DRAFT

Technical Memorandum 3

CURRENT SYSTEM OPERATIONS

IAMP 21

Interchange Area Management Plan for the Interstate-5 Exit 21 Interchange

August 8, 2014

Revised December 1, 2014

Oregon Department of Transportation

Region 3

This memorandum evaluates existing transportation conditions as they relate to Interchange 21 in Talent, Oregon. It covers existing vehicular, freight, pedestrian, and bicyclist volumes; intersection operations; and safety for the area surrounding Interchange 21, which is referred to as the Area of Primary Impact (API).

EXISTING TRAFFIC VOLUMES

Existing traffic volumes were compiled from turning movement counts at API intersections collected by ODOT in 2010, 2012, and 2014. Average daily traffic volumes were derived from 2012 and 2014 48-hour tube counts, as well as online data.

Turning Movement Counts

Manual traffic counts for this analysis were compiled by ODOT in 2010, 2012, and 2014. Traffic counts at intersections with local streets were of 3-hour duration. Counts at Interstate 5 (I-5) ramps and the signalized intersection at OR 99 were of 16-hour duration. All counts included a federal classification breakdown. Table 1 provides a list of intersection count type and location.

Table 1 Traffic Count Locations and Types

Location	Type of Count	Count Date
OR 99 & W Valley View Road	16-hour[2]	7/15/2010
Oak Valley View Road & W Valley View Road	3-hour PM Peak Period[1]	4/9/2014
Mountain View Road & W Valley View Road	3-hour PM Peak Period[1]	4/8/2014
Chevron & W Valley View Road	3-hour PM Peak Period[1]	4/9/2014
Siskiyou View Road & W Valley View Road	3-hour PM Peak Period[1]	4/8/2014
I-5 SB ramps & W Valley View Road	16-hour[2]	9/11/2012
I-5 NB ramps & W Valley View Road	16-hour[2]	9/11/2012
Suncrest Road & W Valley View Road	3-hour PM Peak Period[1]	4/8/2014

Notes:
1. 3-hour counts collected from 3:00 to 6:00 PM that included turning movement and vehicle classification
2. 16-hour counts collected from 6:00 AM to 10:00 PM that included turning movement and vehicle classification
NB=northbound; SB=southbound

Design Hourly Volumes

ODOT requires transportation facilities to be analyzed using design hourly volumes (DHVs), also known as 30th highest hour volumes. The 30th highest hour volume represents the 30th highest traffic volume for the year. It is calculated by multiplying a peak hour volume by a seasonal factor. The seasonal factor is determined from automatic traffic recorders (ATR) or seasonal trends. The seasonal factor for OR 99 used data from an on-site ATR (Sta. 15-014) south of Creel Road. Local street intersections with West Valley View Road used a seasonal commuter trend factor. Freeway ramps at Interchange 21 used a combination of the seasonal trend factors and data from two ATRs with comparable characteristics to the mainline segment through Talent.

A global peak hour of 4:30-5:30 PM was used throughout the API. Peak hour count data were seasonally adjusted and balanced within the network to develop 2014 no-build design hour volumes. Refer to Figure 2 for 2014 no-build traffic volumes and operations.

Average Daily Traffic Volumes

Average daily traffic counts were derived using 48-hour tube counts and ODOT average annual daily traffic (AADT) volumes. Volumes within the API are summarized in Table 2.

