Oregon Department of Transportation

Oregon State Highway Performance Data and Metrics Related to Freight

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Transportation Planning Analysis Unit

Transportation Development Division

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1.0 INTRODUCTION

The information summarized in this report was prepared in support of an ODOT effort to identify freight bottleneck locations. Data assembly and performance metric development were identified as action items in the 2011 Oregon Freight Plan. The objective was to develop a systematic data-oriented approach to reporting performance. This is the first phase of a proof-of-concept approach. A sub-set of the complete State Highway Freight System[1] as evaluated for this analysis.

Nineteen corridors are evaluated using a set of standardized metrics presented for the year 2010. Two analytical tools were used for this study: the Highway Economic Requirements System – State version (HERS-ST) and the Oregon Statewide Integrated Model (SWIM). Metrics used for this study include: average annual daily traffic, daily vehicle miles traveled, truck share of traffic, highway user costs, delay, volume to capacity ratios, crashes, commodity flows and industry use for all nineteen corridors.

This study provides information describing highway corridor performance and economic use in order to support informed decisions by identifying and prioritizing transportation investments across the state of Oregon. Bottlenecks are not specifically defined within this analysis, but the metrics were created to support system evaluation for potential freight bottleneck locations. This information is intended to reveal locations with performance issues and support strategic prioritization of additional refined traffic analysis necessary to develop bottleneck solutions.

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[1] http://www.oregon.gov/ODOT/MCT/docs/freightmobilitymap.pdf

2.0 HOW TO USE THIS DOCUMENT

This analysis results in a process to transform data into information useful for making informed decisions. Identifying performance issues in a systematic, data driven manner at the corridor level is the first step to revealing problem areas. Detailed analysis beyond the summaries presented here can be done by utilizing the data records used to produce the metrics presented for each corridor. Thus, this report presents summary descriptive information, while the methodology provides a rich source of data for further analysis.

A variety of metrics are presented in order to show movement and conditions along each corridor. Together, these metrics reveal problem areas that may warrant further analysis to assess the potential for future investment. The metrics are designed to provide a sense of context useful for decision makers determining how to prioritize future investments related to freight on the Oregon highway system. This information has not been filtered to remove problem locations primarily related to auto use. This allows decision makers the opportunity to find persistent problem areas related to freight, but also see the light vehicle flows. This approach may reveal improvements that would benefit both light and heavy vehicles.

This report is organized to allow a reader to focus on as many or few corridors as desired. Each corridor summary follows the same format providing metrics identified in Table 1. The report begins with select summary information related to industry use and commodity flows; delay by type, and truck vehicle miles traveled.

Please note that some areas identified as problem locations may be a result of the data reporting process followed for this study. For example, a short segment on a highway may show high levels of delay, but the cause is due to steep grade, curves, or an intersection with heavy use of cars. These locations may not be considered legitimate freight bottlenecks, but the information needed to determine this is available through this study methodology.

Projects with major planning efforts underway were not focused on for this analysis. The best example of this is the I-5 crossing over the Columbia River in Portland. Extensive analysis has been conducted on this topic to a level of detail far beyond the scope of this study.

3.0 METHODOLOGY

The corridors evaluated in this analysis were identified by the OFAC. For this first-round of metric development the committee agreed to evaluate a subset of the full State Freight Highway System. They identified 19 corridors to evaluate. The available HERS-ST was for year 2006. HERS-ST data comes from the Highway Performance Monitoring System (HPMS) data submittal to the Federal Highway Administration (FHWA). The HPMS data format changed between years 2006 and 2011. ODOT has not yet developed an automated process to produce a HERS-ST input database. Thus, updating the input data requires significant effort and manual processes.

Three alternative approaches were provided. First, the 2006 database could be used. Second, follow a time consuming update of the database to 2010 with a high level of accuracy and completeness. Third, follow a shorthand version of an updated process requiring a fourth of the time, while producing a database with about 90% accuracy and completeness. Given the ambitious timeline of the bottleneck study, OFAC requested the third option of updating the data for 2010 using a shorter process. Thus, the highway use (vehicle) data was updated, but the detailed infrastructure inventory conditions data was not updated. As a result, there are a small number of errors within the data set. Given the purpose of this study, such errors or missing data are not expected to significantly affect the outcome of the analysis.

The performance metrics reported in this analysis are for the year 2010. The metrics used come from two sources: the *Highway Economic Requirements System – State* version (HERS-ST) and the *Oregon Statewide Integrated Model* (SWIM). HERS was first developed by the FHWA to examine the relationship between national investment levels and the condition and performance of the Nation's highway system. FHWA uses the model to estimate future investment required to either maintain or improve the Nation's highway system. FHWA provides this information to the U.S. Congress on a biennial basis. The HERS-ST model is a direct extension of the national-level model. HERS-ST has been used to conduct analysis for the 1999 Oregon Highway Plan, Congestion Management System, and other analyses.[2] One of the goals of this study is to follow a methodology that supports regular updates automated to the extent possible. Using HER-ST fulfills this goal for future studies.

The first generation SWIM was developed by ODOT in 1999 through the Oregon Modeling Improvement Program (OMIP). The current version of SWIM is a second generation analysis tool integrating the Oregon economy, land use and transportation system into one dynamic system. SWIM has been used to conduct analysis for the Oregon Freight Plan, Oregon Bridge

[2] Go to this site to see more analysis using HERS http://www.oregon.gov/ODOT/TD/TP/Pages/CM_HERS.aspx

Limitations Study[3], and the Willamette Valley Forum, Alternative Transportation Futures Project[4].

HERS-ST provides information on facility characteristics and vehicles using the system. SWIM provides information on the economic flows related to the highway system. Table 1 presents the performance metrics reported for this analysis. Each corridor will be described using these metrics. Corridors will be compared side-by-side for a subset of these metrics in order to gain a sense of how to prioritize resources used for further detailed traffic analysis necessary to formulate bottleneck solutions.

Table 1. HERS-ST Metrics

	Description
Average Annual Daily Traffic	Number of vehicles on the road on an average day of the year (traffic count)
Daily Vehicle Miles Traveled	Number of daily miles of travel on a segment of a road
Percent Trucks	Truck share of traffic on an average day based on corridor classification counts
Vehicle Operating Costs: dollars per 1000 VMT	Estimated vehicle variable costs including fuel, oil, and tires
Vehicle Travel Time Costs: Dollars per 1000 VMT	Estimated cost of time beyond time required to travel at free-flow
Annual Crash Costs: dollars per 1000 VMT	Cost associated with corridor crashes based on national data on the cost of property damage, injury, and fatalities
Annual Hours of Delay: hours per 1000 VMT	Hours of delay on corridor over the course of a year due to congestion, incidents and road geometry
Volume to Capacity Ratio	The ratio of traffic volume to highway capacity. Values close to 1.0 indicate high levels of congestion
Hours of Delay per 1000 VMT	Hours of delay in units of VMT to allow comparison across corridors
Corridor Average User Costs: dollars per 1000 VMT for the three categories together – operational costs, travel time, and crash costs	User cost in units of dollars per VMT to allow comparison across corridors
Proportion of Corridor Miles by Grade and Curvature	
Sum of corridor miles within grade category	Six categories: 0 - 0.4%; 0.5 - 2.4%; 2.5 - 4.4%; 4.5 - 6.4%; 6.5 - 8.4%; >8.5%
Sum of corridor miles by degree of curvature category	Six categories: 0.-3.4; 3.5 - 5.4; 5.5 - 8.4; 8.5 - 13.9; 14 - 27.9; 28+
SWIM Metrics	
Corridor Commodity Flows by Value and Tonnage	Sum of annual commodity flows in dollar value and total tonnage
Industry Using Commodities Flowing on Corridor	Value of industry output using commodities shipped via corridor
Oregon Crash Data 2010	

[3] SWIM identified the economic consequences of the declining condition of Oregon bridges. This work supported the decision to fund a bridge improvement program through bonds (OTIA).
[4] http://www.oregon.gov/ODOT/TD/TP/docs/statewide/smap.pdf

Total Number of Crashes on Corridor	2010 sum of all crashes
Percent of Crashes with Truck Involved	
Crash Rate	Calculated crash rate per 1 million VMT
SPIS Sites	ODOT assigns routes with a Safety Priority Index System value in order to monitor the severity of crashes by location to meet the terms of the SAFETEA-LU Highway Safety Improvement Program.

The reliability of a corridor depends on how predictable travel time is day-to-day. For freight, predictable travel speeds are important for estimating travel time. Reliable corridors have relatively low levels of non-recurring delay, meaning unexpected events causing delay are uncommon. The non-recurring unexpected delay captured for this analysis is the type caused by crashes. Other causes of unexpected delay, such as unusual weather, special events, construction work zones, and intermittent road distractions, are not accounted for in this analysis. However, information related to the primary causes of unexpected delay would be accounted for in a focused traffic analysis designed to resolve specific bottleneck issues.

The HERS-ST model breaks out delay into three distinct categories. *Zero volume delay* is that caused by roadway grade, curvature and other physical characteristics. This type of delay occurs regardless of the number of vehicles present. HERS-ST i*ncident delay* is caused by the disruption of crashes, while *congestion delay* is associated with high traffic volumes approaching capacity constraints.

4.0 CORRIDOR RANKINGS AND COMPARISONS

This section presents several performance metrics for the freight bottleneck corridors side-by-side in order to provide a sense of relative conditions and performance. Sources with information related to safety are listed here as well if more detailed results are desired. The performance metrics presented in this section include:

- Top three industries utilizing each corridor by value and weight,
- Top three commodities moving across each corridor by value and weight,
- Congestion by type for all 19 corridors, and
- Truck share of VMT, total VMT and total delay for all 19 corridors.

Eight aggregate industry categories are used to report activity across the 19 freight corridors in this study. Table 2 reveals that a minimum of 86 percent of flows in terms of value for each industry group moves along three corridors. I-84 and I-5 are consistently the top two routes for each industry. The third highest route is either US97 or OR20 from Bend to Ontario.

Table 2. Top Three Corridors Used by Industry- Total Share of Industry Flows by Value Moving Along the 19 Freight Bottleneck Corridors

AGRICULTUREFORESTRY&FISHERIES	
California - Washigton (I5)	39.19%
Portland - Ontario (I84)	34.51%
Washington - California (US97)	12.37%
TOTAL SHARE OF ALL FLOWS	86.08%
COMPUTER&ELECTRONICS	
Portland - Ontario (I84)	70.00%
California - Washigton (I5)	22.30%
Bend - Ontario (OR20)	3.18%
TOTAL SHARE OF ALL FLOWS	95.48%
FOODMfg	
California - Washigton (I5)	39.69%
Portland - Ontario (I84)	38.43%
Washington - California (US97)	13.74%
TOTAL SHARE OF ALL FLOWS	91.86%
MACHINERY&METALS	
Portland - Ontario (I84)	47.38%
California - Washigton (I5)	35.85%
Bend - Ontario (OR20)	7.24%
TOTAL SHARE OF ALL FLOWS	90.47%
RETAILTRADE	
Portland - Ontario (I84)	47.94%
California - Washigton (I5)	32.54%
Bend - Ontario (OR20)	8.66%
TOTAL SHARE OF ALL FLOWS	89.13%
SERVICES&OTHER	
Portland - Ontario (I84)	49.89%
California - Washigton (I5)	28.86%
Bend - Ontario (OR20)	10.17%
TOTAL SHARE OF ALL FLOWS	88.91%
WHOLESALETRADE	
Portland - Ontario (I84)	50.63%
California - Washigton (I5)	31.14%
Bend - Ontario (OR20)	6.79%
TOTAL SHARE OF ALL FLOWS	88.56%
WOOD&PAPER	
California - Washigton (I5)	57.14%
Portland - Ontario (I84)	24.51%
Bend - Ontario (OR20)	5.62%
TOTAL SHARE OF ALL FLOWS	87.27%

Table 3. Top Three Corridors Used by Industry- Total Share of Industry Flows by Weight Moving Along the 19 Freight Bottleneck Corridors

AGRICULTUREFORESTRY&FISHERIES	
California - Washigton (I5)	40.58%
Portland - Ontario (I84)	35.14%
Washington - California (US97)	10.09%
TOTAL SHARE OF ALL FLOWS	85.81%
COMPUTER&ELECTRONICS	
Portland - Ontario (I84)	65.95%
California - Washigton (I5)	25.05%
Bend - Ontario (OR20)	3.63%
TOTAL SHARE OF ALL FLOWS	94.63%
FOODMfg	
California - Washigton (I5)	39.60%
Portland - Ontario (I84)	37.53%
Washington - California (US97)	15.83%
TOTAL SHARE OF ALL FLOWS	92.97%
MACHINERY&METALS	
California - Washigton (I5)	41.63%
Portland - Ontario (I84)	39.64%
Washington - California (US97)	10.10%
TOTAL SHARE OF ALL FLOWS	91.38%
RETAILTRADE	
California - Washigton (I5)	41.40%
Portland - Ontario (I84)	37.47%
Washington - California (US97)	6.35%
TOTAL SHARE OF ALL FLOWS	85.22%
SERVICES&OTHER	
Portland - Ontario (I84)	37.89%
California - Washigton (I5)	37.15%
Washington - California (US97)	8.31%
TOTAL SHARE OF ALL FLOWS	83.34%
WHOLESALETRADE	
California - Washigton (I5)	41.34%
Portland - Ontario (I84)	37.27%
Washington - California (US97)	9.17%
TOTAL SHARE OF ALL FLOWS	87.78%
WOOD&PAPER	
California - Washigton (I5)	52.52%
Portland - Ontario (I84)	21.37%
Bend - Ontario (OR20)	7.44%
TOTAL SHARE OF ALL FLOWS	81.32%

Table 3 reveals that a minimum of 81 percent of flows for each industry group in terms of weight moves along three corridors. I-84 and I-5 are consistently the top two routes for each industry. The third highest route is either US97 or OR20 from Bend to Ontario.

The patterns of use when evaluating movement by weight are consistent with movement by value in general. The proportions vary by 2 to 9 percent.

Seven aggregate groups are used to report commodity flows in this study. These are the commodities being used by industries as inputs to production or final goods going to market. Any given industry will use a variety of inputs.

Table 4 reports the top three highest corridors for each commodity group in terms of value. There is a greater dispersion pattern for commodity flows than industry flows across the 19 corridors. The total share of commodities moving across the top three corridors ranges from 39 to 64 percent of the total movement for each commodity group. I-5 and I-84 are in most of the top three lists, along with I-205, US97, and OR217.

Table 4. Top Three Corridors for Commodity Flows by Value- Total Share by Commodity Group Across the 19 Freight Bottleneck Corridors

Clay, Minerals & Stone	
California - Washigton (I5)	26.61%
East Portland (I205)	15.52%
Beaverton-Tigard (217)	10.18%
TOTAL SHARE OF ALL FLOWS	52.31%
Food & Kindred Products	
California - Washigton (I5)	27.87%
Portland - Ontario (I84)	16.39%
Washington - California (US97)	9.59%
TOTAL SHARE OF ALL FLOWS	53.86%
Forest Wood Products	
California - Washigton (I5)	21.92%
East Portland (I205)	9.30%
Beaverton-Tigard (217)	7.99%
TOTAL SHARE OF ALL FLOWS	39.21%
Machinery & Instruments	
Portland - Ontario (I84)	29.09%
California - Washigton (I5)	22.81%
Beaverton-Tigard (217)	9.77%
TOTAL SHARE OF ALL FLOWS	61.67%
Other Misc.	
California - Washigton (I5)	37.10%
Portland - Ontario (I84)	15.41%
Washington - California (US97)	11.41%
TOTAL SHARE OF ALL FLOWS	63.92%
Petroleum, Coal, & Chemicals	
East Portland (I205)	22.52%
California - Washigton (I5)	21.51%
Beaverton-Tigard (217)	11.80%
TOTAL SHARE OF ALL FLOWS	55.83%
Pulp & Paper Products	
California - Washigton (I5)	25.84%
East Portland (I205)	16.58%
Beaverton-Tigard (217)	12.30%
TOTAL SHARE OF ALL FLOWS	54.72%

Table 5. Top Three Corridors for Commodity Flows by Weight- Total Share by Commodity Group Across the 19 Freight Bottleneck Corridors

Clay, Minerals & Stone	
California - Washigton (I5)	25.28%
East Portland (I205)	11.26%
Beaverton-Tigard (217)	7.73%
TOTAL SHARE OF ALL FLOWS	44.27%
Food & Kindred Products	
California - Washigton (I5)	28.28%
Portland - Ontario (I84)	15.66%
Washington - California (US97)	9.89%
TOTAL SHARE OF ALL FLOWS	53.82%
Forest Wood Products	
California - Washigton (I5)	21.41%
East Portland (I205)	8.31%
Beaverton-Tigard (217)	7.47%
TOTAL SHARE OF ALL FLOWS	37.20%
Machinery & Instruments	
California - Washigton (I5)	24.38%
Portland - Ontario (I84)	19.30%
East Portland (I205)	13.38%
TOTAL SHARE OF ALL FLOWS	57.06%
Other Misc.	
California - Washigton (I5)	38.12%
East Portland (I205)	9.98%
Portland - Ontario (I84)	9.57%
TOTAL SHARE OF ALL FLOWS	57.67%
Petroleum, Coal, & Chemicals	
California - Washigton (I5)	26.05%
Portland - Ontario (I84)	13.74%
East Portland (I205)	13.29%
TOTAL SHARE OF ALL FLOWS	53.08%
Pulp & Paper Products	
California - Washigton (I5)	28.58%
East Portland (I205)	17.53%
Astoria-Portland (US30)	8.31%
TOTAL SHARE OF ALL FLOWS	54.43%

Table 5 reports the top three highest corridors for each commodity group in terms of weight. Similarly, there is a greater dispersement pattern for commodity flows than industry flows across the 19 corridors. The total share of commodities moving across the top three corridors ranges from 37 to 58 percent of the total movement for each commodity group. Interstate-5 and 84 are in most of the top three lists, along with Interstate-205, US97, and OR217.

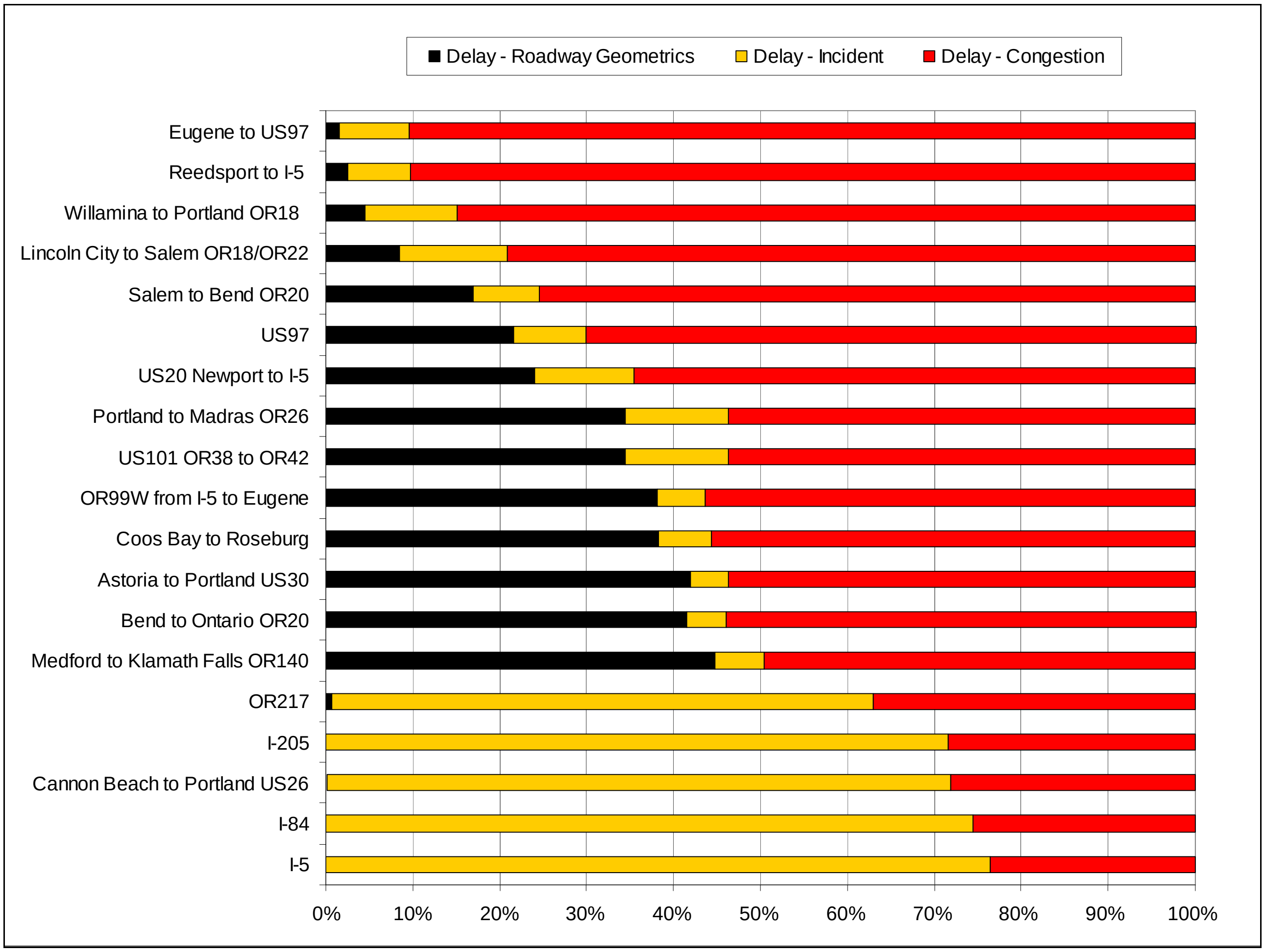


Figure 1. Corridor Delay by Type

Figure 1 illustrates the level of delay by source. The corridors at the top of the figure have the greatest proportion of delay due to congested conditions. All but six of the corridors related more than half of the delay to congestion. Five of the 19 corridors attribute more than 60 percent of the delay to traffic incidents. Seven of the corridors experience more than 30% of delay due to the highway geometrics.

Table 6. 2010 Corridor VMT, Truck Share of VMT, and Hours of Delay for All Vehicles

Corridor Name	Total Hours of Delay per 1000 VMT	Total VMT in millions	Truck Share of VMT
Cannon Beach to Portland US26	24.5	764	6%
OR217	17.7	299	4%
I-205	5.3	1017	9%
OR99W from I-5 to Eugene	4.9	674	7%
Portland to Madras OR 26	3.3	468	15%
I-84	2.7	2298	28%
Astoria to Portland US 30	2.6	411	11%
I-5	2.0	4950	20%
Willamina to Portland OR18	1.9	108	6%
US20 Newport to I-5	1.7	226	8%
Lincoln City to Salem OR18/OR22	1.5	244	7%
Medford to Klamath Falls OR 140	1.5	64	19%
Salem to Bend OR 20	1.3	335	13%
US97 Corridor	1.3	732	22%
Bend to Ontario OR 20	1.2	186	22%
Coos Bay to I-5 OR42	1.0	135	18%
Eugene to US 97 OR58	0.9	139	24%
Reedsport to I-5 OR38	0.7	74	27%
*Five highest values in shaded area.			

Table 6 presents the corridors side-by-side for delay, Total VMT and truck share of VMT. Corridors with the highest amounts of delay do not necessarily have the highest levels of total VMT. Truck shares of VMT vary for the highest delay corridors, between 4 and 15 percent. The corridors with the two highest VMT levels had mid-levels of delay relative to the other corridors and a range of truck VMT shares between 20 and 28 percent. Corridors with the highest levels of truck VMT shares tend to have lower levels of delay and lower VMT in general.

4.1 Safety

Detailed information related to crashes for all corridors is available. The following hyperlinks are for specific ODOT data sources.

http://www.oregon.gov/ODOT/TD/TDATA/car/docs/2010_MC_RateBook_web_opt2.pdf

"State Highway Motor Carrier Crash Rate Tables" - provides crash rates and truck-at-fault crash rates for specific sections of state highways.

http://www.oregon.gov/ODOT/TD/TDATA/car/docs/2010_Crash_Rate_Book.pdf

"2010 State Highway Crash Rate Tables" – provides crash frequencies in relation to traffic volume and highway mileage at specific mile points.

http://www.oregon.gov/ODOT/TD/TDATA/car/docs/2010CrashSummaryBook.pdf

"2010 Crash Summary Book" – provides crash summary reports by city, rural areas, other urban areas, for a variety of crashes, such as truck involved, pedestrian, bicycles, etc.

SPIS Sites Graph:
http://www.oregon.gov/ODOT/TD/TDATA/gis/docs/STIPMAPS/spis_sip2010.pdf

4.2 Corridor Restrictions

ODOT Motor Carrier Division publishes route maps identifying highway restrictions. Restrictions may be related to length, width, weight, or height. Corridors with restrictions include:

OR22/US20 Salem to Bend – Highway 162 mile point 30 to 75 is restricted by weight and/or width for non-divisible loads and/or heavy haul loads.

OR140 Medford to Klamath Falls – Highway 270 mile point 45 to 59 is restricted by weight and/or width for non-divisible loads and/or heavy haul loads.

US20 Newport to I-5 – Highway 33 mile point 6 to 44 is restricted by length and/or width for non-divisible loads and/or heavy haul loads. Mile point 0 to 6 and 44 to 50 are restricted by weight and/or width for non-divisible loads and/or heavy haul loads.

See http://www.oregon.gov/ODOT/MCT/Pages/OD.aspx#Route_Maps for current restrictions.

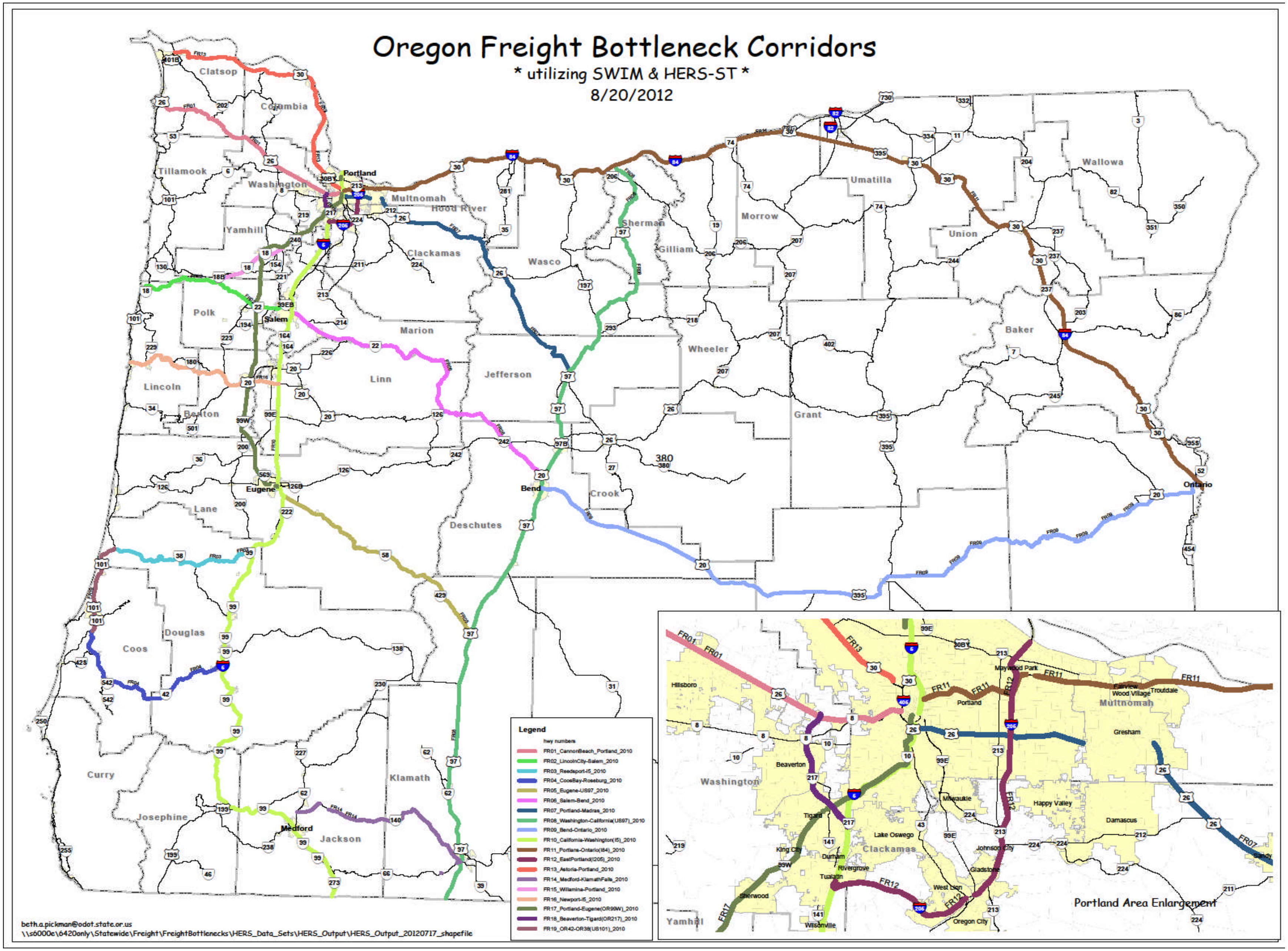


Figure 2. Oregon Freight Bottleneck Corridors

5.0 CORRIDORS DESCRIPTIONS

Nineteen corridors are evaluated for this analysis, illustrated in Figure 2 above and listed in Table 7 below.

Table 7. Freight Bottleneck Corridors by ODOT State Highway Inventory Number

Corridor Number	Corridor	Inventory Highway Number	Posted Route	Begin MP	End MP
1	Cannon Beach Junction - Portland	47	US26	0	73.9
2A	Lincoln City Junction - Salem	39	OR22	0	27.08
2B	Lincoln City Junction - Salem	30	OR22	0	26.2
3	Reedsport - I-5	45	OR38	0	57.13
4	Coos Bay - Roseburg	35	OR42	0	77
5	Eugene - US97	18	OR58	-0.3	86.45
6A	Salem - Bend	162	OR22	1.21	81.74
6B	Salem - Bend	16	OR22	74.8	100.36
6C	Salem - Bend	15	OR22	92.28	93.07
6D	Salem - Bend	17	OR22	0	18.51
7A	Portland - Madras	26	US26	0	57.42
7B	Portland - Madras	53	US26	57.45	117.58
8A	Washington - California	42	US97	0	67.17
8B	Washington - California	4	US97	67.17	291.73
9A	Bend - Ontario	7	US20	0	258.19
9B	Bend - Ontario	455	US20	27.02	31.8
9C	Bend - Ontario	493	US20	Y27.02	Y27.74
10	California - Washington	1	I5	0	308.38
11A	Portland to Ontario	2	I84	0.54	167.58
11B	Portland to Ontario	6	I84	167.58	378.01
12	East Portland	64	I205	0	26
13	Portland to Astoria	92	US30	1.87	99.24
14A	Medford to Klamath Falls	21	OR140	57.67	58.99
14B	Medford to Klamath Falls	270	OR140	0	68.76
15	Willamina to Portland (Dundee)	39	OR18	27.08	52.71
16A	Newport to I-5	33	OR20	0	56.8
16B	Newport to I-5	210	OR20	0.32	10.12
17	Portland to Eugene	91	OR99W	-5.52	126.38
18	Beaverton-Tigard	144	OR217	0	7.52
19	US101 between OR42 & OR38	9	US101	211.48	244.56

5.1 Corridor Performance: Cannon Beach to Portland (US 26)

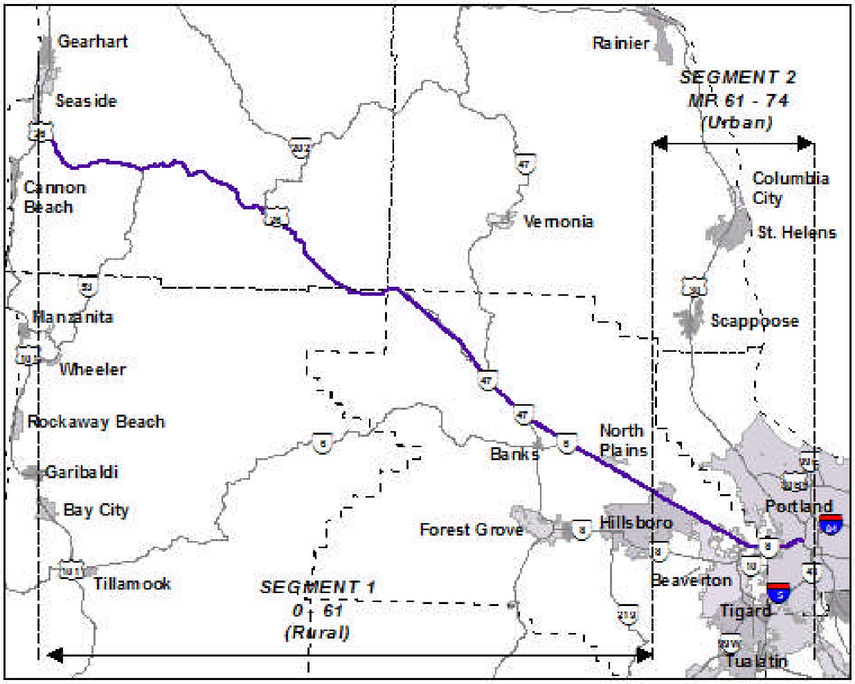


Figure 3. Segmented Map of Cannon Beach to Portland (US 26) Corridor

5.1.1 Corridor Overview

This section of US 26 extends from OR 101 Coast Highway at Cannon Beach to Portland at I-405. The corridor is split into two segments for reporting purposes, as illustrated in Figure 3. The corridor is 74 miles long, of which 61 miles are rural and the remaining 13 miles are urban. This corridor is a primary connection between Portland and the Oregon coast.

Average daily traffic volumes on the highway range from about 5,600 to 22,000 vehicles. Trucks represent 4 to 10 percent of the traffic volume. The urban segment through Hillsboro to Portland is dominated by light vehicles and experiences congested traffic operations.

5.1.2 Economic Characteristics

Figure 4 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, Petroleum, Coal, & Chemicals and Pulp & Paper represent seven percent of each group's movement across all 19 bottleneck corridors. The next largest groups are Forest Wood Products and Clay, Mineral and Stone, with each group moving 6 percent of total commodity flows on this corridor relative to the other 19 corridors. The remaining commodity groups represent about 5 percent of movement for their group.

In terms of weight, Forest Wood Products is the largest group moving via this corridor, about 7 percent by weight. The next largest group by weight is Machinery and Instruments, moving 6 percent of this group via this corridor. The remaining commodity groups move about 5 percent of their goods in terms of weight via this corridor.

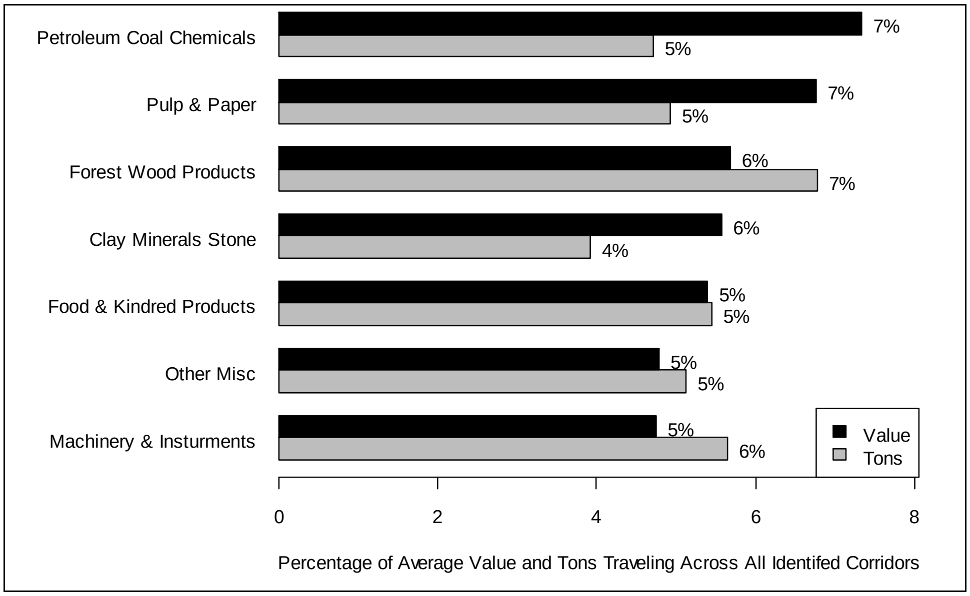


Figure 4. Percentage of Average Values and Tons Traveling Across Cannon Beach Junction – Portland Corridor

Figure 5 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top three industries using this corridor are Computer & Electronics, Wholesale Trade, and Machine & Metals; representing between 13 and 38 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish, Wholesale Trade, and Machine & Metals; representing between 10 and 46 percent of industry use across this corridor.

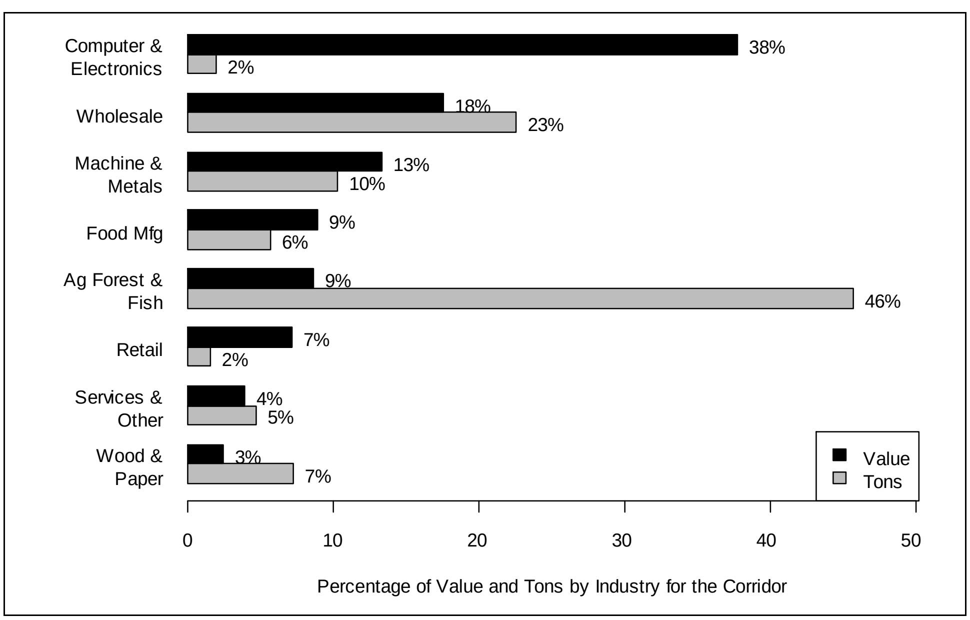


Figure 5. Percentage of Values and Tons by Industry for Cannon Beach Junction – Portland Corridor

5.1.3 Corridor Performance

Corridor performance metrics are presented for several areas of performance, including:

- Traffic volumes
- Volume to capacity ratios
- Corridor geometrics
- Delay and reliability
- User costs: operational, time, and crashes
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites, and
- Corridor restrictions.

Figure 6 illustrates corridor volume to capacity ratios and average annual daily traffic. The first section marked in red, indicating traffic volume has reached capacity, occurs about mile point 15. Here the number of lanes drops from 4 to 2 in a section where grade is greater than 4.5%. The first yellow segment, indicating traffic volumes are approaching capacity levels, is near the intersection of Fishhawk FallsHighway (OR103) and illustrates the rise in light vehicle traffic volumes, enough to cause the truck share of total traffic to drop from 13 percent to 8 percent for this particular location. Traffic volumes increase as the highway transitions from rural to urban conditions. The highway is operating at capacity at this point.

Table 8. Truck Share of Average Annual Daily Traffic and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	**Daily Vehicle Miles Traveled (Share of VMT)**
Segment 1	10 %	11%
Segment 2	4%	4%

Truck traffic makes up more than twice the share of total traffic on the rural segment of this corridor, as illustrated in Table 8. About 10 percent of the traffic is truck on the rural segment from Cannon Beach to Hillsboro. As light vehicle traffic volumes rise, the truck share falls to about 4 percent in the urban segment of the corridor.

5.1.4 Corridor Geometrics

Over three-fourths of this corridor has grade greater than 3.5%, which significantly affects truck speed and operating costs. Table 9 presents details of the highway geometric attributes.

Table 9. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**86%**	**10%**	**4%**	**1%**	**0%**	**0%**	100%
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**24%**	**40%**	**16%**	**21%**	**0%**	**0%**	100%

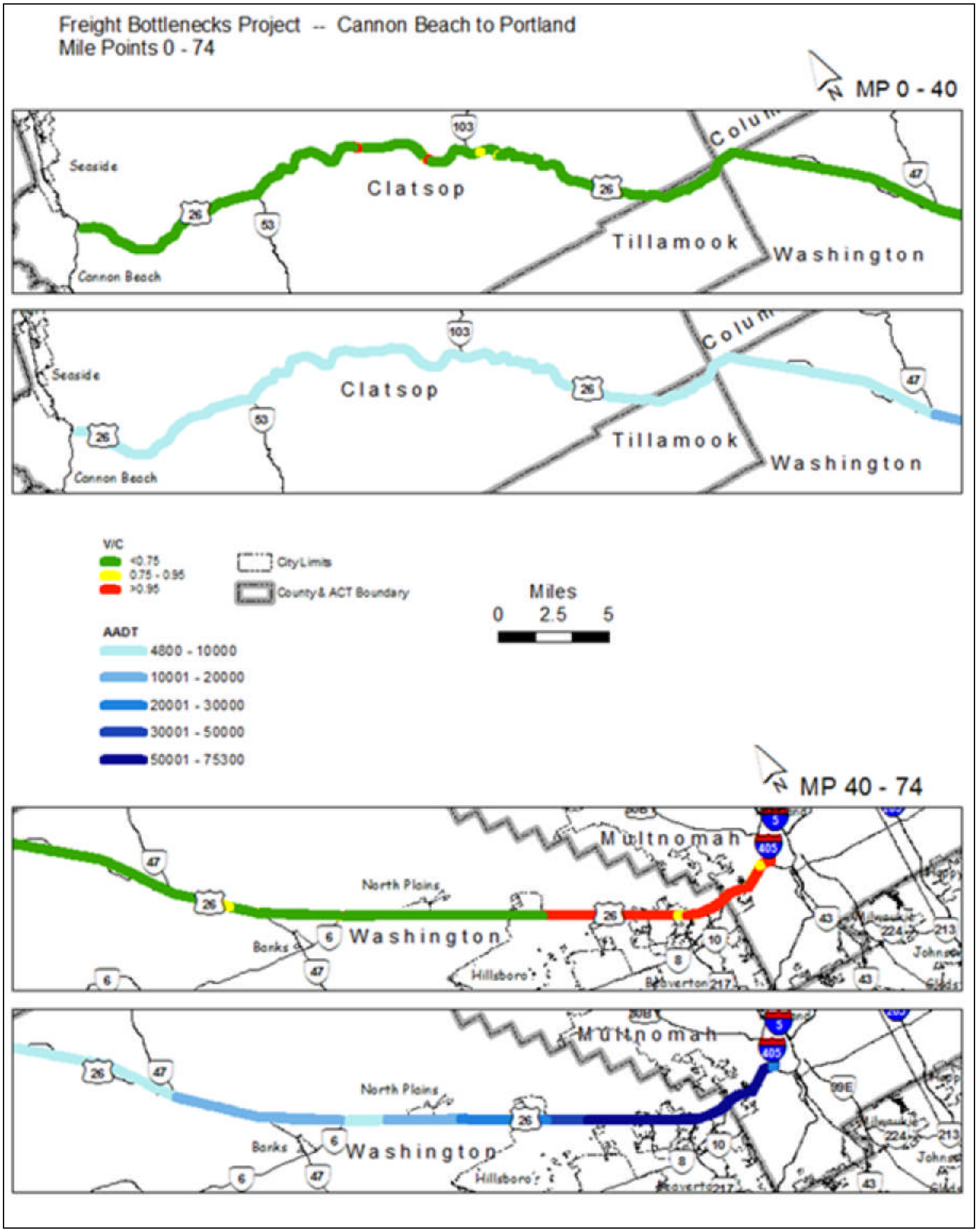


Figure 6. Freight Bottlenecks Project - Cannon Beach to Portland

5.1.5 Corridor Delay and Reliability

Figure 7 presents the average annual hours of delay per 1,000 vehicle miles traveled along this corridor. Traffic volumes rise in the urban segment of the highway, resulting in higher delay. Table 10 reports the sources of delay. Very little delay is due to highway geometrics. Most of the delay occurs in the urban segment and is due to traffic incidents, but over 25 percent is caused by capacity constraints.

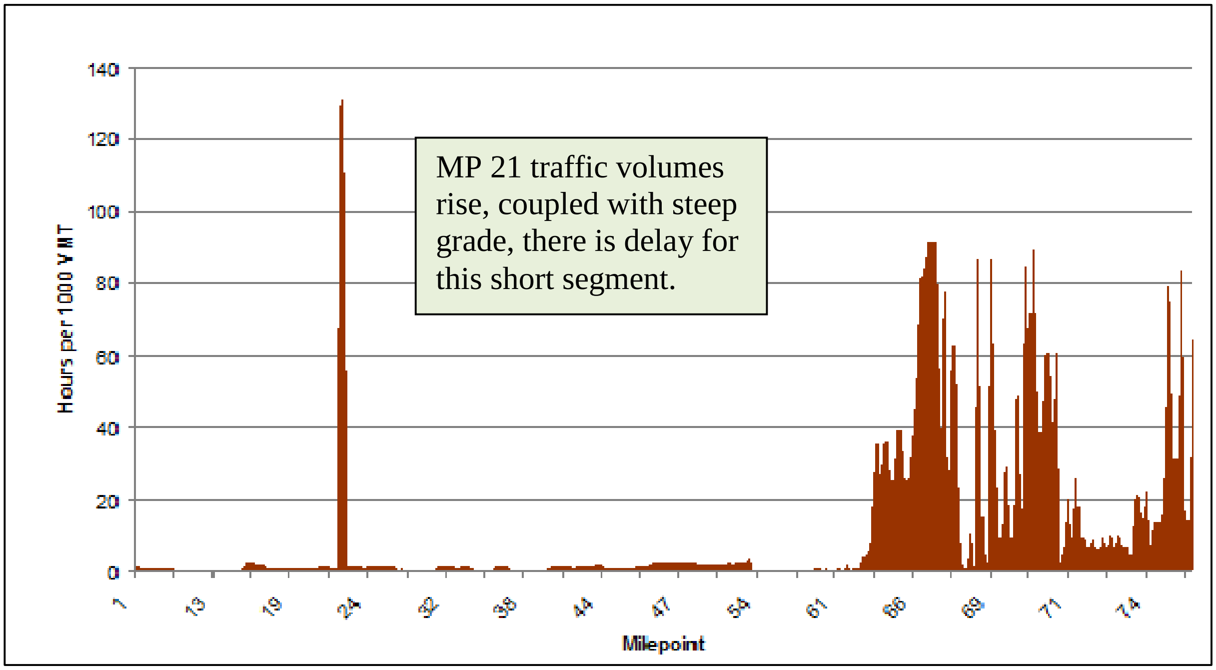


Figure 7. Annual Average Delay: Hours per 1000 VMT

Table 10. Corridor Reliability: Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural	0.1	0.2	0.7	1.1
Urban	0.0	25.0	9.5	34.6
Total Corridor	0.0	17.6	6.9	24.5
Share of Total	0%	72%	28%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs whether there is one car or hundreds of cars on the road.

5.1.6 User Costs

Average truck operating costs, truck travel time costs and vehicle crash costs are reported in Figure 8, Figure 9, and Figure 10 for each corridor segment. Costs are presented as dollars per 1000 VMT in order to compare the two segments. Truck operating costs in the rural portion of the corridor are more than twice that of travel time costs due to the corridor geometrics. However, the opposite is true for the urban segment of the corridor – truck travel time costs are more than double that of the operating costs. Road geometrics are not an issue, but capacity is fully utilized, delay occurs mostly due to incidents and results in higher travel time costs. Crash costs are relatively low compared to the other two users' costs. For trucks, the urban segment of the highway is more costly

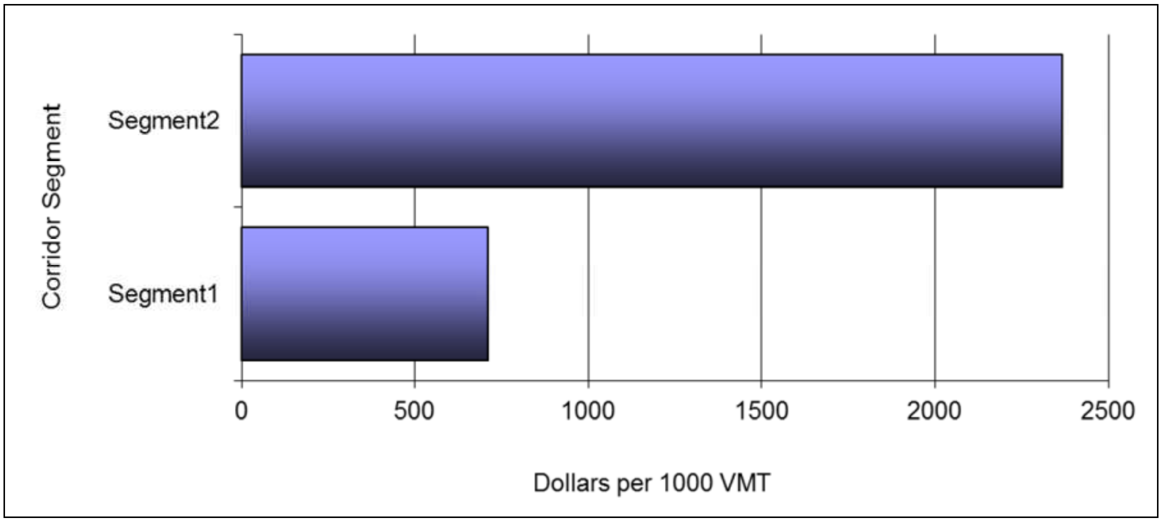


Figure 8. US26 Cannon Beach to Portland Corridor: Average Truck Travel Time Costs

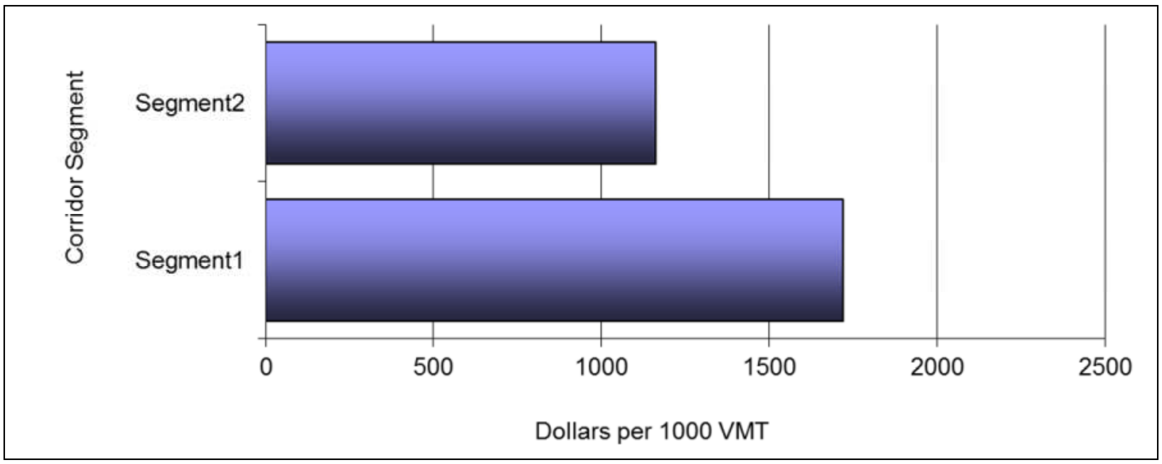


Figure 9. US 26 Cannon Beach to Portland Corridor: Average Truck Operating Costs

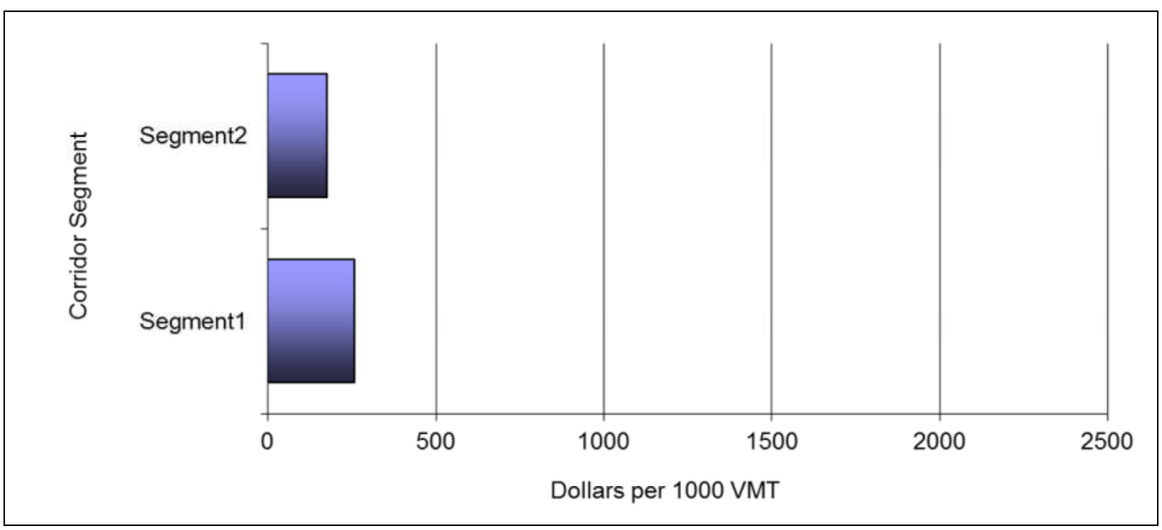


Figure 10. US26 Cannon Beach to Portland Corridor: Average Crash Costs - All Vehicles

Table 11 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up about 10 percent of total user costs, travel time costs are twice that at twenty percent and travel time costs represent the largest share of users' costs at 70 percent of the total.

