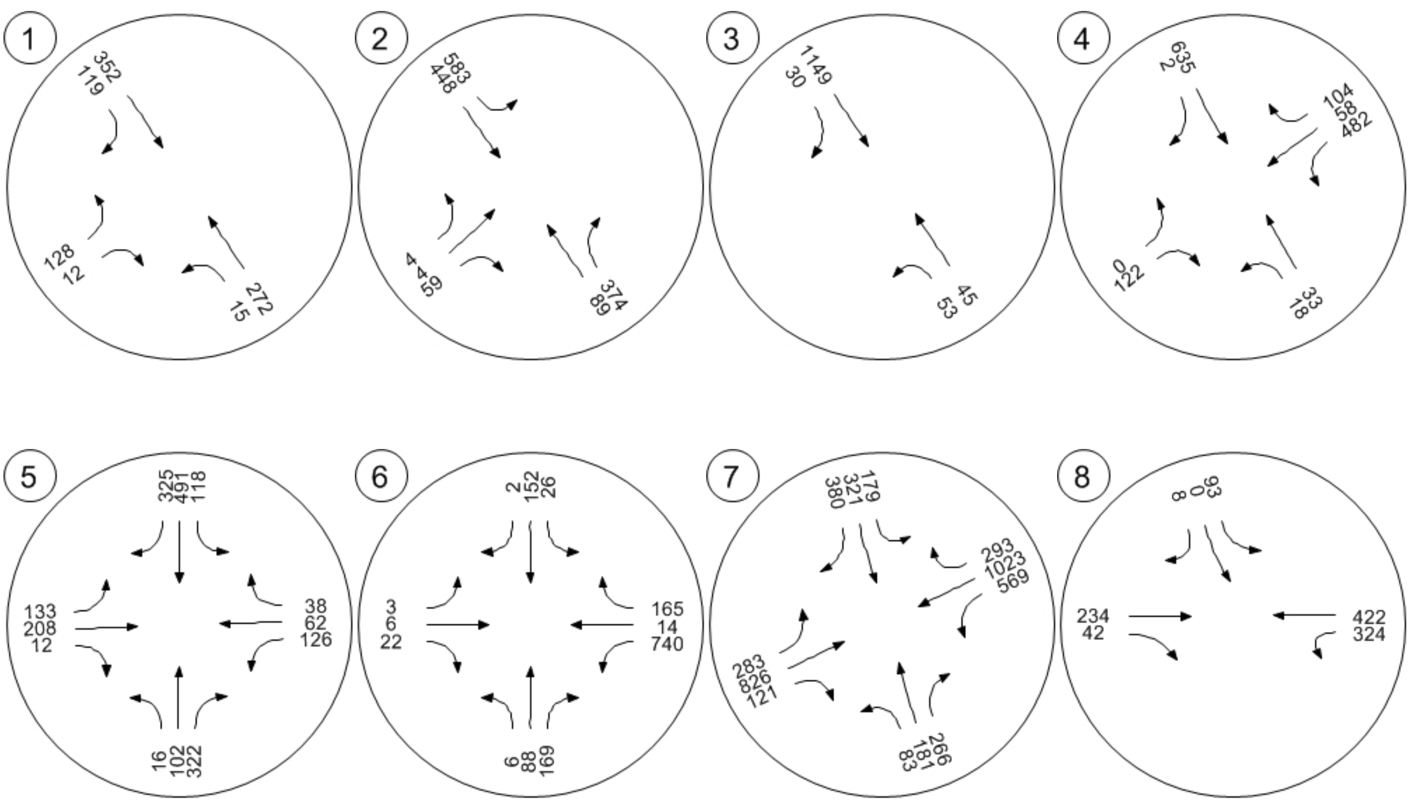
Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			
Number of Storage Spaces in Median	0	0	0

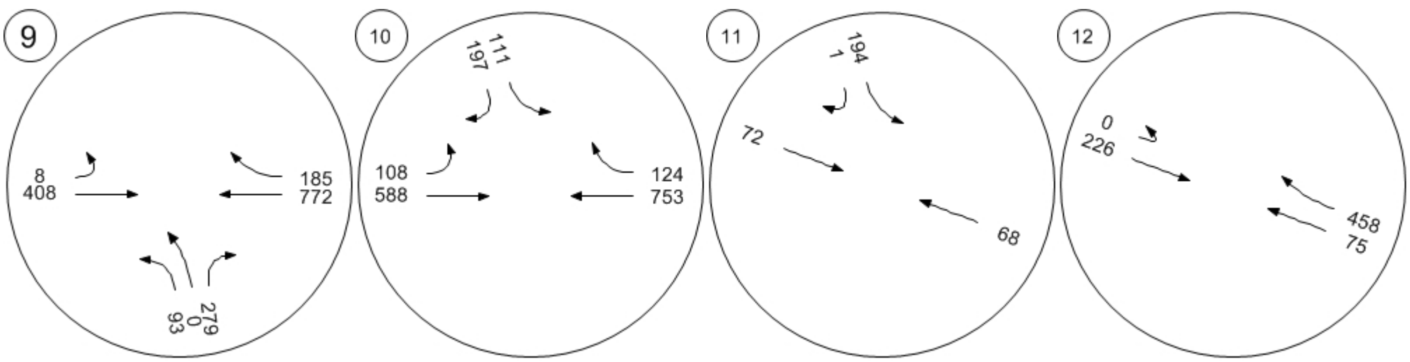
Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.00	0.00	0.00
d_M, Delay for Movement [s/veh]	7.38	0.00	0.00	0.00	0.00	0.00
Movement LOS	A	A	A	A		
95th-Percentile Queue Length [veh]	0.00	0.00	0.00	0.00	0.00	0.00
95th-Percentile Queue Length [ft]	0.00	0.00	0.00	0.00	0.00	0.00
d_A, Approach Delay [s/veh]	0.00		0.00		0.00	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0.00					
Intersection LOS	A					