Table 2 Average Daily Traffic Volumes

Location	Volume	Year
OR 99 – north of W Valley View Road	11,500 vpd[1]	2014
OR 99 – south of W Valley View Road	9,100 vpd[2]	2011
W Valley View Road – east of OR 99	10,000 vpd[1]	2014
Oak Valley View Road – north of W Valley View Road	500 vpd[1]	2014
Mountain View Road – south of W Valley View Road	950 vpd[1]	2014
W Valley View Road – east of Mountain View Road	8,300 vpd[1]	2012
Siskiyou View Road – north of W Valley View Road	500 vpd[1]	2014
Siskiyou View Road – south of W Valley View Road	425 vpd[1]	2014
I-5 SB off ramp	3,650 vpd[3], 3,910 vpd[1]	2012, 2014
I-5 SB on ramp	1,700 vpd[3], 1,560 vpd[1]	2012, 2014
W Valley View Road – between I-5 ramps	5,650 vpd[1], 5,550 vpd[1]	2012, 2014
I-5 NB off ramp	2,200 vpd[3], 1,720 vpd[1]	2012, 2014
I-5 NB on ramp	3,570 vpd[3], 4,160 vpd[1]	2012, 2014
Suncrest Road – north of W Valley View Road	625 vpd[1]	2014
W Valley View Road – south of W Valley View Road	900 vpd[1]	2014
I-5 SB – north of W Valley View Road	20,100 vpd[3]	2012
I-5 SB – south of W Valley View Road	18,150 vpd[3]	2012
I-5 NB – south of W Valley View Road	17,330 vpd[3]	2012
I-5 NB – north of W Valley View Road	18,700 vpd[3]	2012

Notes:
1. Data derived from 48-hour tube counts
2. Data from ODOT online volume tables
3. Data from ODOT online ramp volumes
NB=northbound; SB=southbound; vpd=volume per day

EXISTING TRAFFIC OPERATIONS

Existing PM peak hour traffic operations were evaluated at API intersections to provide a baseline scenario. Operational criteria and procedures are discussed below.

Operational Criteria

Intersection operations are generally measured by either level of service (LOS) or volume to capacity (v/c). Level of service is based on total delay, defined as the total elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line. It ranges from “A” to “F,” with “A” indicating the most desirable condition and “F” an unsatisfactory condition. Volume-to-capacity ratios compare the peak hour traffic volume on a roadway to the maximum volume the roadway can handle. If the traffic volume exceeds the capacity, traffic queues will form and lengthen for as long as there is excessive demand. When a v/c ratio approaches 1.00, traffic flow becomes unstable. Similarly, as a LOS approaches “F,” congestion and delays increase.

The City of Talent bases intersection operation on LOS, specifying a minimum performance of LOS "D" for signalized intersections and unsignalized intersection movements. Jackson County and ODOT require intersections to meet specified mobility measures provided in the 1999 Oregon Highway Plan (OHP). These measures vary according to functional classification, location, travel speed, and role within the National Highway System. Level of service and OHP v/c ratio performance measures are provided in Table 3.

The Exit 21 Interchange layout includes a gull wing configuration east of I-5 at the northbound freeway ramp terminals and a half-diamond configuration west of I-5 at the southbound terminals. The northbound and southbound ramps are connected by a two-lane bridge over I-5. Both ramp terminals have single-lane approaches to West Valley View Road and connect via stop-controlled intersections. Each direction of I-5 traffic experiences one diverge and one merge within the influence area of the interchange. The influence area includes all merge, diverge, acceleration, and deceleration lanes.

Level of service in merge and diverge influence areas is determined by density and represented by LOS A-F. LOS F exists in merges when total flow departing from a merge area exceeds the capacity of the downstream freeway segment. Similarly, in diverges, LOS F exists when demand flows exceed the capacity of the approaching freeway segment. LOS A through E assumes stable operations with no breakdowns within the merge or diverge influence area. Volume-to-capacity ratios are derived from calculated flow rates and interpolated capacities provided in the *2010 Highway Capacity Manual* (HCM).

Operational Procedures

Operations were conducted utilizing the methodologies outlined in the HCM, as well as guidelines outlined in ODOT's *Analysis Procedures Manual* (APM). HCM 2000 methodology was used for signalized intersection analysis. Capacity and level of service calculations were prepared using SYNCHRO analysis software.

Existing PM Peak Hour Traffic Operations

Free-flow operations were evaluated at I-5 ramps to and from West Valley View Road, as well as I-5 segments upstream, downstream, and in-between the ramps under existing year 2014 PM peak hour conditions. Results are summarized in Table 3.