Table 11. Total Corridor Average User Costs: Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**350**	**1230**	**410**	**20%**
Travel Time Costs	**1390**	**1720**	**1410**	**70%**
Crash Costs*			**200**	**10%**
		TOTAL USER COSTS	**2020**	**100%**
* based on national data used in HERS-ST				

Table 12 presents additional crash information for this corridor. There were nearly 600 crashes in this corridor in 2010. Just over one percent of them involved a truck. This corridor has a crash rate lower than the statewide rate for highways with the same functional classification. Yet, delay caused by crashes and incidents represents over seventy percent of total delay. There are eleven SPIS sites that fall into the top ten percent list of state SPIS sites.

Table 12. US 26 Cannon Beach to Portland 2010 Crash Statistics

Total Number of Crashes	580
Truck Involved Crashes (Percent Truck Involved)	8 (1.4%)
Corridor Crash Rate per 1 milllion VMT	0.77
Statewide Crash Rate (same functional class)	1.33
Corridor Average Crash Costs $ per 1000 VMT	200
Number of Top 10% SPIS Sites on Corridor	11
Truck Safety Corridor?	no

5.2 Corridor Performance: Lincoln City to Salem (OR 18 and OR 22)

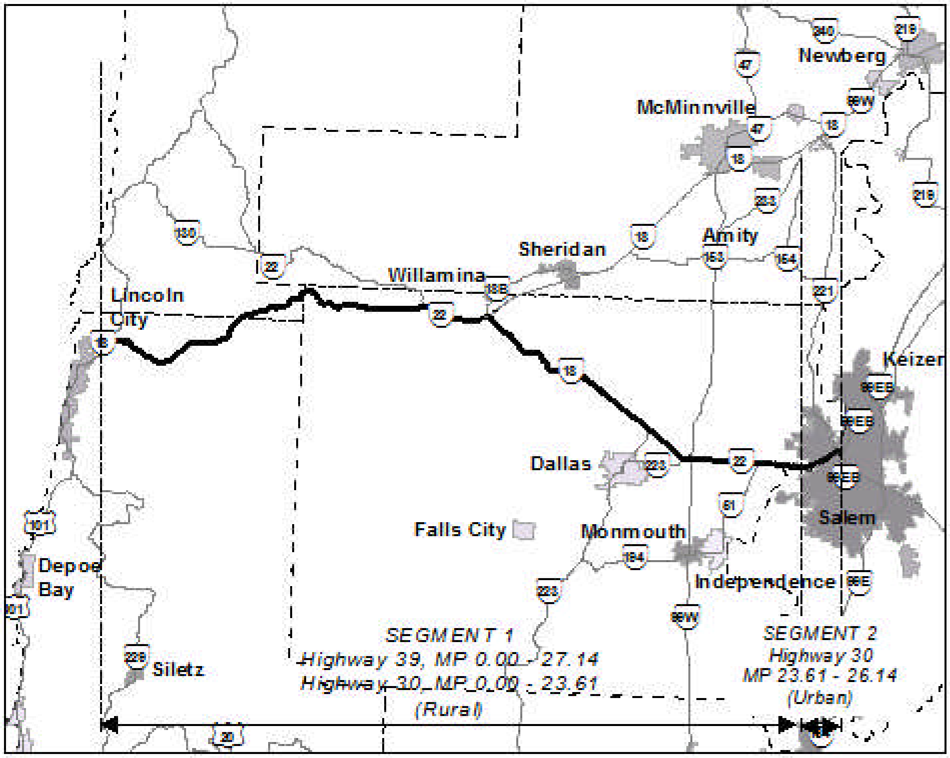


Figure 11. Segmented Map of Lincoln City to Salem (OR 18 and OR 22) Corridor

5.2.1 Corridor Overview

This corridor connects Lincoln City on the coast to Salem. The corridor consists of two state highways – OR 18 and OR 22, as illustrated in Figure 11. For reporting purposes, the corridor will be reported as 2 segments. This corridor is 57 miles in length, predominantly rural and connects the Willamette Valley to the Oregon coast. Average annual daily traffic volumes on the highway range from about 5,800 to 27,000 vehicles. Trucks comprise 5 to 9 percent of the traffic volume.

5.2.2 Economic Characteristics

Figure 12 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, Forest Wood Products; Clay, Minerals & Stone; and Petroleum, Coal, & Chemicals represent the 3 largest groups moving this corridor, relative to the other 19 bottleneck corridors.

In terms of weight, Clay, Minerals & Stone; Forest Wood Products; and Petroleum, Coal, & Chemicals are the largest groups moving via this corridor, about 5 to 3 percent by weight. Overall, a fairly small share of commodity flows move across this corridor relative to the other 19 corridors, but that is consistent with the economic activity and population of the coast.

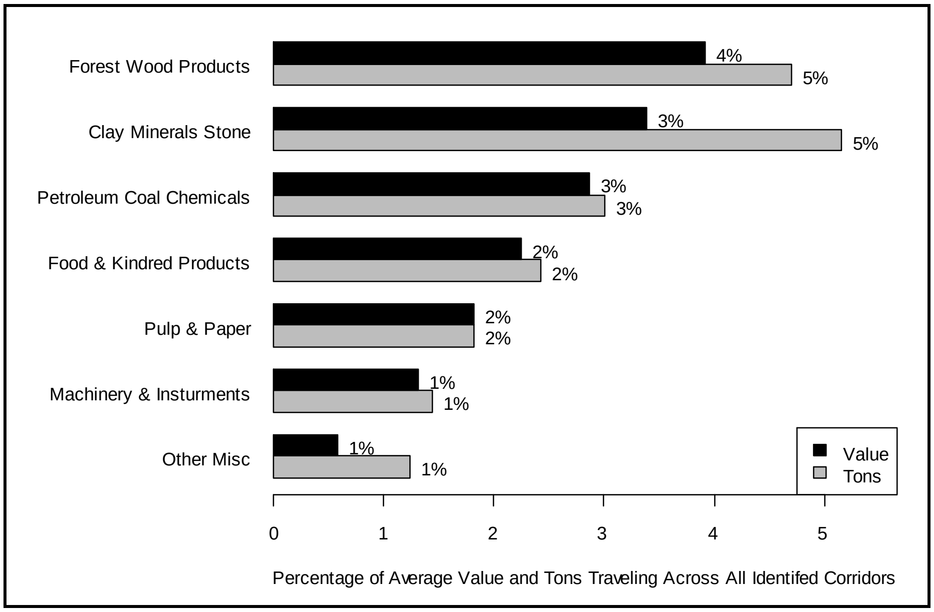


Figure 12. Lincoln City Junction - Salem Percentage of Average Value and Tons

Figure 13 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top two industries using this corridor are Wholesale Trade and Machine & Metals; representing between 15 and 21 percent of industry use along this corridor. Computer & Electronics; Ag Forest & Fish; and retail industries represent 13 to 14 percent of industry use along this corridor.

In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Wholesale Trade; Wood & Paper; and Machine & Metals; representing between 15 and 42 percent of industry use across this corridor.

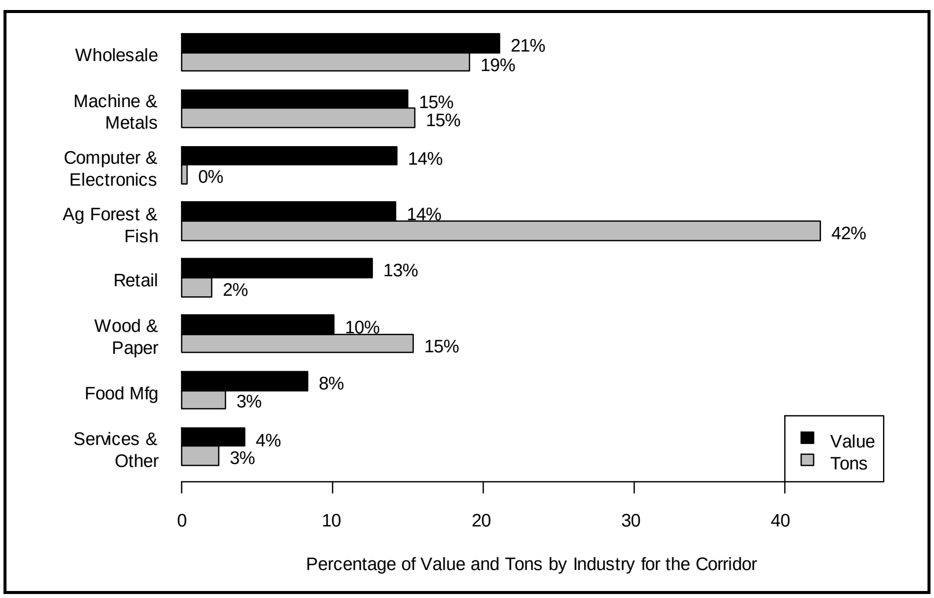


Figure 13. Lincoln City Junction - Salem Percentage of Value and Tons by Industry

5.2.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 14 illustrates areas where volumes are approaching capacity levels (yellow) or have reached capacity (red.) This is reported as a ratio of traffic volume over highway capacity. Average annual daily traffic volumes are illustrated in blue, where the darker the blue the higher the traffic volumes. Volumes are relatively higher around mile point 23, where the Spirit Mountain Casino is located. Posted speed drops from 55 to 45 in this segment as well. Thus, in this vicinity there is congestion as capacity is approached. Volumes also increase as the highway approaches Salem. There is sufficient capacity in this part of the highway, but as the highway approaches Salem, there are merging lanes and bridges crossing the Willamette River which operate at capacity with the higher traffic volumes.

Table 13 presents the truck share of traffic in terms of daily vehicle flows and miles traveled. Both measures show that trucks make up about nine percent of the traffic in the rural segment which drops to five percent in the urban segment.

Table 13. Truck Share of ADT and VMT

	Average Annual Daily Traffic (Share of vehicles)	**Daily Vehicle Miles Traveled (Share of VMT)**
Segment 1	9 %	9%
Segment 2	5%	5%

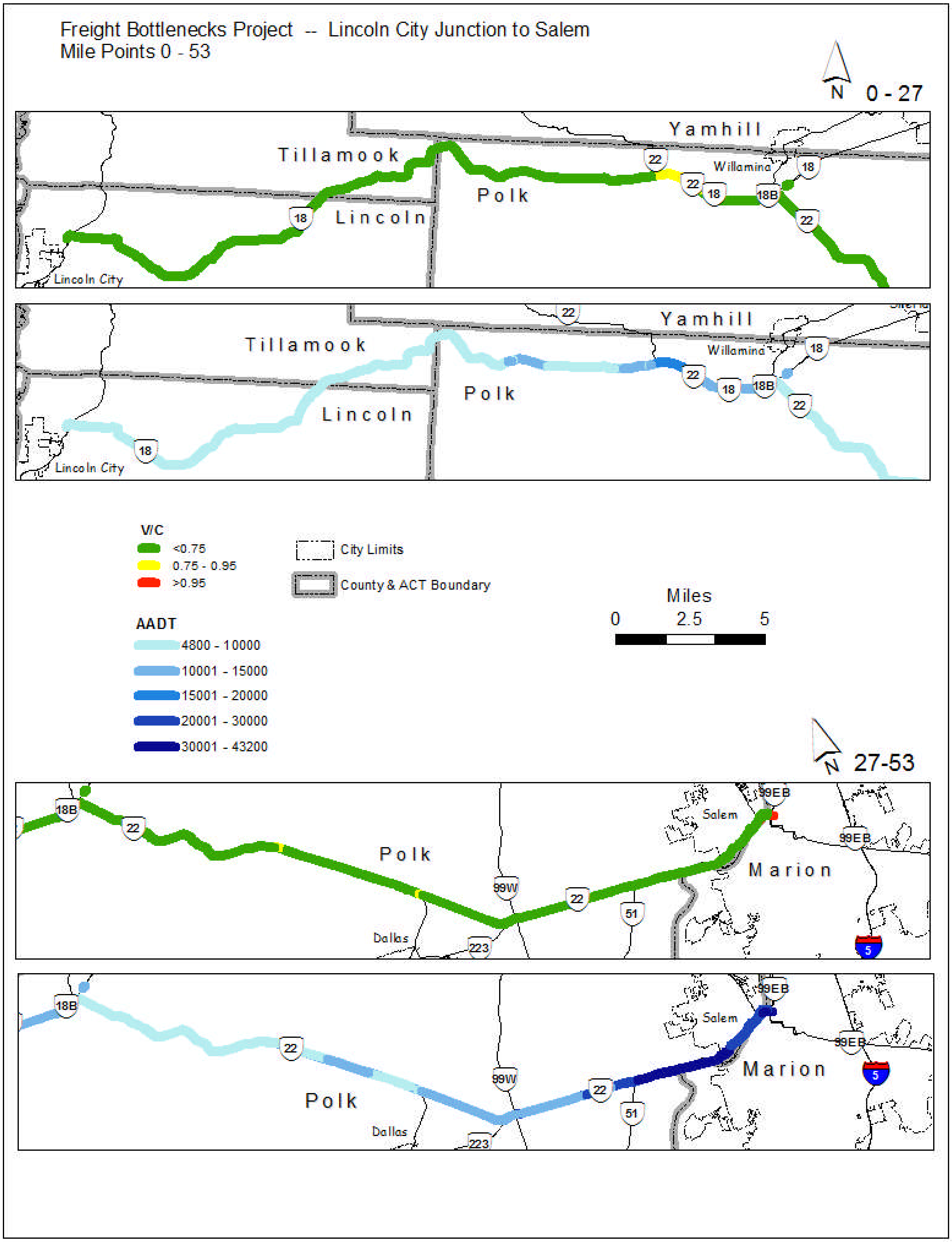


Figure 14. Freight Bottlenecks Project - Lincoln City Junction to Salem

5.2.4 *Corridor Geometrics*

About 20 percent of this corridor has curvature above 3.5%. About 30 percent of this corridor has grades above 2.5%, which significantly affects truck operating costs. Table 14 presents details of the highway geometric attributes.

Table 14. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**79%**	**13%**	**6%**	**2%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**31%**	**39%**	**17%**	**12%**	**1%**	**0%**	100%

5.2.5 *Corridor Delay and Reliability*

Figure 15 presents the average annual hours of delay per 1,000 vehicle miles traveled along this corridor for all vehicles. The delay occurring by the casino is evident in this figure. The spike in delay around mile point 43 is the interchange at OR 99W where there is weaving and dropped lanes.

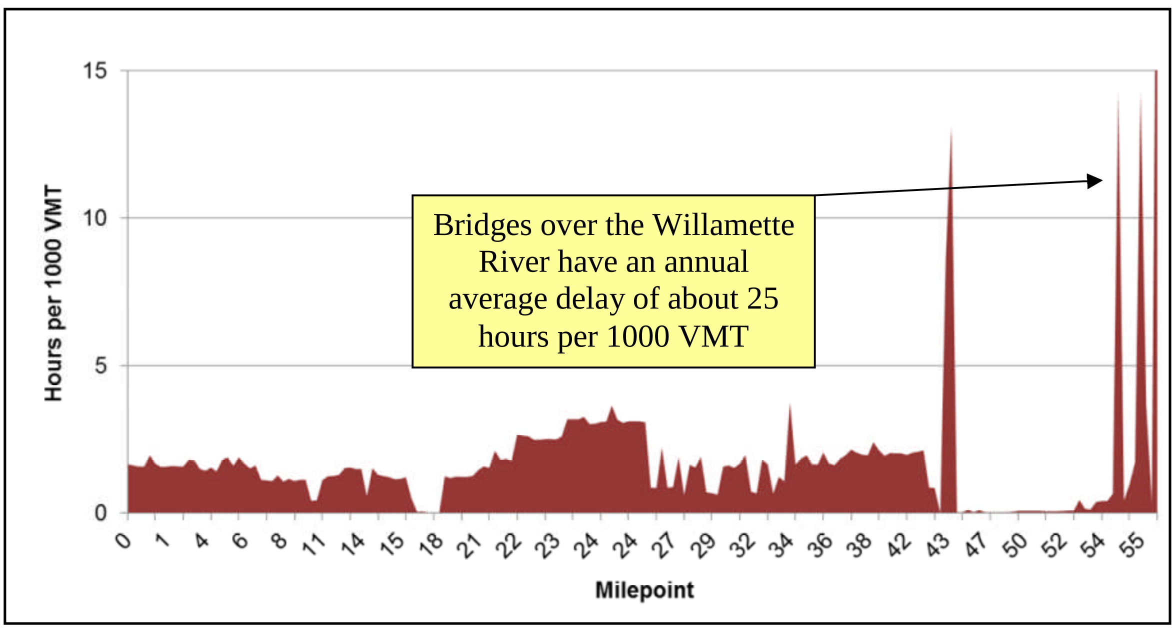


Figure 15. Annual Average Delay: Hours per 1000 VMT

Table 15 separates delay by source. Zero volume delay is associated with roadway geometrics such as grade and curvature. Less than 10 percent of corridor delay is due to geometrics. Incident delay is relatively low as well, just over 10 percent of total corridor delay. The primary cause of delay is congestion cause by capacity constraints. Nearly 80 percent of the delay on this corridor is due to capacity issues.

Table 15. Corridor Reliability: Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural	0.0	0.1	1.1	1.3
Urban	0.4	0.4	1.6	2.5
Total Corridor	0.1	0.2	1.2	1.5
Share of Total	9%	12%	79%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs whether there is one car or hundreds of cars on the road.

5.2.6 User Costs

Average truck operating costs, truck travel time costs and vehicle crash costs are reported in Figure 16, Figure 17, and Figure 18 for the 2 corridor segments. Costs are reported as dollars per 1000 VMT in order to compare the two segments. Segment 1 is the longer rural segment and Segment 2 the urban segment at Salem. The rural segment has some grade and curvature that makes the operating costs higher than to relatively flat urban segment of the corridor. However, the travel time costs are higher in the urban segment due to the higher traffic volumes and associated congestion.

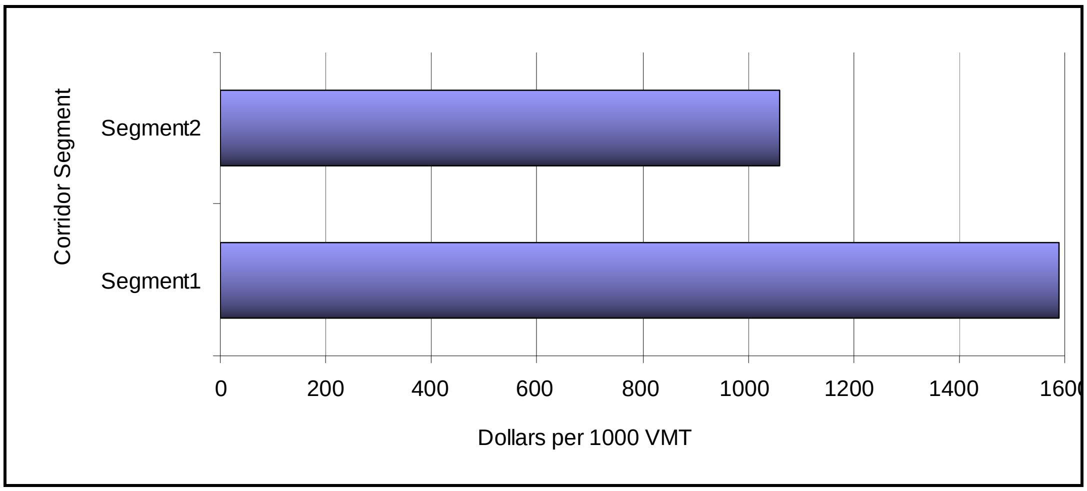


Figure 16. Lincoln City to Salem Corridor: Average Truck Operating Costs

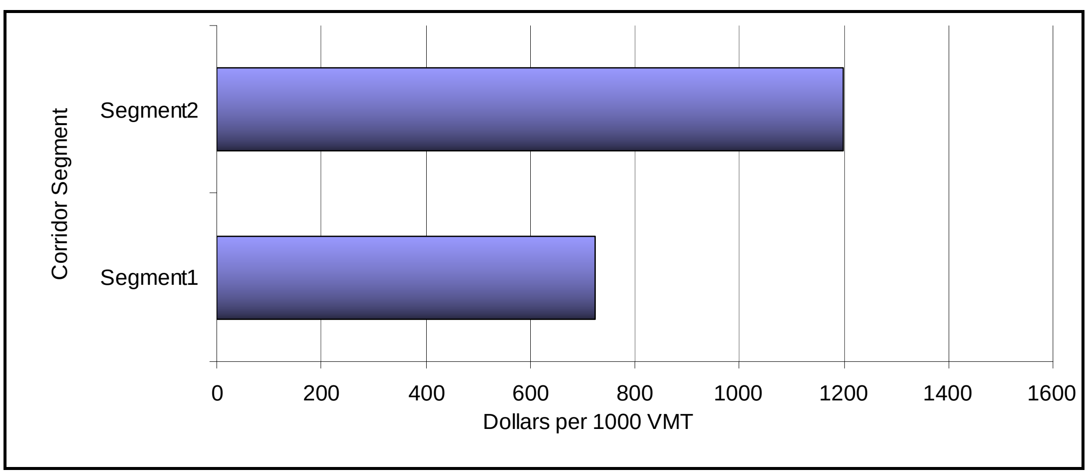


Figure 17. Lincoln City to Salem Corridor: Average Truck Travel Time Costs

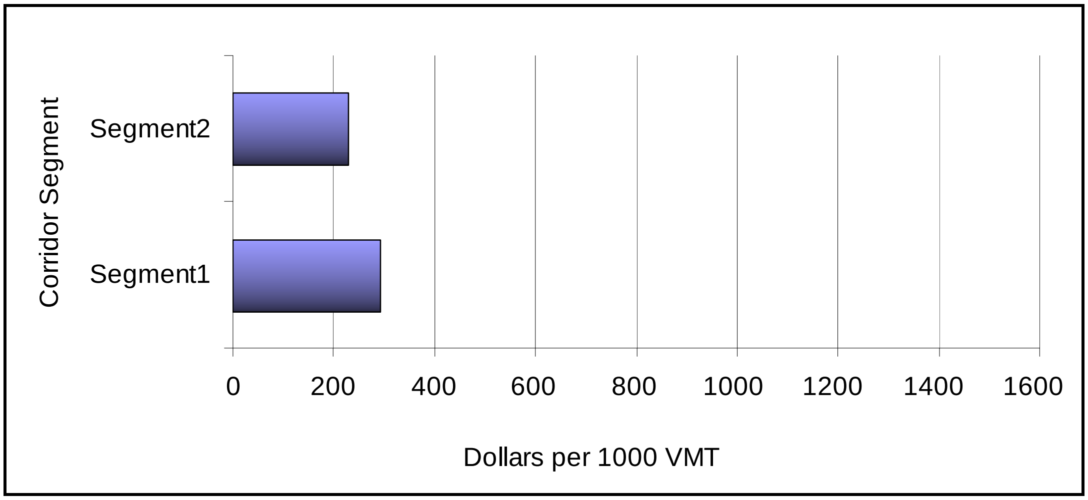


Figure 18. Lincoln City to Salem Corridor: Average Crash Costs - All Vehicles

Table 16 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up twenty percent of total user costs. Travel time costs and vehicle operating costs are each forty percent of total user costs for all vehicles.

Table 16. Total Corridor Average User Costs: Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**372**	**1569**	**467**	**40%**
Travel Time Costs	**450**	**696**	**469**	**40%**
Crash Costs*			**225**	**19%**
		TOTAL USER COSTS	**1161**	**100%**
* based on national data used in HERS-ST				

Finally, the crash costs for the two corridor segments are fairly close in value. Table 17 reveals more about the crashes on this corridor. In 2010 there were just over 190 crashes. Nearly three percent were truck involved crashes. The crash rate for this corridor is higher than the average rates for a corridor of the same functional classification. There are eight SPIS sites that fall into the top ten percent list of state SPIS sites.

Table 17. OR 18 & OR 22 Lincoln City to Salem: Crash Statistics 2010

Total Number of Crashes	192
Truck Involved Crashes (Percent Truck Involved)	5 (2.6%)
Corridor Crash Rate per 1 milllion VMT	1.05
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	225
Number of Top 10% SPIS Sites on Corridor	8
Truck Safety Corridor?	no

5.3 Corridor Performance: OR 38 Reedsport to I-5 Corridor

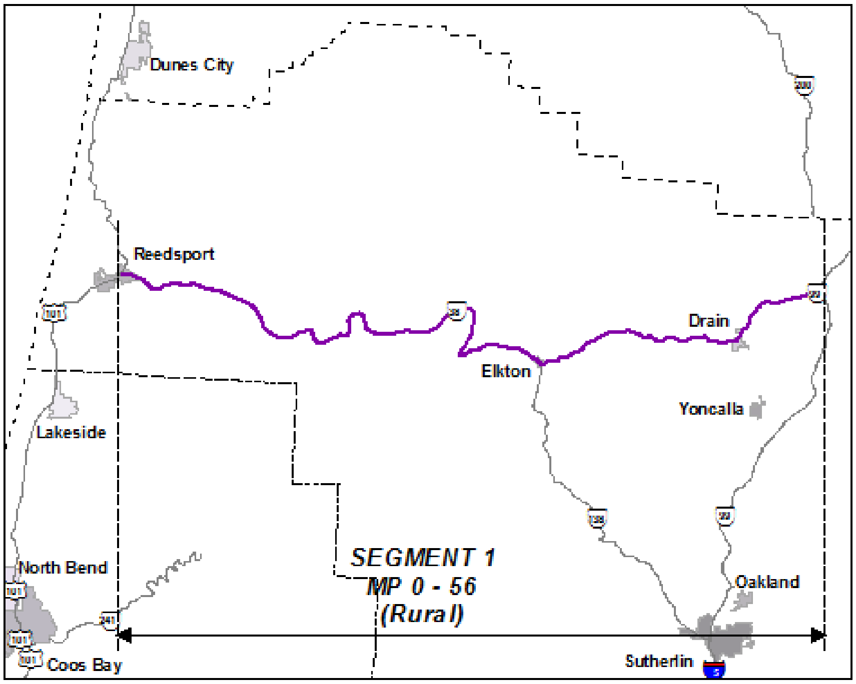


Figure 19. Segmented Map of Reedsport (OR 38) to I-5 Corridor

5.3.1 Corridor Overview

Figure 19 illustrates the OR 38 corridor running between Reedsport on the coast and Interstate-5. This corridor is 56 miles long and mostly rural. Average annual daily traffic ranges between 2,900 and 5,700 vehicles. On average, trucks represent about twenty seven percent of daily traffic. There do not appear to be locations where lack of capacity is a persistent issue.

5.3.2 Economic Characteristics

Figure 20 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value and weight, Pulp & Paper and Forest Wood Products are the top 2 commodity groups moving across this corridor. They make up about 2 to 3 percent of flows across all 19 study corridors.

Figure 21 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top three industries using this corridor are Wood & Paper; Machine & Metals; and Ag Forest & Fish, representing between 14 and 36 percent of industry use across this corridor. In terms of weight, the top 3 industry groups are Ag Forest & Fish; Wood & Paper; and Wholesale Trade, representing between 13 and 48 percent of industry use across this corridor.

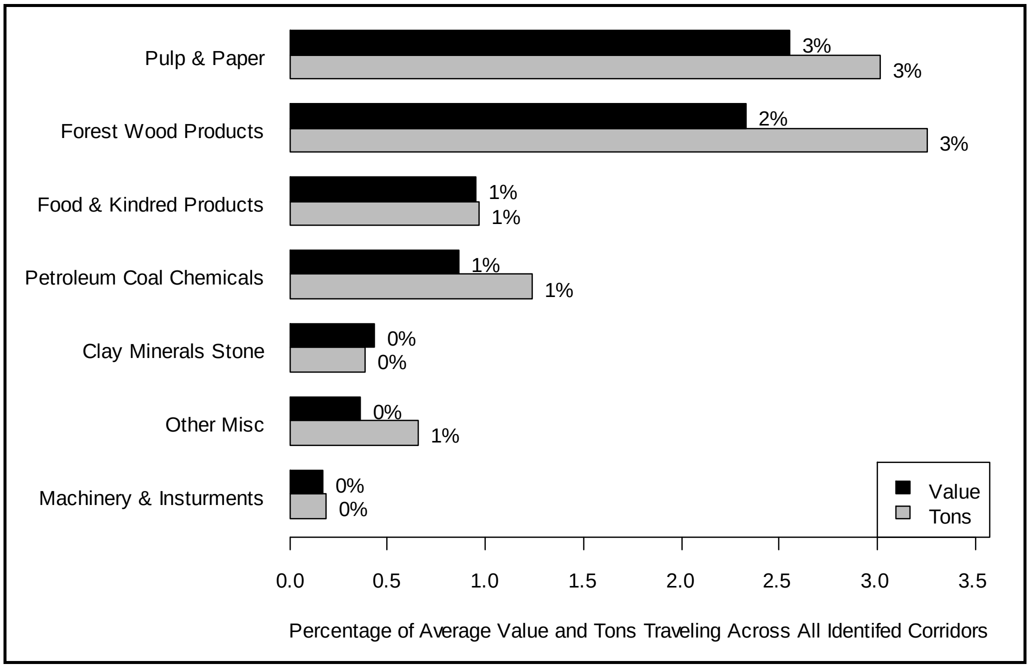


Figure 20. Reedsport to I-5 Percent of Average Value and Tons Traveling

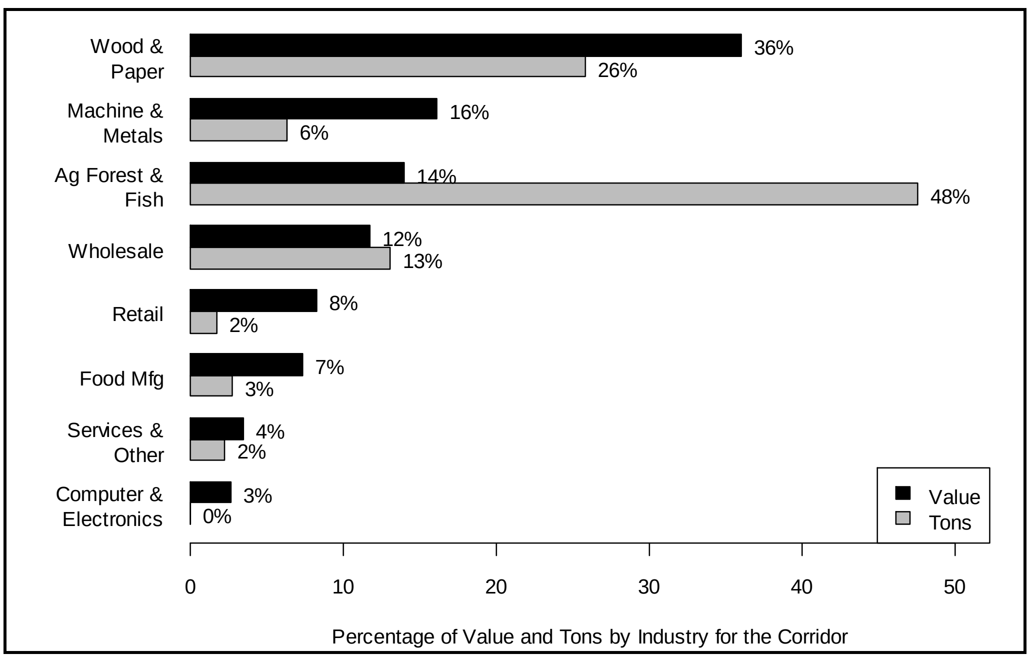


Figure 21. Reedsport to I-5 Percentage of Value and Tons by Industry

5.3.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,

- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 22 illustrates the traffic volumes for this corridor. Volumes are not consistently approaching capacity at specific points on the corridor. Traffic volumes are highest in the vicinity of Reedsport, west of Elkton and between Drain and I-5. Table 18 reports that trucks make up a large proportion of the traffic on this corridor, over one fourth of the traffic is trucks.

Table 18. Truck Share of Average Annual Daily Traffic

	Average Annual Daily Traffic (Share of vehicles)	**Daily Vehicle Miles Traveled (Share of VMT)**
Corridor	27 %	28%

5.3.4 Corridor Geometrics

Table 19 reports the corridor geometrics for curvature and grade. About 15 percent of the corridor has curves greater than 3.5 degrees. Over 10 percent of the corridor has grades greater than 2.5 percent. About 3 percent of corridor delay is attributed to roadway geometrics.

Table 19. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**85%**	**7%**	**6%**	**2%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**47%**	**42%**	**8%**	**3%**	**0%**	**0%**	**100%**

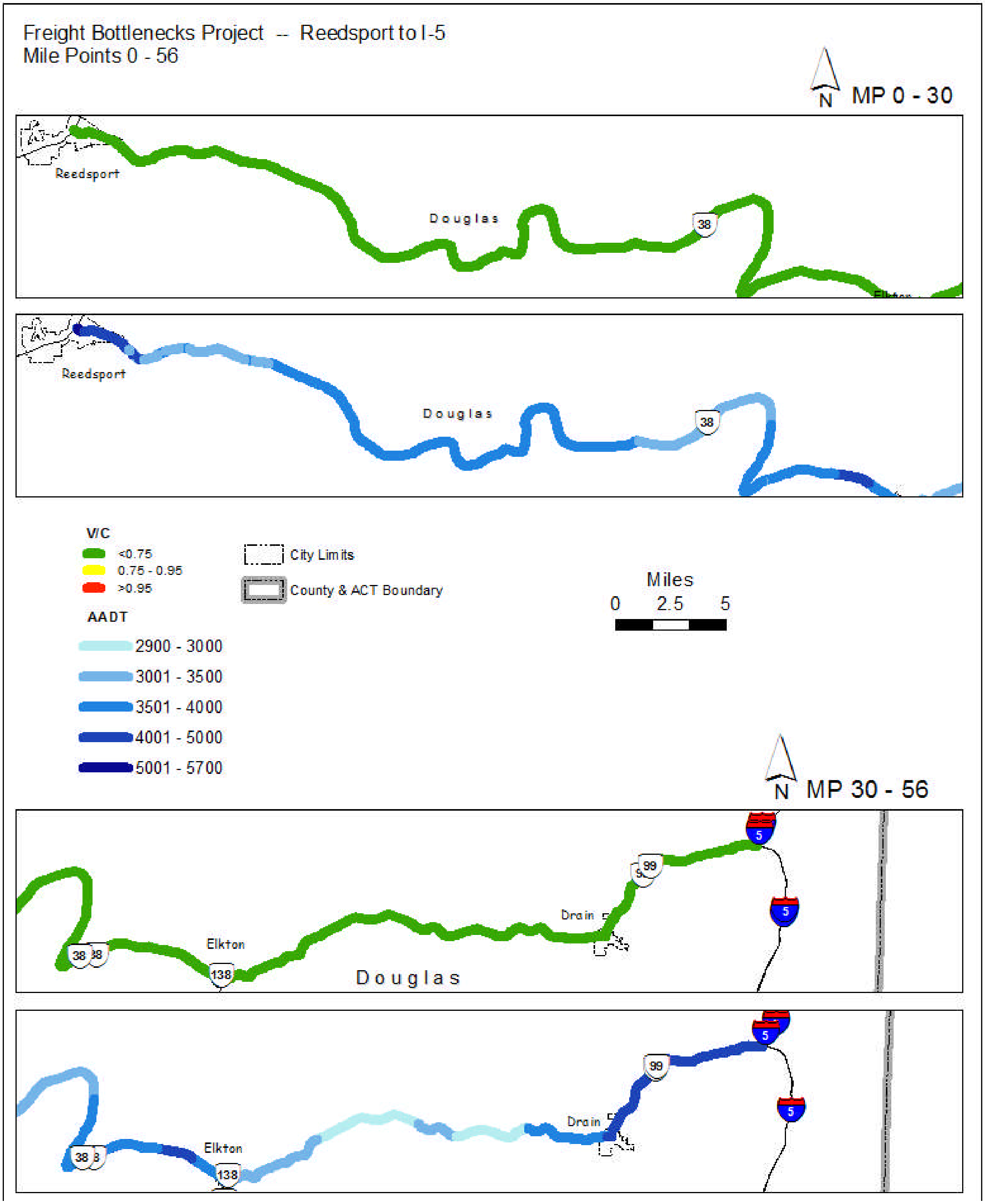


Figure 22. Freight Bottlenecks Project – Reedsport to I-5

5.3.5 Corridor Delay and Reliability

Figure 23 presents the annual average hours of delay per 1000 vehicle miles traveled. Table 20 reveals most of the delay is due to traffic congestion. The presence of incident delay is about 7 percent of total corridor delay.

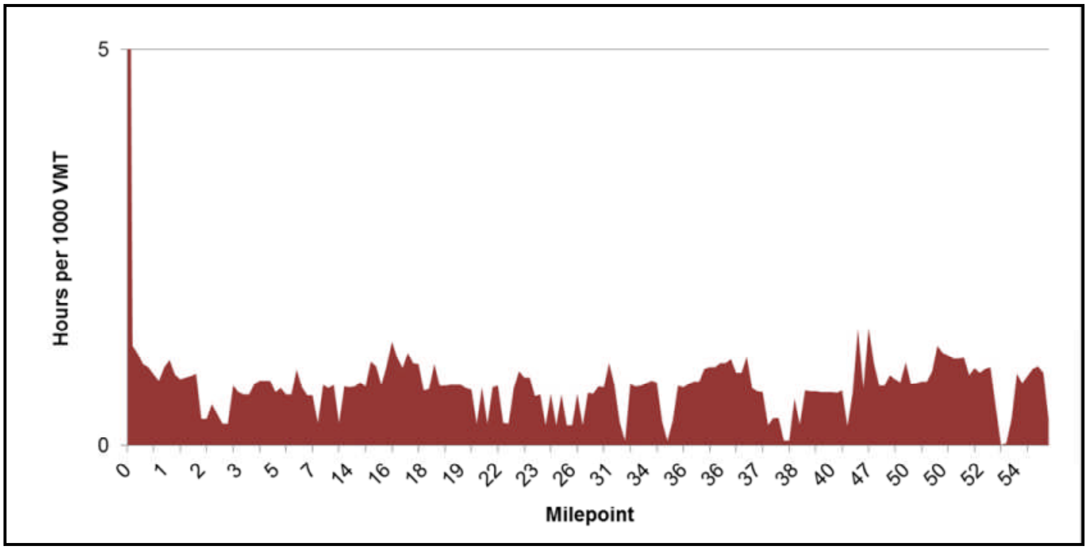


Figure 23. Annual Average Delay: Hours per 1000 VMT

Table 20. Corridor Reliability: Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural	0.02	0.05	0.64	0.71
Urban	0.00	0.00	0.00	0.00
Total Corridor	0.02	0.05	0.64	0.71
Share of Total	3%	7%	90%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of traffic volumes.

5.3.6 User Costs

Average truck operating costs, truck travel time costs and vehicle crash costs are reported in Figure 24, Figure 25, and Figure 26 for each corridor segment. Among the 3 user costs, truck operating costs are the largest, about twice the cost of travel time delay. Crash costs are a smaller component of user costs, less than half as much as travel time costs.

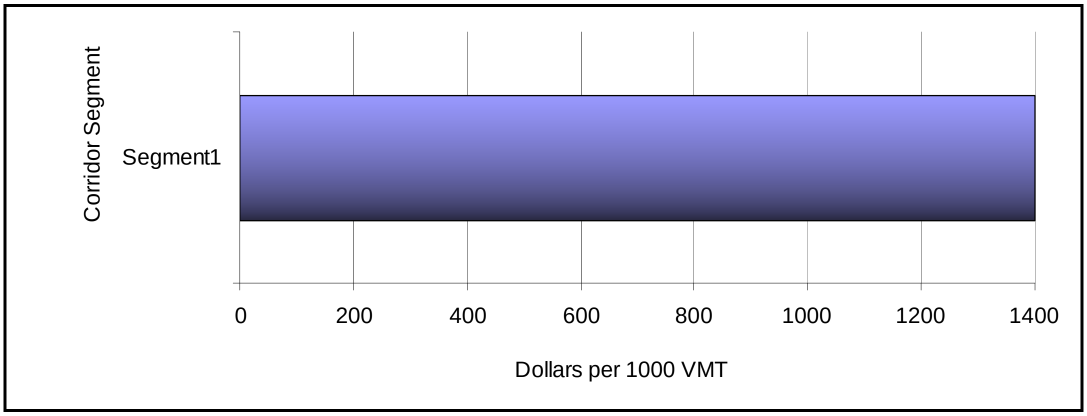


Figure 24. Reedsport to I-5 Corridor Average Truck Operating Costs

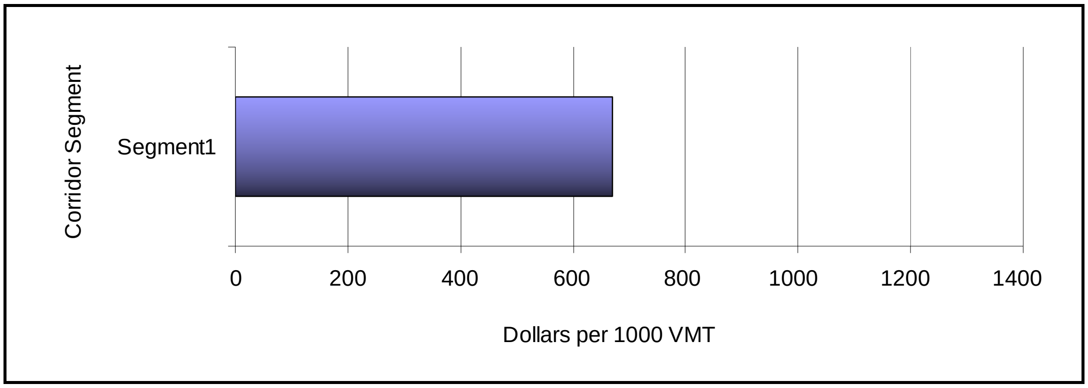


Figure 25. Reedsport to I-5 Corridor Average Truck Travel Time Costs

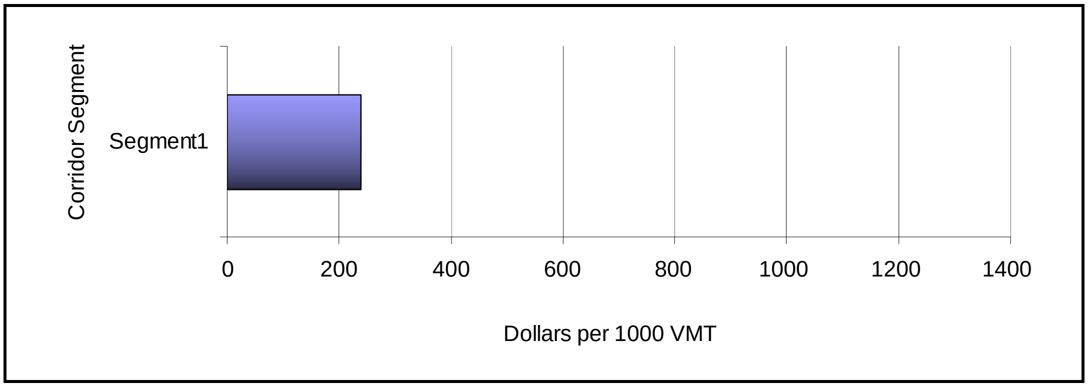


Figure 26. Reedsport to I-5 Corridor Average Crash Costs - All Vehicles

Table 21 reports user costs for trucks alongside light vehicles. If crash costs are left out of the equation, over 40 percent of light vehicle user costs are due to operating costs, compared to nearly 70 percent of truck user costs due to operating costs.

Table 21. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**345**	**1400**	**640**	**46%**
Travel Time Costs	**440**	**670**	**500**	**36%**
Crash Costs*			**240**	**17%**
		TOTAL USER COSTS	**1380**	**100%**
* based on national data used in HERS-ST				

Table 22. Reedsport to I-5 2010 Crash Statistics

Total Number of Crashes	47
Truck Involved Crashes (Percent Truck Involved)	2 (4.3%)
Corridor Crash Rate per 1 milllion VMT	0.63
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	240
Number of Top 10% SPIS Sites on Corridor	0

Truck Safety Corridor?	no

presents additional crash information for this corridor. There were 47 crashes reported on this corridor in 2010. Only 2 crashes had truck involvement. The overall crash rate for this corridor is less than the statewide average rate for highway in this functional classification.

Table 22. Reedsport to I-5 2010 Crash Statistics

Total Number of Crashes	47
Truck Involved Crashes (Percent Truck Involved)	2 (4.3%)
Corridor Crash Rate per 1 milllion VMT	0.63
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	240
Number of Top 10% SPIS Sites on Corridor	0
Truck Safety Corridor?	no

5.4 Corridor Performance: OR 42 Coos Bay to Interstate-5 (South of Roseburg)

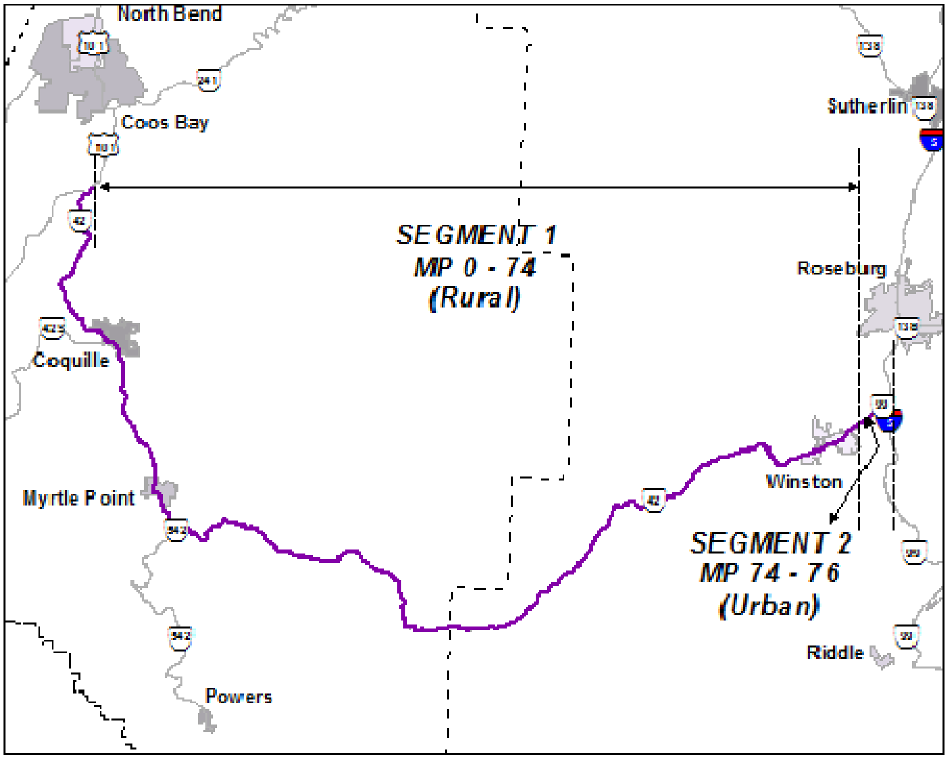


Figure 27. Segmented Map of Coos Bay (OR 42) to I-0s (South of Roseburg)

5.4.1 Corridor Overview

Figure 27 illustrates the OR 42 corridor running between Coos Bay on the coast and I-5 south of Roseburg. This corridor is 76 miles long and mostly rural. Average annual daily traffic ranges between 3,000 and 25,000 vehicles. On average, trucks represent about 22 percent of daily traffic. There do not appear to be locations where lack of capacity is a persistent issue.

5.4.2 Economic Characteristics

Figure 28 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight.

In terms of value and weight, Pulp & Paper and Forest Wood Products represent about 2 percent of their group's movement across all 19 bottleneck corridors. The remaining commodity groups represent less than 1 percent of the total movement across all 19 corridors.