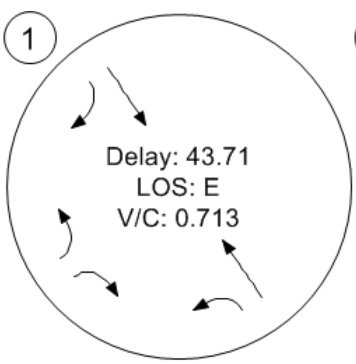
Traffic Volume - Future Total Volume

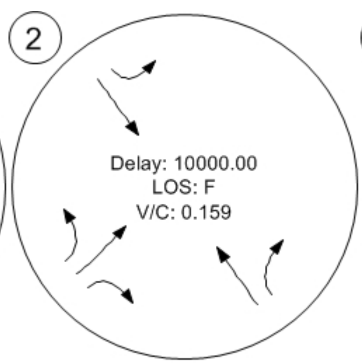


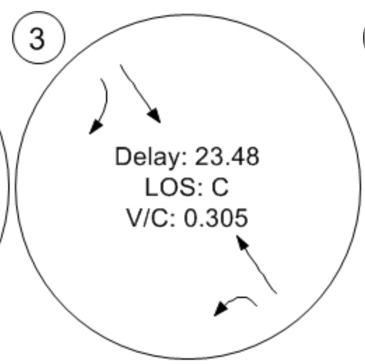
Traffic Volume - Future Total Volume

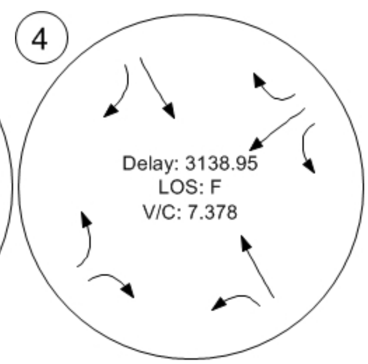


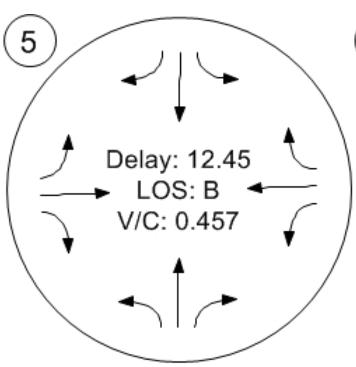
Traffic Conditions

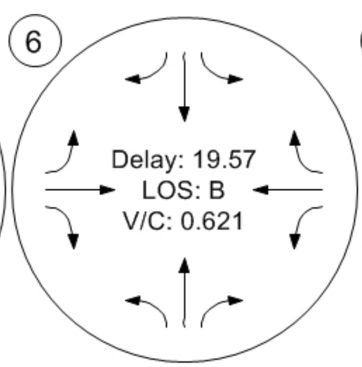


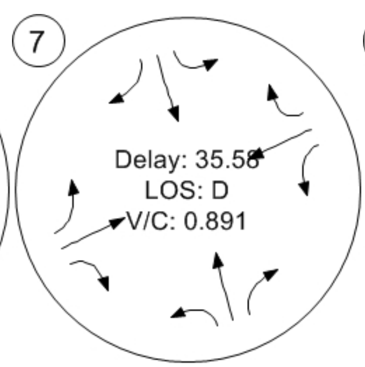


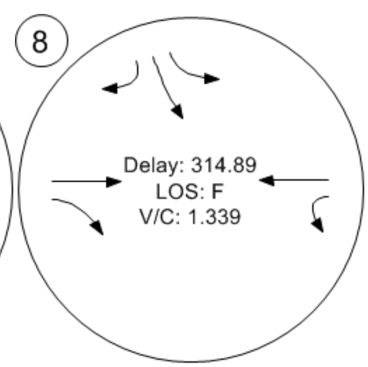












Traffic Conditions