Table 3 Existing Year 2014 PM Peak Hour Free-Flow Merge/Diverge Analysis Results

Segment	V/C	LOS
I-5 NB freeway (south of off-ramp)	0.32	B
I-5 NB off-ramp diverge	0.32	B
I-5 NB freeway (in between on/off ramps)	0.28	B
I-5 NB freeway (north of on-ramp)	0.34	B
West Valley View Road to I-5 NB loop ramp merge	0.34	B
I-5 SB freeway (north of off-ramp)	0.53	C
I-5 SB off-ramp diverge	0.53	B
I-5 SB freeway (in between off/on ramps)	0.41	B
I-5 SB freeway (south of on-ramp)	0.44	B
West Valley View Road to I-5 SB ramp merge	0.43	B

Notes:
1. Data derived from 2010 HCM output
NB=northbound; SB=southbound; v/c=volume to capacity; LOS=level of service

The merge and diverge analysis for the design hour between 4:30-5:30 PM show that the freeway and the merge and diverge points associated with Interchange 21 ramps are currently operating well below the mobility standard of 0.80. During this period, the southbound direction has the higher directional flow on the freeway.

Existing year 2014 traffic operations were evaluated at API intersections during the PM peak hour. Results are summarized in Table 4. Refer to Figures 1 and 2 for intersection lane configurations/traffic control and traffic operations.