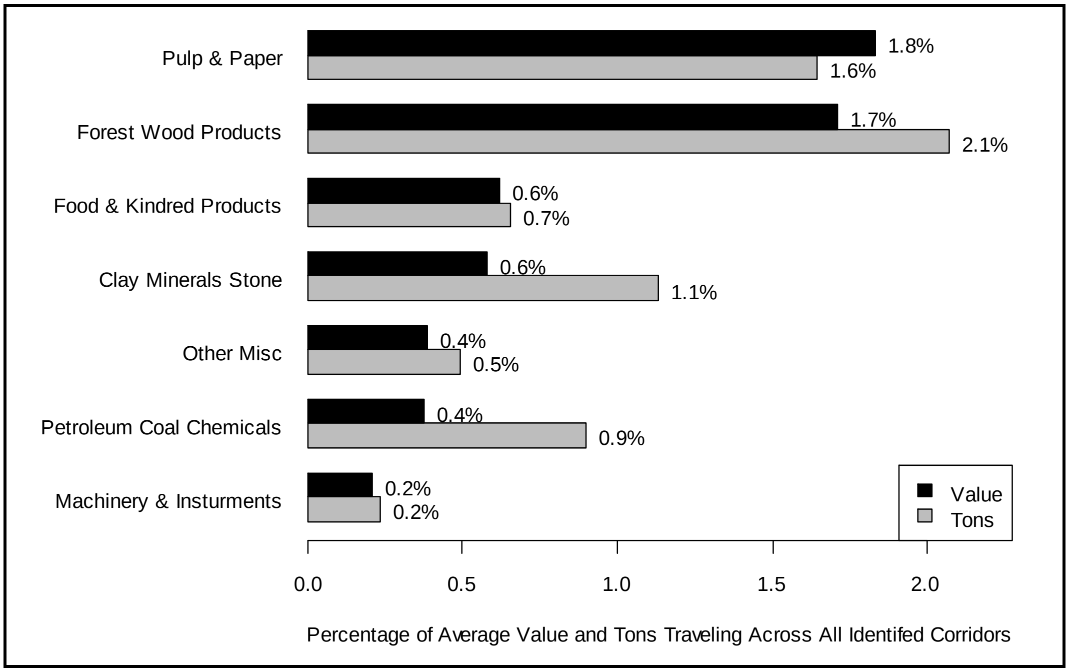


Figure 28. Coos Bay-Roseburg Percentage of Average Value and Tons

Figure 29 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value and weight, the top 3 industries using this corridor are Ag Forestry & Fish; Wood & Paper; and Wholesale Trade; representing between 17 and 24 percent of industry use by value and 13 to 53 percent of industry use by weight across this corridor.

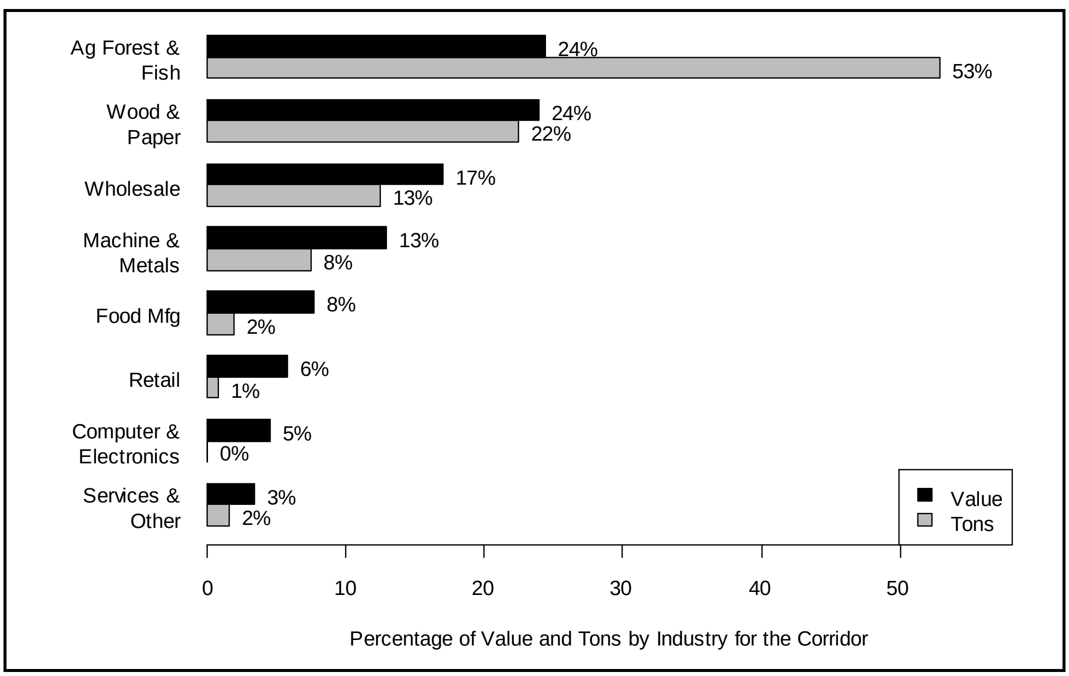


Figure 29. Coos Bay to Roseburg Percentage of Value and Tons by Industry

5.4.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 30 illustrates the traffic volumes for this corridor. Volumes are not consistently approaching capacity at specific points on the corridor. Traffic volumes are highest between Winston and I-5. Table 23 reports that trucks make up a fairly large proportion of the traffic on this corridor; one fifth of the traffic is trucks.

Table 23. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	**Daily Vehicle Miles Traveled (Share of VMT)**
Segment 1	22%	20%
Segment 2	20%	20%

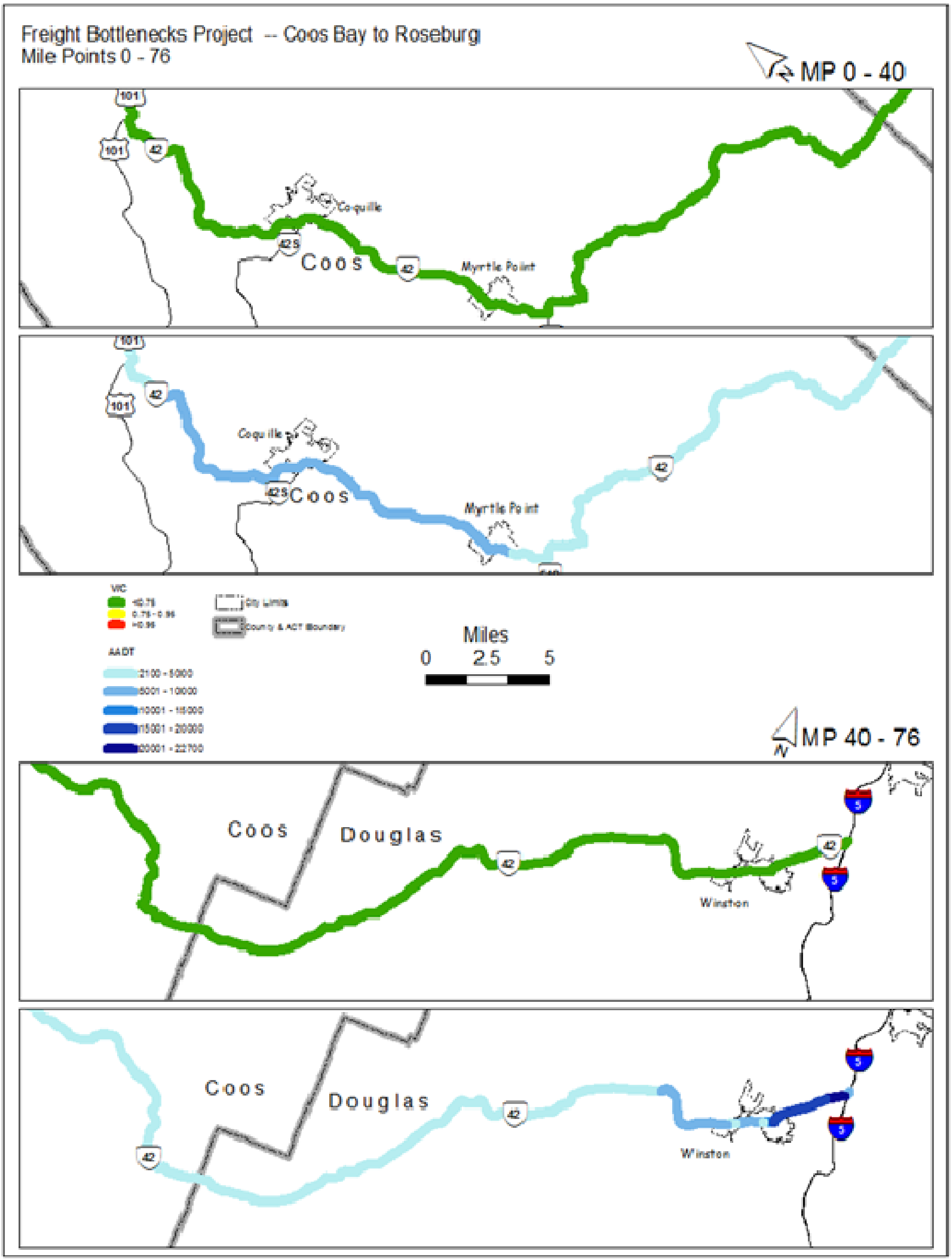


Figure 30. Freight Bottlenecks Project - Coos Bay to Roseburg

5.4.4 Corridor Geometrics

Table 24 reports the corridor geometrics for curvature and grade. Over 35 percent of the corridor has curves greater than 3.5 degrees. Over 10 percent of the corridor has grades greater than 2.5 percent. Nearly 40 percent of corridor delay is attributed to roadway geometrics.

Table 24. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**85%**	**7%**	**6%**	**2%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**47%**	**42%**	**8%**	**3%**	**0%**	**0%**	**100%**

5.4.5 Corridor Delay and Reliability

Figure 31 presents the annual average hours of delay per 1000 vehicle miles traveled. The locations with the most delay are at the intersections of US101 and I-5. For the corridor overall, over half of the delay is due to congestion and less than 10 percent due to incidents. Roadway curvature and grade account for nearly 40 percent of total delay.

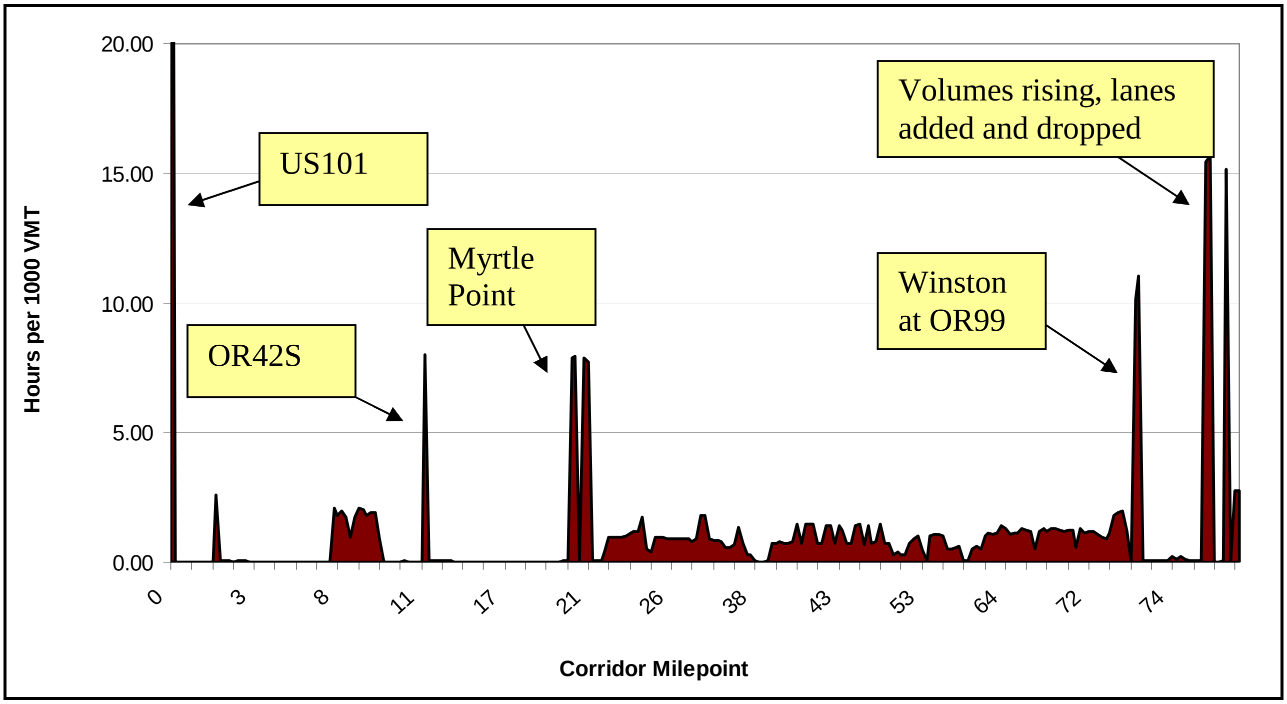


Figure 31. Annual Average Delay - Hours per 1000 VMT

Table 25 presents the breakdown of corridor delay. Congestion is the source of more than half of the delay. Roadway geometrics causes nearly 40 percent of the delay.

Table 25. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	**Incident Delay**	**Congestion Delay**	**Total Delay**
Rural	0.02	0.05	0.64	0.71
Urban	0.00	0.00	0.00	0.00
Total Corridor	0.02	0.05	0.64	0.71
Share of Total	3%	7%	90%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of traffic volumes.

5.4.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 32, Figure 33 and Figure 34 for the 2 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs and travel time costs are very similar for both segments of the corridor. For rural Segment 1 the operating costs are a little higher than travel time costs, while the opposite is true for the urban Segment 2. These patterns are consistent with the characteristics of the highway where grade and curvature affect performance on the rural portion and congestion affects the urban portions. Crash costs are relatively low compared to the other users' costs.

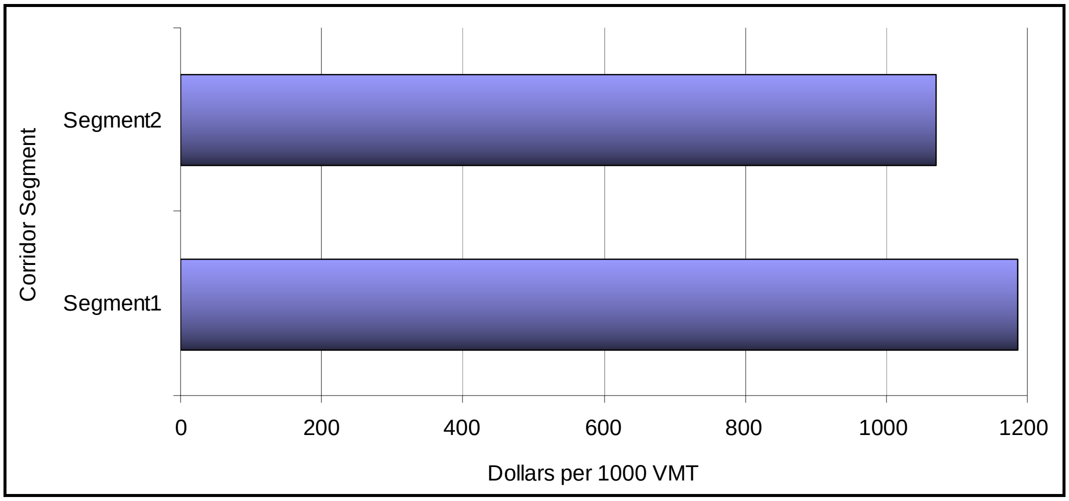


Figure 32. OR42 Corridor Average Truck Operating Costs

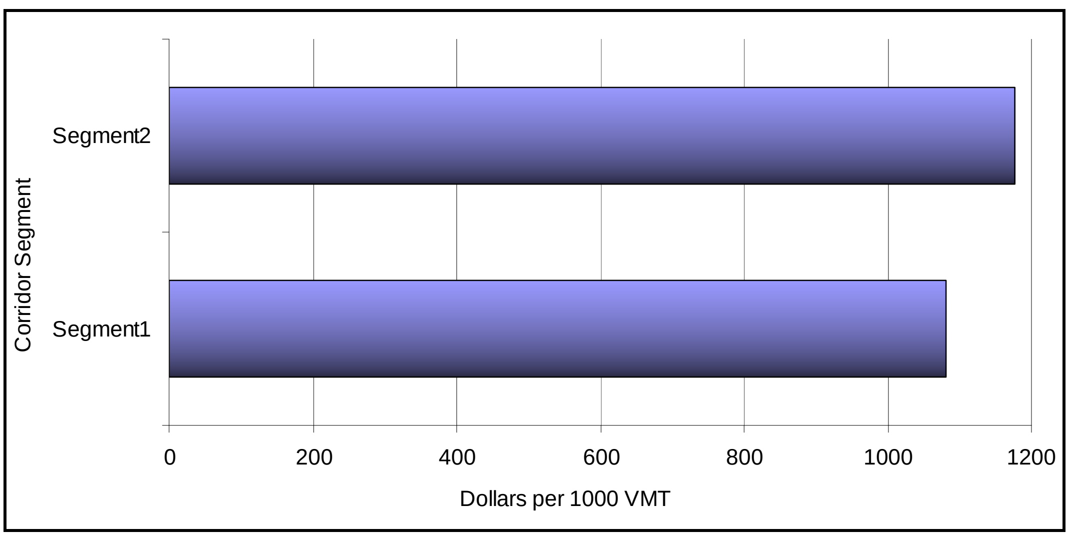


Figure 33. OR 42 Corridor Average Truck Travel Time Costs

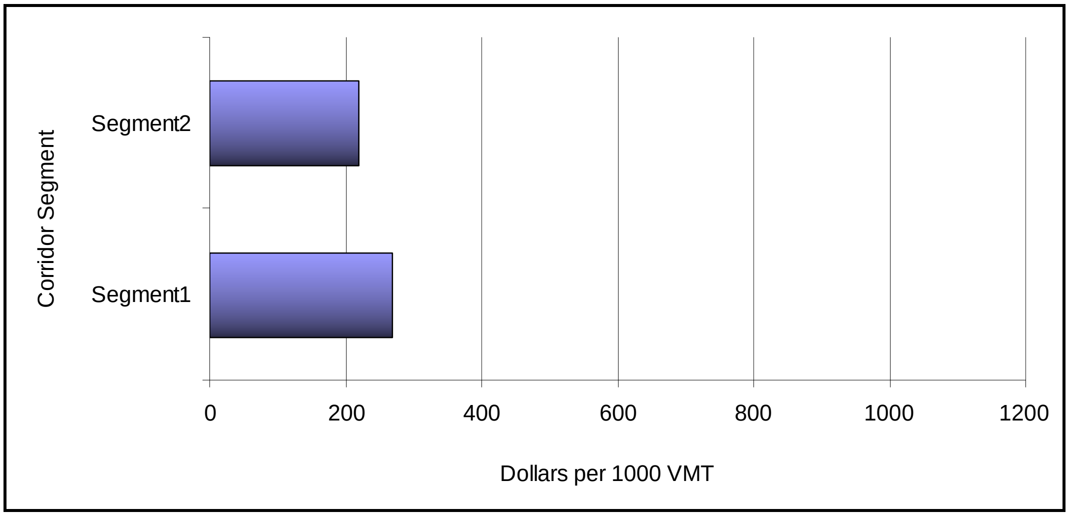


Figure 34. OR 42 Corridor Average Crash Costs - All Vehicles

Table 26 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up over 20 percent of total user costs. Travel time costs are just under 40 percent for all vehicles. Vehicle operating costs make up about 40 percent of the total user costs. Note that heavy vehicle operating costs are much greater than light vehicles due to the geometric characteristics of the corridor.

Table 26. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**345**	**1400**	**640**	**46%**
Travel Time Costs	**440**	**670**	**500**	**36%**
Crash Costs*			**240**	**17%**
		TOTAL USER COSTS	**1380**	**100%**
* based on national data used in HERS-ST				

Table 27 presents additional crash information for this corridor. There were 127 crashes in this corridor in 2010. About 8 percent of them involved a truck. This corridor has a crash rate a little higher than the statewide rate for highways with the same functional classification. Yet, delay caused by incidents is fairly low (6%). There are seven SPIS sites that fall into the top ten percent list of state SPIS sites.

Table 27. OR 42 to I-5 2010 Crash Statistics

Total Number of Crashes	127
Truck Involved Crashes (Percent Truck Involved)	10 (7.9%)
Corridor Crash Rate per 1 milllion VMT	0.86
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	275
Number of Top 10% SPIS Sites on Corridor	7
Truck Safety Corridor?	no

5.5 Corridor Performance: OR 58 Eugene to US 97

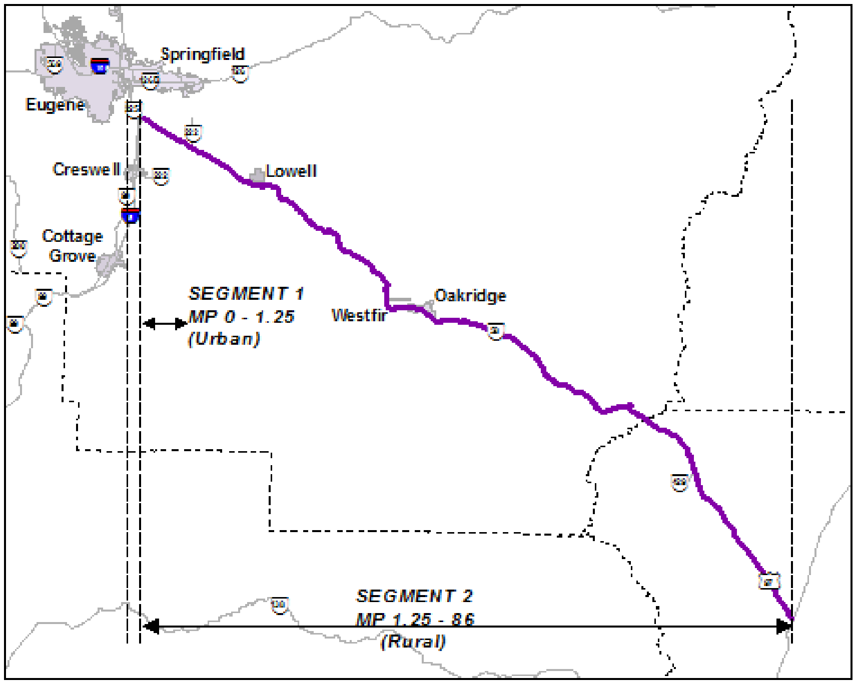


Figure 35. Segmented Map of OR 58 (Eugene) to US 97

5.5.1 Corridor Overview

Figure 35 illustrates the OR 58 corridor running between Eugene-Springfield and US 97 east of the Cascades. This corridor is 86 miles long and mostly rural, with the exception of an urban segment in the Springfield vicinity. Average annual daily traffic ranges between 2,000 and 10,000 vehicles. On average, trucks represent about 22 percent of daily traffic. There do not appear to be locations where lack of capacity is a persistent issue.

5.5.2 Economic Characteristics

Figure 36 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight.

In terms of value and weight, Forest Wood Products represents 2 percent of the total flows for this group across all 19 bottleneck corridors. The remaining commodity groups represent less than 2 percent of the total commodity flows on this corridor relative to the other 19 corridors.

Figure 37 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top three industries using this corridor are Wholesale Trade; Machine & Metals; and Computer & Electronics; representing between 17 and 29 percent of industry use across this corridor. In terms of weight, the top three industries using this corridor are Ag Forest & Fish;

Machine & Metals; and Wholesale Trade; ranging from 16 to 35 percent of industry use across this corridor.

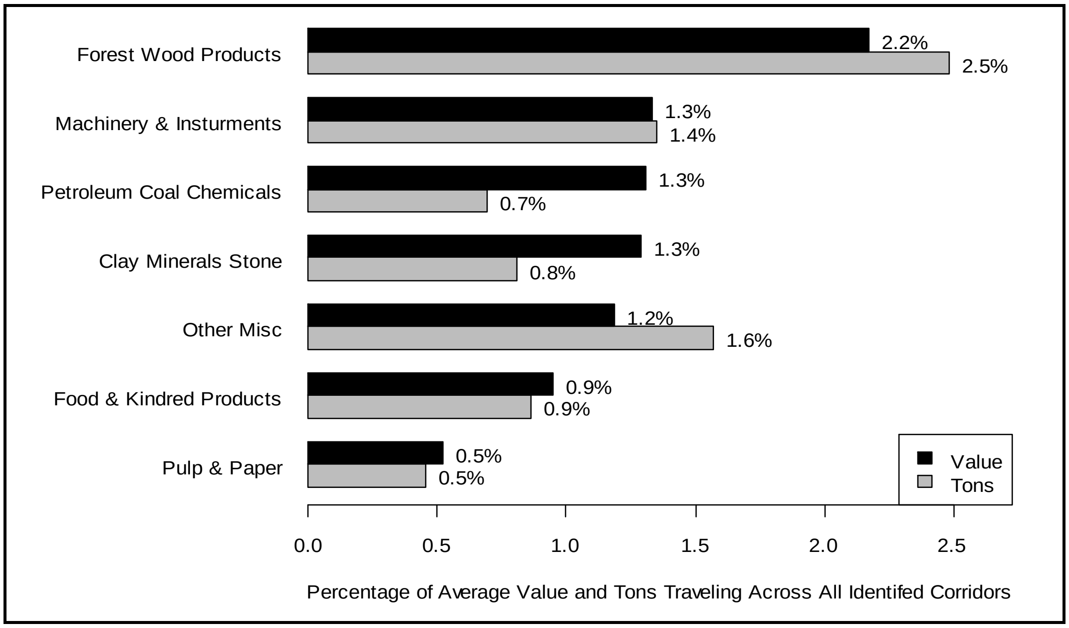


Figure 36. Eugene to US 97 Percentage of Average Value and Tons

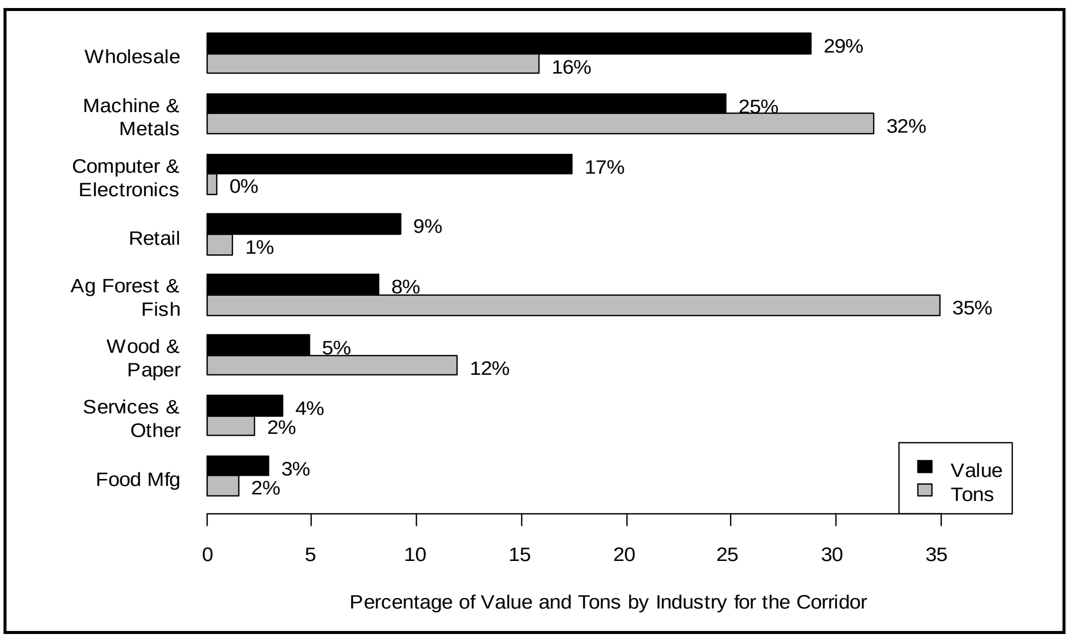


Figure 37. Eugene to US 97 Percentage of Value and Tons by Industry

5.5.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Table 28 reports that trucks make up a fairly large proportion of the traffic on this corridor; one fourth of the traffic is trucks. Figure 38 illustrates the traffic volumes for this corridor. Volumes are not consistently approaching capacity at specific points on the corridor. Traffic volumes are highest between Springfield and Oakridge.

Table 28. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	14%	14%
Segment 2	22%	25%

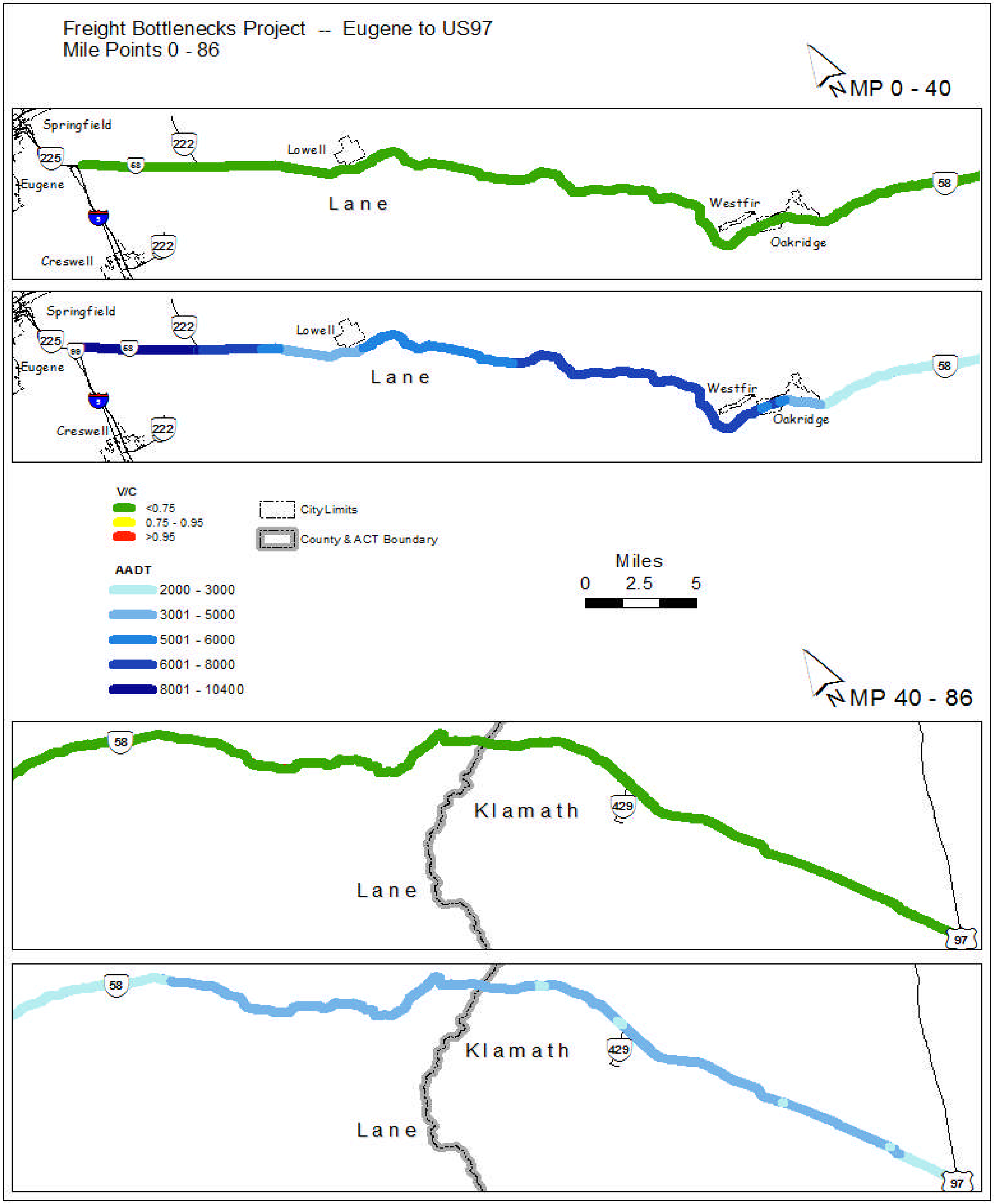


Figure 38. Freight Bottlenecks Project – Eugene to US 97

Table 29. Corridor Geometrics

Degree of Curvature	0 - 3.4	3.5 - 5.4	5.5 - 8.4	8.5 - 13.9	14 - 27.9	28+	
Proportion of Miles	82%	11%	4%	2%	0%	0%	100%
Degree of Grade	0-.4%	.5-2.4%	2.5-4.4%	4.5-6.4%	6.5-8.4%	>8.5%	
Proportion of Miles	24%	48%	11%	17%	0%	0%	100%

Table 29 reports the corridor geometrics for curvature and grade. About 18 percent of the corridor has curves greater than 3.5 degrees. About 28 percent of the corridor has grade greater than 2.5 percent. Very little of corridor delay is attributed to roadway geometrics.

5.5.4 Corridor Delay and Reliability

Figure 39 presents the annual average hours of delay per 1000 vehicle miles traveled. Overall, this corridor does not have a lot of delay. (Note once again that delay cause by weather is not included in this analysis.) One location within Oakridge stands out as having more delay than the rest of the corridor.

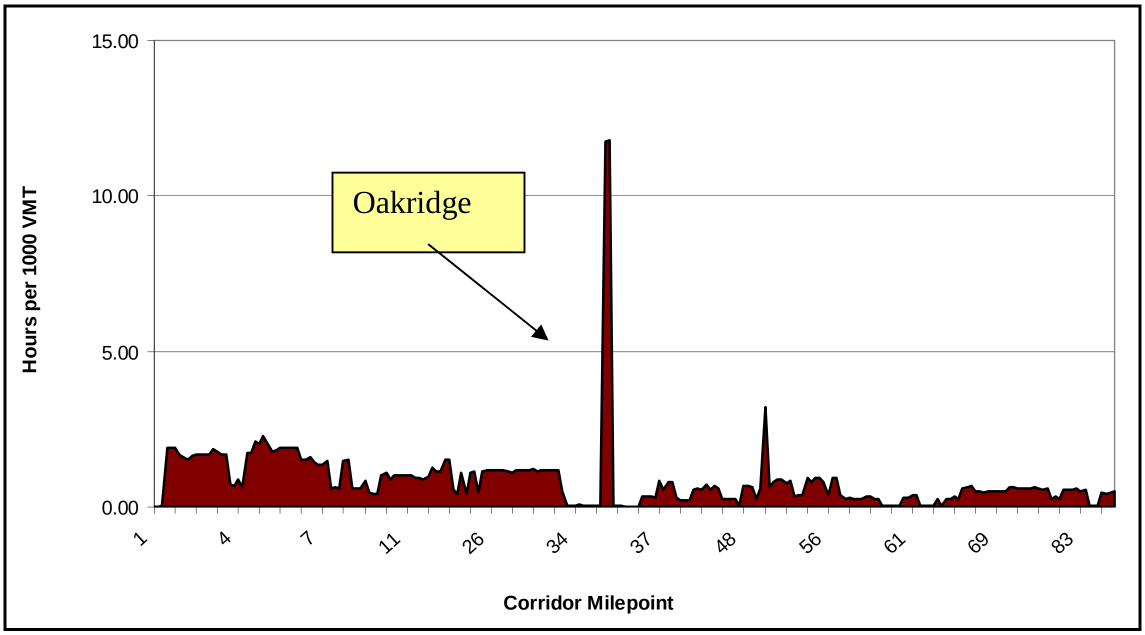


Figure 39. Annual Average Delay for All Vehicles -Hours per 1000 VMT

Table 30 presents a breakdown of corridor delay, where the majority of delay is caused by congestion.

Table 30. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural	0.01	0.07	0.82	0.90
Urban	0.00	0.33	1.05	1.38
Total Corridor	0.01	0.07	0.82	0.91
Share of Total	2%	8%	90%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of traffic volume.

5.5.5 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 40, Figure 41 and Figure 42 for the 2 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs make up the largest user cost for trucks, with rural segment 2 having 25 percent higher costs. Truck travel time costs are very similar for both segments of the corridor. Crash costs are relatively low compared to the other users' costs.

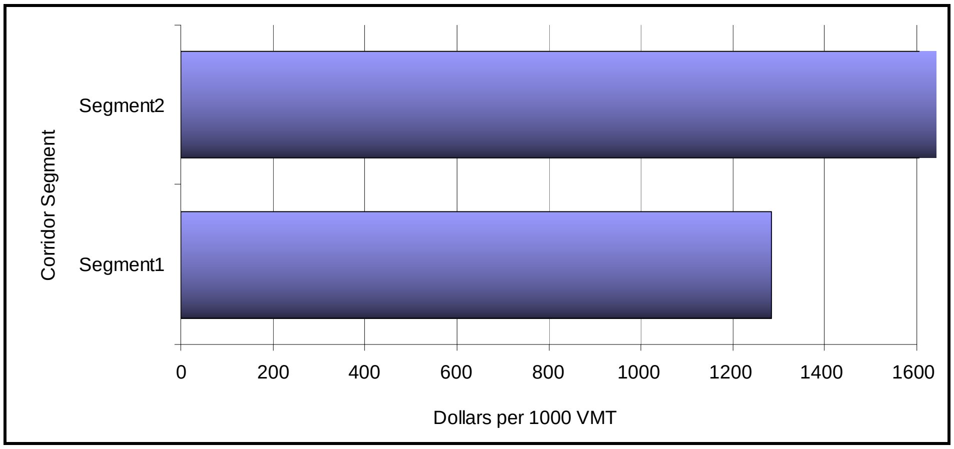


Figure 40. Eugene to US97 Corridor Average Truck Operating Costs

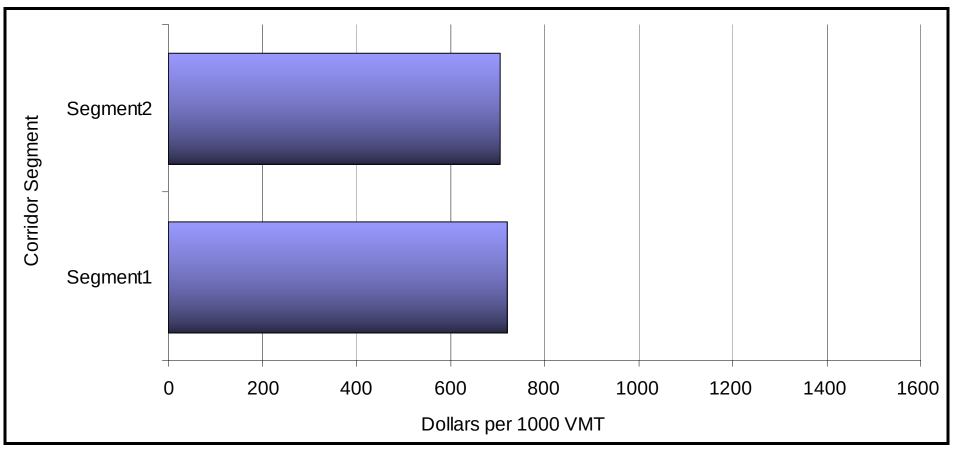


Figure 41. Eugene to US 97 Corridor Average Truck Travel Time Costs

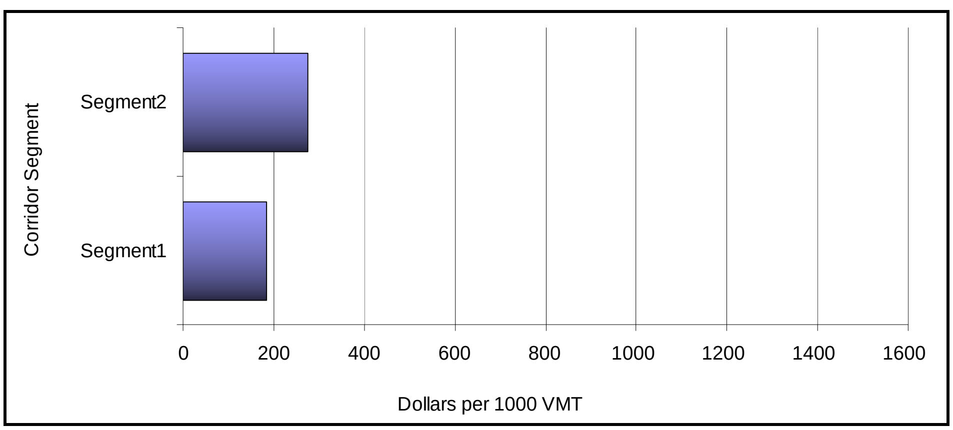


Figure 42. Eugene to US 97 Corridor Average Crash Costs – All Vehicles

Table 31 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up about 17 percent of total user costs. Travel time costs are about 36 percent for all vehicles. Vehicle operating costs make up about 47 percent of the total user costs. Heavy vehicle operating costs are much greater than light vehicles due to the geometric characteristics of the corridor.

Table 31. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**340**	**1650**	**660**	**47%**
Travel Time Costs	**440**	**680**	**500**	**36%**
Crash Costs*			**240**	**17%**
		TOTAL USER COSTS	**1400**	**100%**
* based on national data used in HERS-ST				

Table 32 presents additional crash information for this corridor. This corridor is a designated truck safety corridor. There were 72 crashes in this corridor in 2010. About 10 percent of them involved a truck. This corridor has a crash rate a little lower than the statewide rate for highways with the same functional classification. There are no SPIS sites that fall into the top ten percent list of state SPIS sites.

Table 32. Eugene to US 97 2010 Crash Statistics

Total Number of Crashes	72
Truck Involved Crashes (Percent Truck Involved)	7 (9.7%)
Corridor Crash Rate per 1 milllion VMT	0.50
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	240
Number of Top 10% SPIS Sites on Corridor	0
Truck Safety Corridor?	yes

5.6 Corridor Performance: OR22/US20 Salem to Bend

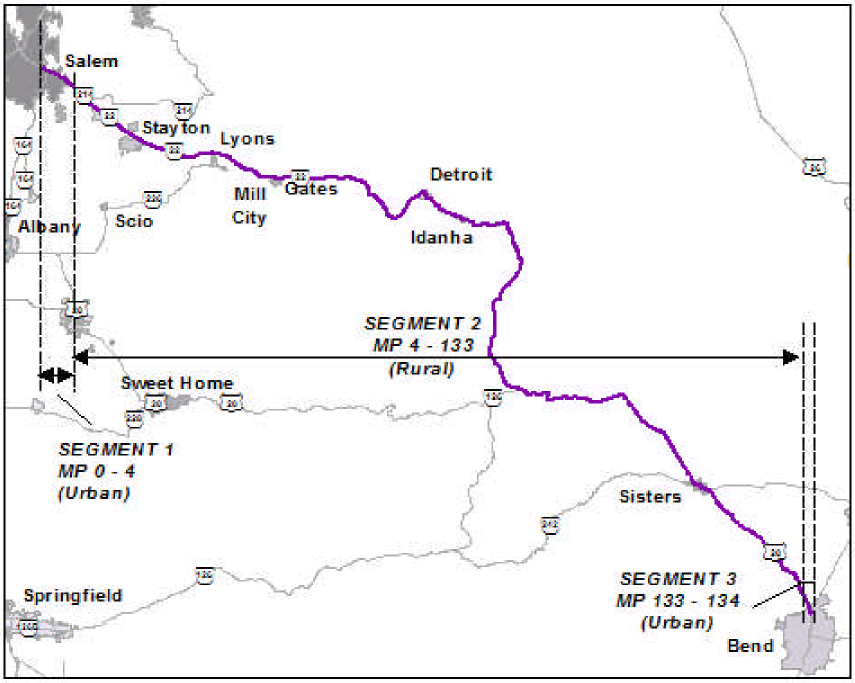


Figure 43. Segmented Map of Salem to Bend (OR 22/US 20)

5.6.1 Corridor Overview

Figure 43 illustrates the OR22/US20 corridor running between Salem and Bend. This corridor is 134 miles long and mostly rural with Salem at the west end and Bend at the east end. Average annual daily traffic ranges between 3,000 and 56,000 vehicles. On average, trucks represent 14 percent of daily traffic on the rural segment and 7 percent on the urban. Capacity issues are related to steep grade and curvature on two-lane segments.

5.6.2 Economic Characteristics

Figure 44 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value and weight, Forest Wood Products is the largest commodity group moving across this corridor, representing 8 percent by value and 10 percent by weight. The remaining groups represent less than 3 percent of all commodities moving along the 19 corridors.

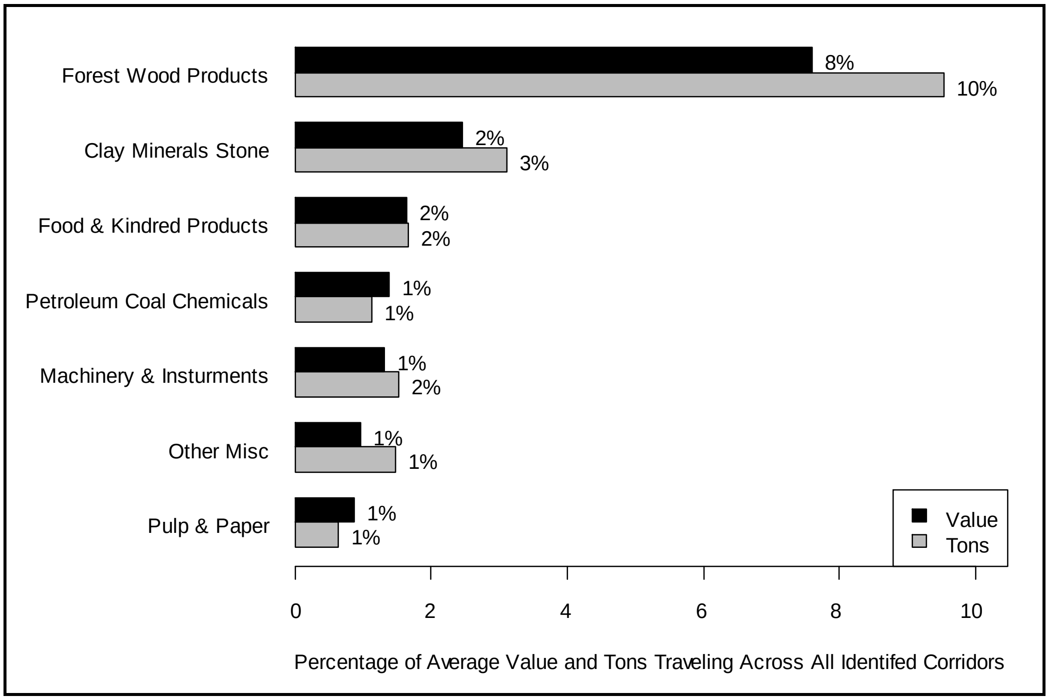


Figure 44. Salem to Bend Percent of Average Value and Tons

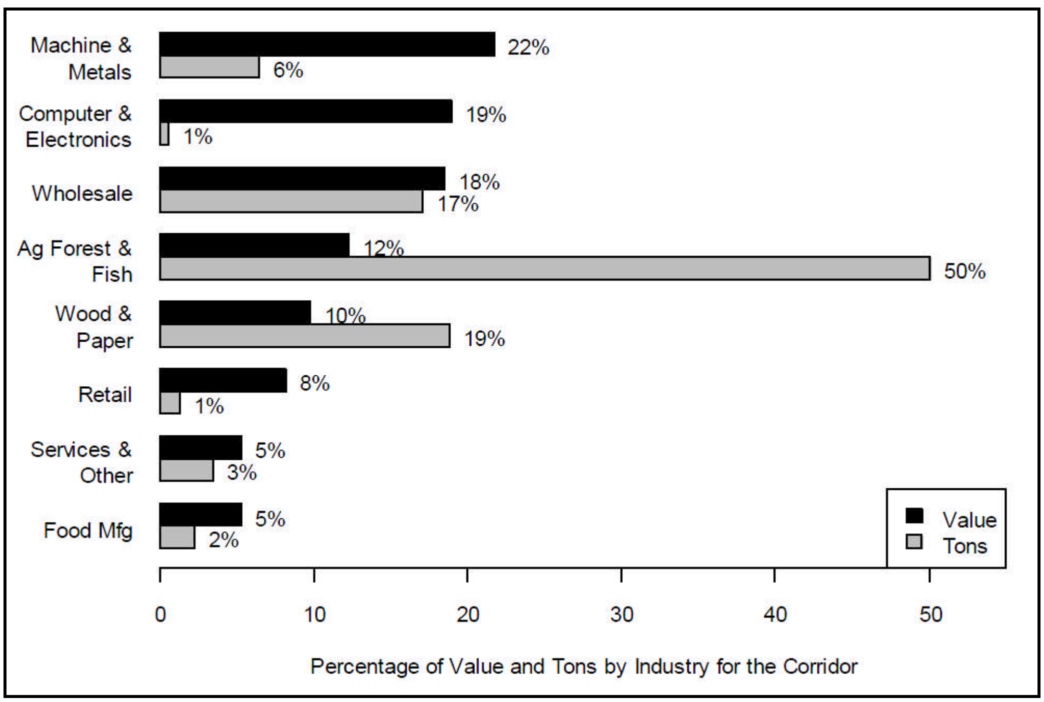


Figure 45. Salem to Bend Percentage of Value and Tons by Industry

Figure 45 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Machine & Metals; Computer & Electronics; and Wholesale Trade, representing between 18 and 22 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Wood & Paper; and Wholesale Trade, representing between 17 and 50 percent of industry use across this corridor.

5.6.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 46 illustrates the traffic volumes for this corridor. Traffic volumes are higher in the urban areas, highest in the Salem area. The segment in red about mile point 41 has 2 lanes, steep grade and significant curvature. This slows down trucks considerably and cars have no opportunity to pass, creating a chokepoint. The smaller red dot near the Linn and Jefferson County boundary represents a short section that drops from 3 lanes to 2 lanes and has curvature and grade causing a capacity issue when trucks are moving along slowly with no opportunity to pass, although this section is less than 1 mile long. Geometric traits like this are the cause of 17 percent of the corridor delay. Trucks make up about 14 percent of traffic on the rural segment of the corridor and 7 percent of the urban, as illustrated in Table 33.

Table 33. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	7%	8%
Segment 2	14%	14%
Segment 3	7%	7%

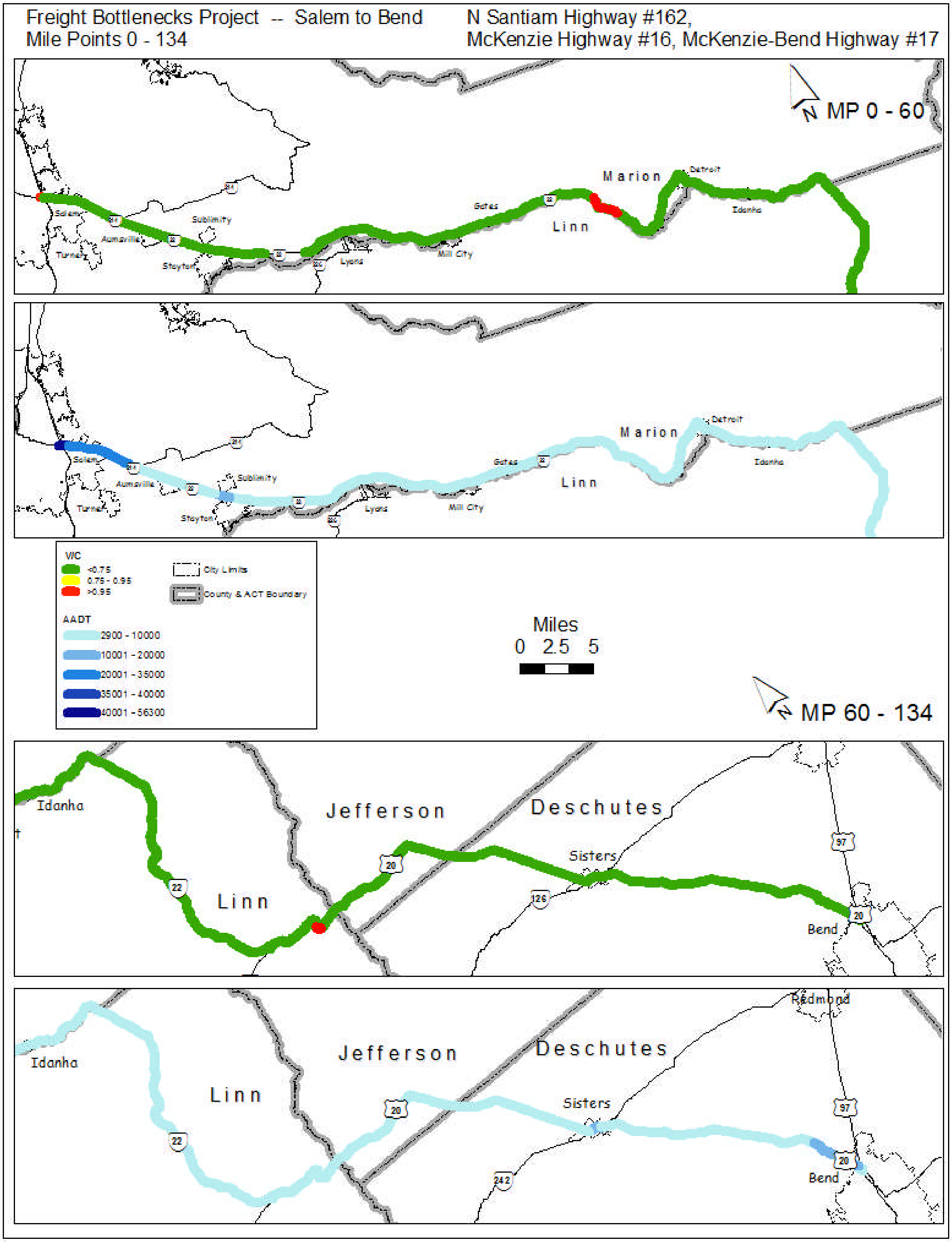


Figure 46. Freight Bottlenecks Project – Salem to Bend

5.6.4 Corridor Geometrics

Table 34. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	84%	9%	4%	3%	0%	0%	100%
Degree of Grade	0-.4%	.5-2.4%	2.5-4.4%	4.5-6.4%	6.5-8.4%	>8.5%	
Proportion of Miles	33%	41%	16%	11%	0%	0%	100%

Table 34 reports the corridor geometrics for curvature and grade. Sixteen percent of the corridor has curves greater than 3.5 degrees. Twenty-seven percent of the corridor has grades greater than 2.5 percent. Seventeen percent of corridor delay is attributed to roadway geometrics.