Table 4 Existing Year 2014 PM Peak Hour Traffic Operations

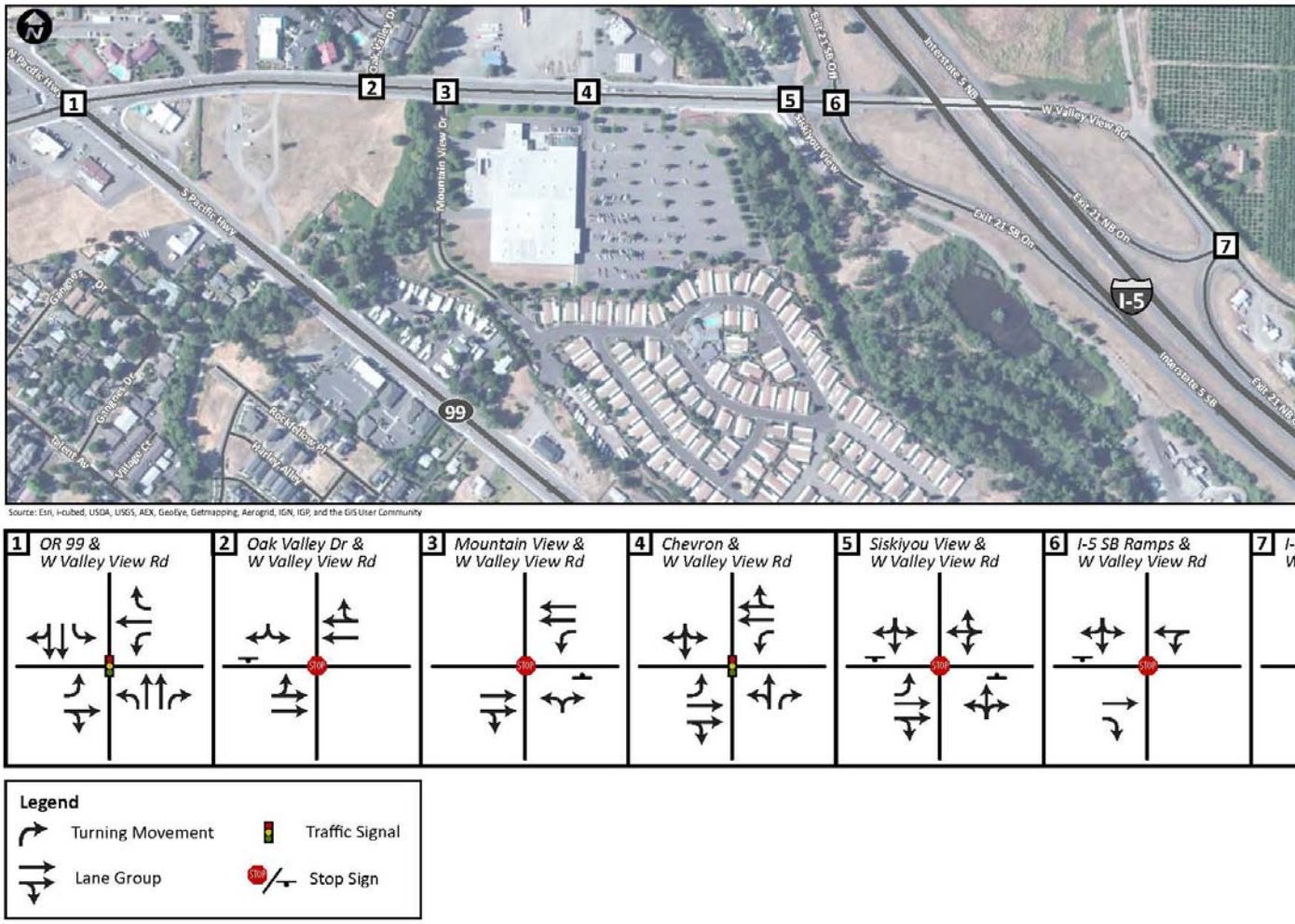
Intersection	Performance Standard		Movement	2014 PM Peak Hour	
	OHP[1]	City		V/C	LOS
OR 99 & W Valley View Road	0.90	D	Overall	0.44	B
Oak Valley View Road & W Valley View Road	N.A.	D	SB L/R WBT	0.02 0.25	B A
Mountain View Road & W Valley View Road	N.A.	D	NB L/R WBT	0.07 0.18	B A
Chevron & W Valley View Road	N.A.	D	Overall	0.32	A
Siskiyou View Road & W Valley View Road	N.A.	D	NB L/T/R WBT/R	0.05 0.36	C A
I-5 SB ramps & W Valley View Road	0.85	N.A.	SB L/T EBT	0.48 0.20	N.A.
I-5 NB ramps & W Valley View Road	0.85	N.A.	EB L/R SBT/R	0.21 0.22	N.A.
Suncrest Road & W Valley View Road	0.95	D	WB L/R NBT/R	0.04 0.03	A A

Notes:
1. 1999 Oregon Highway Plan (OHP), Policy 1F applies to existing and no-build conditions through the planning horizon
EB=eastbound; WB=westbound; NB=northbound; SB=southbound; L=left; T=through; R=right; v/c=volume to capacity; LOS=level of service

Results of the existing year 2014 PM peak hour analysis show that all API intersections operate within performance standards and have available capacity.

Queuing and Blocking

Queuing is the stacking up of vehicles for a given lane movement and can have a significant effect on roadway safety and the overall operation of a transportation


1 OR 99 & W Valley View Rd
2 Oak Valley Dr & W Valley View Rd
3 Mountain View & W Valley View Rd
4 Chevron & W Valley View Rd
5 Siskiyou View & W Valley View Rd
6 I-5 SB Ramps & W Valley View Rd
7
Legend
Turning Movement
Traffic Signal
Lane Group
Stop Sign

system. Queue lengths that exceed the provided storage at turn lanes can block the adjacent through lane, thus creating a temporary reduction in capacity. Long queue lengths in through lanes can block access to turn lanes, driveways, and minor street approaches. The estimation of queue lengths is an important aspect of the analysis process for determining how a transportation corridor operates.

Queue lengths are reported as the average, maximum, or 95th percentile queue length. The 95th percentile queue length is used for design purposes and is the queue length reported in this analysis. Queue lengths were derived at API intersections using SimTraffic. SimTraffic was calibrated in accordance with ODOT's APM, including but not limited to, adjustments for vehicle length, fleet percentages, storage lengths, taper lengths, lane alignments, headway factors, and turning speeds. Vehicles exited were also checked to ensure proper model calibration. Results of the analysis showed that no link distances were exceeded under existing conditions during the PM peak hour.