5.6.5 Corridor Delay and Reliability

Figure 47 presents the annual average hours of delay per 1000 vehicle miles traveled for all vehicles. Delay on this corridor predominantly occurs in the urban areas, Salem, Sisters and Bend. For the corridor overall, 75 percent of the delay is due to congestion and about 8 percent due to incidents. Roadway curvature and grade account for less than 20 percent of total delay. Table 35 presents the breakdown of corridor delay by source.

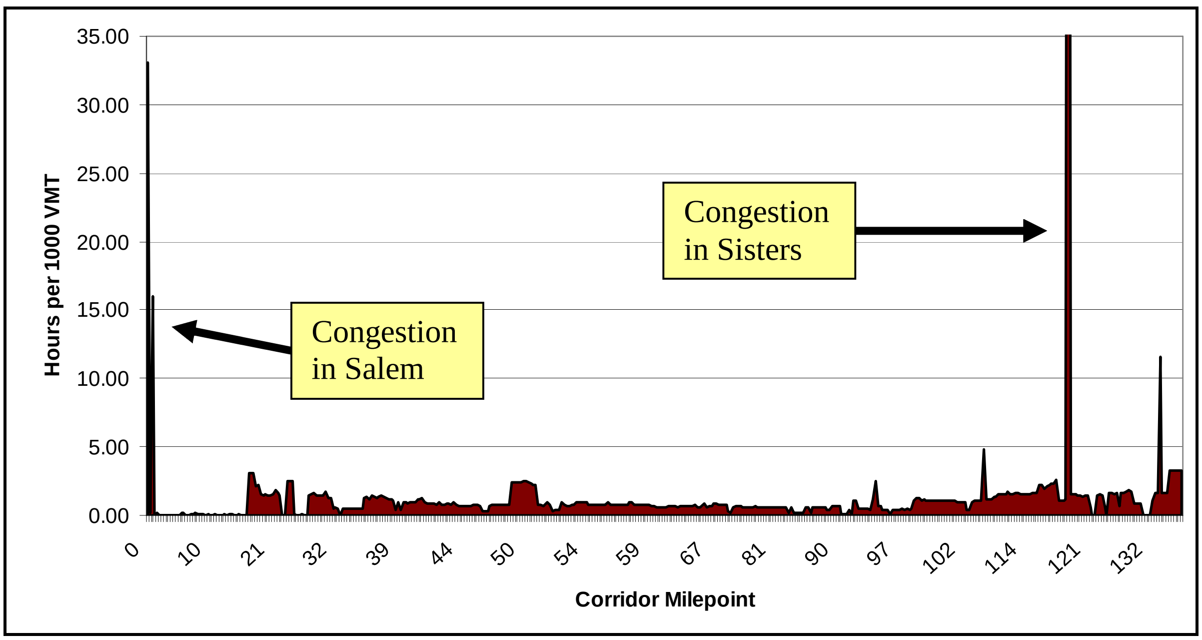


Figure 47. Annual Average Delay - Hours per 1000 VMT

Table 35. Corridor Reliability – Hours of Delay per 1000 VMT

	Zero Volume Delay*	**Incident Delay**	**Congestion Delay**	**Total Delay**
Rural (58 miles)	0.1	0.1	0.7	0.9
Urban (71 miles)	1.4	0.3	3.2	5.0
Total Corridor	0.2	0.1	1.0	1.3
Share of Total	17%	8%	75%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of the number of cars on the road.

5.6.6 User Costs

Truck operating costs, truck travel time costs and crash costs (all vehicles) are presented in Figure 48, Figure 49, and Figure 50 for the 3 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side.

Travel time costs are very similar across all three corridor segments. This is not the case for truck operating costs. Segment 1, within the Salem area, has the highest truck operating costs of all 3 segments. This is a highly congested area with 8 percent truck share of traffic. Segment 3, also an urban segment within the Bend area, has the lowest truck operating costs of the 3 segments. Segment 2 truck operating costs are more than double the travel time costs. These patterns are consistent with the characteristics of the highway where grade and curvature affect performance on the rural portion and congestion affects the urban portions. Crash costs are relatively low compared to the other users' costs.

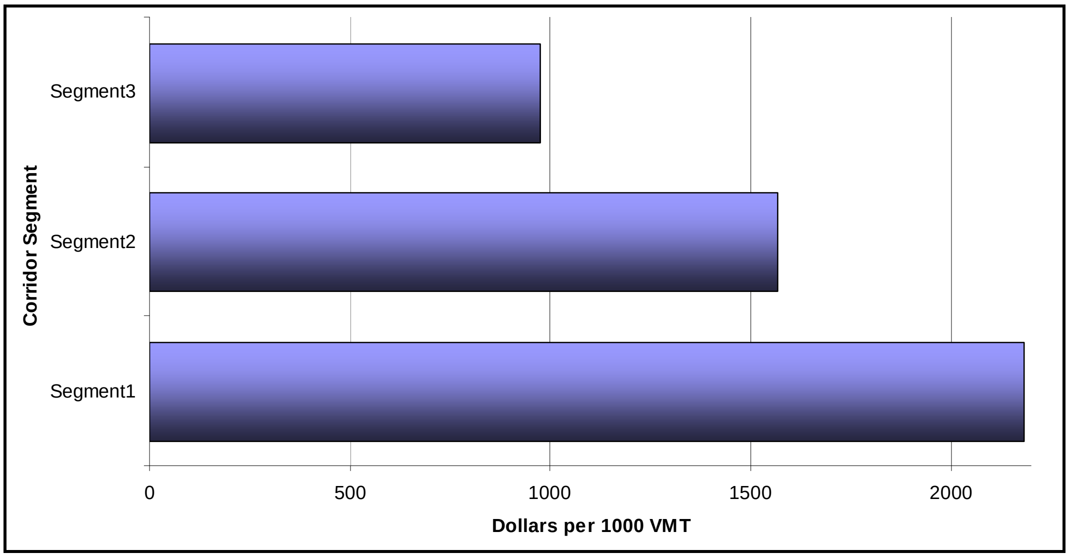


Figure 48. Salem to Bend Corridor Average Truck Operating Costs

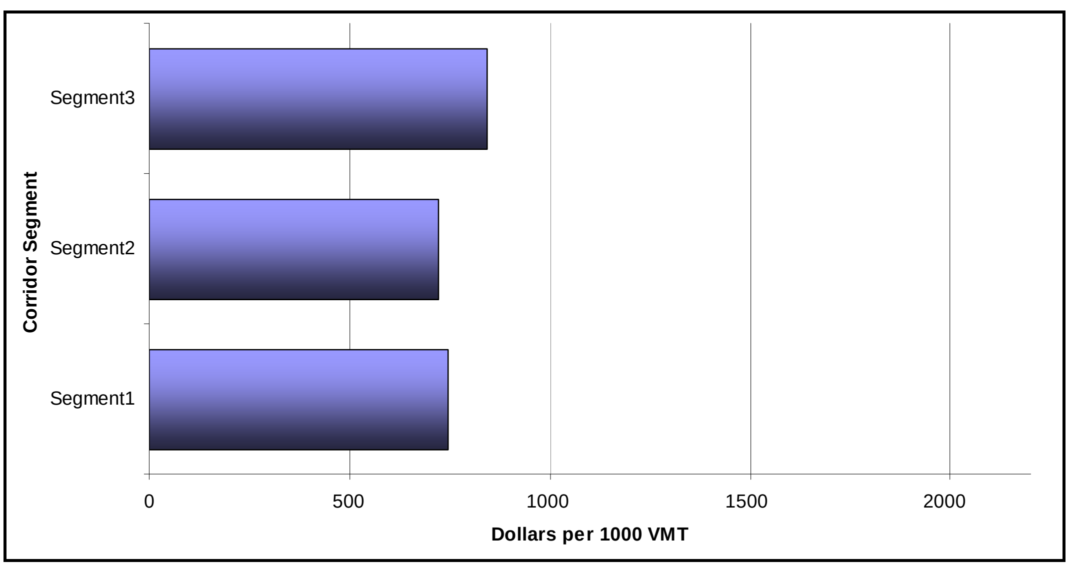


Figure 49. Salem to Bend Corridor Average Truck Travel Time Costs

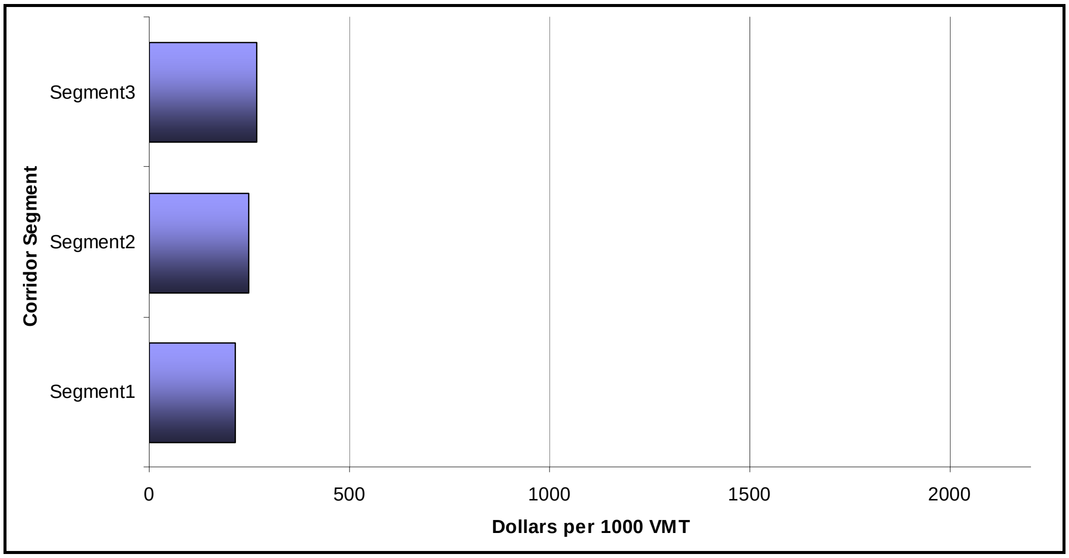


Figure 50. Salem to bend Corridor Average Crash Costs - All Vehicles

Table 36 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up about 18 percent of total user costs. Travel time costs are 40 percent of total user costs for all vehicles. Vehicle operating costs make up about 42 percent of the total user costs. Note that heavy vehicle operating costs are more than 4 times larger than light vehicles due to the geometric characteristics of the corridor.

Table 36. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**359**	**1491**	**504**	**42%**
Travel Time Costs	**444**	**677**	**474**	**40%**
Crash Costs*			**219**	**18%**
		TOTAL USER COSTS	**1197**	**100%**
* based on national data used in HERS-ST				

Table 37 presents additional crash information for this corridor. There were 259 crashes in this corridor in 2010. About 4 percent of them involved a truck. This corridor has a crash rate very close to the statewide rate for highways with the same functional classification. Delay caused by incidents is fairly low (8%). There are seven SPIS sites on this corridor that fall into the top 10 percent list of state SPIS sites.

Table 37. Salem to Bend 2010 Crash Statistics

Total Number of Crashes	259
Truck Involved Crashes (Percent Truck Involved)	9 (3.5%)
Corridor Crash Rate per 1 milllion VMT	0.73
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	220
Number of Top 10% SPIS Sites on Corridor	5
Truck Safety Corridor?	yes

5.7 Corridor Performance: US 26 from Portland to Madras (US97)

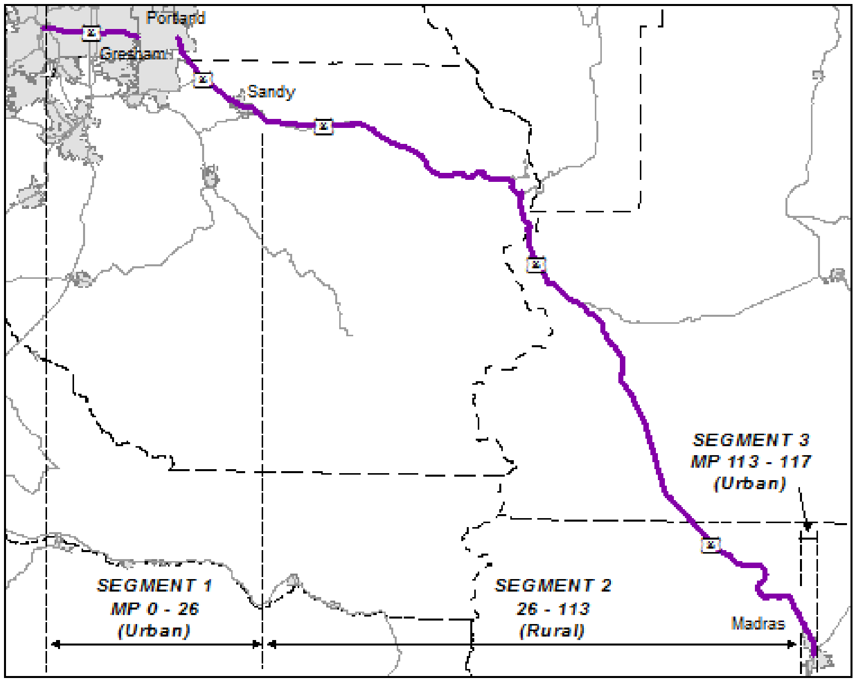


Figure 51. Segmented Map of US 26 Portland to Madras (US 97)

5.7.1 Corridor Overview

This section of US 26 extends between the City of Portland and the City of Madras. It consists of 2 ODOT highways, 26 and 53. The corridor is split into 3 segments for reporting purposes, as illustrated in Figure 51. Segments 1 and 3 are urban and Segment 2 is rural. The corridor is 117 miles long and serves the metropolitan area east of Portland, connecting the communities of Sandy, Government Camp, Warm Springs and Madras. This corridor is a primary link between Portland and US 97.

Average daily traffic volumes on the highway range from about 3,000 to 36,000 vehicles. Trucks comprise 5 to 25 percent of the traffic volume. The urban segment through Portland and Gresham is dominated by light vehicles and experiences congested traffic operations.

5.7.2 Economic Characteristics

Figure 52 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along the 19 bottleneck corridors. Flows are reported by value and weight for each commodity group. In terms of value, Clay, Minerals and Stone; Forest Wood Products; and Pulp & Paper are the largest commodity groups, moving 4 percent of the total commodity movement across all 19 bottleneck corridors. In terms of weight, Clay, Minerals and Stone; Other Misc.; and Forest Wood Products are the top 3 groups for this corridor, representing 4 to 5 percent of the commodity movement across all 19 bottleneck corridors.

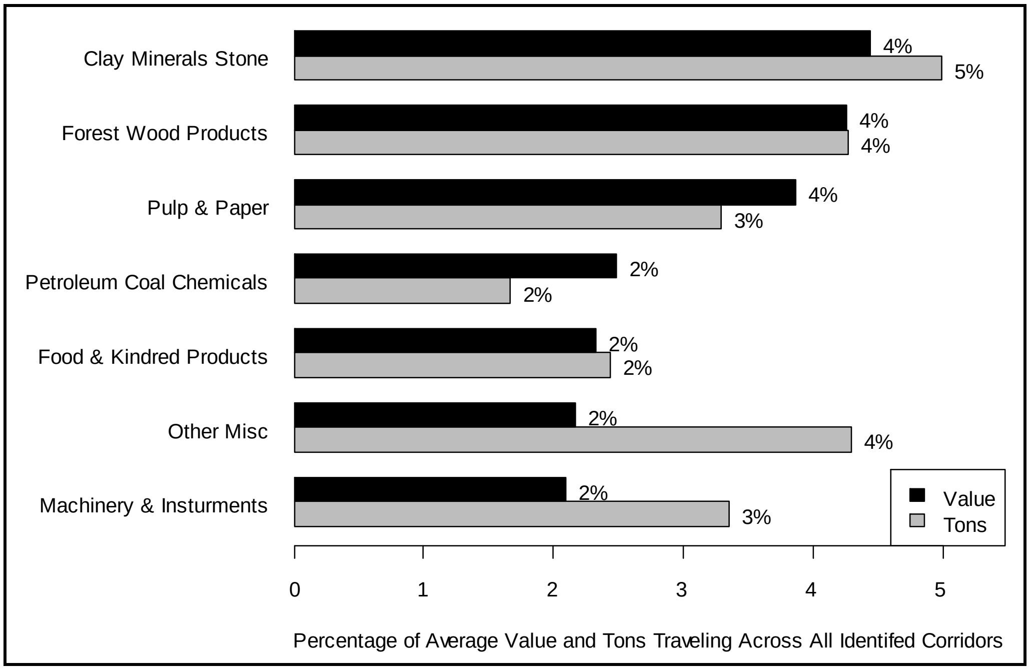


Figure 52. Portland to Madras Percentage of Average Value and Tons

Figure 53 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Wholesale Trade; Computer & Electronics; and Machine & Metals representing between 19 and 24 percent of industry use along this corridor. In terms of weight, the top 3 industries are Machine & Metals, Ag Forest & Fish, and Wholesale Trade representing between 17 and 33 percent of industry use along this corridor.

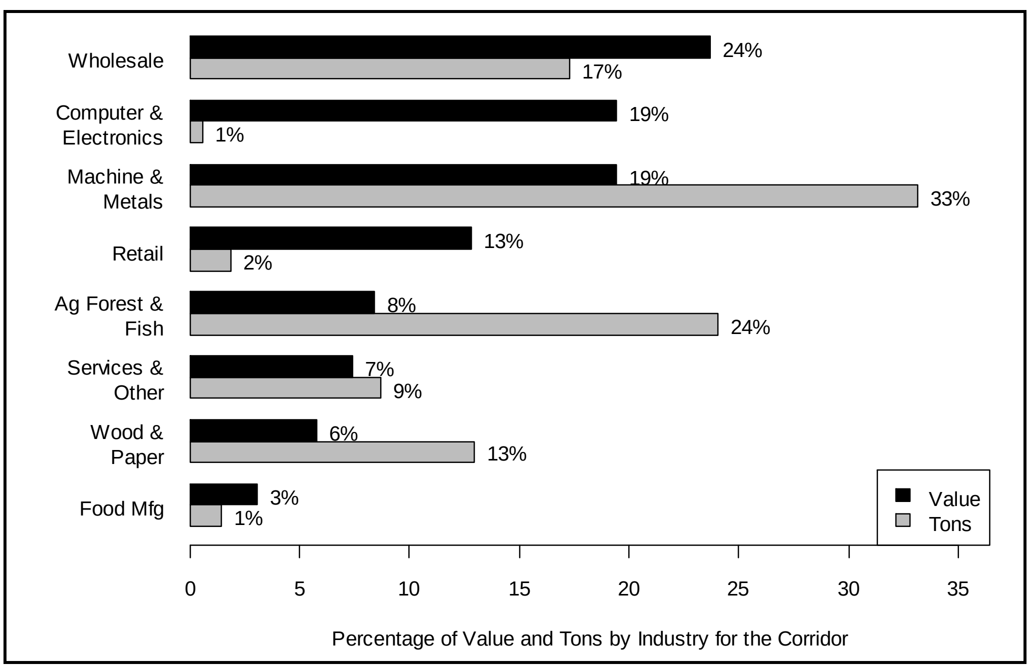


Figure 53. Portland to Madras Percentage of Value and Tons by Industry

5.7.3 Corridor Performance

Corridor performance metrics are presented for several areas of performance, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 54 illustrates corridor volume to capacity ratios and average annual daily traffic. The first 25 miles of the corridor has portions where traffic volumes approach the limit of highway capacity. These segments are indicated in red. Nearby segments are approaching the point when capacity limitations affect speed, segments indicated in yellow. Most of the capacity issues occur on the urban section of the corridor, through Portland, Gresham and Sandy[5]. One other segment has a capacity issue in the vicinity of the OR 216 intersection. The cause of this issue is not self-evident looking at volumes alone, but would be revealed through more detailed traffic analysis.

[5] The missing segment is not a state-owned facility, therefore ODOT does not have performance data for this segment.

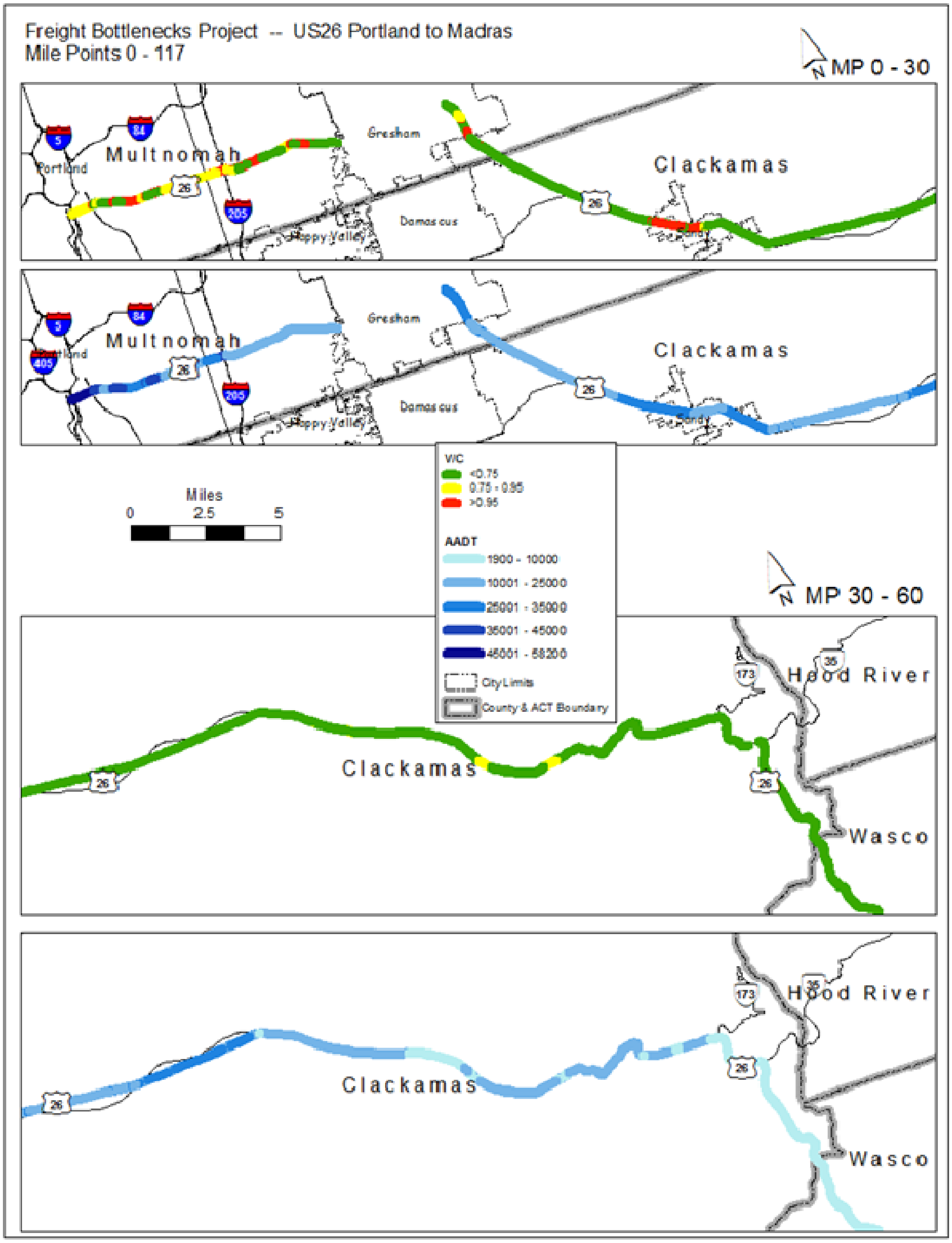


Figure 54. Freight Bottlenecks Project - US 26 Portland to Madras

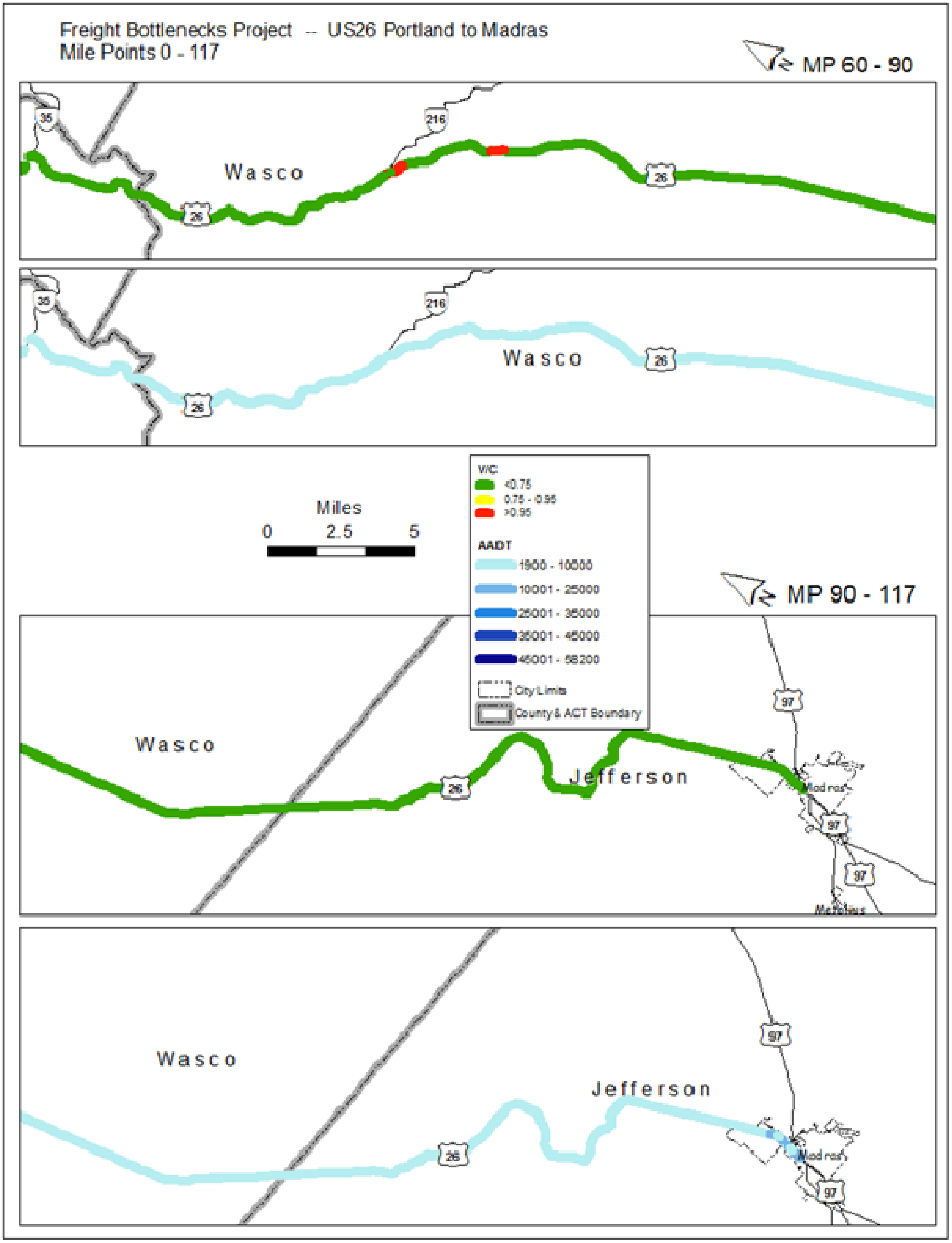


Figure 54 Freight Bottlenecks Project - US 26 Portland to Madras Continued

Truck traffic makes up a sizeable portion of movement on this corridor, as illustrated in Table 38. A 5 percent share of truck traffic in the urban portion of this highway is relatively large. The truck share is over 20 percent on the rural portion and drops down a bit in the Madras urban area.

Table 38. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	5 %	5%
Segment 2	23%	21%
Segment 3	16%	14%

5.7.4 Corridor Geometrics

The role of roadway geometric characteristics is significant for this corridor. Table 39 presents the proportion of corridor miles by curvature and grade categories. Over one third of the length of this corridor has grade greater than 2.5%, which affects truck speed and operating costs. Over 30 percent of the corridor delay is attributed to roadway geometrics.

Table 39. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**85%**	**7%**	**7%**	**1%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**15%**	**48%**	**18%**	**19%**	**0%**	**0%**	**100%**

5.7.5 Corridor Delay and Reliability

Figure 55 presents the average annual hours of delay per 1,000 vehicle miles traveled along this corridor. As seen previously, traffic volumes are highest in the Portland-Gresham-Sandy portion of this corridor with close to maximum capacity utilization in some areas. As a result, speeds are less than posted speeds and travel time through the corridor is reduced. Sections of the corridor with bottleneck issues, such as dropped lanes, interchanges, intersections, signal timing, narrow lanes, and geometric constraints; can cause spikes in delay along the corridor.

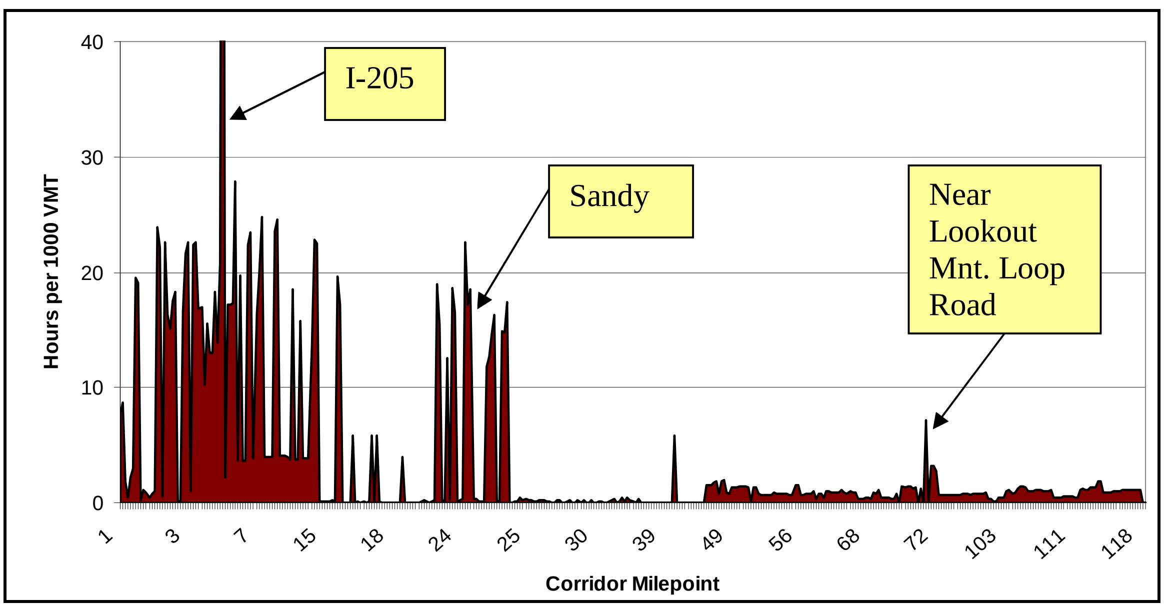


Figure 55. Annual Average Delay for All Vehilcles - Hours per 1000 VMT

Table 40 presents a breakout of delay for this corridor. Over half of the delay is due to capacity constraints, while just over 10 percent is due to traffic incidents.

Table 40. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural (92 miles)	0.0	0.1	0.4	0.5
Urban (20miles)	3.2	1.0	4.3	8.4
Total Corridor	1.1	0.4	1.8	3.3
Share of Total	34%	12%	54%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of traffic volume.

5.7.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 56, Figure 57 and Figure 58 for the 2 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Segment 1 is the urban segment of the corridor in the Portland/Gresham/Sandy area. Truck operating costs are higher in the other two corridor segments due to the increased grade. Even relatively low level grade significantly decreases fuel efficiency of heavy trucks and results in higher operating costs.

Travel time costs for trucks in the Portland-Gresham-Sandy vicinity are close to the same as truck operating costs, while the rural section of the highway's travel time costs are less than half the operating costs. The nature of these costs demonstrates the need for more refined traffic analysis in order to determine viable strategies to resolve bottleneck conditions.

Crash costs are based on national data and include the cost of fatalities, injuries, and property damage. The crash costs per 1000 VMT are similar across the three sections of the corridor. Total corridor user costs are the sum of the three cost categories – operating, travel time and crash for all vehicles. For this corridor, crash costs represent the smallest portion of user costs.

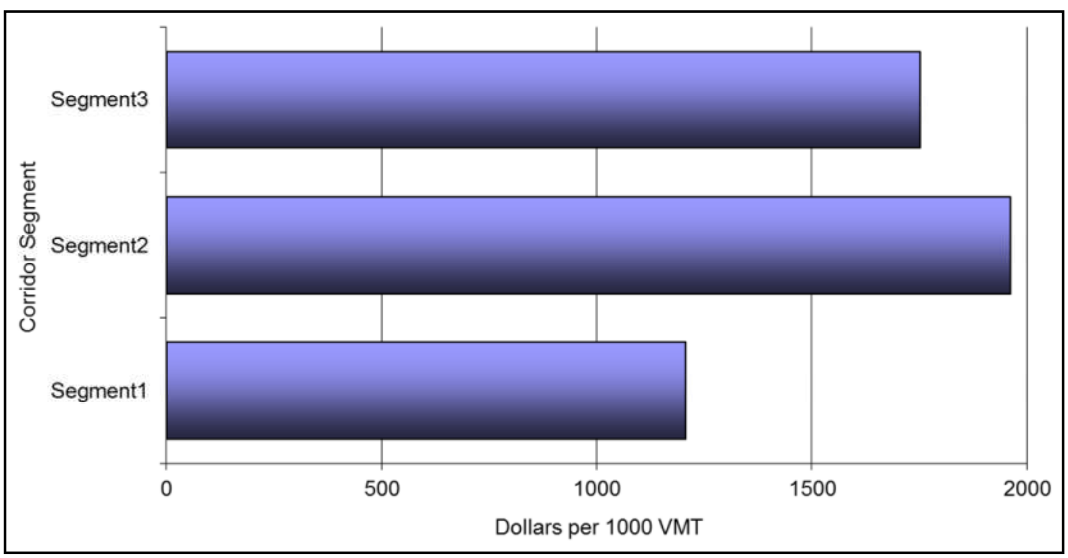


Figure 56. Portland to Madras Corridor Average Truck Operating Costs

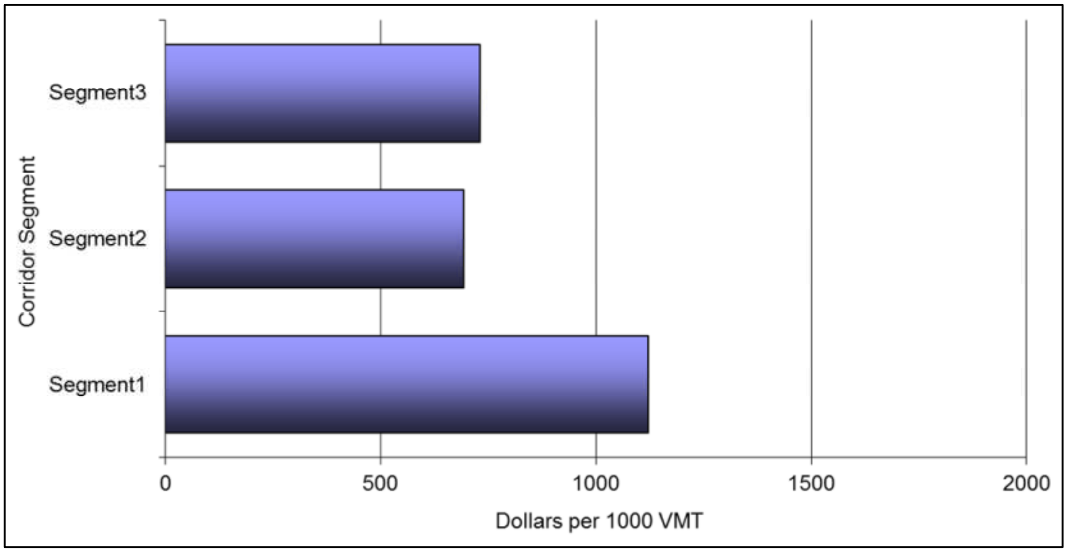


Figure 57. Portland to Madras Corridor Average Truck Travel Time Costs

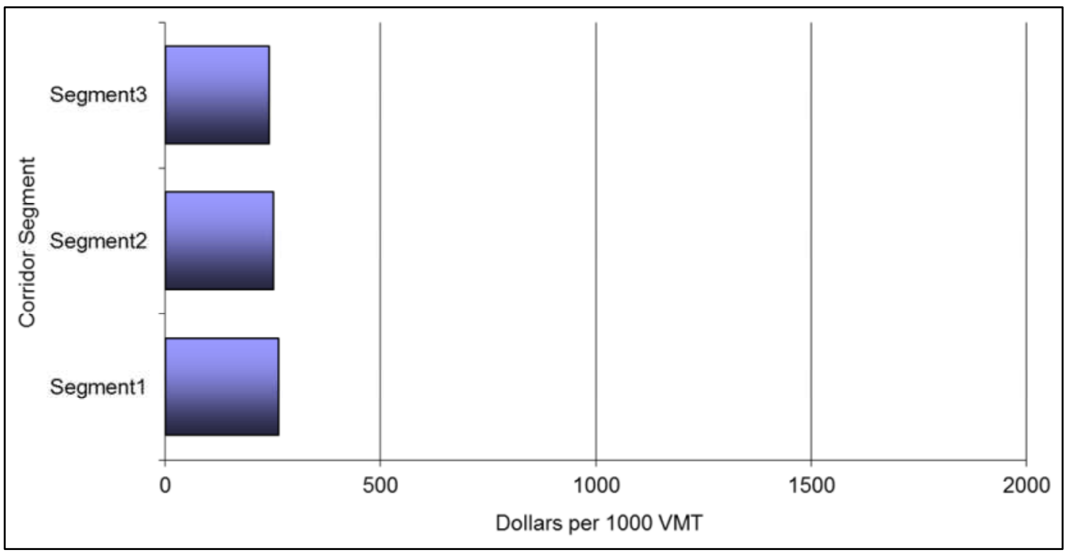


Figure 58. Portland to Madras Corridor Average Crash Costst - All Vehicles

Table 41 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up about 18 percent of the corridor user costs, while travel time and operating costs are over 40 percent of total user costs. When costs are split out by vehicle type, it is clear costs associated with time are considerably less than the vehicle operating costs for trucks and more for light vehicles.

Table 41.Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**380**	**1823**	**599**	**42%**
Travel Time Costs	**557**	**731**	**583**	**41%**
Crash Costs*			**254**	**18%**
		TOTAL USER COSTS	**1436**	**100%**
* based on national data used in HERS-ST				

Table 42 presents additional crash information for this corridor. There were over 700 crashes in this corridor in 2010. Less than 3 percent of them were truck-involved. This corridor has a crash rate higher than the statewide rate for highways with the same functional classification. However, estimated delay caused by incidents is about 12%, relatively low compared to the delay caused by geometrics and high traffic volumes.

Table 42. Portland to Madras 2010 Crash Statistics

Total Number of Crashes	747
Truck Involved Crashes (Percent Truck Involved)	19 (2.5%)
Corridor Crash Rate per 1 milllion VMT	1.02
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	250
Number of Top 10% SPIS Sites on Corridor	52
Truck Safety Corridor?	no

5.8 Corridor Performance: US 97 Washington to California Borders

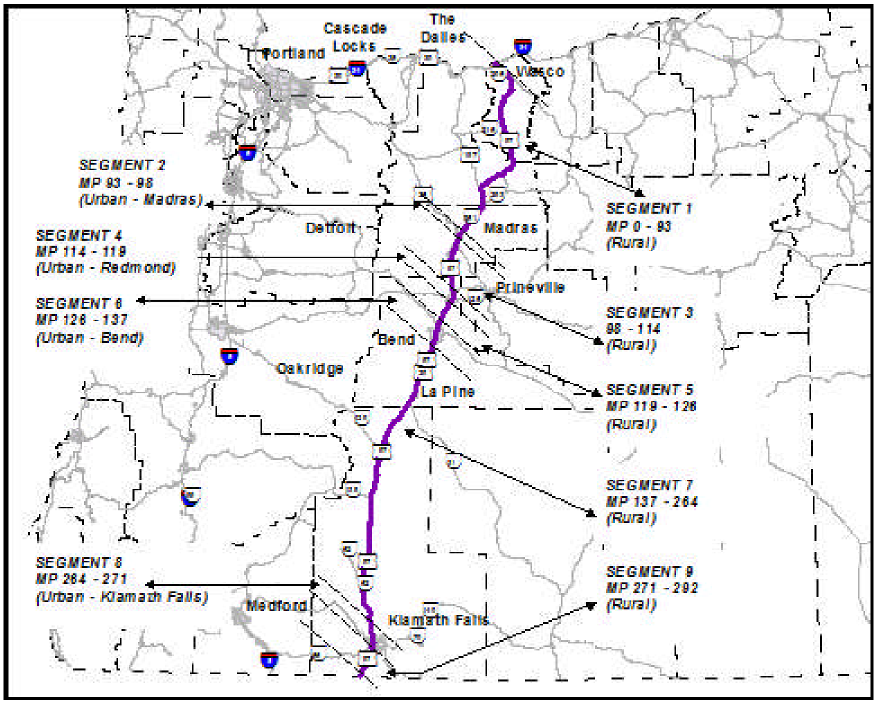


Figure 59. Segmented Map of US 97 Washington to California Borders

5.8.1 Corridor Overview

Figure 59 illustrates the US97 corridor running from the north at the Oregon/Washington State border to the south at the Oregon/California border running east of the Oregon Cascade range. This corridor is composed of two ODOT highways: highway 42 from the Washington border for the first 67 miles and the remainder is highway 4. This highway corridor is 292 miles long and mostly rural. Average annual daily traffic ranges between 4,000 and 28,000 vehicles. Truck share of traffic ranges from 8 to 40 percent of daily traffic. Ten percent of the US97 corridor is classified as urban highway, which experiences relatively small levels of congestion and do not appear to have persistent capacity issues.

5.8.2 Economic Characteristics

Figure 60 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, Other Misc.; Food & Kindred Products; and Machinery & Instruments are the top three largest commodity groups, representing between 6 to 11 percent of the total flows across all 19 bottleneck corridors. In terms of weight, Food & Kindred Products; Petroleum, Coal & Chemicals; and Other Misc. are the top three commodity groups, representing between 7 to 10 percent of the total flows across the bottleneck corridors.

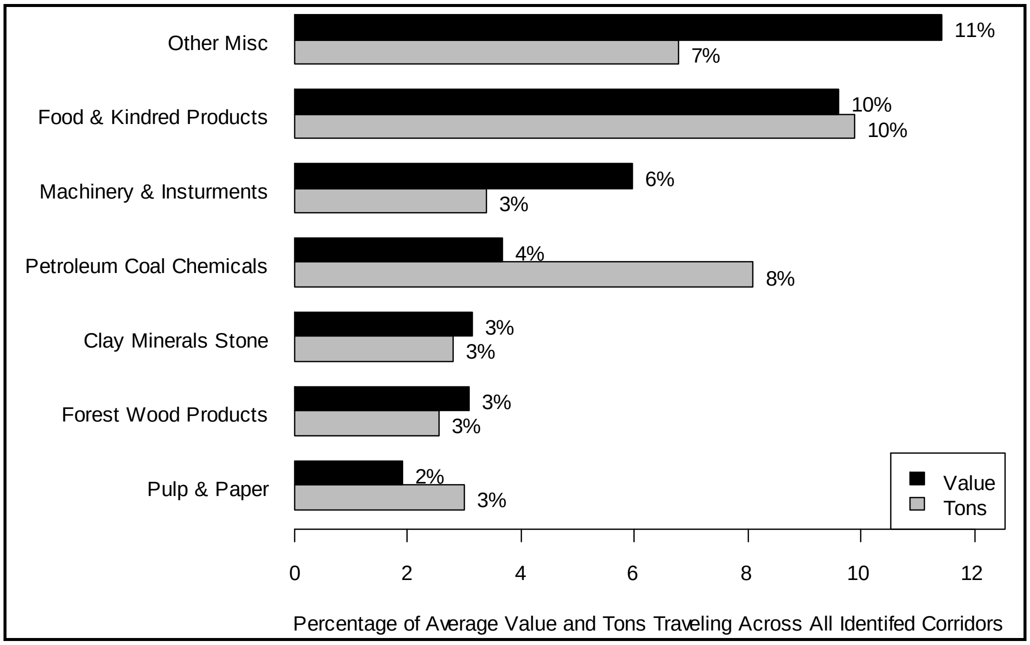


Figure 60. Washington to California (US97) Percentage of Average Value and Tons

Figure 61 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 4 industries using this corridor are Wholesale Trade; Machine & Metals; Food Manufacturing; and Ag Forestry & Fish, representing between 15 and 24 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Machine & Metals; and Wholesale Trade; ranging from 19 to 33 percent of industry use across this corridor.

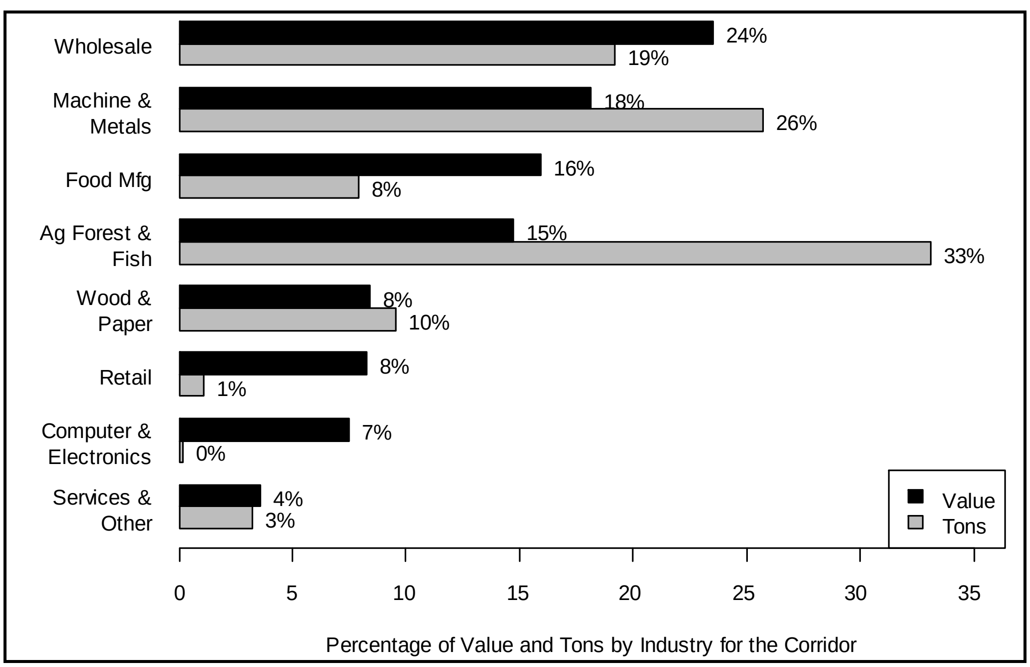


Figure 61. Washington to California (US97) Percentage of Value and Tons by Industry

5.8.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure illustrates the traffic volumes for this corridor. Volumes are not consistently approaching capacity at specific points on the corridor, with the exception of one segment within the Redmond city limits. Traffic volumes are highest near and within the urban areas of Madras, Redmond, Bend and Klamath Falls.

Table 43 reveals the variation in truck share of traffic on this corridor.