Little to no congestion is observed at API intersections in the field during the PM peak hour, which is consistent with simulation output results. No inconsistencies between the simulation output and field conditions are noted.

Freight Movements

I-5 is a designated freight route and freight from I-5 accesses City of Talent businesses via West Valley View Road. Table 5 summarizes the percentage of truck traffic on API roadways.

Table 5 Existing Truck Traffic Percentages

Location	Truck Percentages		
	Single Unit	Multi-Unit	Total
I-5 Ramps			
SB Off-Ramp	2.5[2]	2.3[2]	4.8[2]
SB On-Ramp	2.3[2]	3.6[2]	5.9[2]
NB Off-Ramp	1.5[2]	3.1[2]	4.6[2]
NB On-Ramp	10.7[2]	4.0[2]	14.7[2]
W. Valley View Road			
East of I-5 NB Ramps	2.5[2]	3.0[2]	5.5[2]
In Between I-5 Ramps	2.5[2]	3.3[2]	5.8[2]
West of I-5 SB Ramps	2.4[2]	2.9[2]	5.3[2]
East of OR 99	2.1[1]	0.7[1]	2.8[1]
West of OR 99	2.2[1]	0.5[1]	2.7[1]
OR 99			
North of W. Valley View Road	2.7[1]	0.6[1]	3.3[1]
South of W. Valley View Road	2.6[1]	0.8[1]	3.4[1]

Notes:
1. ODOT 16-hour turning movement count collected in 2010
2. ODOT 16-hour turning movement count collected in 2012
NB=northbound; SB=southbound

Approximately 11 percent of I-5 traffic northbound and southbound is freight traffic. This freight traffic accounts for about 13 percent of traffic to/from the City of Talent and Jackson County in the project vicinity using West Valley View Road as the

connecting route. No issues were identified with freight traffic in terms of congestion, roadway geometrics, weight/height restrictions, or overall safety. Land east of I-5 is mainly rural residential and agricultural in nature, while land west of I-5 is commercial and industrial.

Non-Motorized Movements

Non-motorized transportation movements were assessed by volume, type, and direction at all API intersections and summarized in Table 6.

Table 6 West Valley View Road Non-motorized Transportation Movements

Location	Pedestrians/Cyclists			
	Eastbound	Westbound	Northbound	Southbound
W. Valley View Road				
@ OR 99	3/3	5/3	3/0	3/1
@ Oak Valley View Road	3/3	5/3	0/0	0/0
@ Mountain View Road	3/3	5/3	0/0	0/0
@ Chevron signal	3/3	5/3	1/0	0/0
@ American RV Resort	2/4	5/3	2/0	3/0
@ I-5 SB ramps	0/0	0/0	0/0	0/0
@ I-5 NB ramps	0/0	0/0	0/0	0/0
@ Suncrest Road	0/0	0/0	0/1	0/4

NB=northbound; SB=southbound

The majority of pedestrian and bicycle trips were shown to travel east and west along West Valley View Road between the greenway and OR 99 during the PM peak hour. None were shown to/from Oak Valley View Road or Mountain View Road, but there were trips to/from the Chevron service station parcel and American RV Resort. Pedestrian and bicycle movements decreased to zero east of I-5 and were not shown again in counts until Suncrest Road, where there were bicycle trips northbound and southbound.

Pedestrian and bicycle facilities on West Valley View Road are complete west of I-5 but are limited east of I-5 where West Valley View Road becomes rural and changes jurisdiction from City of Talent to Jackson County.

SAFETY ANALYSIS

A safety analysis was conducted to determine whether any significant safety concerns exist within the interchange area. The analysis evaluates crash history, critical crash rates, and ODOT Safety Priority Index System (SPIS) data.