Table 43. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	**Daily Vehicle Miles Traveled (Share of VMT)**
Segment 1	40%	40%
Segment 2 (Madras)	16%	16%
Segment 3	15%	15%
Segment 4 (Redmond)	23%	19%
Segment 5	9%	9%
Segment 6 (Bend)	8%	9%
Segment 7	22%	26%
Segment 8 (Klamath Falls)	28%	28%
Segment 9	38%	38%

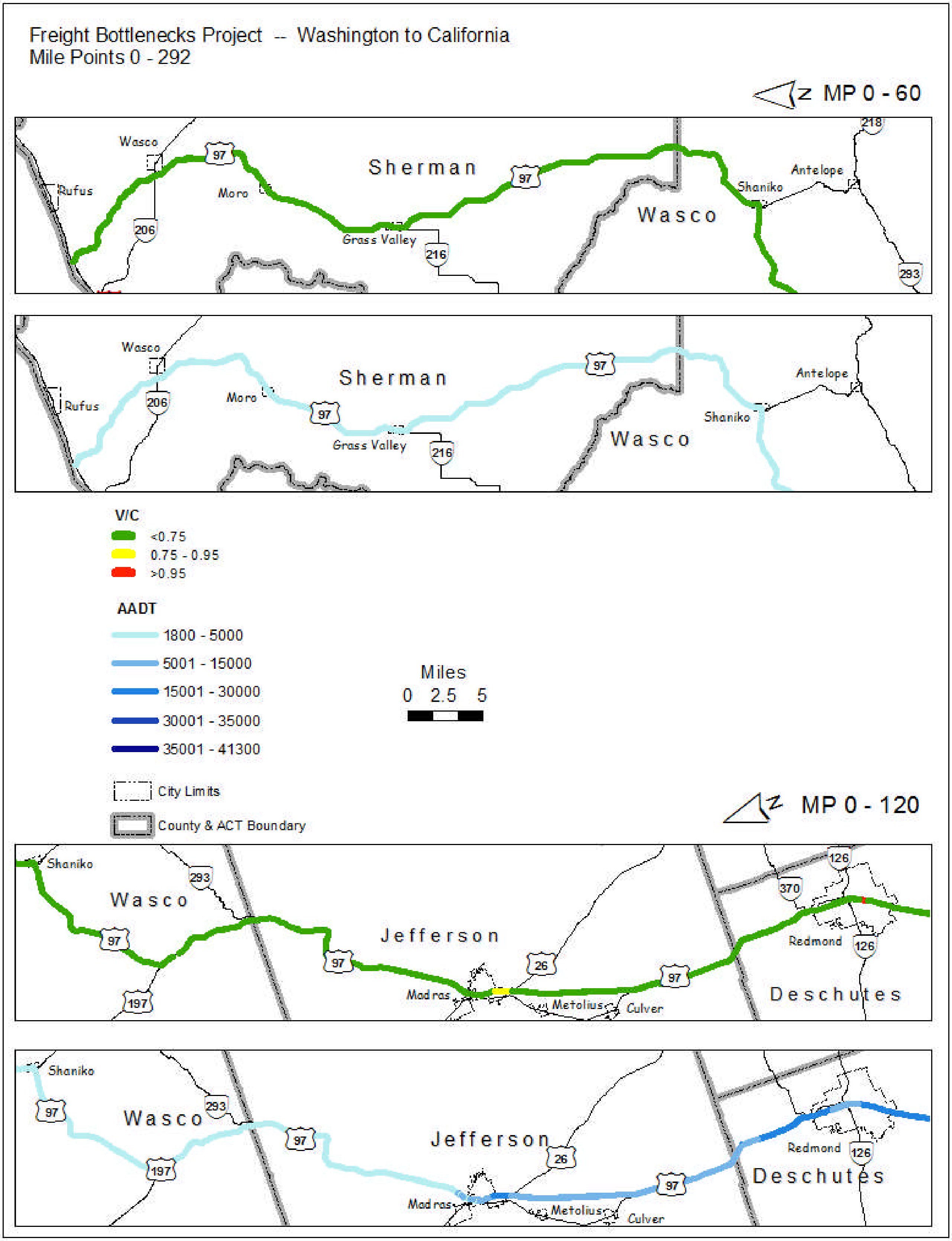


Figure 62. Freight Bottlenecks Project – Washington to California

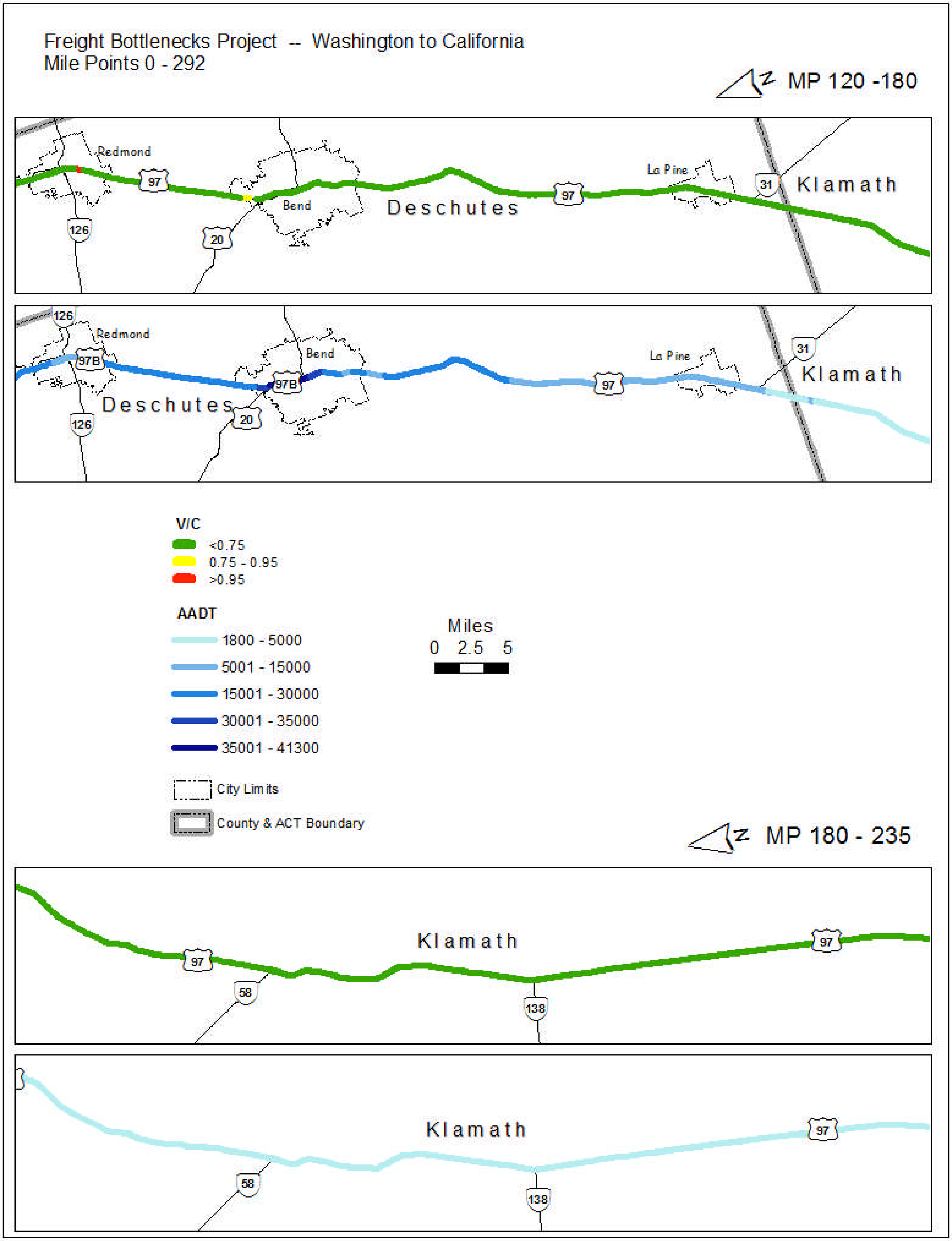


Figure 62. Freight Bottlenecks Project – Washington to California (Continued)

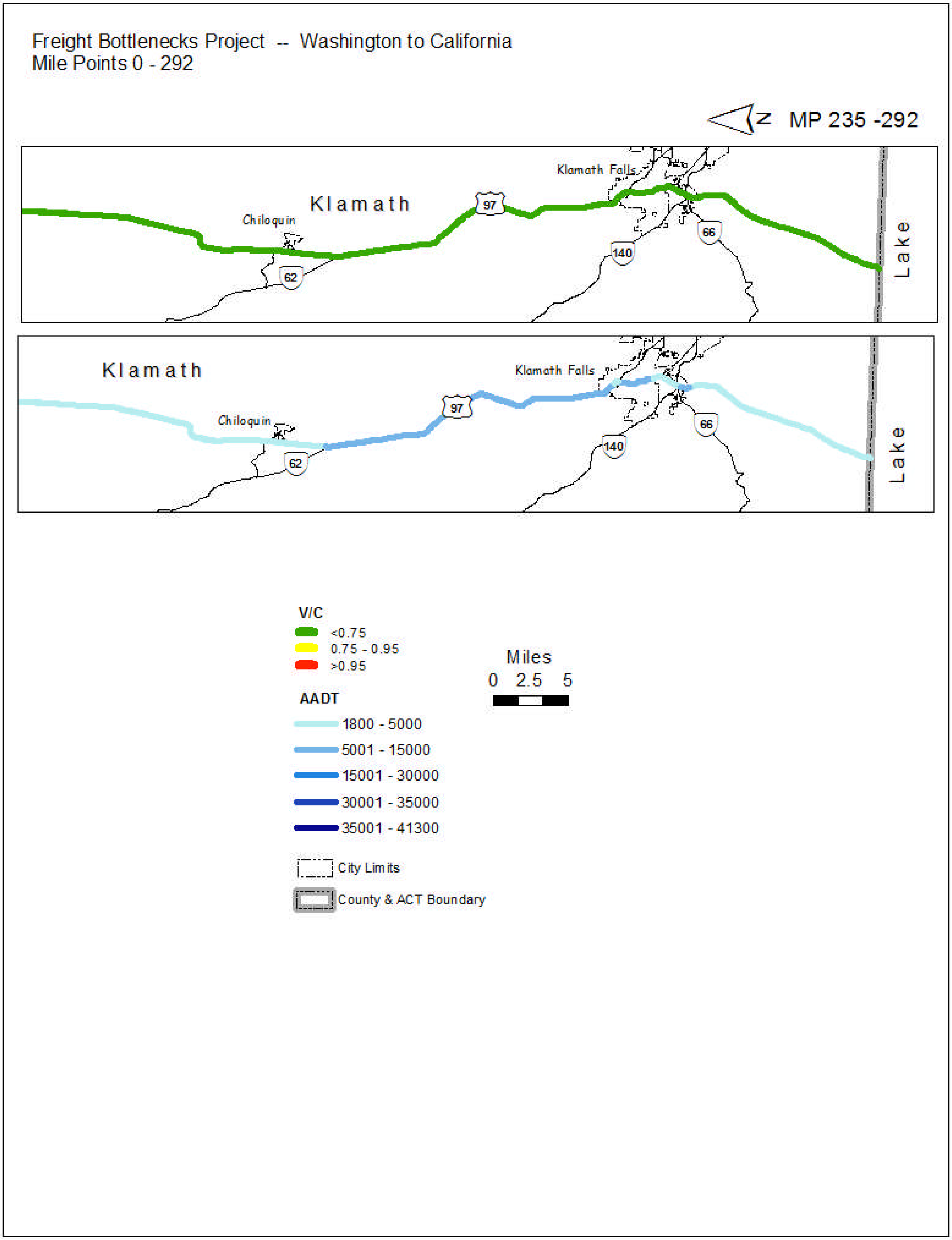


Figure 62. Freight Bottlenecks Project – Washington to California (Continued)

5.8.4 Corridor Geometrics

Table 44 reports the corridor geometrics for curvature and grade. There is very little curvature over 3.4 degrees. Nearly 20 percent of the corridor has grades greater than 2.5 percent. Over 20 percent of corridor delay is attributed to roadway geometrics.

Table 44. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**95%**	**3%**	**1%**	**0%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**43%**	**39%**	**11%**	**7%**	**0%**	**0%**	**100%**

5.8.5 Corridor Delay and Reliability

Figure 63 presents the annual average hours of delay per 1000 vehicle miles traveled. The locations with the most delay are in urban areas and sections with grade. For the corridor overall, about 70 percent of delay is due to congestion, about 8 percent due to incidents. Roadway curvature and grade account for about 22 percent of total delay. Table 45 presents the breakdown of corridor delay.

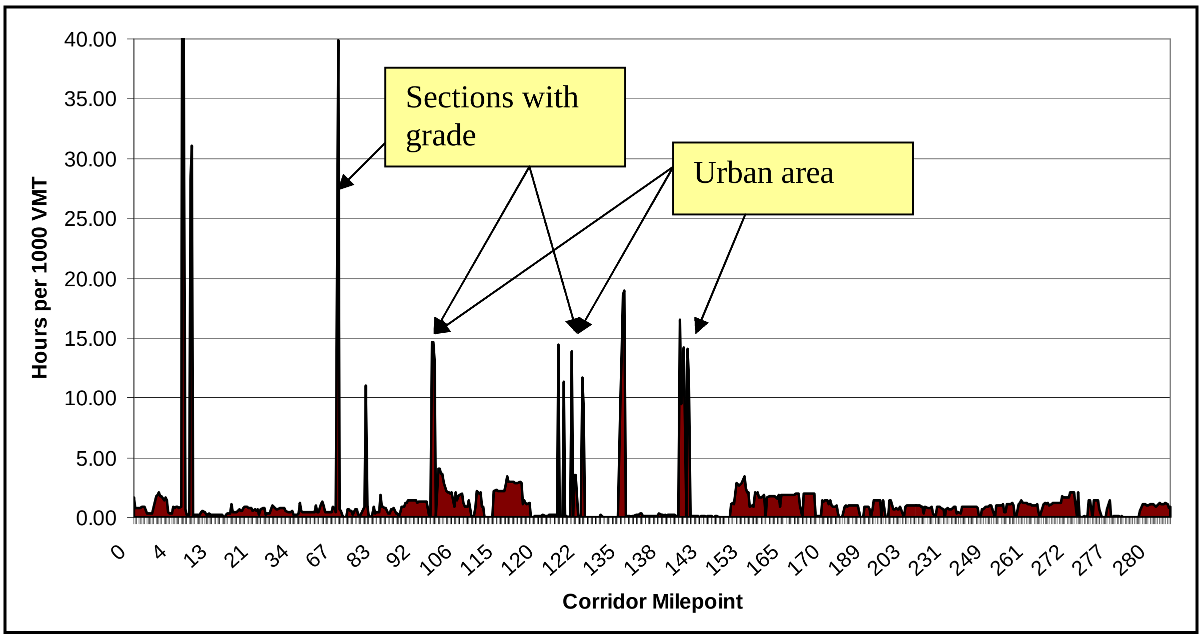


Figure 63. Annual Average Delay for All Vehicles - Hours per 1000 VMT

Table 45. Corridor Reliability - Hours of Delay per 1000 VMT

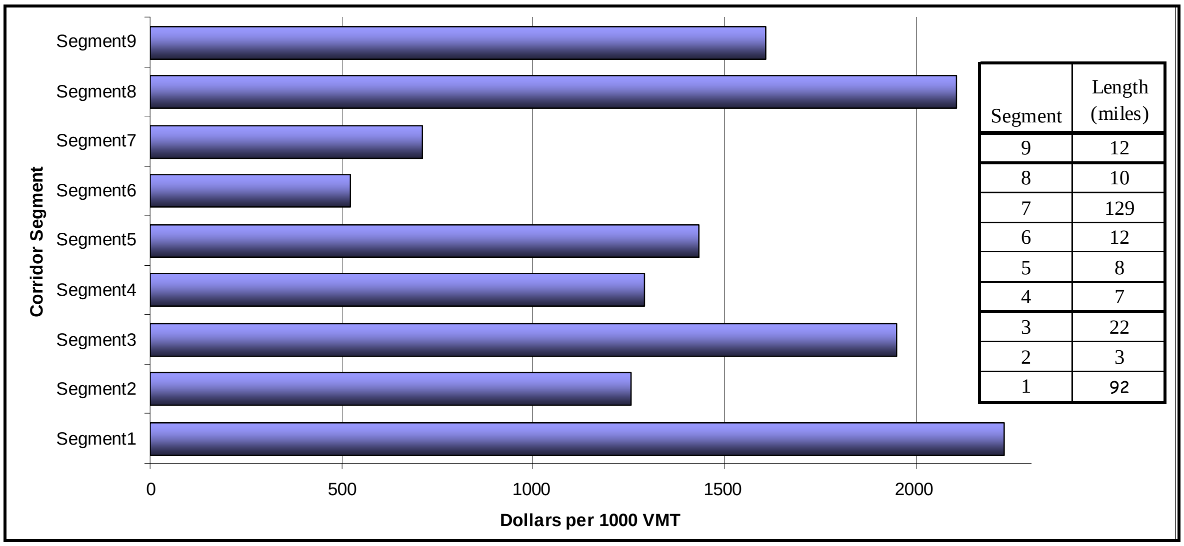
	Zero Volume Delay*	**Incident Delay**	**Congestion Delay**	**Total Delay**
Rural	0.1	0.1	0.8	0.9
Urban	0.9	0.2	1.1	2.2
Total Corridor	0.3	0.1	0.9	1.3
Share of Total	22%	8%	70%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of the number of cars on the road.

5.8.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 64, Figure 65 and Figure 66 for all 9 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Segments 2, 4, 6 and 8 are urban segments and relatively short. Truck operating costs are lower in the urban areas, than the with the exception of Segment 8 (Klamath Falls) which has some grade and curvature. The rural operating costs vary quite a bit. These patterns are consistent with the characteristics of the highway where grade and curvature affect performance. Congestion has very little bearing on the operating costs within this corridor.

Travel time costs are a smaller component of total user costs. They do not vary among the segments too much, with the higher levels generally associated with the urban areas. Crash costs are relatively low compared to the other users' costs. Higher crash costs are associated with the rural segments of the corridor.



Segment	Length (miles)
9	12
8	10
7	129
6	12
5	8
4	7
3	22
2	3
1	92

Figure 64. Washington to California (US97) Average Truck Operating Costs

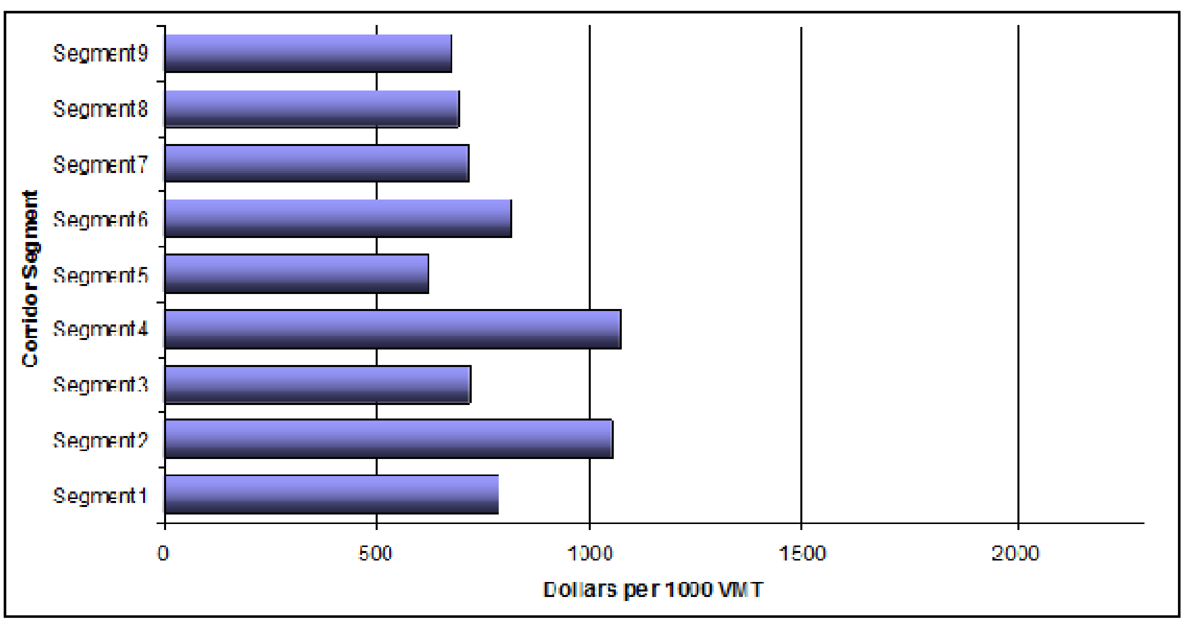


Figure 65. Washington to California (US97) Average Truck Travel Time Costs

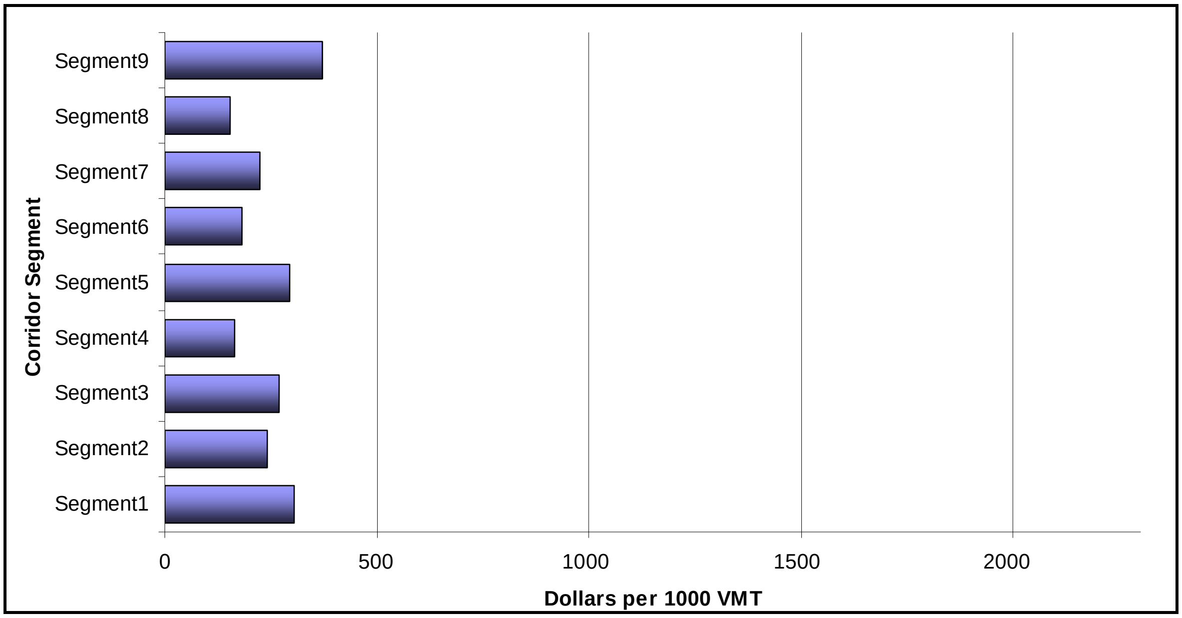


Figure 66. Washington to California (US97) Average Crash Costs for All Vehicles

Table 46 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up over 20 percent of total user costs. Travel time costs are just under 40 percent for all vehicles. Vehicle operating costs make up about 40 percent of the total user costs, note that heavy vehicle operating costs are much greater than light vehicles due to the geometric characteristics of the corridor.

Table 46. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**350**	**1690**	**650**	**48%**
Travel Time Costs	**460**	**710**	**510**	**38%**
Crash Costs*			**200**	**15%**
		TOTAL USER COSTS	**1360**	**100%**
* based on national data used in HERS-ST				

Table 47 presents additional crash information for this corridor. There were 506 crashes in this corridor in 2010. About thirteen percent of them involved a truck. This corridor has a crash rate less than half the rate of the statewide average for highways with the same functional classification. This is consistent with delay attributed to incidents at 8% of total delay. There are 7 SPIS sites that fall into the top 10 percent list of state SPIS sites on the truck safety corridor.

Table 47. Washington to California (US97) 2010 Crash Statistics

Total Number of Crashes	506
Truck Involved Crashes (Percent Truck Involved)	67 (13.2%)
Corridor Crash Rate per 1 milllion VMT	0.51
Statewide Crash Rate (same functional class)	1.33
Corridor Average Crash Costs $ per 1000 VMT	200
Number of Top 10% SPIS Sites on Corridor	7
Truck Safety Corridor?	yes

5.9 Corridor Performance: US 20 Bend to Ontario

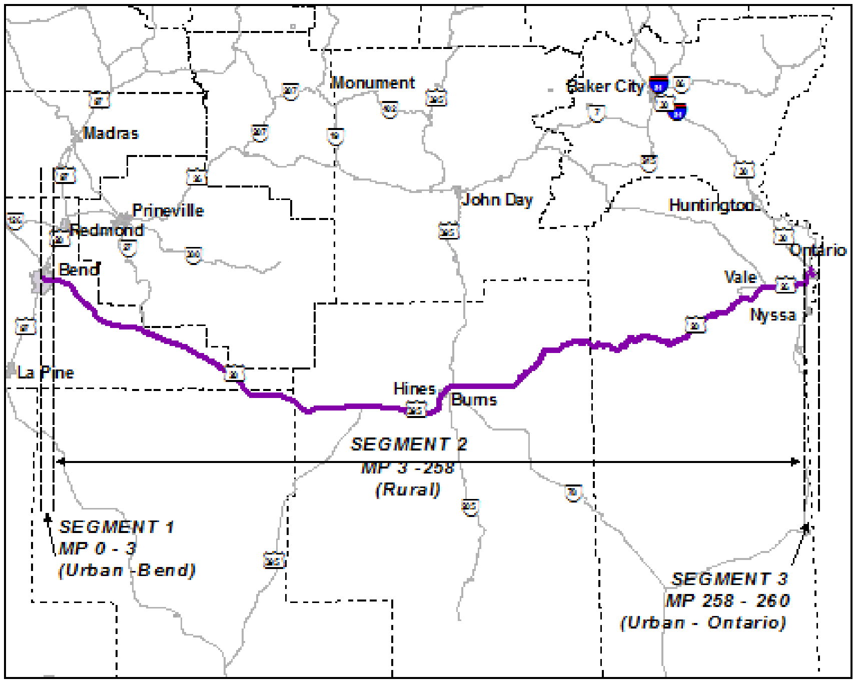


Figure 67. Segmented Map of US 20 Bend to Ontario

5.9.1 Corridor Overview

Figure 67 illustrates the US20 corridor running east from Bend to Ontario at I-84. This corridor is about 260 miles long and mostly rural, with urban segments on either end of the corridor. Average annual daily traffic ranges between 1,000 and 25,000 vehicles. On average, trucks represent over 20 percent of daily traffic. There do not appear to be locations where lack of capacity is a persistent issue.

5.9.2 Economic Characteristics

Figure 68 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value and weight, Machinery & Instruments; Forest & Wood Products; and Food & Kindred Products are the top 3 groups moving via this corridor. They represent between 2 and 5 percent of the total flows across all 19 bottleneck corridors by value and 1 to 3 percent by weight.

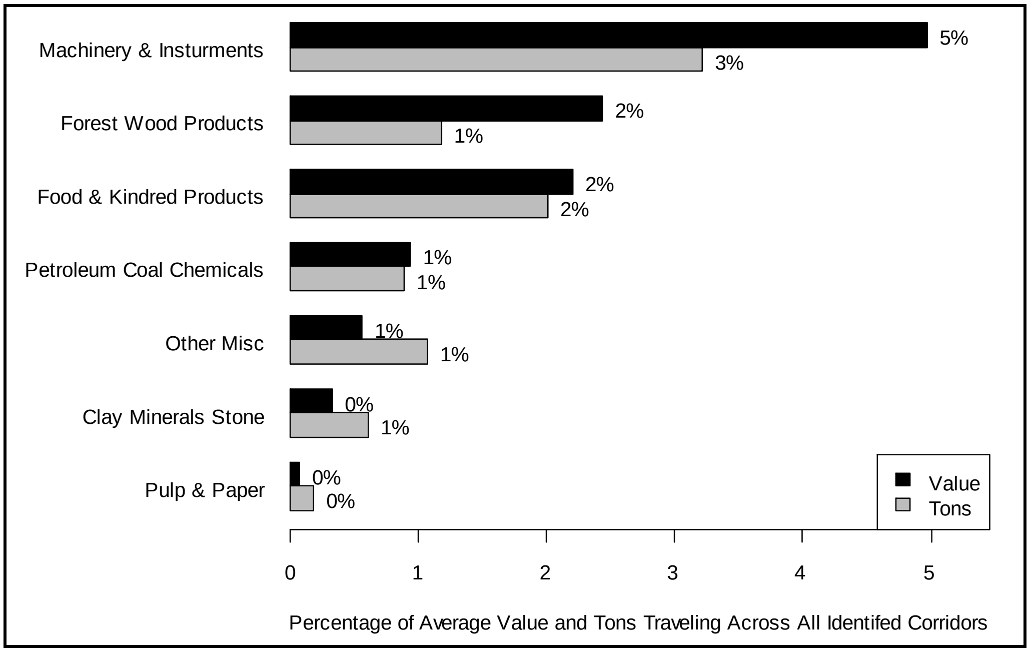


Figure 68. Bend to Ontario Percentage of Average Value and Tons

Figure 69 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Machine & Metals; Wholesale Trade; and Computer & Electronics; representing between 18 and 26 percent of industry use on this corridor. In terms of weight, the top 3 industries are Ag Forest & Fish; Wood & Paper; and Wholesale Trade; ranging from 20 to 35 percent of industry use.

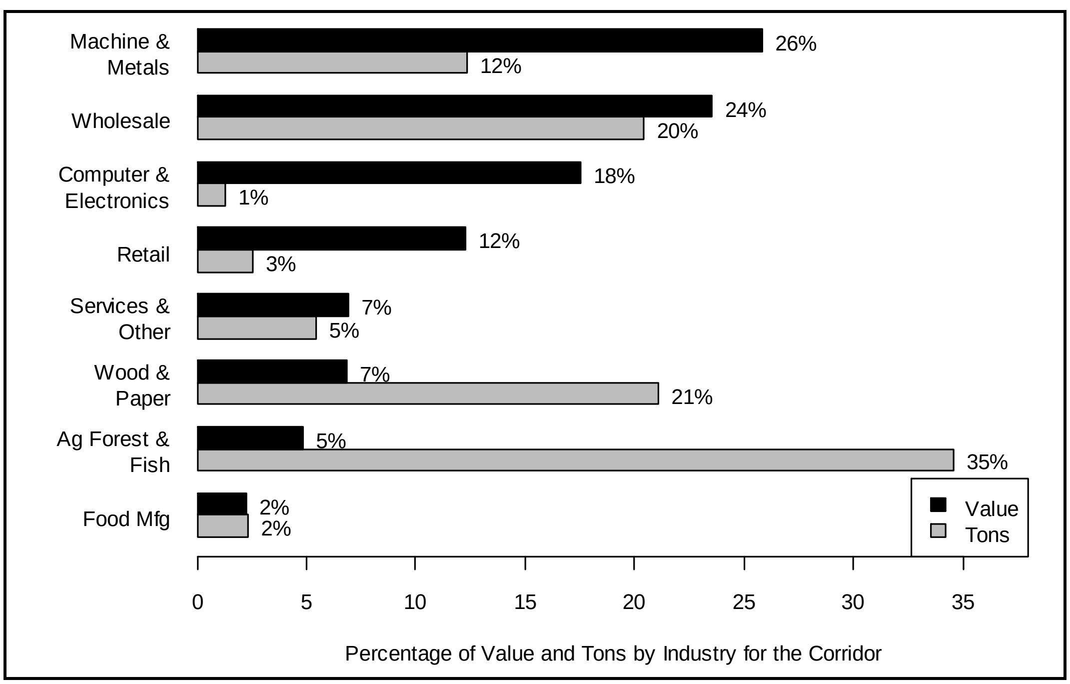


Figure 69. Bend to Ontario Percentage of Value and Tons by Industry

5.9.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Table 48 demonstrates trucks make up a fairly large proportion of the traffic on this corridor. Between 5 and 7 percent of the urban traffic is trucks and about 23 percent of the rural traffic is trucks. Figure 70 illustrates the traffic volumes for this corridor. Volumes are not consistently approaching capacity at specific points on the corridor. Traffic volumes are highest in the Bend segment of the corridor.

Table 48. Truck Share of Average ADT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	5%	5%
Segment 2	23%	25%
Segment 3	7%	8%

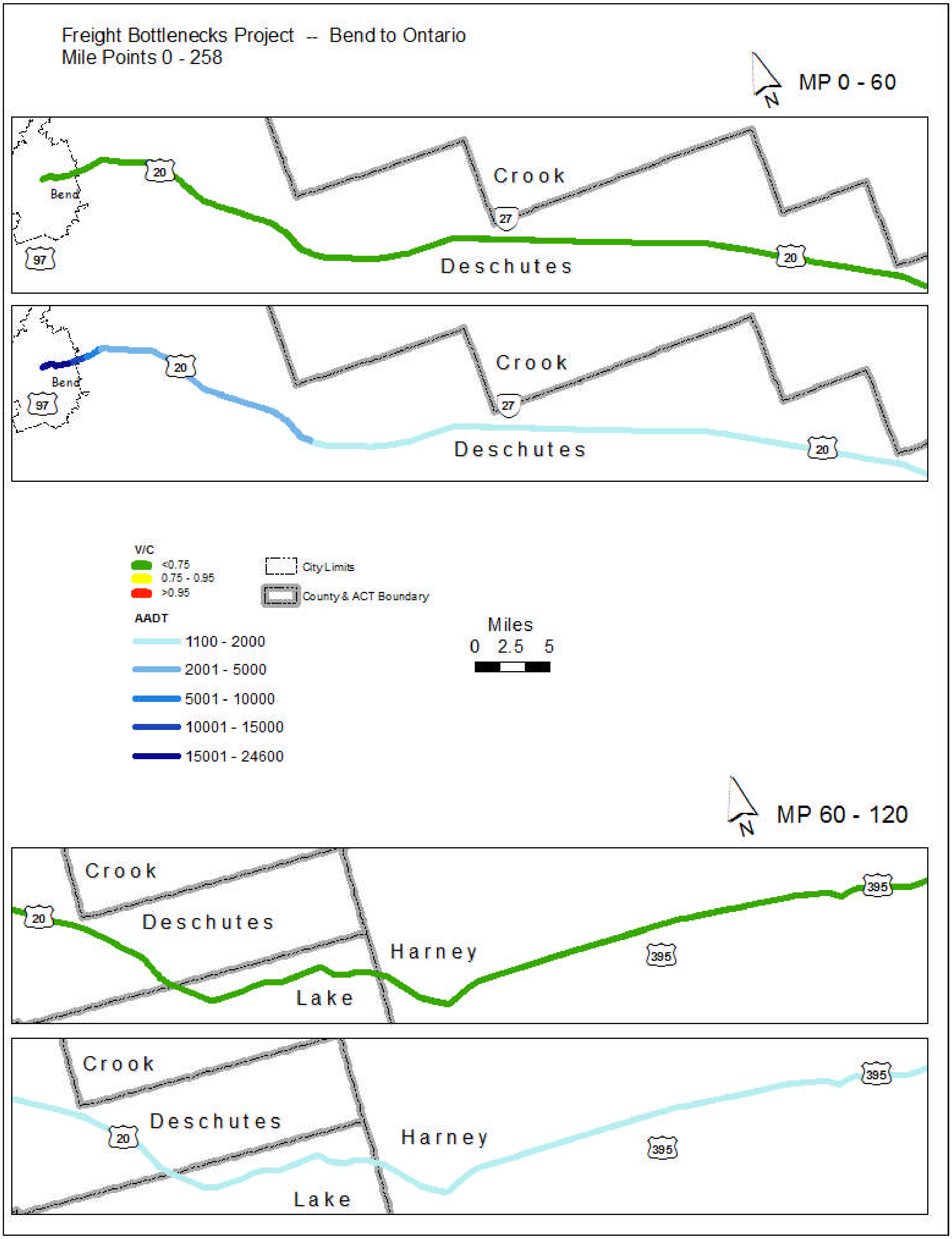


Figure 70. Freight Bottlenecks Project - Bend to Ontario

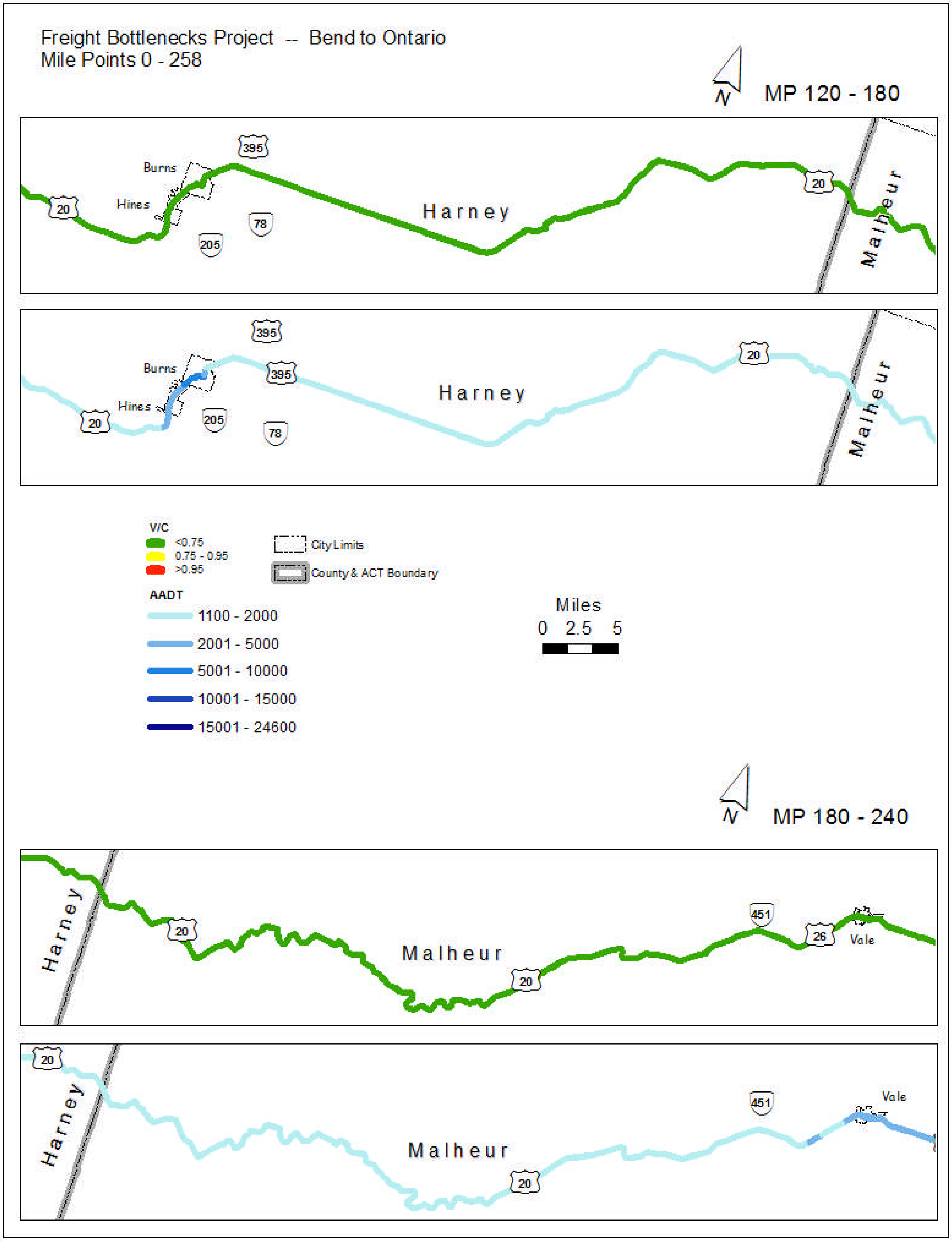


Figure71. Freight Bottlenecks Project - Bend to Ontario (Continued)

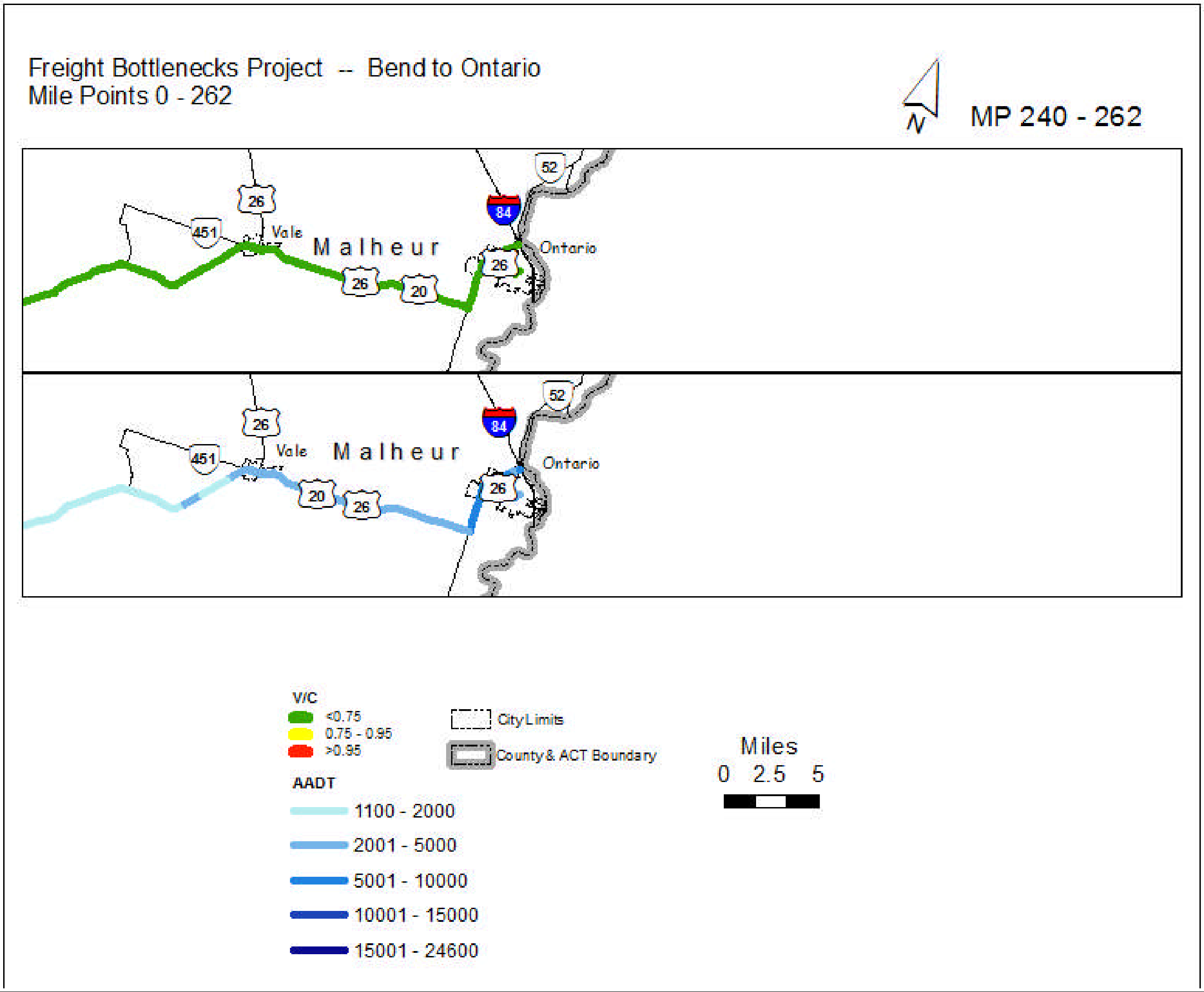


Figure 71. Freight Bottlenecks Project - Bend to Ontario (Continued)

5.9.4 Corridor Geometrics

Table 49 reports the corridor geometrics for curvature and grade. Eight percent of the corridor has curves greater than 3.5 degrees. About 16 percent of the corridor has grades greater than 2.5 percent. Over 40 percent of corridor delay is attributed to roadway geometrics.

Table 49. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**92%**	**4%**	**3%**	**1%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**49%**	**34%**	**9%**	**7%**	**0%**	**0%**	**100%**

5.9.5 Corridor Delay and Reliability

Figure 71 presents the annual average hours of delay per 1000 vehicle miles traveled. The locations with the most delay are within the city limits of Bend, Burns and Hines and at the intersection of OR 201. For the corridor overall, over half of the delay is due to congestion, over 40 percent from roadway geometrics and 5 percent due to incidents. Table 50 presents the detailed breakdown of corridor delay.

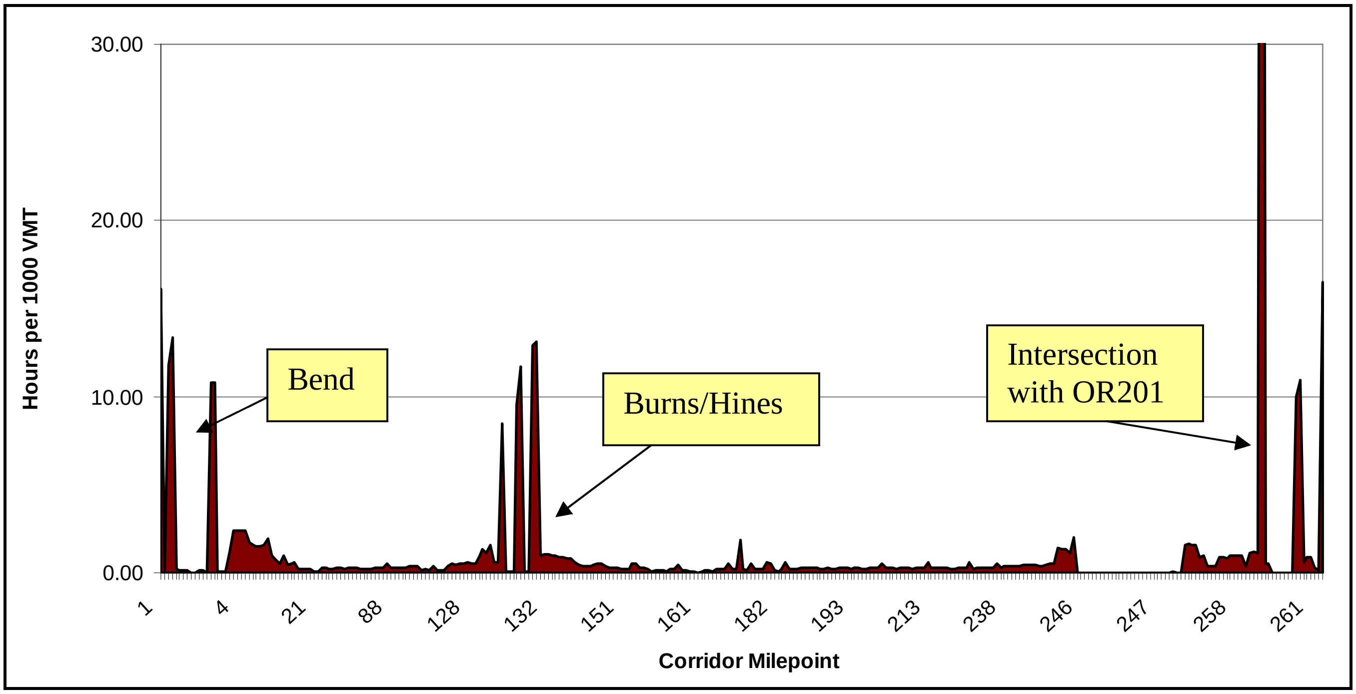


Figure 71. Annual Average Delay for All Vehicles - Hours per 1000 VMT

Table 50. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural	0.1	0.0	0.4	0.6
Urban	2.7	0.2	1.9	4.8
Total Corridor	0.5	0.1	0.6	1.2
Share of Total	42%	5%	54%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of traffic volume.

5.9.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 72, Figure 73 and Figure 74 for the 3 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs vary by highway segment. They are lowest in the Bend area and highest in the long rural segment, ending with Segment 3 operating costs between the other two. Travel time costs for trucks are very similar, implicating highway geometrics play a role in the higher truck operating costs. Overall corridor crash costs are relatively low compared to the other users' costs. The rural segment of the corridor has the highest crash costs relative to the other two segments.

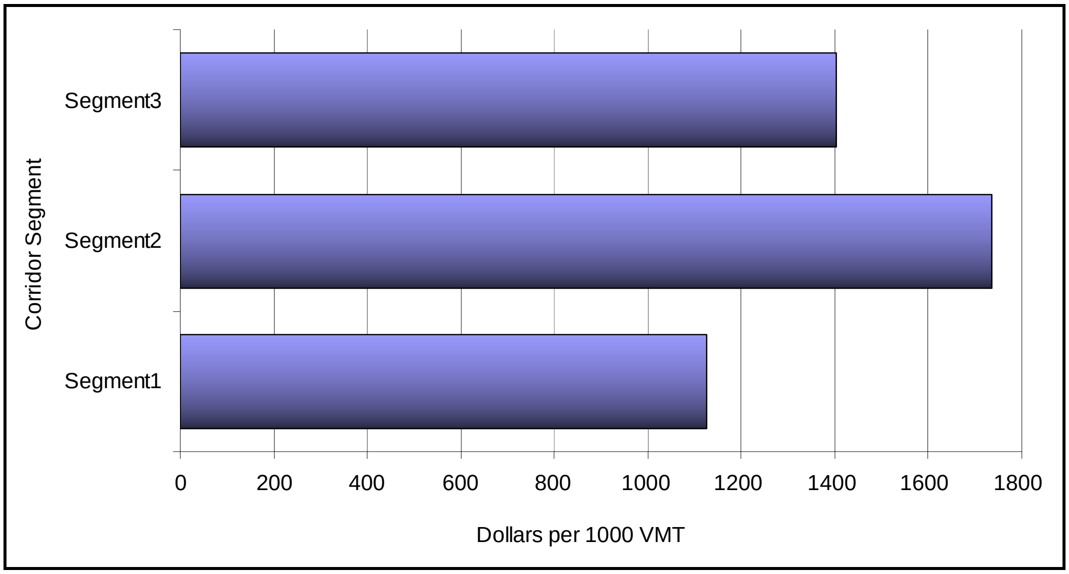


Figure 72. Bend to Ontario Corridor Average Truck Operating Costs

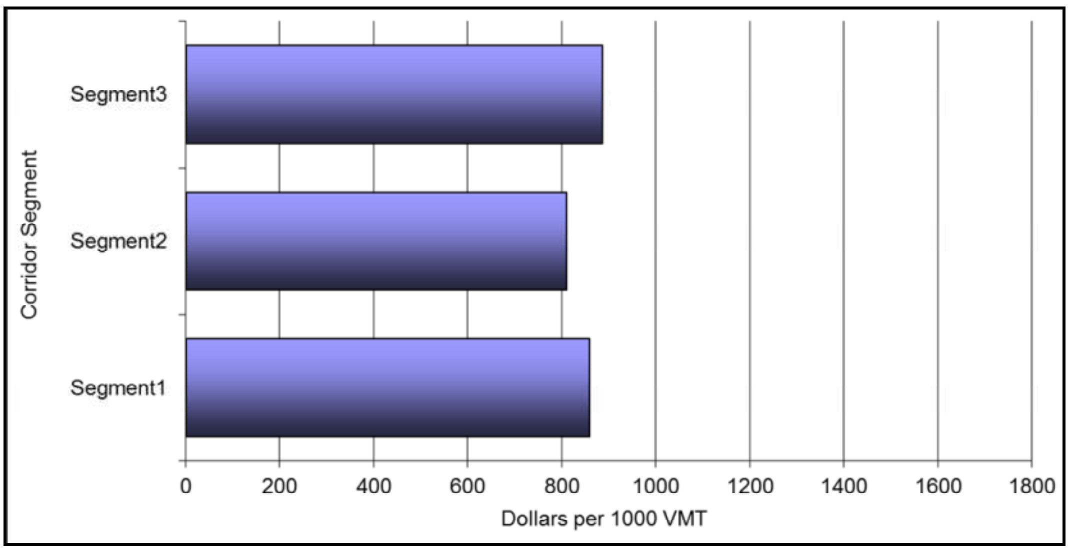


Figure 73. Bend to Ontario Corridor Average Truck Travel Time Costs

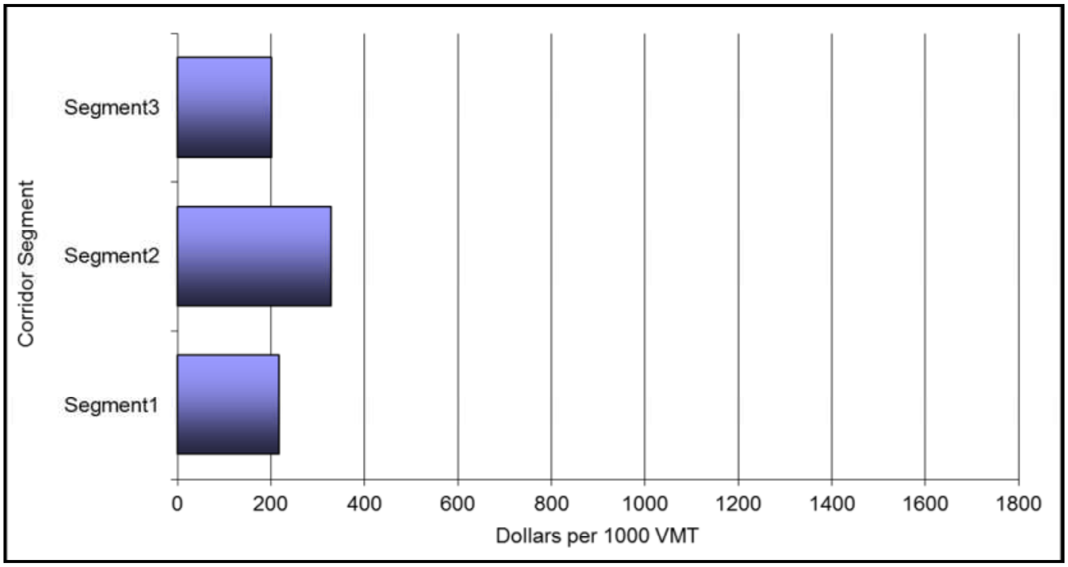


Figure 74. Bend to Ontario Corridor Average Crash Costs for All Vehicles

Table 51 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up about 16 percent of total user costs. Travel time costs are about 37 percent for all vehicles. Vehicle operating costs make up about 47 percent of the total user costs. Note that heavy vehicle operating costs are much greater than light vehicles due to the geometric characteristics of the corridor.