Crash History

A crash analysis is provided for all API intersections along West Valley View Road from OR 99 to Suncrest Road. Crash history was supplied by the ODOT's Crash Analysis and Reporting Unit for the period between January 1, 2008, and December 31, 2013. This provided the most recent 6 years of crash data available at the time of the analysis. Table 7 compares intersection crash rates with ODOT published 90th percentile and statewide crash rates. Table 8 provides a summary of crash history collision type and severity.

Table 7 API Crash Rates

Type	API Crashes									ODOT
	2008	2009	2010	2011	2012	2013	Total Crashes	AADT	Crash Rate	Crash Rate
Intersection										
West Valley View Road at										
OR 99	2	2	3	5	2	4	18	21,500	0.38	0.860[1]
Oak Valley View Road	0	0	0	0	1	0	1	10,500	0.04	0.293[1]
Mountain View Road	2	0	2	0	0	0	4	9,200	0.20	0.293[1]
Chevron	0	0	0	0	0	0	0	N.A.	0.00	0.860[1]
Siskiyou View Road	0	0	0	0	0	0	0	8,800	0.00	0.408[1]
I-5 SB ramps	0	0	0	2	1	1	4	9,300	0.20	0.408[1]
I-5 NB ramps	0	0	0	0	0	0	0	7,300	0.00	0.408[1]
Suncrest Road	0	0	0	0	0	0	0	1,000	0.00	0.475[1]
Segment										
I-5 NB (1 mile south of Interchange)	2	2	0	3	1	3	11	17,330	0.29	0.29[2]
I-5 NB (1 mile north of Interchange)	2	2	1	2	3	1	11	18,700	0.27	0.29[2]
I-5 SB (1 mile north of Interchange)	1	0	1	2	2	1	7	20,100	0.16	0.29[2]
I-5 SB (1 mile south of Interchange)	1	0	0	1	5	1	8	18,150	0.20	0.29[2]

Notes:
1. 90th Percentile crash rate from Exhibit 4-1 in ODOT's Analysis Procedures Manual
2. Statewide average crash rate from Table II in ODOT Crash Tables
AADT=Average Annual Daily Traffic; NB=northbound; SB=southbound

Table 8 Crash History at API intersections

Location	Performance Standard								Total	Severity	
	Rear End	Fixed object	Angle	Turning	Sideswipe	Backing	Pedestrian	Cyclist		Injury	Property Damage
West Valley View Road at											
OR 99	5	1	2	5	1	1	2	1	18	9	9
Oak Valley View Road	1	0	0	0	0	0	0	0	1	0	1
Mountain View Road	1	1	0	2	0	0	0	0	4	2	2
Chevron	0	0	0	0	0	0	0	0	0	0	0
Siskiyou View Road	0	0	0	0	0	0	0	0	0	0	0
I-5 SB ramps	2	0	1	1	0	0	0	0	4	1	3
I-5 NB ramps	0	0	0	0	0	0	0	0	0	0	0
Suncrest Road	0	0	0	0	0	0	0	0	0	0	0

Abbreviations: NB=northbound and SB=southbound

Intersection and segment crash rates were compared to ODOT published 90th percentile and statewide crash rates. Results show that crash rates at all API intersections are less than the 90th percentile crash rate. Similarly, I-5 segment crash rates were shown to be less than or equal to the statewide crash rate. No further review is shown to be necessary.

Safety Priority Index System

The SPIS is a method used in Oregon to identify safety problem areas along State highways. Highways are evaluated in approximately one-tenth mile increments and each year these segments are ranked with a SPIS score based on the frequency and severity of crashes observed. When a segment is ranked in the top 10 percent of the index, a crash analysis is typically warranted and corrective actions are considered. No segments of I-5 at Exit 21 are identified in the top 10 percent of the most recent (2013) SPIS rankings. Similarly, no segments of West Valley View Road within the API are identified in the top 10 percent of SPIS rankings.