Table 51. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**350**	**1750**	**660**	**47%**
Travel Time Costs	**470**	**690**	**520**	**37%**
Crash Costs*			**230**	**16%**
		TOTAL USER COSTS	**1410**	**100%**
* based on national data used in HERS-ST				

Table 52 presents additional crash information for this corridor. This corridor is a designated truck safety corridor. There were 179 crashes in this corridor in 2010. About 10 percent of them involved a truck. This corridor has a crash rate a little lower than the statewide rate for highways with the same functional classification. There are 3 SPIS sites that fall into the top 10 percent list of state SPIS sites.

Table 52. Bend to Ontario 2010 Crash Statistics

Total Number of Crashes	179
Truck Involved Crashes (Percent Truck Involved)	18 (10.1%)
Corridor Crash Rate per 1 milllion VMT	0.50
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	230
Number of Top 10% SPIS Sites on Corridor	3
Truck Safety Corridor?	yes

5.10 Corridor Performance: I-5 Washington to California Borders

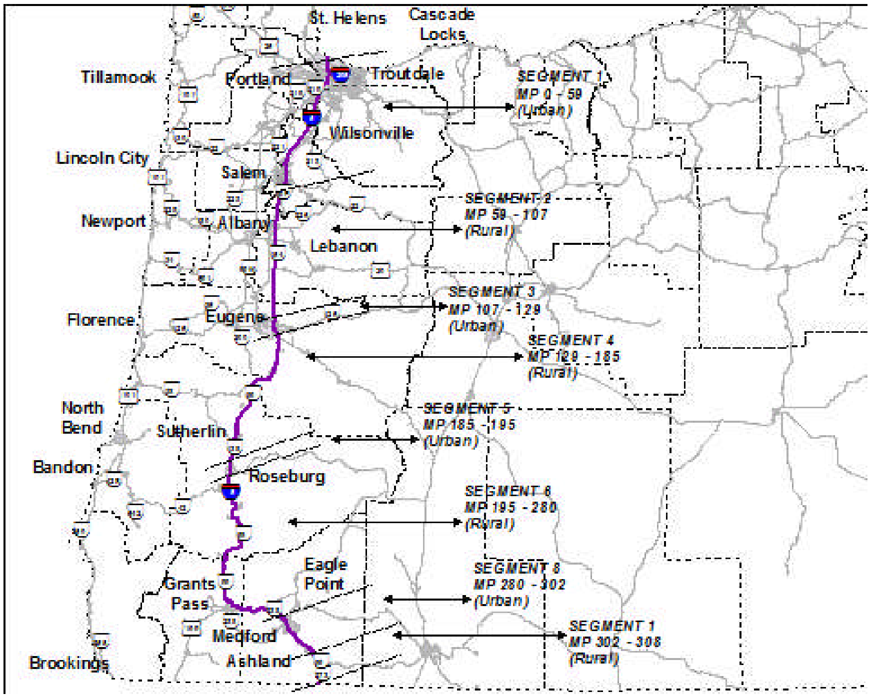


Figure 75. Segmented Map of I-5 Washington to California Corridor

5.10.1 Corridor Overview

Figure 75 illustrates the I-5 corridor running west of the Oregon Cascade range from the south at the Oregon/California border to the Oregon/Washington State border to the north. This highway corridor is 308 miles long. Average annual daily traffic ranges between 7,300 and 54,000 vehicles. Truck share of traffic ranges from 13 to 38 percent of daily traffic. One third of this corridor is classified as urban highway, which encompasses the congested areas. About 11 percent of the corridor is operating at capacity level, predominantly in the Salem to Portland vicinity.

5.10.2 Economic Characteristics

Figure 76 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. Other Misc. commodity group has the highest share of flows on this corridor, representing 37 percent by value and 38 percent by weight. In terms of value and weight, Food & Kindred Products; Clay, Minerals, and Stone; and Pulp and Paper represent 25 to 29 percent of movement across all 19 bottleneck corridors. The remaining flows range from 21 to 26 percent of flows for their group.

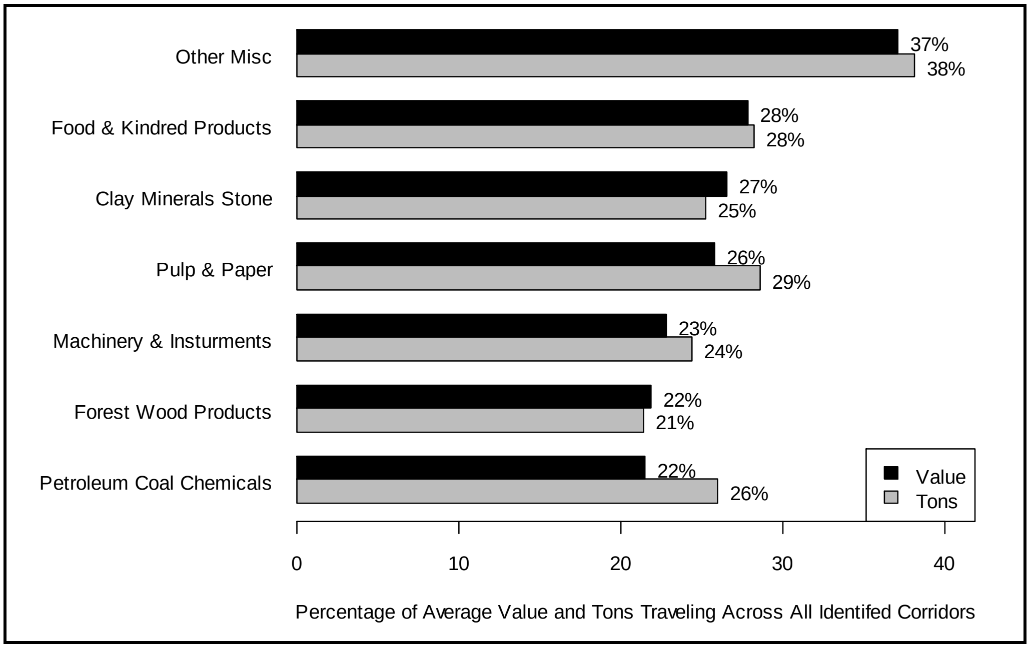


Figure 76. California to Washington (I-5) Percentage of Average Value and Tons

Figure 77 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Machine & Metals; Computer & Electronics; and Wholesale Trade, representing between 19 and 22 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Machine & Metals; and Wholesale Trade, and representing between 20 and 31 percent of industry use across this corridor.

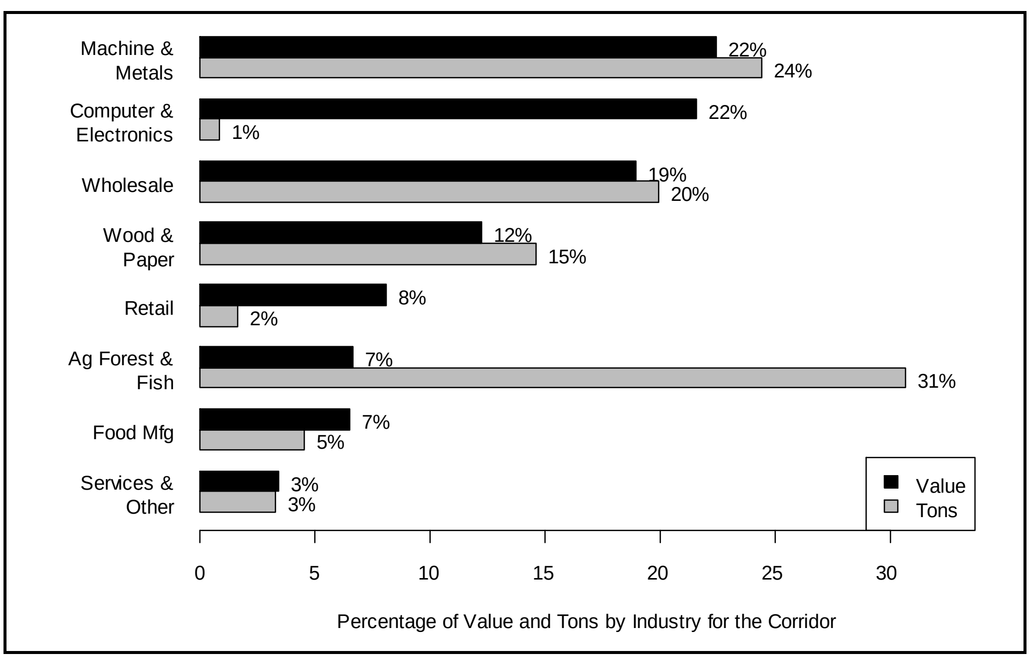


Figure 77. California to Washington (I-5) Percentage of Value and Tons by Industry

5.10.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 78 illustrates the traffic volumes for this corridor. Volumes on I-5 are considerably higher in the Willamette Valley, peaking in the Portland area. Over 70 percent of the state population resides in the upper Willamette Valley, representing a large proportion of the economic activity of the state. There are several areas operating at capacity (yellow) and beyond with poor performance (red). Areas consistently operating at capacity are in the Eugene, Salem and Wilsonville areas. Severe performance areas are in the vicinity of mile points 289 to 292 and 299 to 302. At this level of operation reliability becomes an increasing issue. Interchanges are fairly close along this corridor and major highways are feeding traffic from outlying areas. Trucks with the ability to shift the time of day they travel through the peak congested periods can reduce the effects of the high-volume segments. However, many carriers do not have this option given the requirements of their clients.

Truck share of traffic ranges between 13 and 38 percent on an average daily basis. The variation is much greater by time of day and day of year. Table 53 reports the truck shares for the 8 corridor segments.

Table 53. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	38%	38%
Segment 2 (RVMPO)	20%	20%
Segment 3	25%	25%
Segment 4 (Roseburg)	22%	24%
Segment 5	32%	30%
Segment 6 (Eugene)	23%	23%
Segment 7	20%	21%
Segment 8 (Salem to Portland)	13%	15%

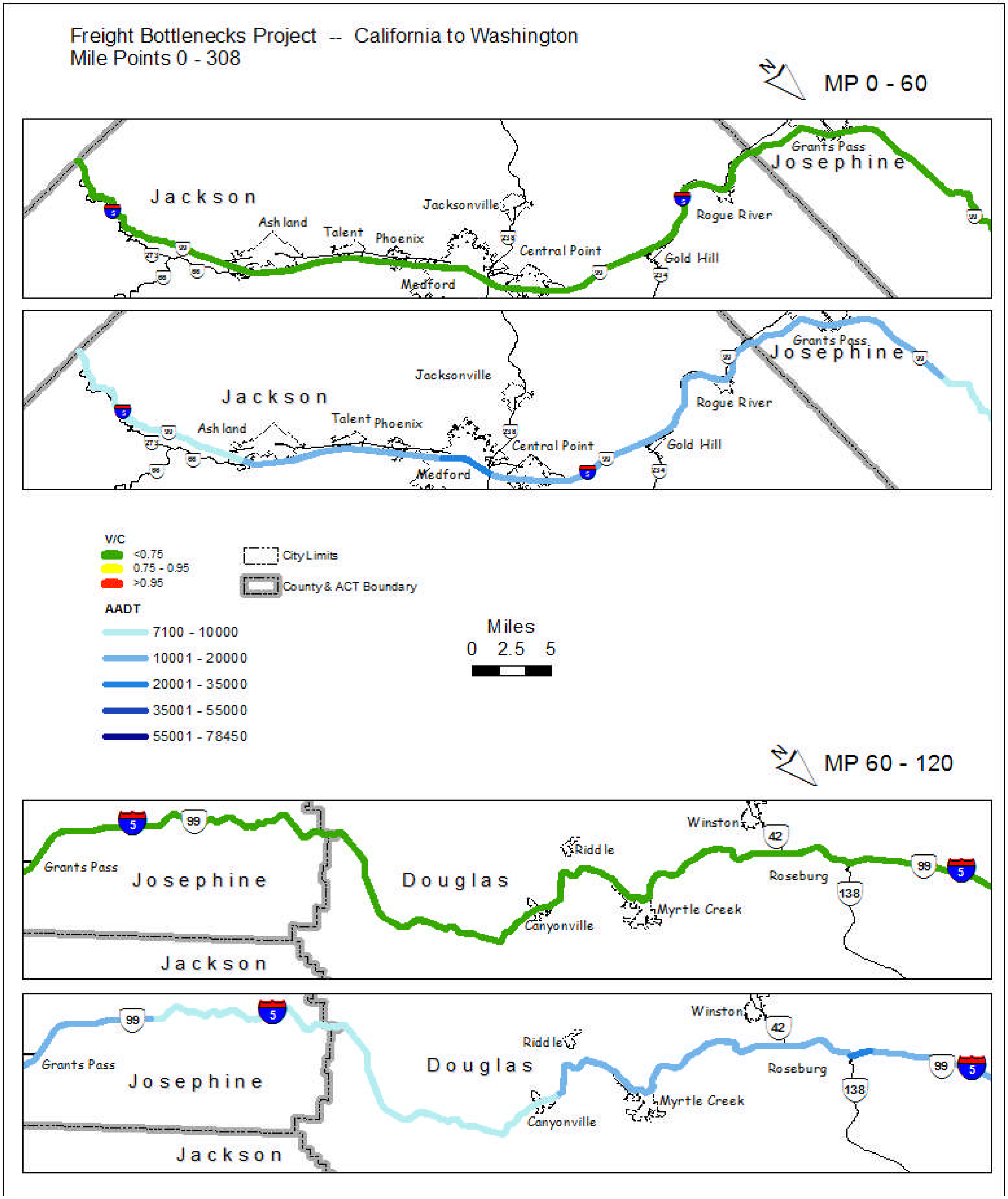


Figure 78. Freight Bottlenecks Project – California to Washington

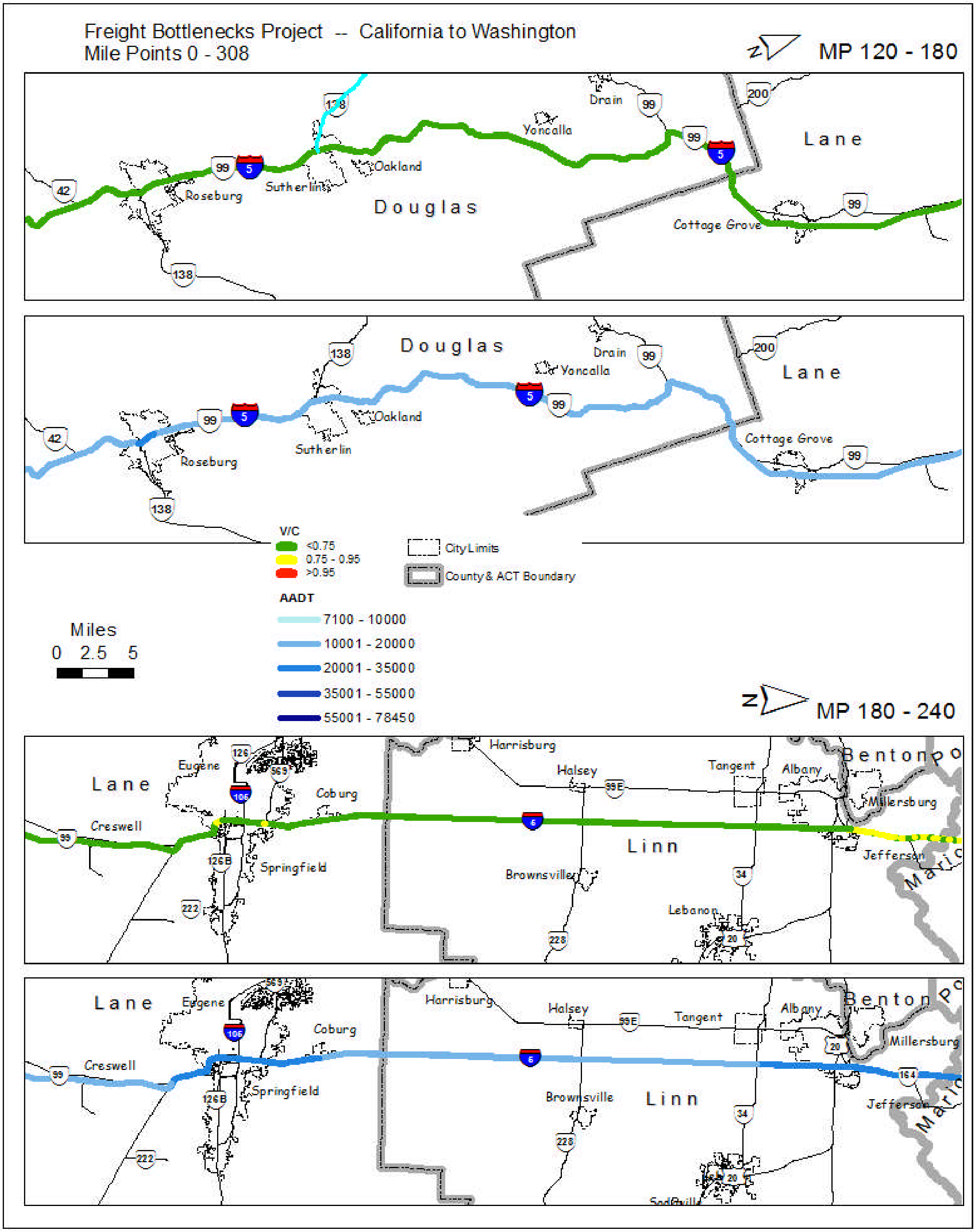


Figure 78. Freight Bottlenecks Project – California to Washington (Continued)

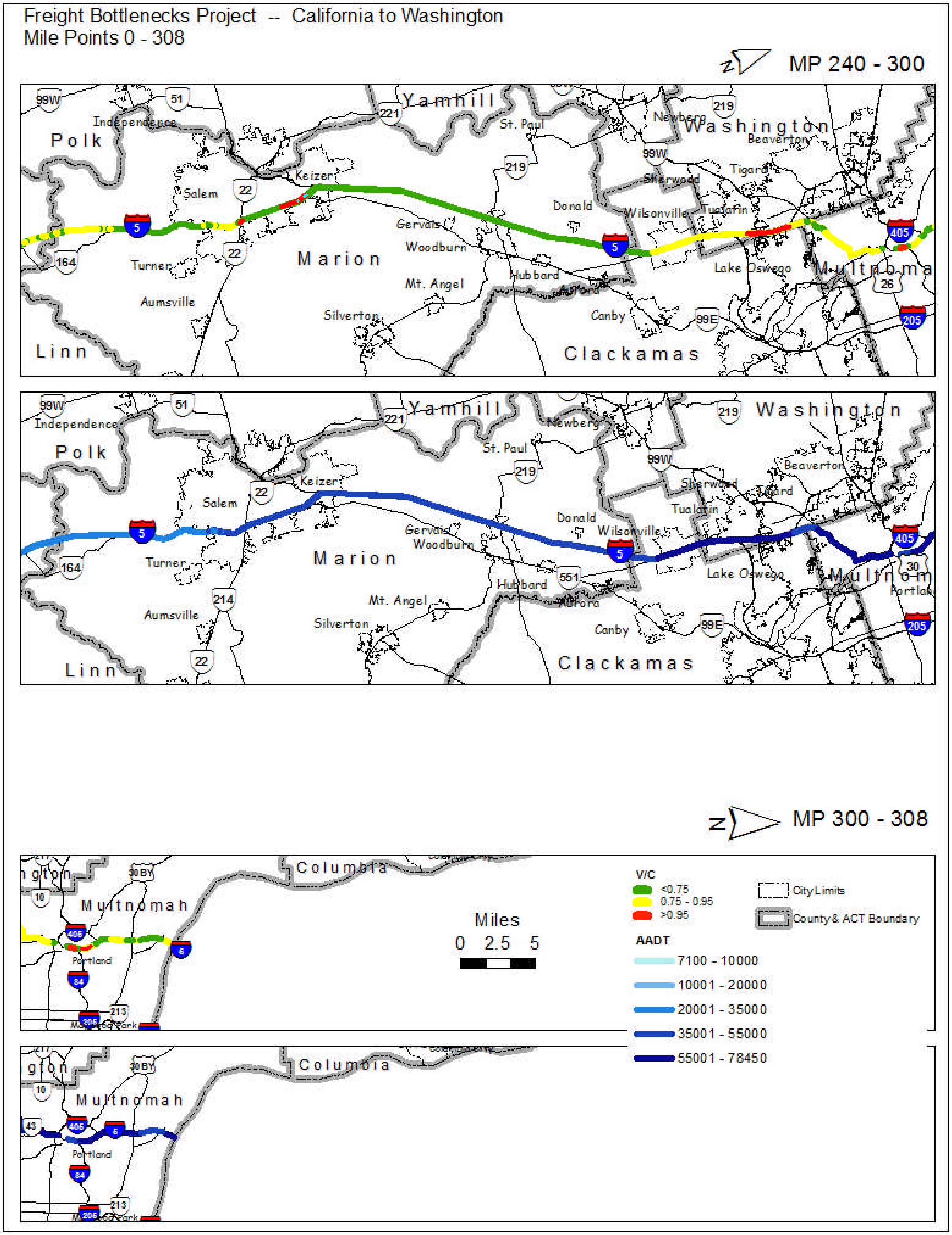


Figure 78. Freight Bottlenecks Project – California to Washington (Continued)

5.10.4 Corridor Geometrics

Table 54 reports the corridor geometrics for curvature and grade. About 6 percent of the entire corridor has curvature greater than 3.4 degrees. Over 20 percent of the corridor has grades greater than 2.5 percent, of which locations are distributed across the entire corridor. To gain a clear understanding of the effects of grade on corridor travel, detailed analysis is required. However, delay caused by grade and curvature is less than 1% of the total delay.

Table 54. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	91%	6%	3%	0%	0%	0%	100%
Degree of Grade	0-.4%	.5-2.4%	2.5-4.4%	4.5-6.4%	6.5-8.4%	>8.5%	
Proportion of Miles	45%	33%	11%	10%	0%	0%	100%

5.10.5 Corridor Delay and Reliability

Figure 79 presents the annual average hours of delay per 1000 vehicle miles traveled. The locations with the most delay are in urban areas and the escalation in delay as one moves north is evident. Table 55 provides a breakdown in delay by type. About one fourth of the total corridor delay is caused by congestion. The remaining three-fourths are due to incident delay. When highways operate at or near capacity, small disruptions cause large effects.

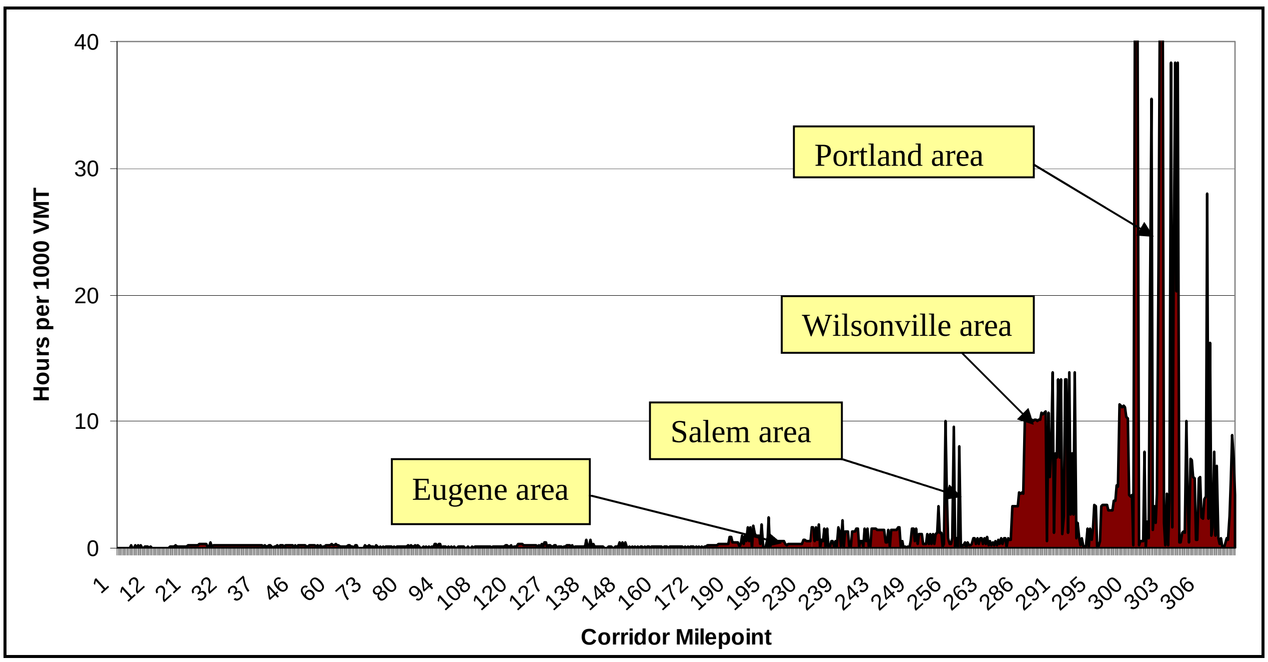


Figure 79. Annual Average Delay for All Vehicles - Hours per 1000 VMT

Table 55. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural	0.0	0.3	0.0	0.3
Urban	0.0	2.8	1.0	3.8
Total Corridor	0.0	1.6	0.5	2.0
Share of Total	0%	76%	24%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of the number of cars on the road.

5.10.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 80, Figure 81, and Figure 82 for all 8 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs are the largest component of user costs. About 50 miles of this corridor has grades greater than 2.5%. Of these steep sections, Segments 1 through 5 include over 75 percent of the length of steep highway. Given the large affect of grade on truck operating costs, we can understand why the costs are higher for these segments. However, when congestion becomes as issue, as it is in the Salem to Portland areas, we see the higher operating costs on Segment 8.

Travel time costs are a smaller component of total user costs. Given the higher levels of congestion in the Salem to Portland areas on Segment 8, we can see how travel time costs are affected. Crash costs are relatively low compared to the other users' costs. Crash costs are very similar across the eight segments.

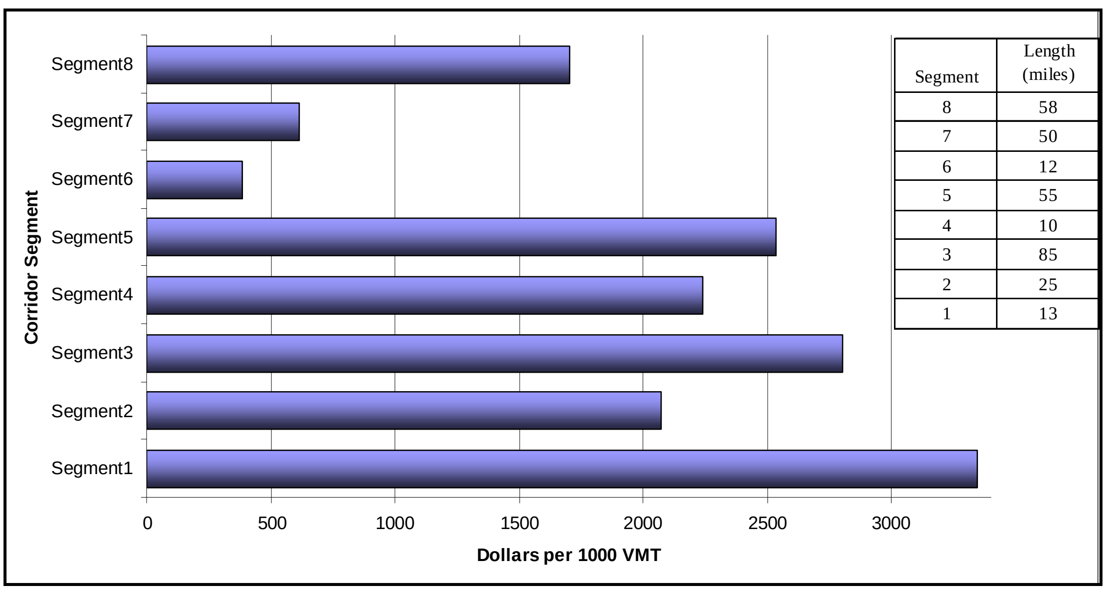


Figure 80. California to Washington (I-5) Average Truck Operating Costs

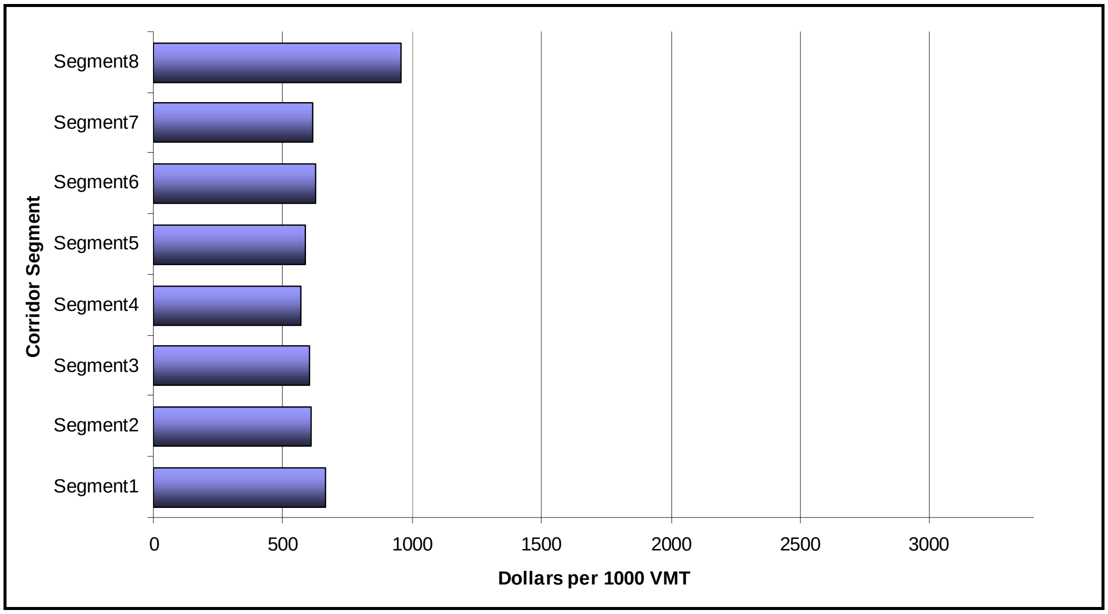


Figure 81. California to Washington (I-5) Average Truck Travel Time Costs

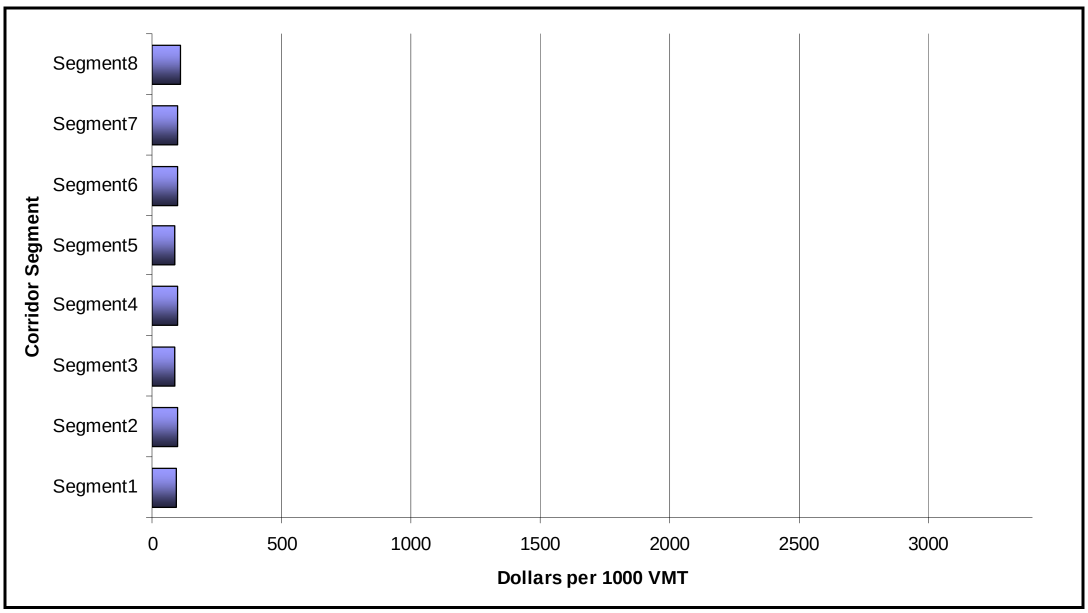


Figure 82. California to Washington (I-5) Average Crash Costs for All Vehicles

Table 56 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up less than 10 percent of total user costs. Travel time costs are just under 40 percent for all vehicles. Vehicle operating costs make up about 56 percent of the total user costs.

Table 56. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**375**	**2160**	**740**	**56%**
Travel Time Costs	**450**	**660**	**490**	**37%**
Crash Costs*			**100**	**8%**
		TOTAL USER COSTS	**1330**	**100%**
* based on national data used in HERS-ST				

Table 57 presents additional crash information for this corridor. There were 1775 crashes in this corridor in 2010. About 9 percent of them involved a truck. This corridor has a crash rate lower than the statewide average for highways with the same functional classification. There are 41 SPIS sites that fall into the top 10 percent list of state SPIS sites on this truck safety corridor.

Table 57. California to Washington (I-5) 2010 Crash Statistic

Total Number of Crashes	1775
Truck Involved Crashes (Percent Truck Involved)	165 (9.3%)
Corridor Crash Rate per 1 milllion VMT	0.35
Statewide Crash Rate (same functional class)	0.41
Corridor Average Crash Costs $ per 1000 VMT	100
Number of Top 10% SPIS Sites on Corridor	41
Truck Safety Corridor?	yes

5.11 Corridor Performance: I-84 Portland to Ontario

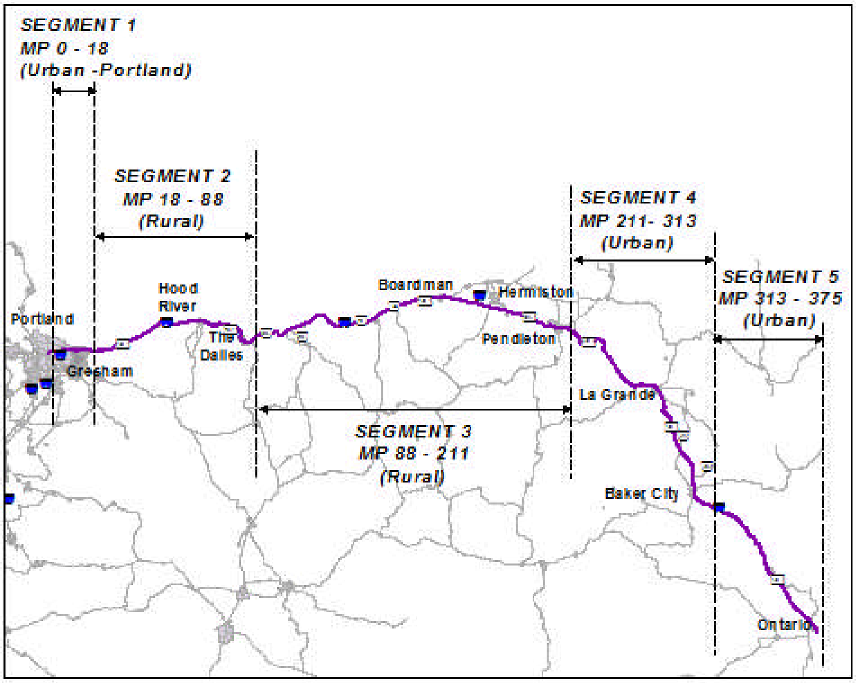


Figure 83. Segmented Map of Portland to Ontario (I-84) Corridor

5.11.1 Corridor Overview

Figure 83 illustrates the I-84 corridor running from Portland to the east and south to Ontario at the Oregon/Idaho border. This corridor consists of highway 2 and 6. This corridor is 375 miles long. Average annual daily traffic ranges between 4,700 and 49,000 vehicles. Truck share of traffic ranges from 7 to 48 percent of daily traffic. Eleven percent of this corridor is classified as urban highway, which encompasses the congested areas. About 2 percent of the corridor is operating at capacity level, all within the Portland/Gresham vicinity.

5.11.2 Economic Characteristics

Figure 84 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, Machinery & Instruments; Food & Kindred Products; and Other Misc. Goods are the top 3 commodity groups along this corridor, representing 15 to 29 percent of the movement across all 19 bottleneck corridors.

In terms of weight, Machinery & Instruments; Food & Kindred Products; and Petroleum Coal and Chemicals are the top 3 groups moving via this corridor, representing 14 to 19 percent moving along this corridor.

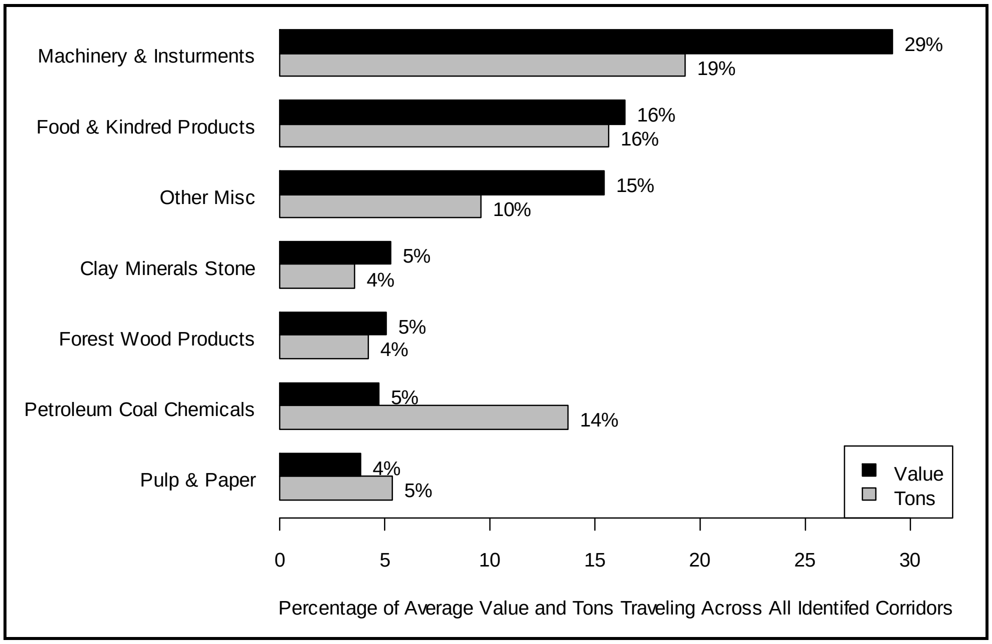


Figure 84. Portland to Ontario (I-84) Percentage of Average Value and Tons

Figure 85 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Computer & Electronics, Wholesale Trade, and Machine & Metals; representing between 18 and 41 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Machine & Metals; and Wholesale Trade, representing between 21 and 31 percent of industry use across this corridor.

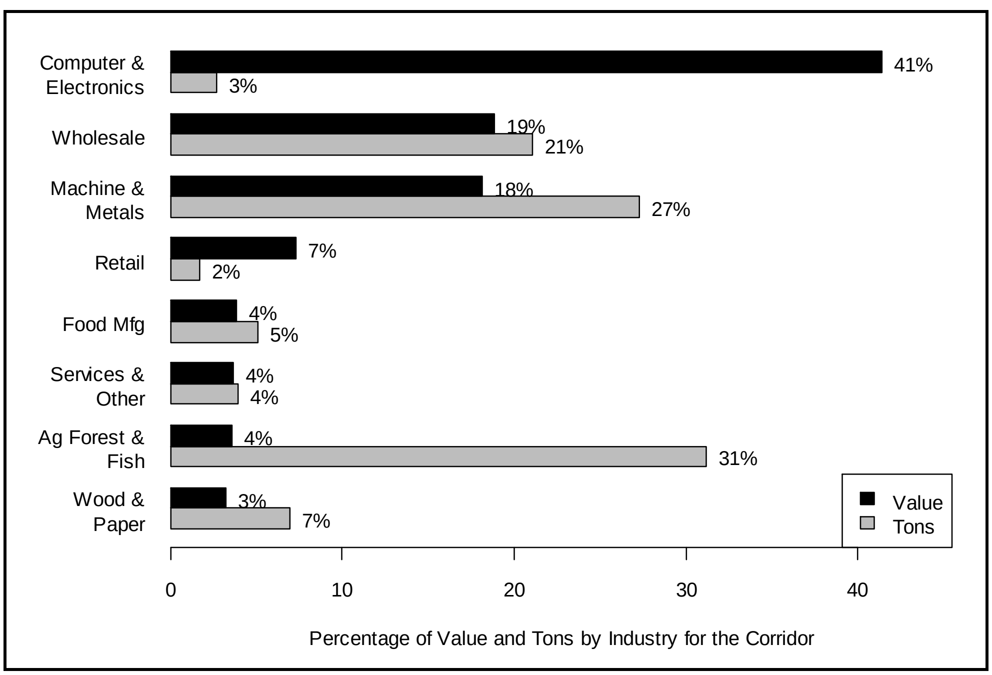


Figure 85. Portland to Ontario (I-84) Percentage of Value and Tons by Industry

5.11.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 86 illustrates the traffic volumes for this corridor. Volumes are highest in the Portland area and this section is consistently operating at capacity (yellow and red). Capacity issues exist between mile points 0 and 10 when traffic flow increases, remaining steady where lanes are added/dropped to accommodate interchanges. Trucks with the ability to shift the time of day they travel through the peak congested periods can reduce the effects of the high-volume segments. However, many carriers do not have this option given the requirements of their clients. Choice of travel through Oregon is also based on the congestion experienced on routes outside of Oregon. Carriers have reported choosing peak hour times in Oregon to avoid peak time in the Seattle area.

Truck share of average annual daily traffic ranges between 7 and 48 percent along the 5 segments presented for this corridor. Table 58 reports the truck shares for all 5 corridor segments.

Table 58. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	7%	8%
Segment 2	25%	26%
Segment 3	34%	35%
Segment 4	45%	44%
Segment 5	48%	48%

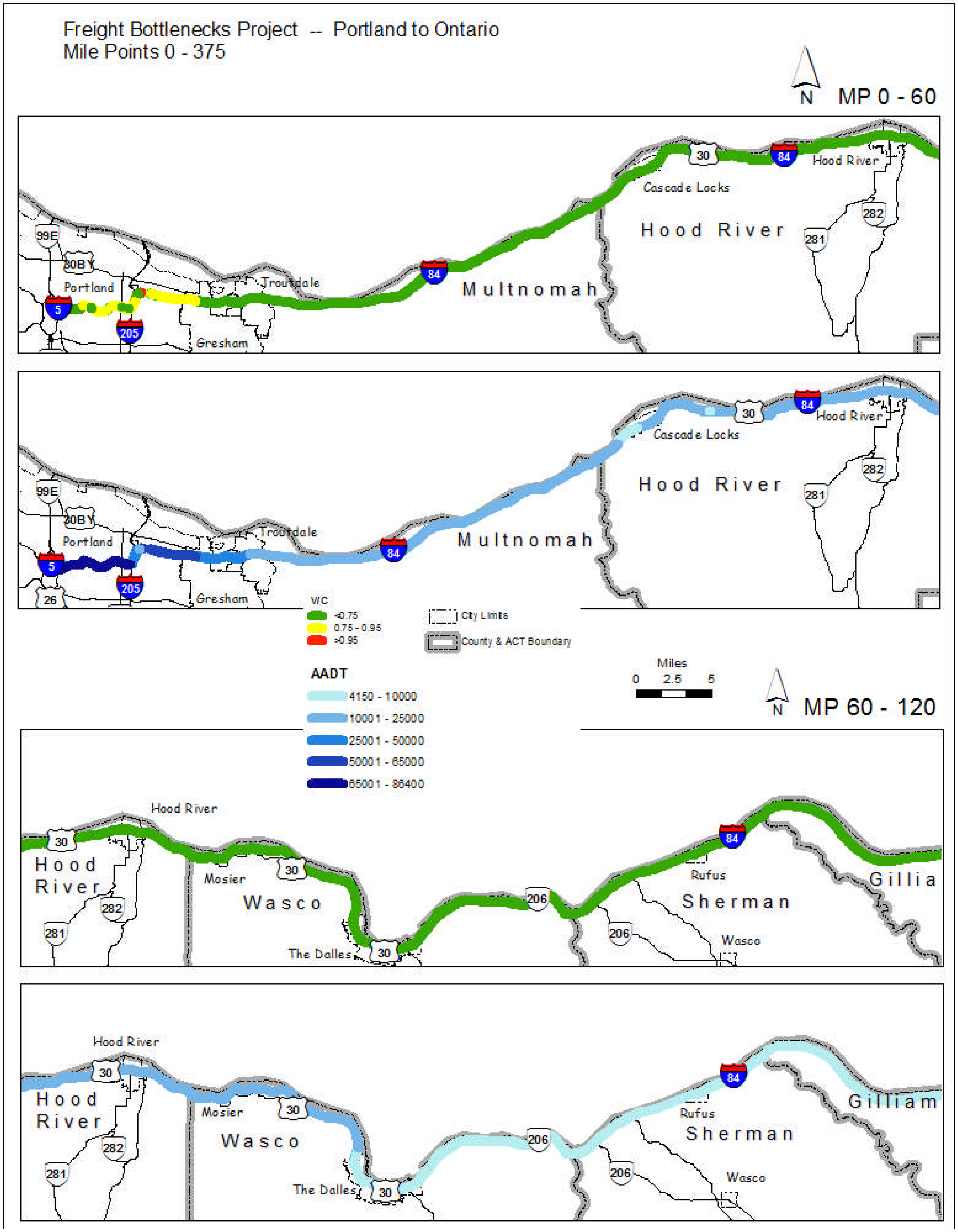


Figure 86. Freight Bottlenecks Project - Portland to Ontario (I-84)

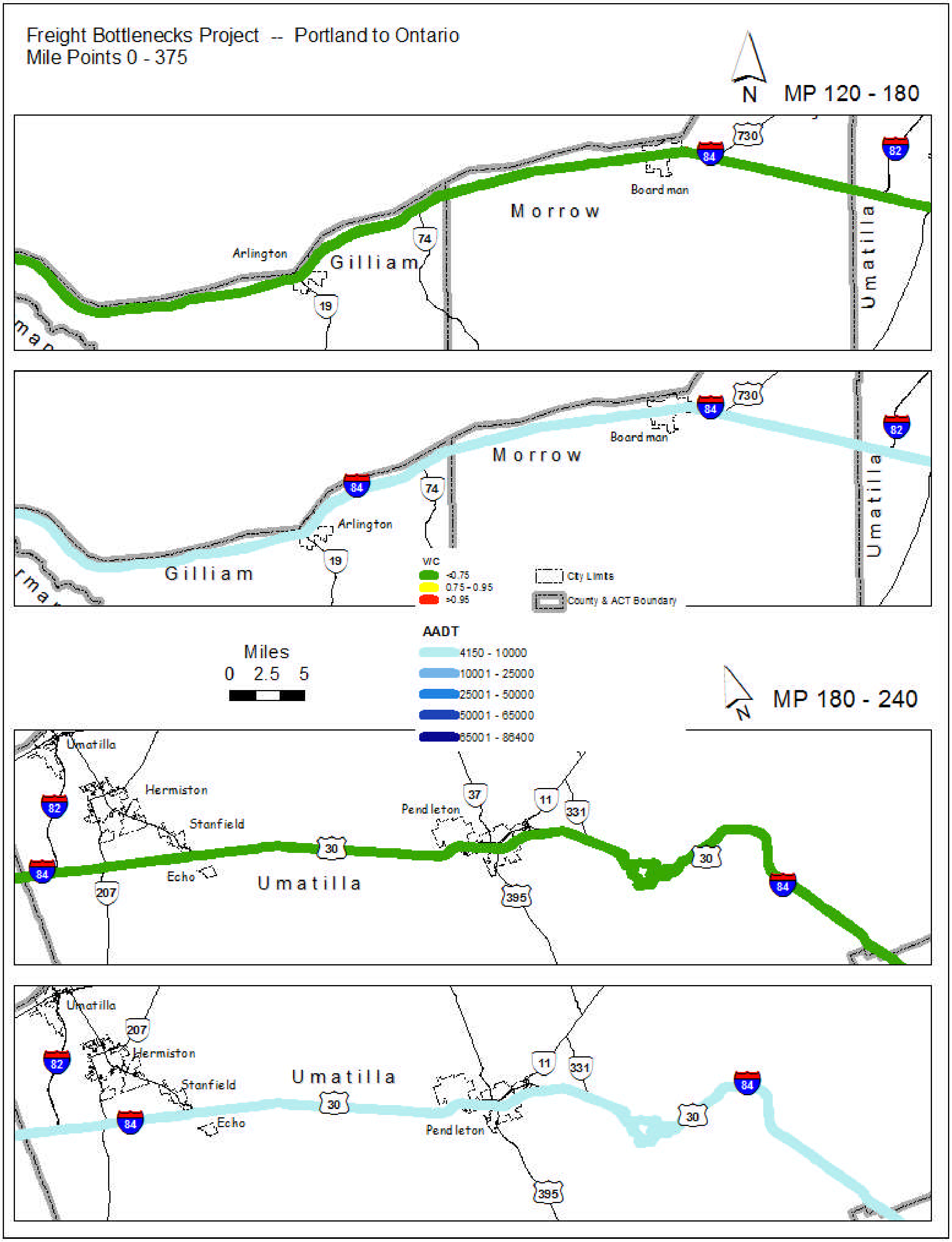


Figure 87. Freight Bottlenecks Project - Portland to Ontario (I-84) (Continued)

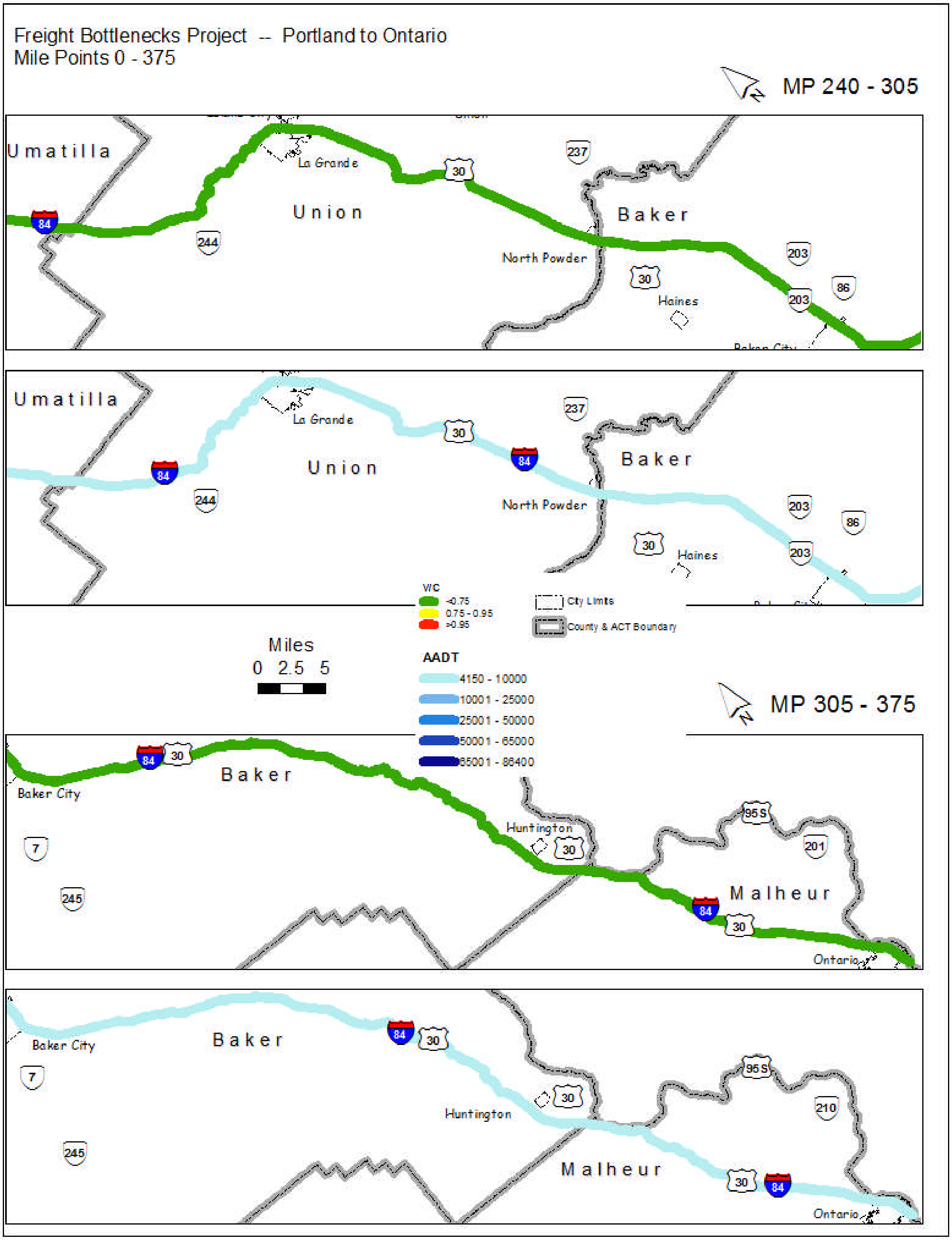


Figure 88. Freight Bottlenecks Project - Portland to Ontario (I-84) (Continued)

5.11.4 Corridor Geometrics

Table 59 reports the corridor geometrics for curvature and grade. Over 20 percent of the corridor has grades greater than 5.5 percent, which significantly affects truck operations. However, passing lanes allow lighter traffic to pass and overall corridor delay associated with roadway geometrics is less than 1 percent of total delay costs.

Table 59. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**98%**	**2%**	**0%**	**0%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**57%**	**31%**	**11%**	**1%**	**0%**	**0%**	**100%**

5.11.5 Corridor Delay and Reliability

Figure 89 presents the annual average hours of delay per 1000 vehicle miles traveled. The locations with the most delay are in the Portland area. There is a small spike in delay at the OR730 interchange where a lane is dropped for a short span. Table 60 provides a breakdown in delay by type. About one fourth of the total corridor delay is caused by congestion. The remaining three-fourths is due to incident delay. Most of the delay is from the urban portion of the corridor. When highways operate at or near capacity, small disruptions cause large effects.

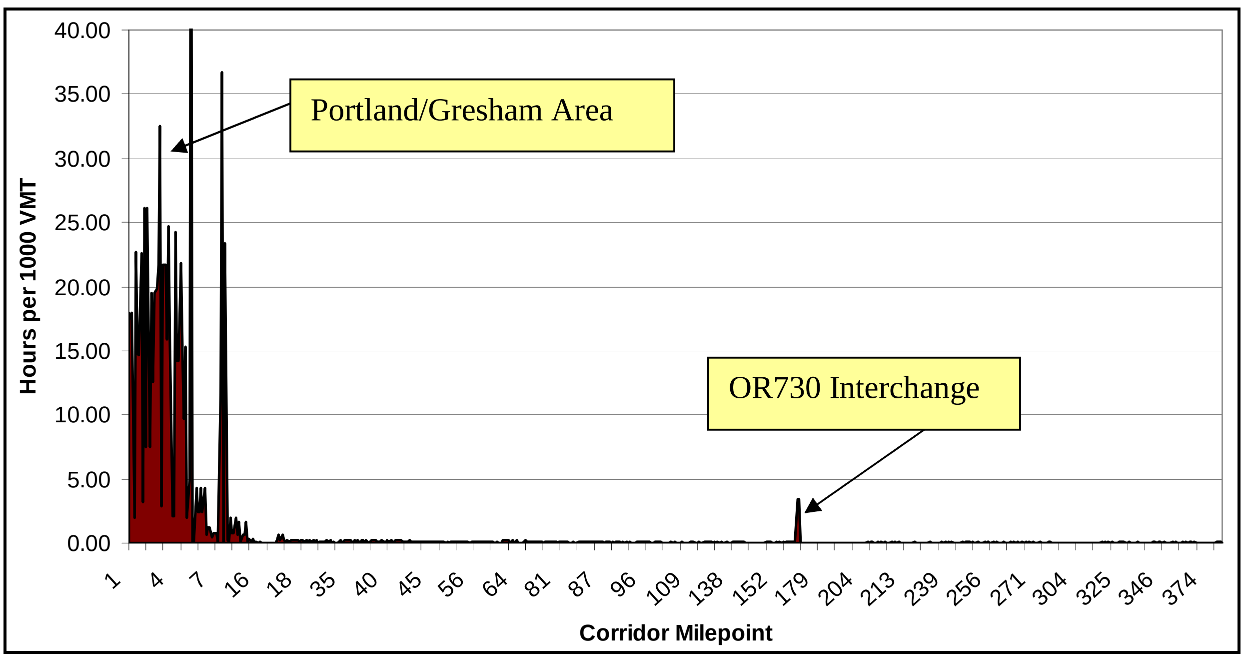


Figure 89. Annual Average Delay for All Vehicles - Hours per 1000 VMT

Table 60. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	**Incident Delay**	**Congestion Delay**	**Total Delay**
Rural	0.0	0.1	0.0	0.1
Urban	0.0	6.4	2.2	8.6
Total Corridor	0.0	2.0	0.7	2.7
Share of Total	0%	74%	26%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of the number of cars on the road.

5.11.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 90, Figure 91, and Figure 92 for all 5 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs are the largest component of user costs. About 50 miles of this corridor has grades greater than 2.5% which is scattered throughout the length of the corridor outside the Portland vicinity.

Travel time costs are a smaller component of total user costs. Given the higher levels of congestion in the Portland/Gresham area on Segment 1, we can see how travel times for trucks are affected by high auto use. Crash costs are relatively low compared to the other users' costs. Crash costs are very similar across the five segments, decreasing a little as traffic volumes decrease on the eastern end of the corridor.

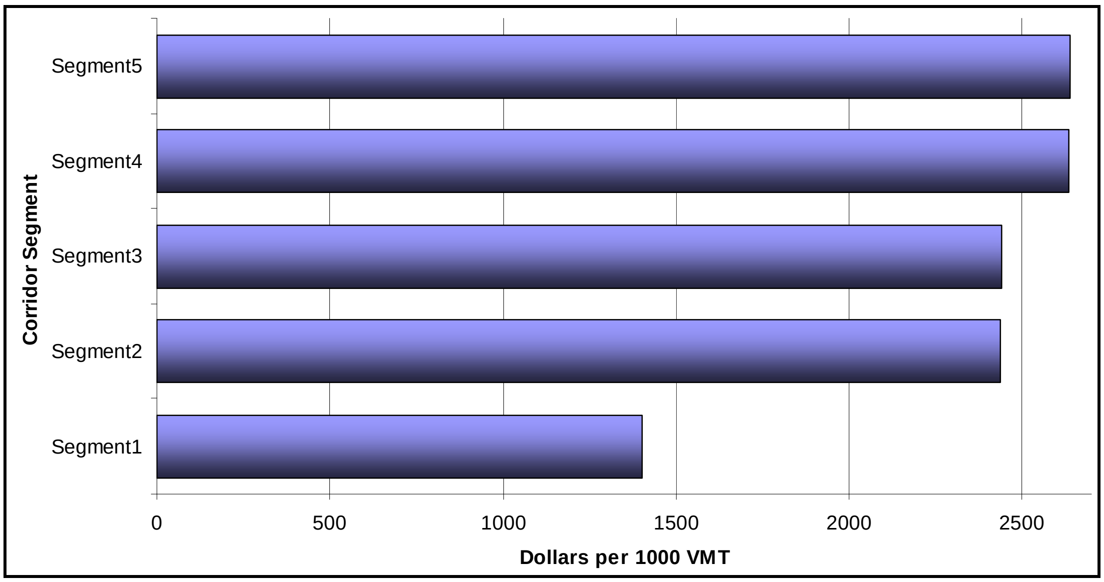


Figure 90. Portland to Ontario (I-84) Corridor Average Truck Operating Costs

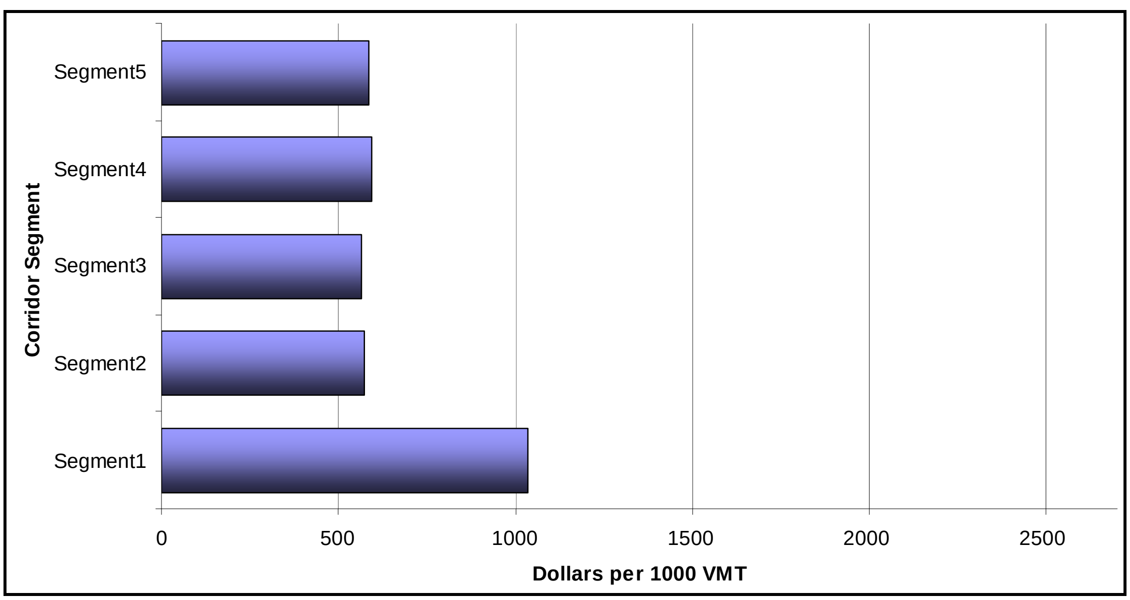


Figure 91. Portland to Ontario (I-84) Corridor Average Truck Travel Time Costs

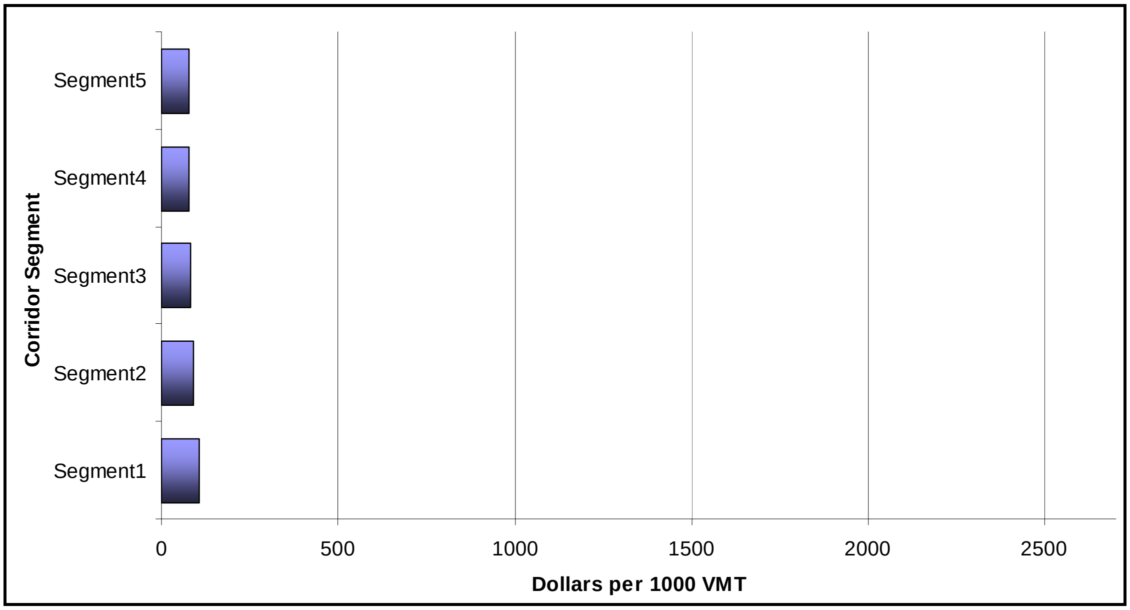


Figure 92. Portland to Ontario (I-84) Corridor Average Crash Costs for All Vehicles

Table 61 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up about 6 percent of total user costs. Travel time costs are about 34 percent for all vehicles. Vehicle operating costs make up about 60 percent of the total user costs. The table reveals the impact grade has on truck operating costs, with heavy vehicle operating costs over 6 times higher than the light vehicles, while travel time costs are very similar for the 2 vehicle groups.

Table 61. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**370**	**2330**	**930**	**60%**
Travel Time Costs	**500**	**610**	**530**	**34%**
Crash Costs*			**90**	**6%**
		TOTAL USER COSTS	**1550**	**100%**
* based on national data used in HERS-ST				

Table 62 presents additional crash information for this corridor. There were 965 crashes in this corridor in 2010. About 13 percent of them involved a truck. This corridor has a crash rate about the same as the statewide average for highways with the same functional classification. There are 16 SPIS sites that fall into the top 10 percent list of state SPIS sites on this truck safety corridor.

Table 62. Portland to Ontario (I-84) 2010 Crash Statistics

Total Number of Crashes	965
Truck Involved Crashes (Percent Truck Involved)	123 (12.7%)
Corridor Crash Rate per 1 milllion VMT	0.44
Statewide Crash Rate (same functional class)	0.41
Corridor Average Crash Costs $ per 1000 VMT	90
Number of Top 10% SPIS Sites on Corridor	16
Truck Safety Corridor?	yes

5.12 Corridor Performance: Interstate 205

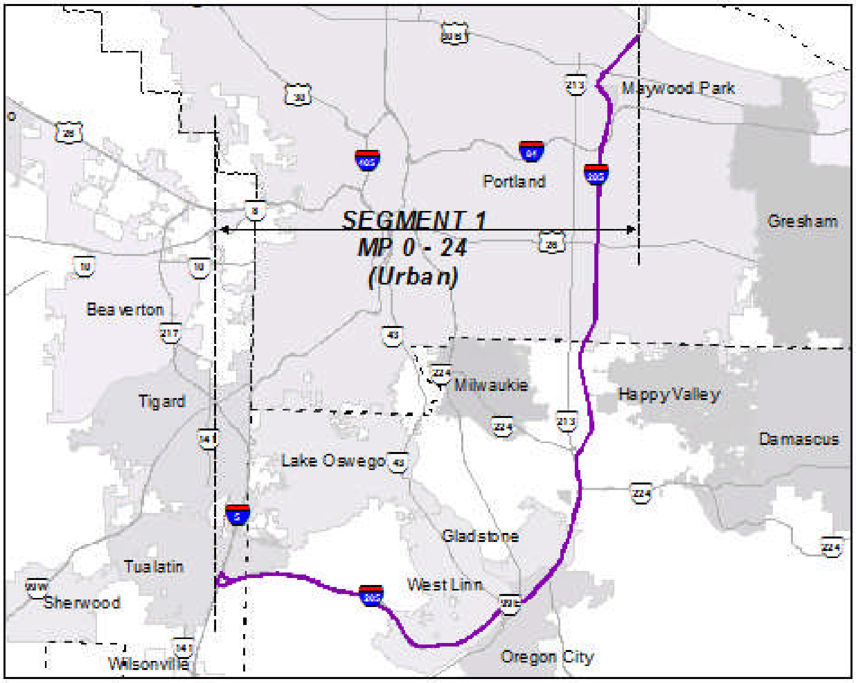


Figure 93. Segmented Map of I-205 Corridor

5.12.1 Corridor Overview

Figure 93 illustrates the I-205 corridor running through the east side of Portland. This corridor is 24 miles long and urban. Average annual daily traffic ranges between 20,000 and 82,000 vehicles. On average, trucks represent about 9 percent of daily traffic.

5.12.2 Economic Characteristics

Figure 94 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, Petroleum, Coal, & Chemicals; Pulp & Paper; and Clay Minerals & Stone represent 16 to 23 percent of each group's movement across all 19 bottleneck corridors. In terms of weight, Pulp & Paper; Machinery & Instruments; and Petroleum Coal & Chemicals are the top 3 groups moving along this corridor, representing 13 to 18 percent of movement all 19 bottleneck corridors.

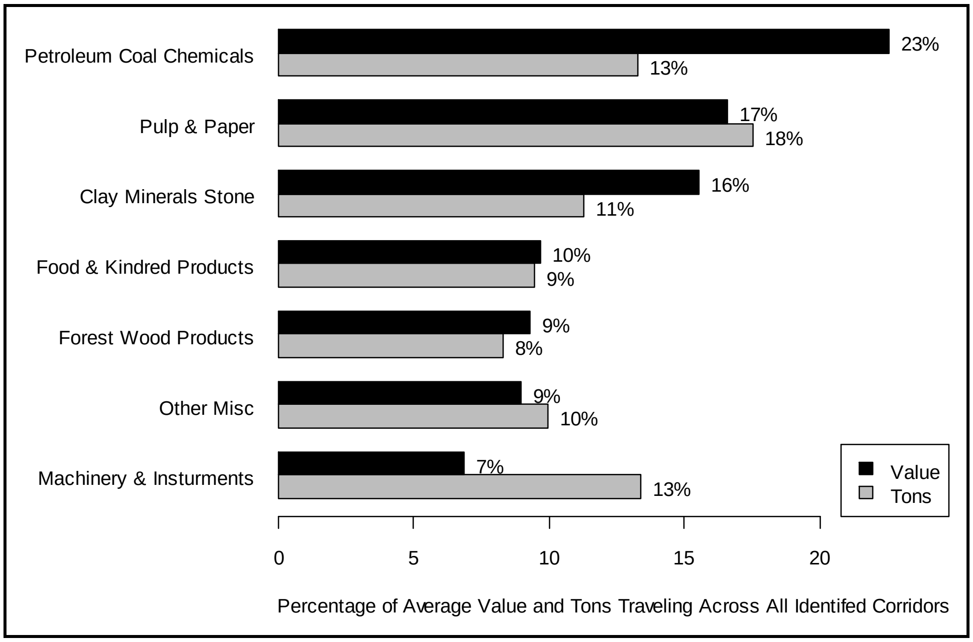


Figure 94. East Portland (I-205) Percentage of Average Value and Tons

Figure 95 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Wholesale Trade; Machine & Metals; and Computer & Electronics, representing between 15 and 27 percent of industry use across this corridor. In terms of weight, the top 3 industries are Machine & Metals; Wholesale Trade; and Ag Forest & Fish; representing between 22 and 29 percent of industry use across this corridor.

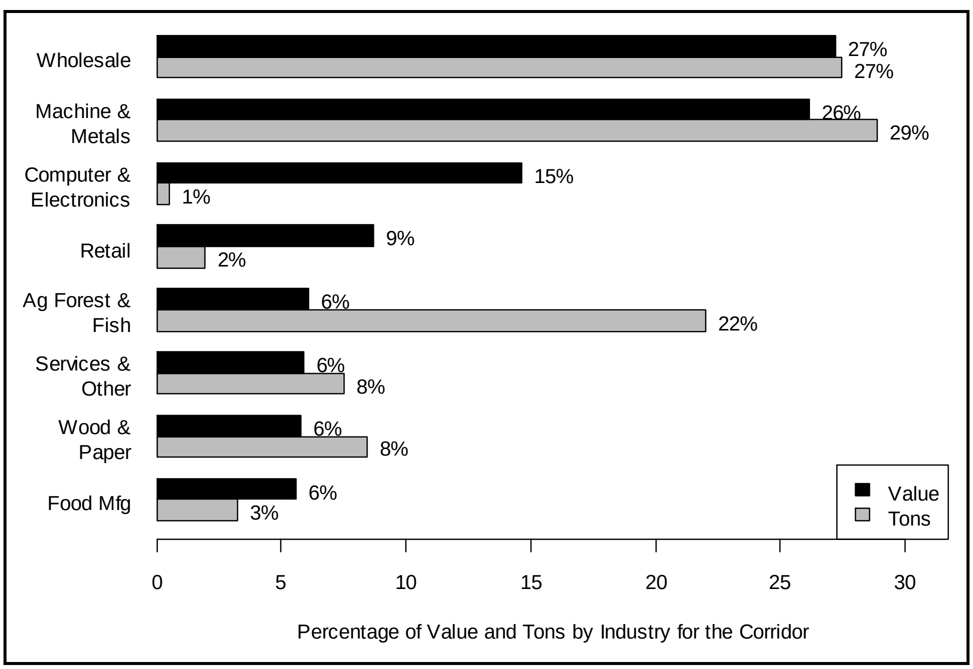


Figure 95. East Portland (I-205) Percentage of Value and Tons by Industry

5.12.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Table 63 reports the share of truck traffic for this corridor. Figure 96 illustrates the traffic volumes for this corridor. Volumes increase on the corridor as you move from the south end at I-5 towards the north. As indicated by the volume to capacity ratio plot, the corridor has reached capacity for the bulk of the corridor. As a result, this corridor is vulnerable to delay caused by even minor incidents and peak hour delay.

Table 63. Truck Share of Annual ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Corridor	9 %	9%

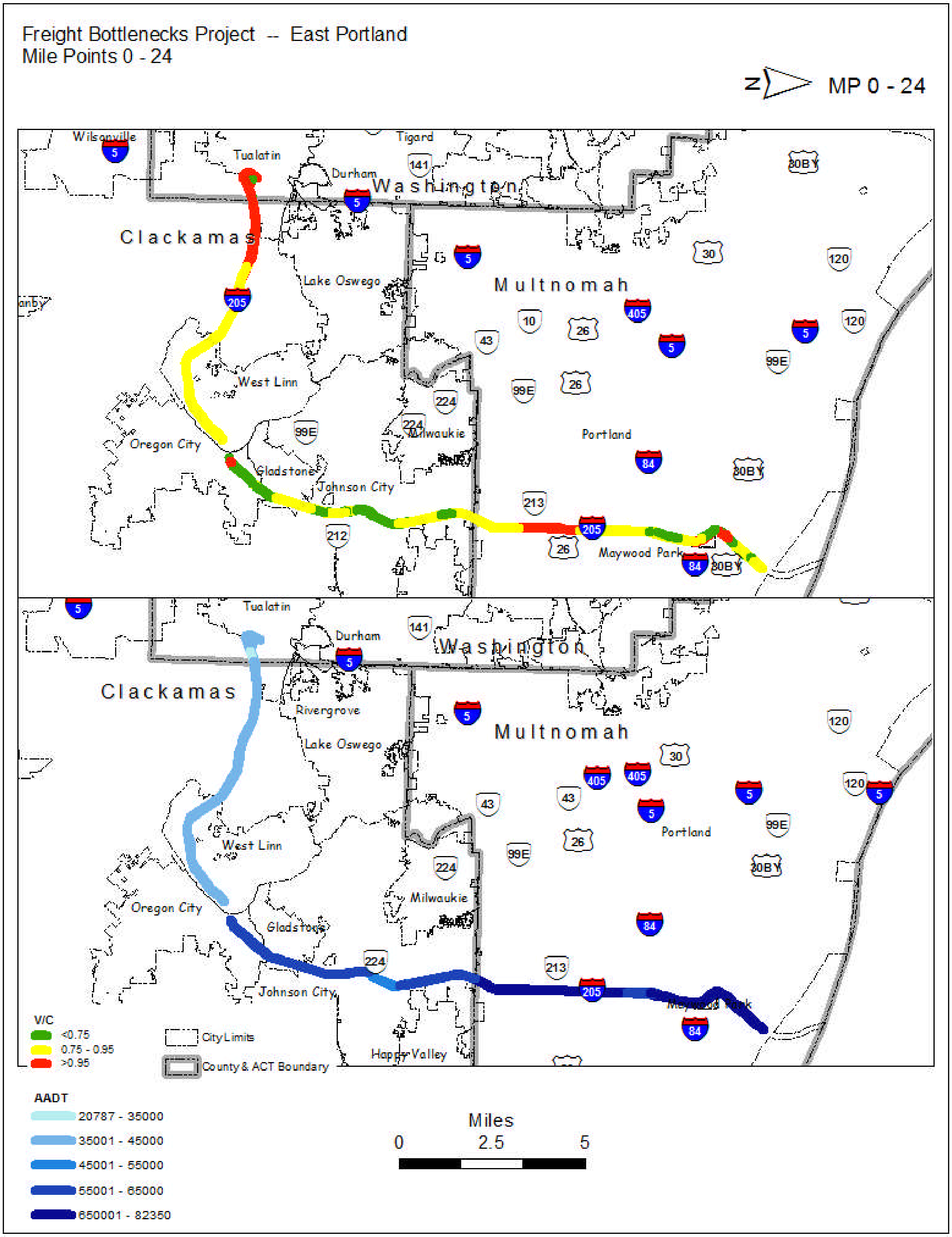


Figure 96. Freight Bottlenecks Project – East Portland (I-205)

5.12.4 Corridor Geometrics

Table 64 reports the corridor geometrics for curvature and grade. Curvature is not a significant factor for this corridor. Thirteen percent of the corridor has grades greater than 2.5 percent, which will affect truck operations. However, delay caused by roadway geometrics does not amount to a significant amount of delay over the entire length of the corridor.

Table 64. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**97%**	**0%**	**2%**	**0%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**20%**	**68%**	**13%**	**0%**	**0%**	**0%**	**100%**

5.12.5 Corridor Delay and Reliability

Figure 97 presents the annual average hours of delay per 1000 vehicle miles traveled. There are distinct locations of delay in the areas of Lake Oswego, Oregon City/West Linn and at Powell Boulevard. Table 65 reveals over 70 percent of the delay due to incidents. Congested conditions cause nearly a third of the corridor delay.

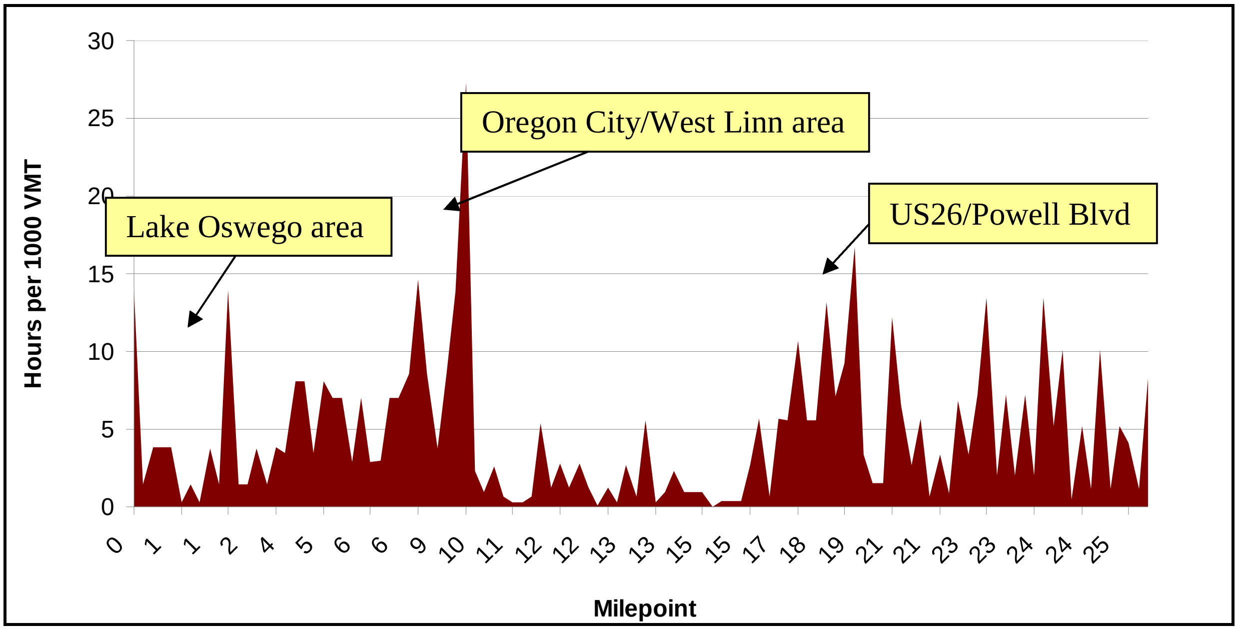


Figure 97. Annual Average Delay - Hours per 1000 VMT

Table 65. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	**Incident Delay**	**Congestion Delay**	**Total Delay**
Rural (6 miles)	0.0	4.0	0.9	4.9
Urban (43)	0.0	3.7	1.6	5.3
Total Corridor	0.0	3.8	1.5	5.3
Share of Total	0%	72%	28%	100%
* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of the number of vehicles on the road.				

5.12.6 User Costs

Truck operating costs are reported in Figure 98 and travel time costs in Figure 99 for the entire corridor. Among the three user costs, truck operating costs are the largest, about 30 percent more than travel time costs. Figure 100 illustrates crash costs, which are a relatively small component of total user costs.

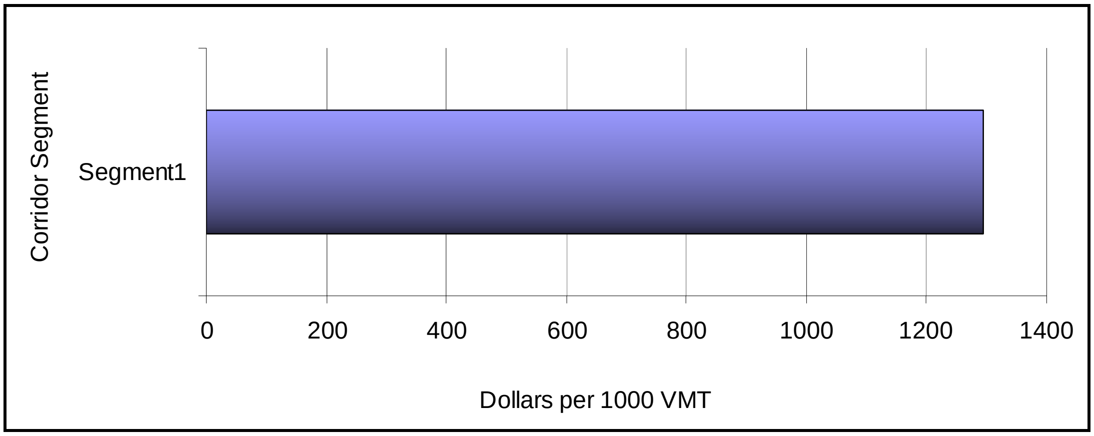


Figure 98. I-205 Corridor Average Truck Operating Costs

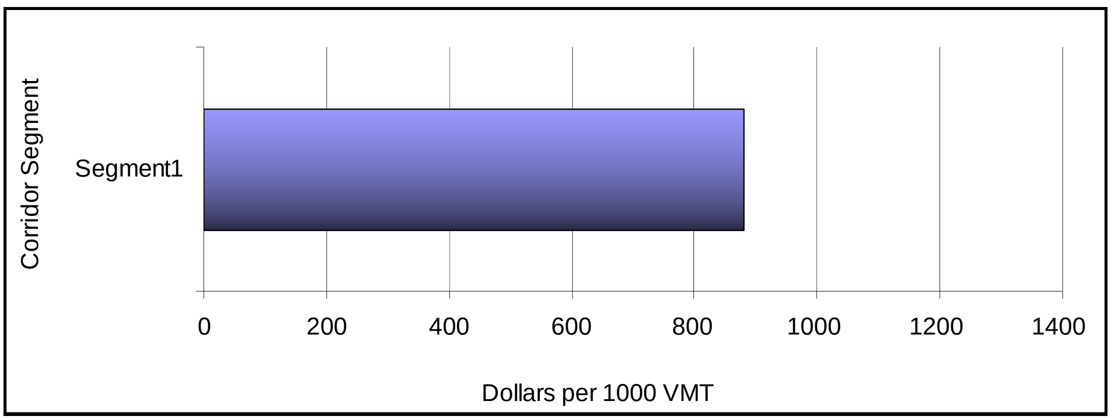


Figure 99. I-205 Corridor Average Truck Travel Time Costs

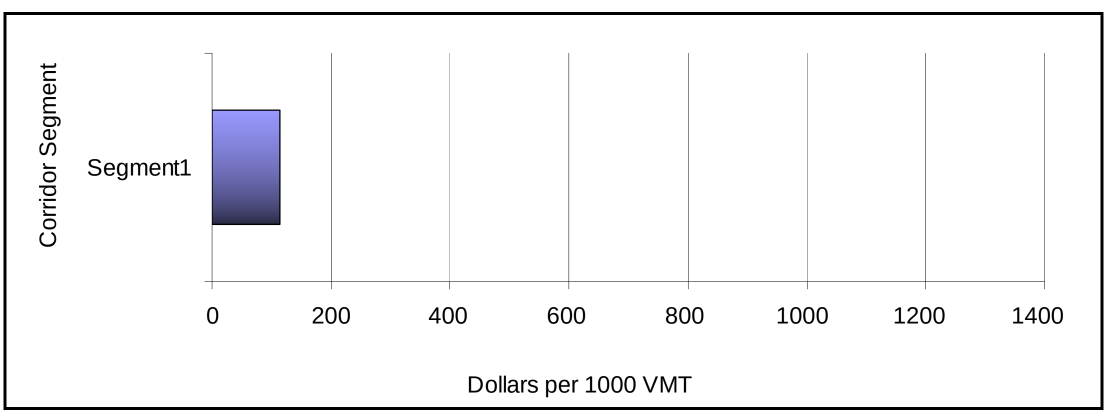


Figure 100. I-205 Corridor Average Crash Costs for All Vehicles

Table 66 reports user costs for trucks alongside light vehicles. If crash costs are left out of the equation, over 40 percent of light vehicle user costs are due to operating costs, compared to nearly 70 percent of truck user costs due to operating costs.

Table 66. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**300**	**1215**	**385**	**35%**
Travel Time Costs	**590**	**930**	**620**	**56%**
Crash Costs*			**110**	**10%**
		TOTAL USER COSTS	**1115**	**100%**
* based on national data used in HERS-ST				

Table 67 presents additional crash information for this corridor. There were 573 crashes reported on this corridor in 2010. Four percent of the crashes had truck involvement. The overall crash rate for this corridor is about the same as the statewide average rate for a highway in this functional classification. There are 14 SPIS sites that fall into the top ten percent list of state SPIS sites on this truck safety corridor.

Table 67. I-205 East Portland 2010 Crash Statistics

Total Number of Crashes	573
Truck Involved Crashes (Percent Truck Involved)	23 (4%)
Corridor Crash Rate per 1 milllion VMT	0.51
Statewide Crash Rate (same functional class)	0.52
Corridor Average Crash Costs $ per 1000 VMT	110
Number of Top 10% SPIS Sites on Corridor	14
Truck Safety Corridor?	yes

5.13 Corridor Performance: US 30 Astoria to Portland

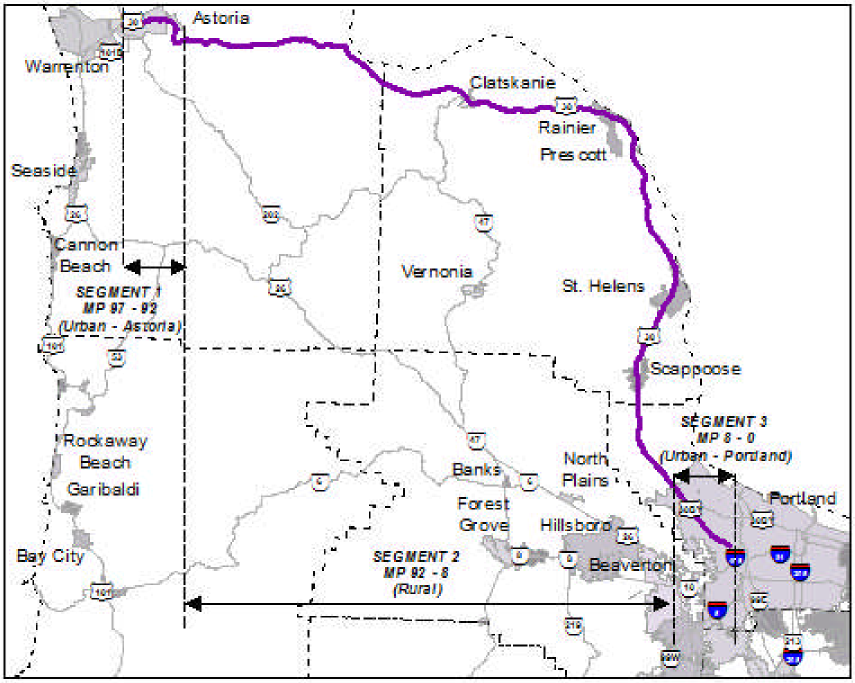


Figure 101. Segmented Map of Astoria to Portland (US 30) Corridor

5.13.1 Corridor Overview

This section of US 30 extends between Astoria and Portland along the Columbia River. It consists of one ODOT highway 92. The corridor is split into 3 segments for reporting purposes, as illustrated in Figure 101. Segments 1 and 3 are urban and Segment 2 is rural. The corridor is 97 miles long. It connects the communities of Prescott, Columbia City, and Scappoose. Average annual daily traffic volumes range from 11,000 to 25,000 vehicles. Trucks comprise about 11 percent of the traffic volume. There are sections on the corridor approaching capacity, mostly on the urban portions in Astoria, St. Helens, Scappoose and Portland.

5.13.2 Economic Characteristics

Figure 102 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, Pulp & Paper; Petroleum, Coal, & Chemicals; and Clay Minerals & Stone represent 4 to 7 percent of each group's movement across all 19 bottleneck corridors. In terms of weight, Pulp & Paper and Petroleum Coal & Chemicals are the top 2 groups moving along this corridor, representing 4 to 8 percent of movement all 19 bottleneck corridors.

In terms of value, the top 3 industries using this corridor are Wholesale Trade; Machine & Metals; and Computer & Electronics, representing between 15 and 27 percent of industry use across this corridor. In terms of weight, the top 3 industries are Machine & Metals; Wholesale Trade; and Ag Forest & Fish; representing between 22 and 29 percent of industry use across this corridor.

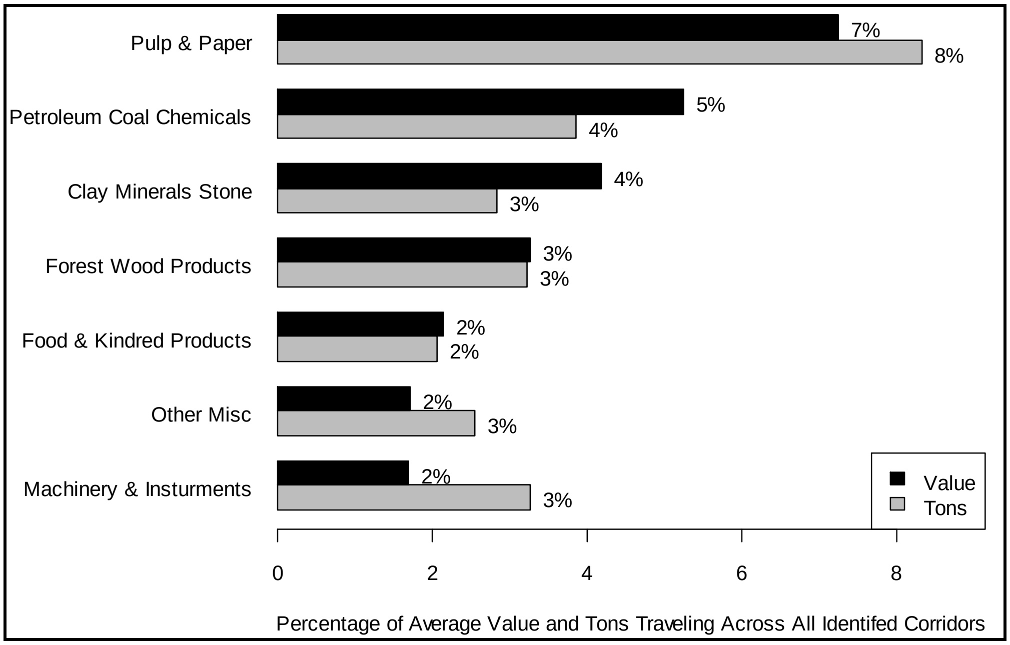


Figure 102. Astoria to Portland (US 30) Percentage of Average Value and Tons

Figure 103 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Wood & Paper; Machine & Metals; and Wholesale Trade, representing between 20 and 24 percent of industry use across this corridor. In terms of weight, the top 3 industries are Ag Forest & Fish; Wood & Paper; and Machine & Metals, representing between 20 and 30 percent of industry use across this corridor.

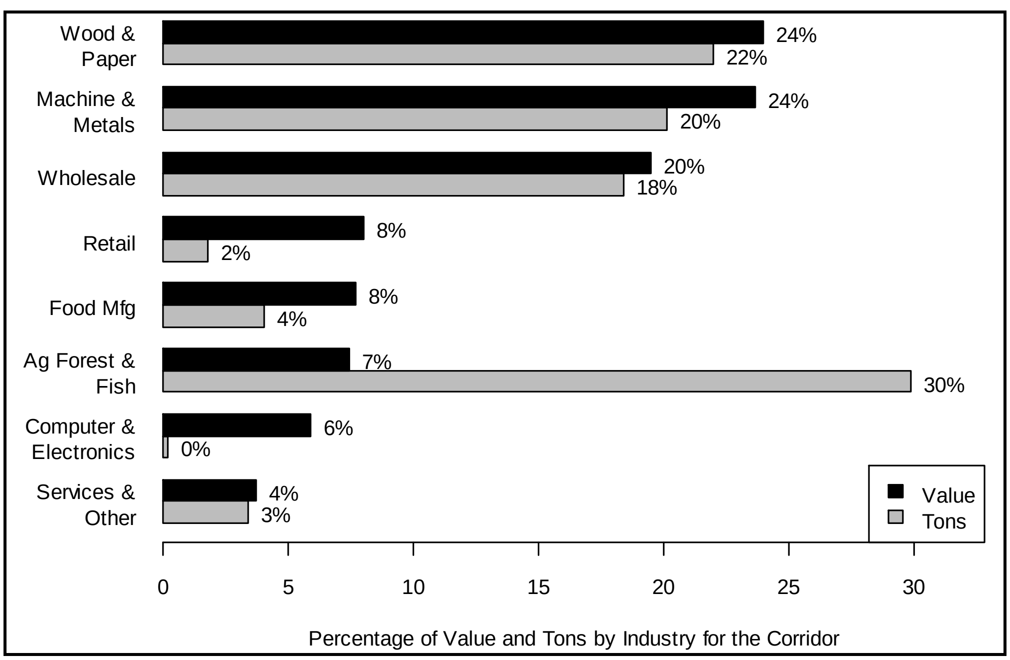


Figure 103. Astoria to Portland (US 30) Percentage of Value and Tons by Industry

5.13.3 Corridor Performance

Corridor performance metrics are presented for several areas of performance, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Traffic volumes rise along the corridor from the west to the east, although the share of trucks on the highway remains about the same, as indicated in Table 68. Figure 104 illustrates corridor volume to capacity ratios and average annual daily traffic. There are sections on the corridor approaching capacity, mostly on the urban portions in Astoria, St. Helens, Scappoose and Portland. About 5 miles of the corridor is operating at capacity.

Table 68. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	10%	11%
Segment 2	11%	11%
Segment 3	11%	11%

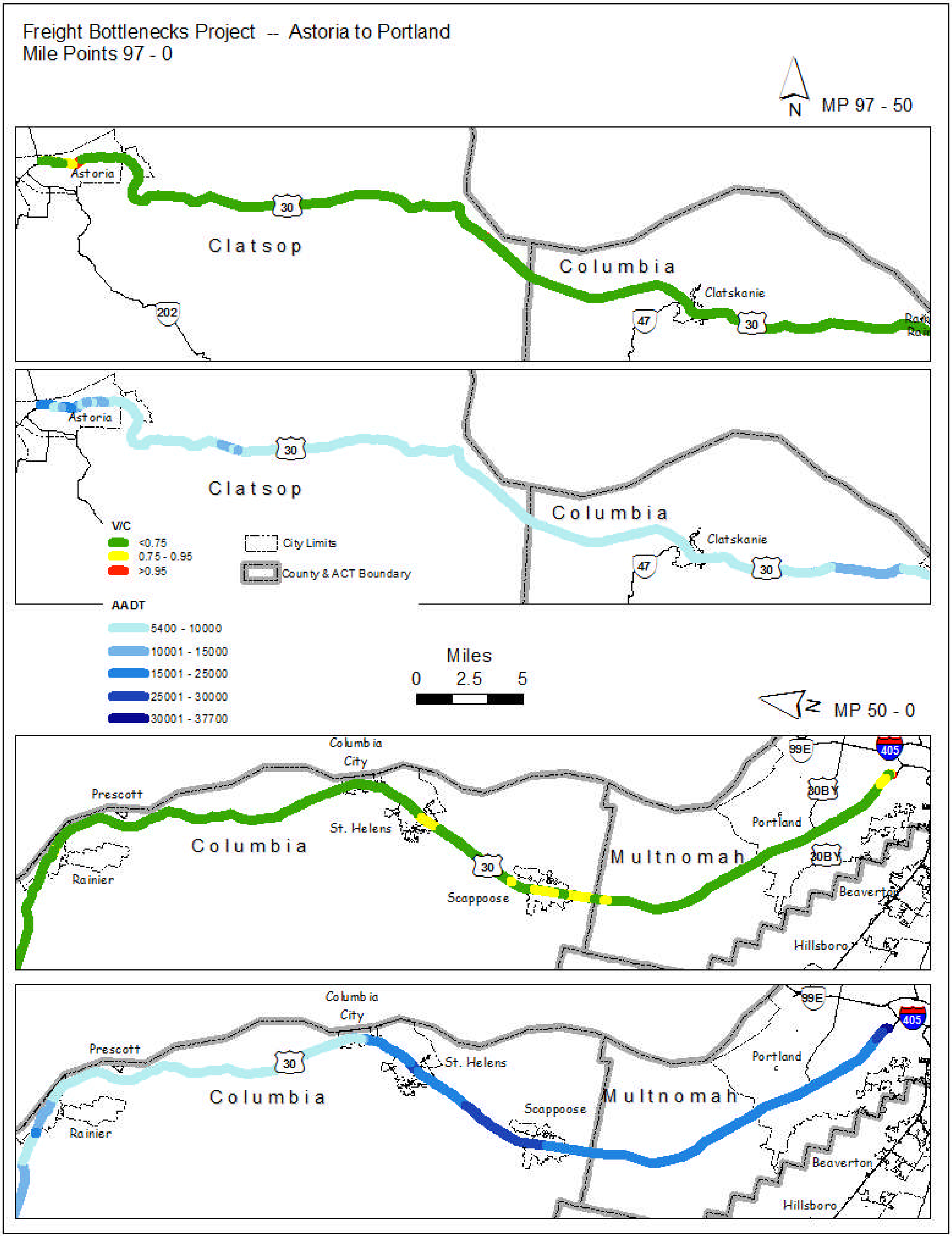


Figure 104. Freight Bottlenecks Project –Astoria to Portland (US 30)

5.13.4 Corridor Geometrics

Table 69 reports the corridor geometrics for curvature and grade. Twelve percent of this corridor has curvature greater than 3.5 degrees. Twenty-five percent of the corridor has grades greater than 2.5 percent, which significantly affects truck operations. Forty-two percent of the total delay on this corridor is associated with geometric characteristics.

Table 69. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**88%**	**7%**	**4%**	**1%**	**1%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**47%**	**27%**	**10%**	**12%**	**3%**	**0%**	**100%**

5.13.5 Corridor Delay and Reliability

Figure 105 presents the average annual hours of delay per 1,000 vehicle miles traveled along this corridor. As seen previously, congestion occurs in the urban areas, even smaller urban areas such as Rainier and Scappoose. Some of these sections have additional lanes, other do not. There is quite a bit of variation by sections of the corridor.

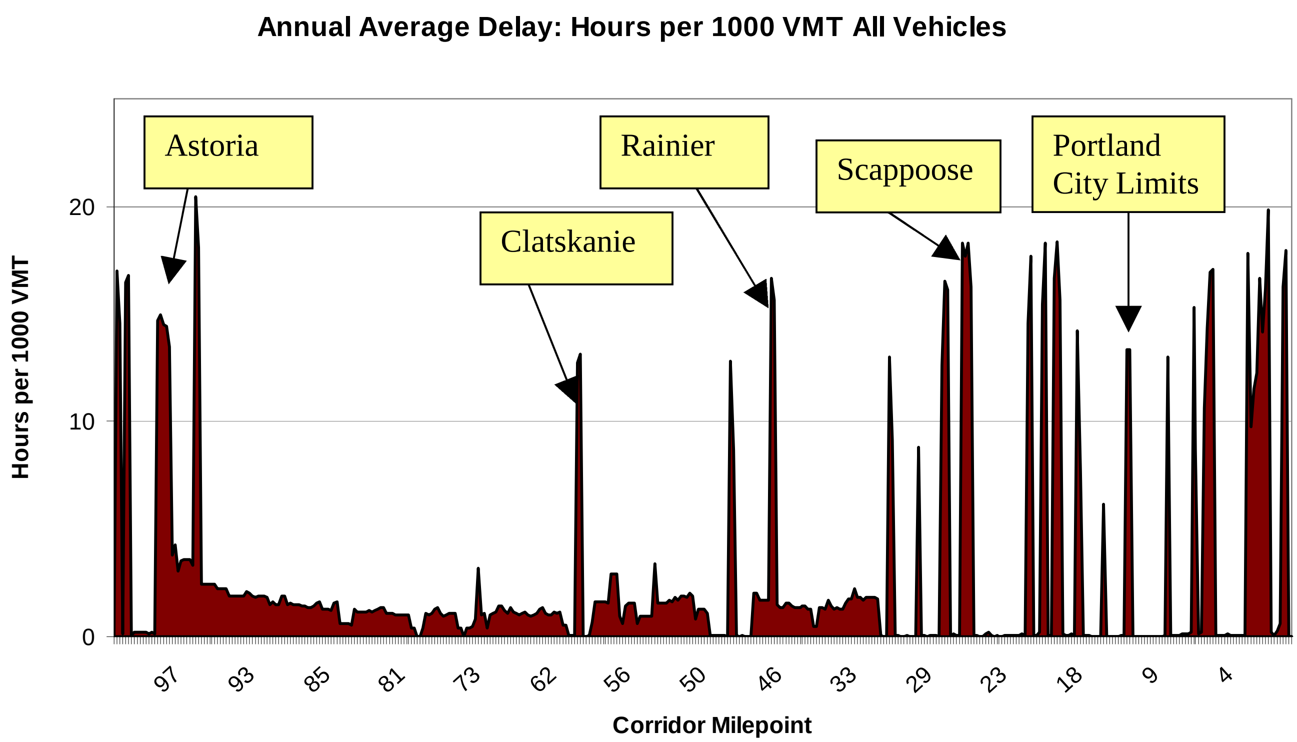


Figure 105. Annual Average Delay for All Vehicles - Hours per 1000 VMT

Table 70 reveals over 50 percent of the delay on this corridor is due to congestion. Only 4 percent is associated with incident delay. As noted previously, corridor geometrics cause over 40 percent of total corridor delay.

Table 70. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural (92 miles)	0.4	0.1	0.9	1.5
Urban (20 miles)	2.5	0.2	2.3	5.0
Total Corridor	1.1	0.1	1.4	2.6
Share of Total	42%	4%	54%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of the number of vehicles on the road.

5.13.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 106, Figure 107, and Figure 108 for the 3 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs vary by highway segment somewhat. Segments 1 and 3 are the urban portions of the corridor. They represent a total of 13 miles. The Astoria segment has slightly lower truck operating costs than the Portland segment, but higher travel time costs. The rural segment of the corridor, with smaller cities included, has significantly higher truck operating costs than travel time costs, most likely due to the highway geometrics. Crash costs are nearly equal for all 3 corridor segments. Total user costs are very close to the same for all 3 segments as well, a little lower (7%) overall for the Portland segment.

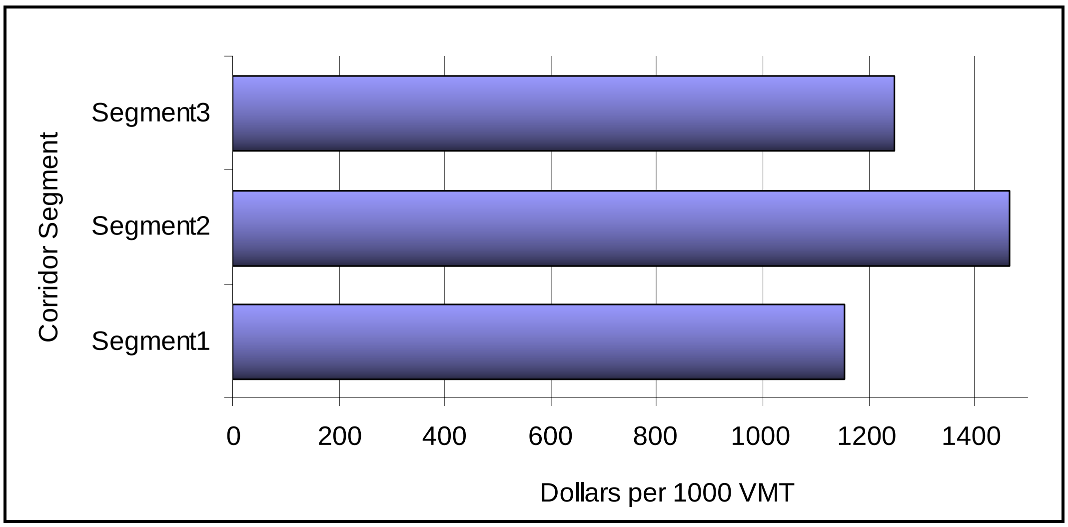


Figure 106. Astoria to Portland (US 30) Corridor Average Truck Operating Costs

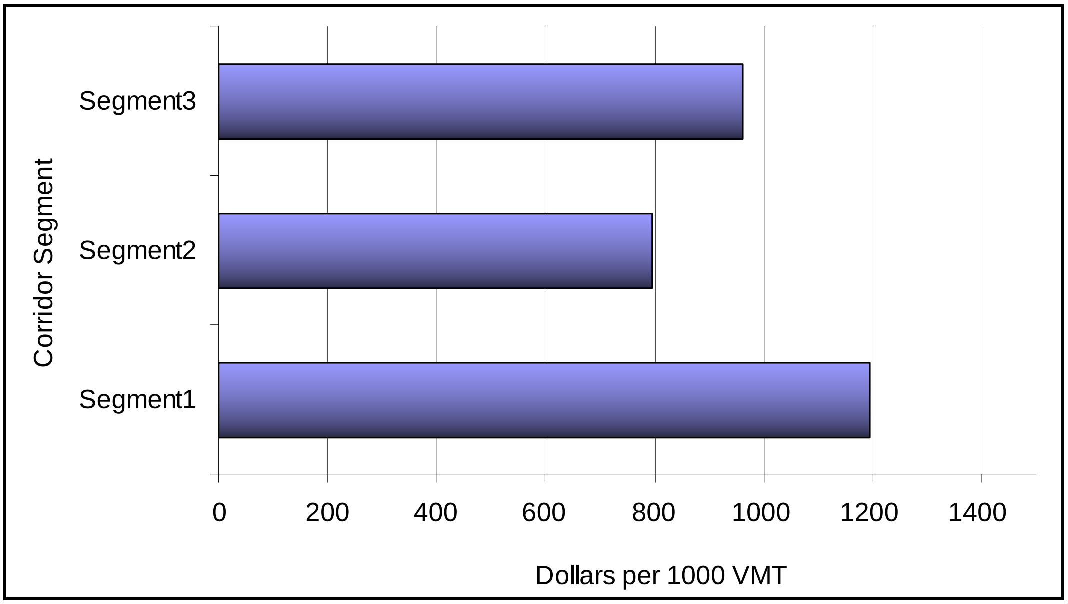


Figure 107. Astoria to Portland (US 30) Corridor Average Truck Travel Time Costs

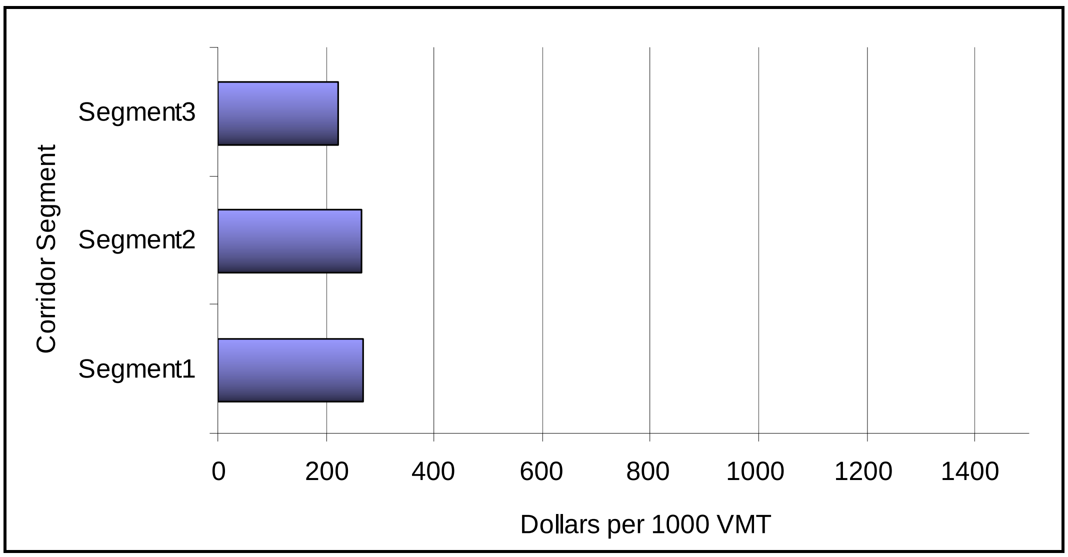


Figure 108. Astoria to Portland (US 30) Corridor Average Crash Costs for All Vehicles

Table 71 reports user costs for trucks alongside light vehicles. Overall, operating costs represent about 37 percent of the corridor costs, travel time about 44 percent and crash costs 20 percent.

Table 71. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	350	1435	470	37%
Travel Time Costs	520	780	550	44%
Crash Costs*			240	19%
		TOTAL USER COSTS	1260	100%
* based on national data used in HERS-ST				

Table 72 presents additional crash information for this corridor. There were 328 crashes on this corridor in 2010. About 3 percent of them were truck-involved. This corridor has a crash rate about half that of the statewide rate for highways with the same functional classification. This is consistent with the low amount of delay associated with incidents. There are 5 SPIS sites that fall into the top 10 percent list of state SPIS sites on this corridor.

Table 72. Astoria to Portland (US 30) 2010 Crash Statistics

Total Number of Crashes	328
Truck Involved Crashes (Percent Truck Involved)	11 (3.4%)
Corridor Crash Rate per 1 milllion VMT	0.73
Statewide Crash Rate (same functional class)	1.33
Corridor Average Crash Costs $ per 1000 VMT	240
Number of Top 10% SPIS Sites on Corridor	5
Truck Safety Corridor?	no

5.14 Corridor Performance: OR140 Medford to Klamath Falls

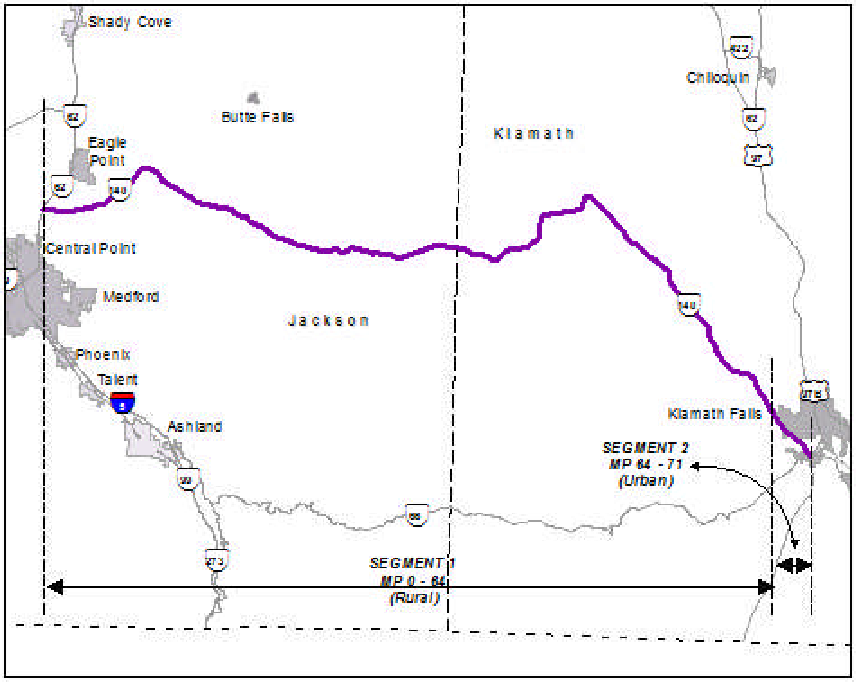


Figure 109. Segmented Map of Medford to Klamath Falls (OR 140) Corridor

5.14.1 Corridor Overview

This corridor extends from OR62 at White City (north of Medford) east to Klamath Falls. It consists of 2 ODOT highways, 270 and 21 (last mile connection to Klamath Falls.) The corridor is split into 2 segments for reporting purposes to capture the characteristics of the Klamath Falls urban segment, as illustrated in Figure 109. The corridor is 71 miles long. Average annual daily traffic volumes range from 2,700 to 5,400 vehicles. Trucks comprise 8 to 21 percent of the traffic volume. There do not appear to be any persistent capacity limitations on this corridor.

5.14.2 Economic Characteristics

Figure 110 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. Forest Wood Products is the largest group moving across this corridor, representing 2 percent of flows by value and 1.5 percent by weight across all 19 bottleneck corridors. The remaining commodity groups are all less than 1 percent of total commodity movement on the bottleneck corridors, with the exception of Other Misc. group by weight, representing 1.4% of total commodity flows on this corridor relative to the other 19 corridors.

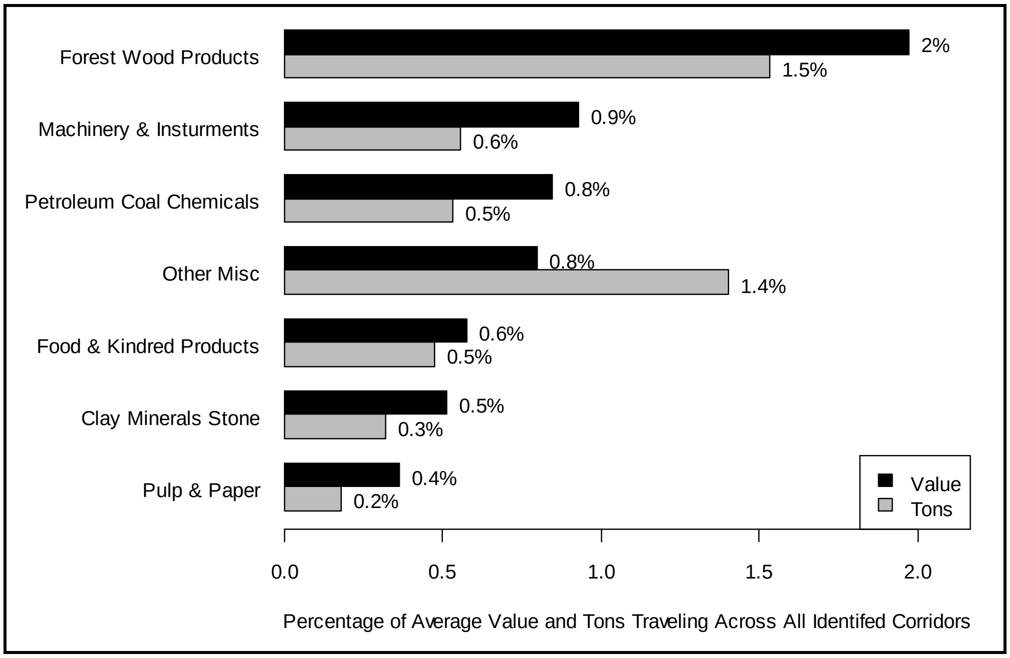


Figure 110. Medford to Klamath Falls (OR 140) Percentage of Average Value and Tons

Figure 111 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Wholesale Trade; Machine & Metals; and Computer & Electronics, representing between 17 and 28 percent of industry use across this corridor. In terms of weight, the top 3 industries are Ag Forest & Fish, Wholesale Trade, and Wood & Paper; representing between 21 and 33 percent of industry use across this corridor.

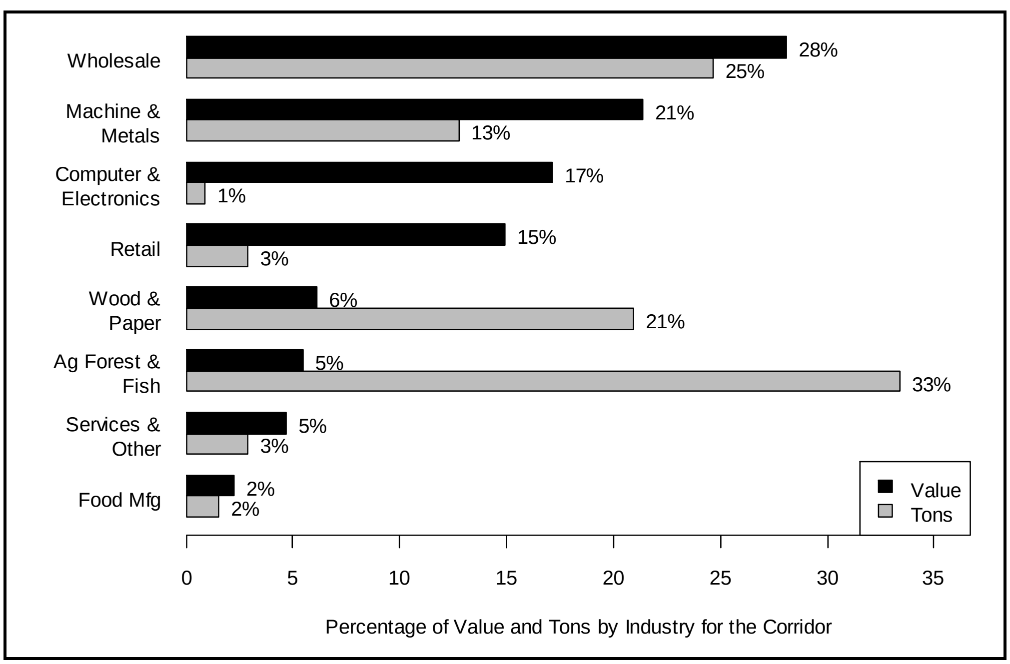


Figure 111. Medford to Klamath Falls (OR 140) Percentage of Value and Tons by Industry

5.14.3 Corridor Performance

Corridor performance metrics are presented for several areas of performance, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Table 73 reports the share of truck traffic, which is 8% in Klamath Falls. Figure 112 illustrates corridor volume to capacity ratios and average annual daily traffic. Traffic volumes are higher in the urban areas, especially Klamath Falls.

Table 73. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	**Daily Vehicle Miles Traveled (Share of VMT)**
Segment 1	21 %	23%
Segment 2	8%	10%

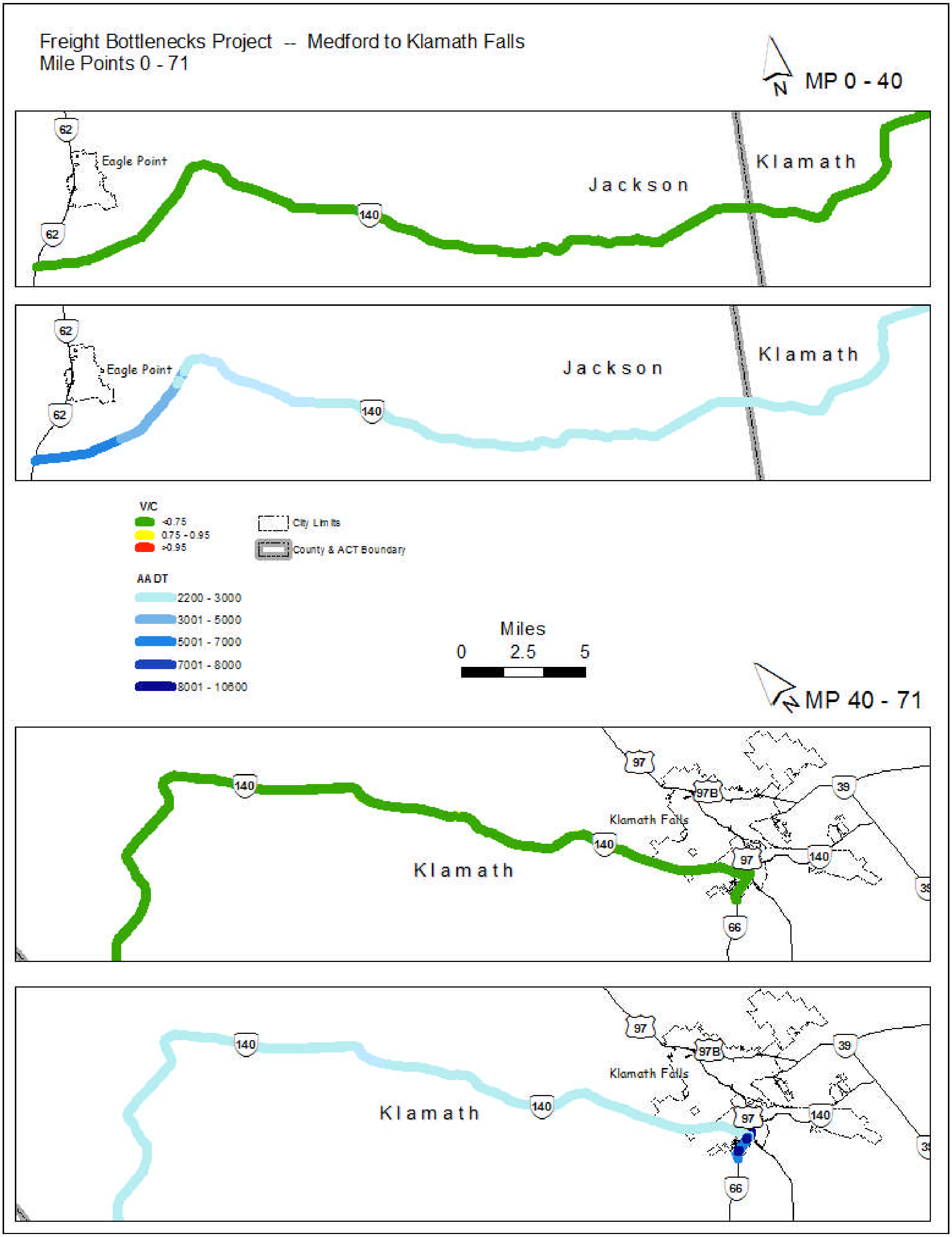


Figure 112. Freight Bottlenecks Project - Medford to Klamath Falls (OR 140)

5.14.4 Corridor Geometrics

Table 74 reports the corridor geometrics for curvature and grade. Sixteen percent of this corridor has curvature greater than 3.5 degrees. Forty percent of the corridor has grades greater than 2.5 percent, which significantly affects truck operations. Forty-five percent of the total delay on this corridor is associated with geometric characteristics.

Table 74. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**84%**	**7%**	**4%**	**2%**	**3%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**23%**	**37%**	**14%**	**23%**	**3%**	**0%**	**100%**

5.14.5 Corridor Delay and Reliability

Figure 113 presents the average annual hours of delay per 1,000 vehicle miles traveled along this corridor. As seen previously, congestion occurs in the urban areas. There is one section that distinctly shows delay caused by roadway geometrics.

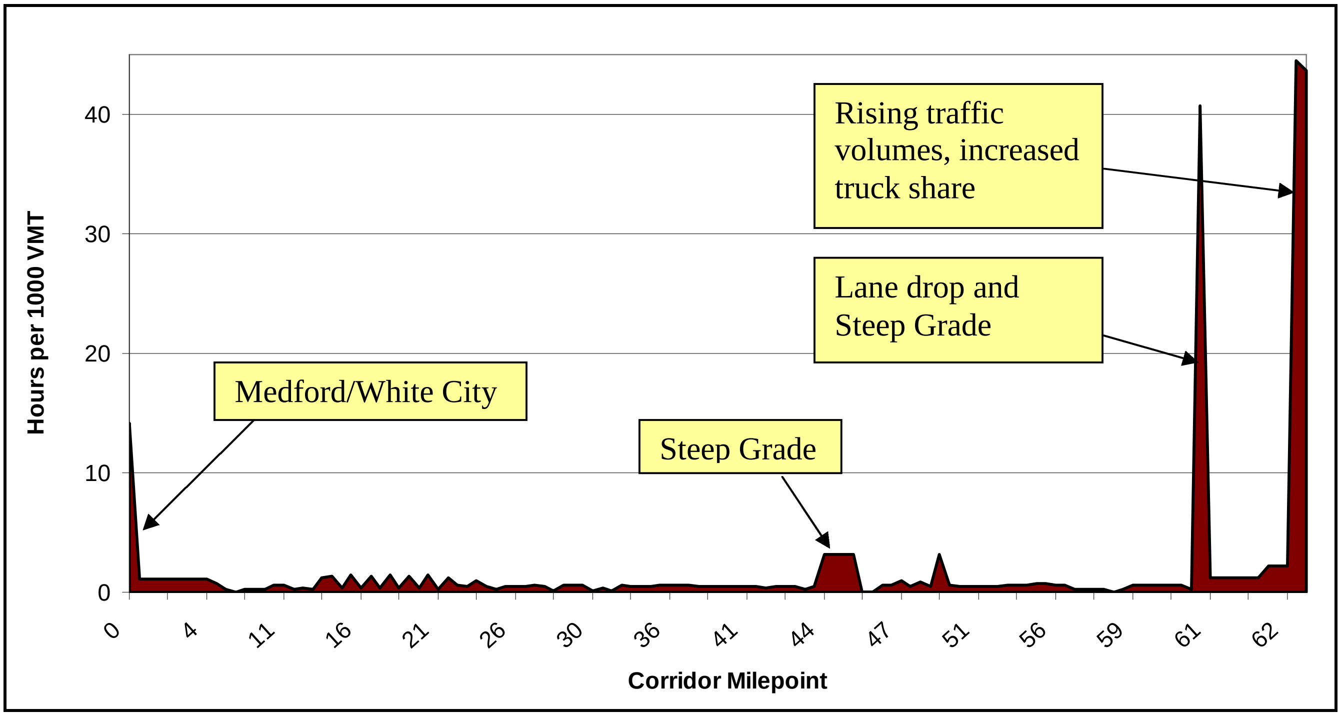


Figure 113. Annual Average Delay for All Vehicles - Hours per 1000 VMT

Error! Not a valid bookmark self-reference. reports 50 percent of the delay on this corridor is due to congestion. Six percent is associated with incident delay, while 45 percent is associated with roadway geometrics, as mentioned earlier.

Table 75. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural (92 miles)	0.0	0.0	0.7	0.7
Urban (20 miles)	2.9	0.2	1.1	4.3
Total Corridor	0.7	0.1	0.8	1.5
Share of Total	45%	6%	50%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of the number of vehicles on the road.

5.14.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 114, Figure 115, and Figure 116. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs are similar for both corridor segments, running more than double the travel time costs. Travel time costs are greater in the Klamath Falls segment, where volumes are higher and delay occurs. Crash costs are the smallest component of total user costs and higher on Segment 1.

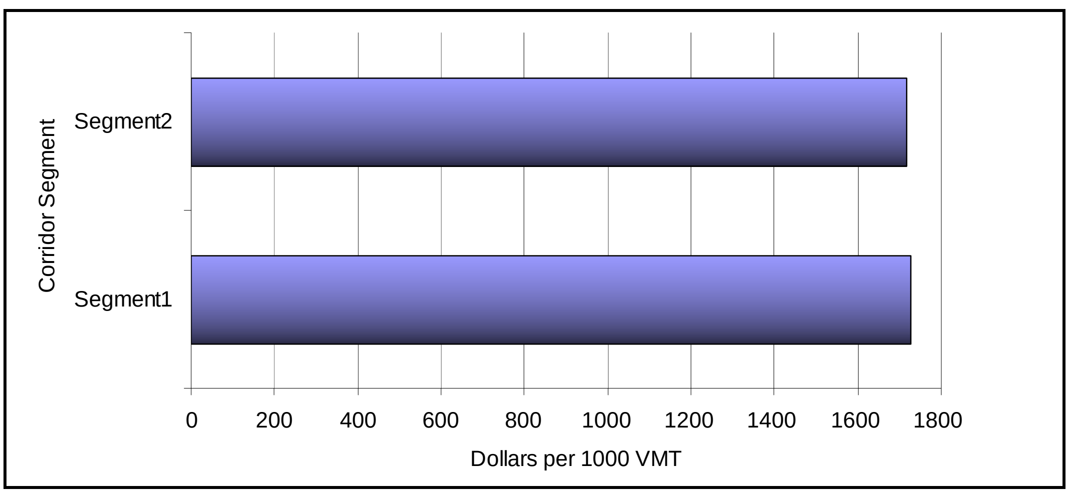


Figure 114. Medford to Klamath Falls (OR 140) Corridor Average Truck Operating Costs

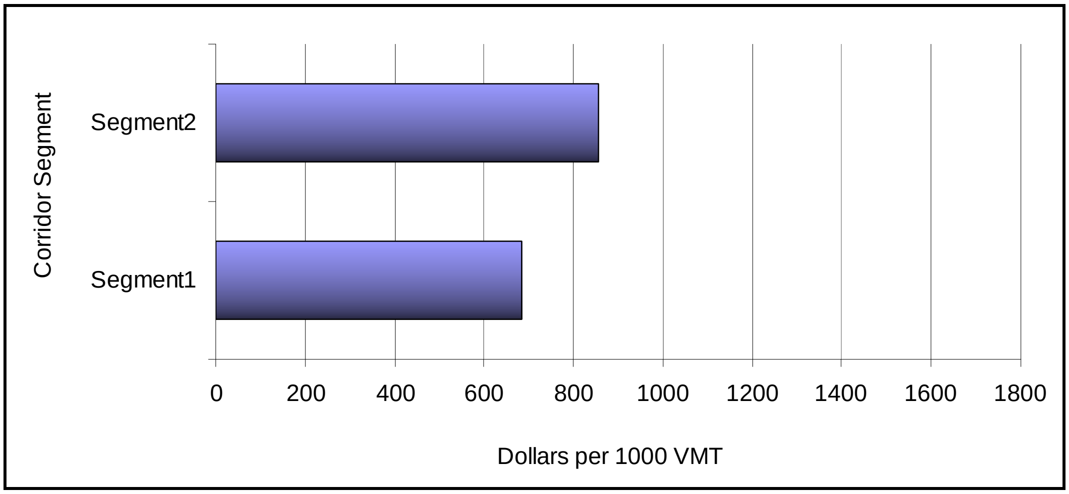


Figure 115. Medford to Klamath Falls (OR 140) Corridor Average Truck Travel Time Costs

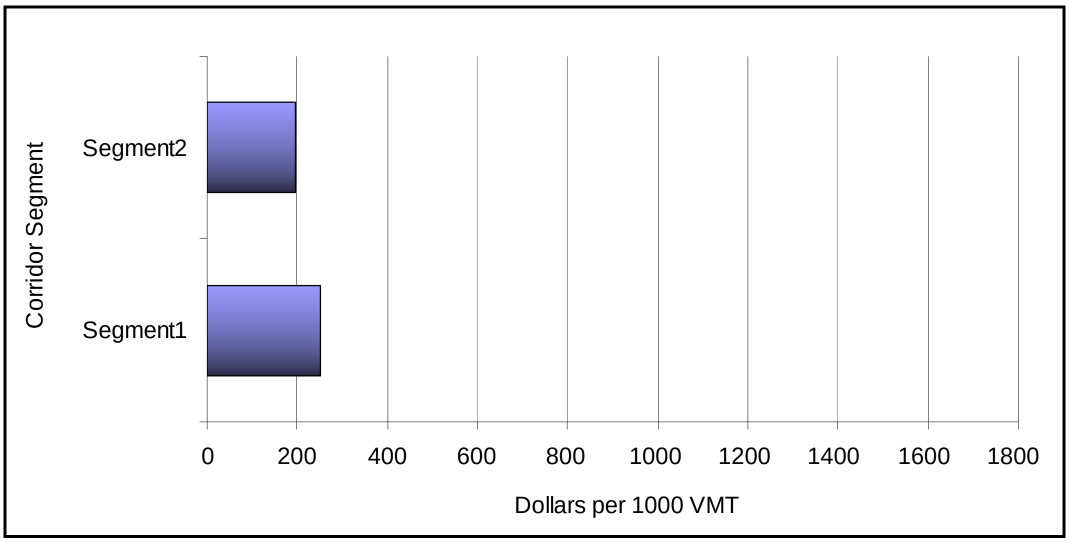


Figure 116. Medford to Klamath Falls (OR 140) Corridor Average Crash Costs for All Vehicles

Table 76 reports user costs for trucks as well as light vehicles. Overall, operating costs represent 47 percent of the corridor costs, travel time 36 percent and crash costs 17 percent.

Table 76. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**390**	**1710**	**670**	**47%**
Travel Time Costs	**470**	**680**	**510**	**36%**
Crash Costs*			**240**	**17%**
		TOTAL USER COSTS	**1420**	**100%**
* based on national data used in HERS-ST				

Table 77 presents additional crash information for this corridor. There were 93 crashes on this corridor in 2010. About 2 percent of them were truck-involved. This corridor has a crash rate nearly double the rate of highways with the same functional classification. There are 3 SPIS sites that fall into the top 10 percent list of state SPIS sites on this corridor.

Table 77. Medford to Klamath Falls (OR 140) 2010 Crash Statistics

Total Number of Crashes	93
Truck Involved Crashes (Percent Truck Involved)	2 (2.2%)
Corridor Crash Rate per 1 milllion VMT	1.26
Statewide Crash Rate (same functional class)	0.70
Corridor Average Crash Costs $ per 1000 VMT	240
Number of Top 10% SPIS Sites on Corridor	3
Truck Safety Corridor?	no

5.15 Corridor Performance: OR18 Willamina to Dundee

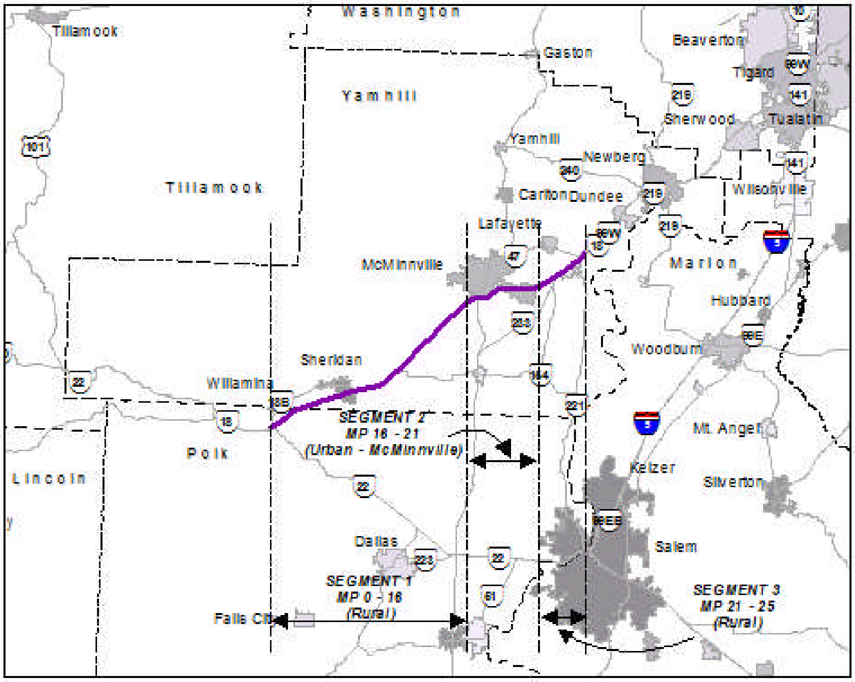


Figure 117. Segmented Map of Willamina to Dundee (OR 18) Corridor

5.15.1 Corridor Overview

This section of OR18 extends between the Willamina intersection at OR22 to the southwest and OR99W at Dundee to the northeast. This corridor consists of ODOT highway 39. The corridor is split into 3 segments for reporting purposes, as illustrated in Figure 117. Segments 1 and 3 are rural and Segment 2 is urban. The corridor is 25 miles long and connects the communities of Sheridan, McMinnville, Lafayette and Dundee. Average annual daily traffic volumes range from 9,000 to 13,500 vehicles. Trucks comprise 6 percent of the traffic volume. There are not persistent issues related to capacity on this corridor when assessing average annual daily patterns. However, this corridor is known for peak hour and weekend congestion.

5.15.2 Economic Characteristics

Figure 118 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, Forest Wood Products; Pulp & Paper; Petroleum, Coal, & Chemicals; and Clay Minerals & Stone are the top 4 groups, representing 5 to 7 percent of each group's movement across all 19 bottleneck corridors. In terms of weight, the top 3 groups are Clay, Mineral & Stone; Forest Wood Products; and Petroleum, Coal & Chemicals, representing 4 to 7 percent moving via this corridor.

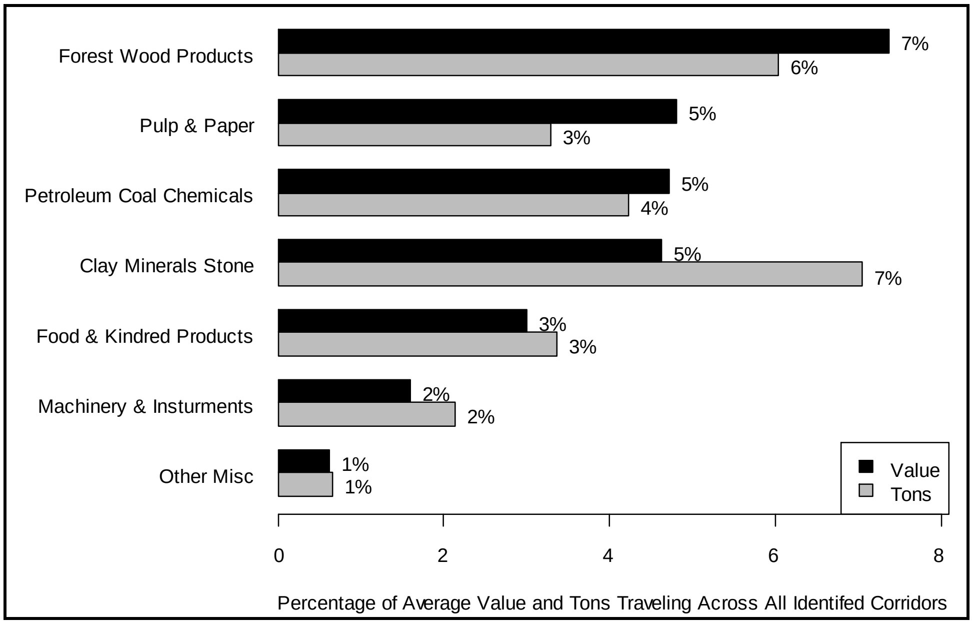


Figure 118. Willamina to Dundee (OR 18) Corridor Percentage of Average Value and Tons

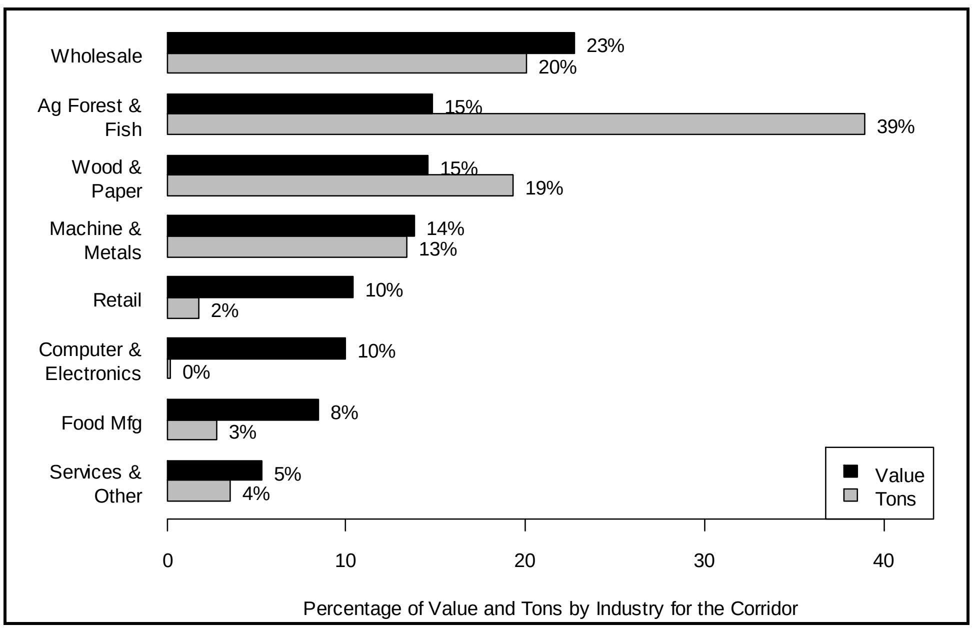


Figure 119. Willamina to Dundee (OR 18) Corridor Percentage of Value and Tons by Industry

Figure 119 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 4 industries using this corridor are Wholesale Trade; Ag Forestry & Fish; Wood & Paper; and Machine & Metals, representing between 14 and 23 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Wholesale Trade; and Wood & Paper, representing between 19 and 39 percent of industry use across this corridor.

5.15.3 Corridor Performance

Corridor performance metrics are presented for several areas of performance, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Truck share of traffic remains steady on the corridor at 6 percent, as indicated in Table 78. Figure 120 illustrates corridor volume to capacity ratios and average annual daily traffic. Traffic volumes rise considerably as the corridor moves toward Dundee. There is sufficient capacity at this time.

Table 78. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	6%	6%
Segment 2	6%	6%
Segment 3	6%	6%

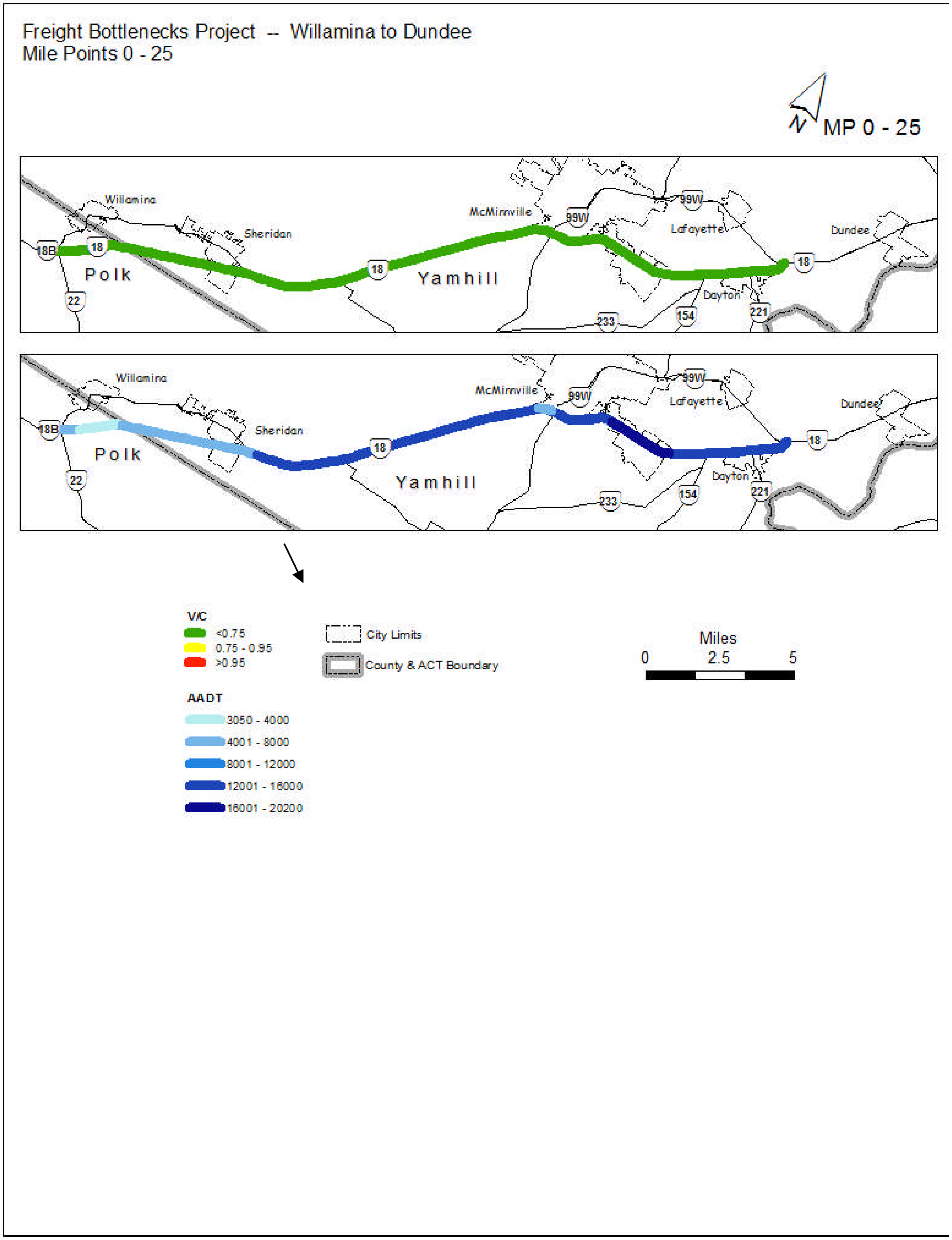


Figure 120. Freight Bottlenecks Project - Willamina to Dundee (OR 18)

5.15.4 Corridor Geometrics

Table 79 reports the corridor geometrics for curvature and grade. Two percent of this corridor has curvature greater than 3.5 degrees. Three percent of the corridor has grades greater than 2.5 percent.

This is consistent with the 4 percent share of delay associated with the corridor geometric characteristics.

Table 79. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**97%**	**2%**	**0%**	**0%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**50%**	**47%**	**3%**	**0%**	**0%**	**0%**	**100%**

5.15.5 Corridor Delay and Reliability

Figure 121 presents the average annual hours of delay per 1,000 vehicle miles traveled along this corridor. Delay is relatively low on this corridor, with one delay spike at a point where traffic volumes rise considerably. Table 80 reveals most of the delay is due to congestion. Only 4 percent is associated with corridor geometrics and 11 percent with incident delay.

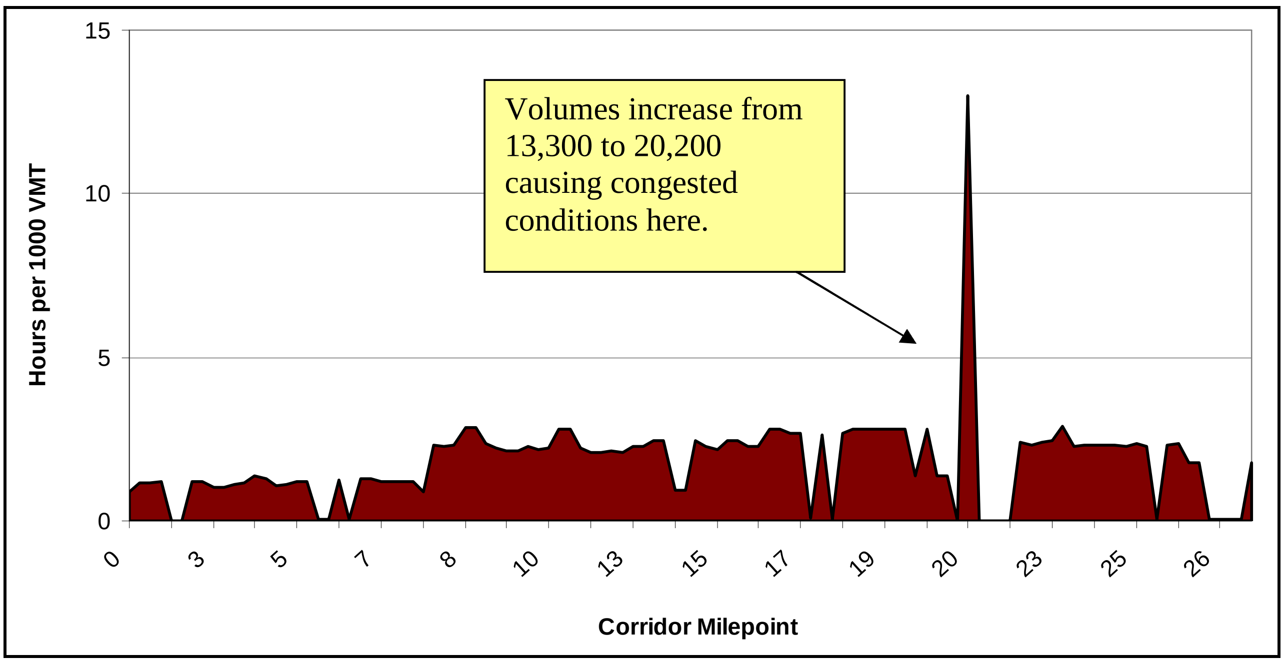


Figure 121. Annual Average Delay for All Vehicles - Hours per 1000 VMT

Table 80. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	**Incident Delay**	**Congestion Delay**	**Total Delay**
Rural (22 miles)	0.0	0.1	1.8	1.9
Urban (5 miles)	0.3	0.4	1.1	1.8
Total Corridor	0.1	0.2	1.6	1.9
Share of Total	4%	11%	85%	100%
* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of the number of vehicles on the road.				

5.15.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 122, Figure 123, and Figure 124 for the 3 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs vary by highway segment somewhat. Segments 1 and 3 are the rural portions of the corridor and come out a little higher cost than the urban segment. Travel time costs are virtually the same on the rural portion of the corridor and slightly higher on the urban segment. Crash costs are close to the same for all 3 corridor segments. Total user costs are very close to the same for all 3 segments.

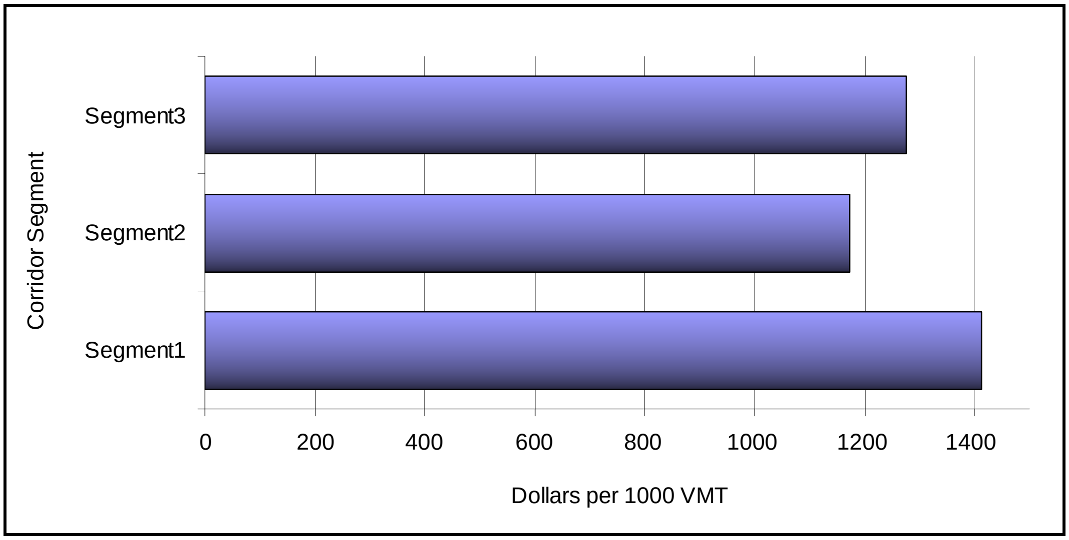


Figure 122. Willamina to Dundee (OR 18) Average Truck Operating Costs

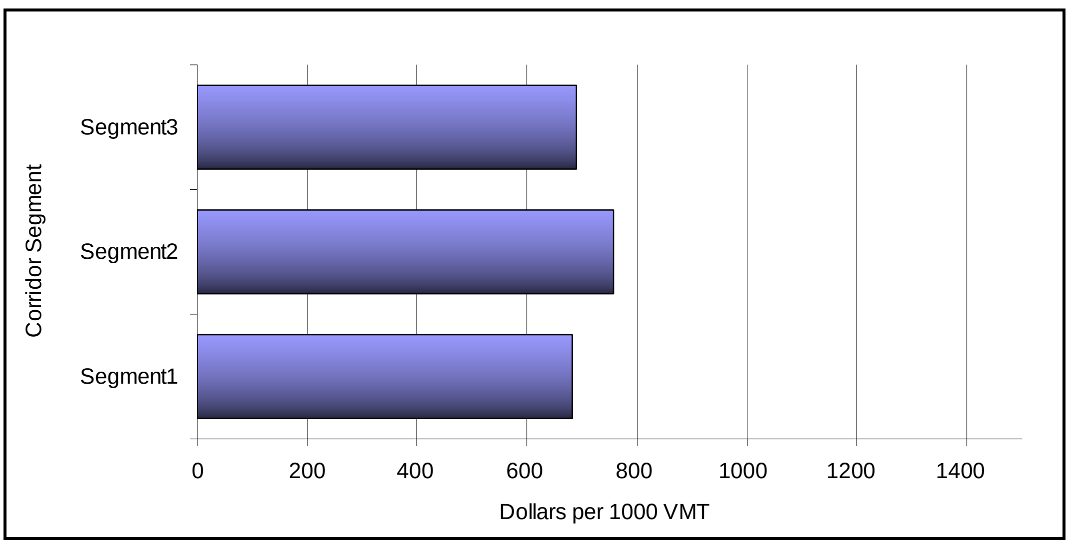


Figure 123. Willamina to Dundee (OR 18) Average Truck Travel Time Costs

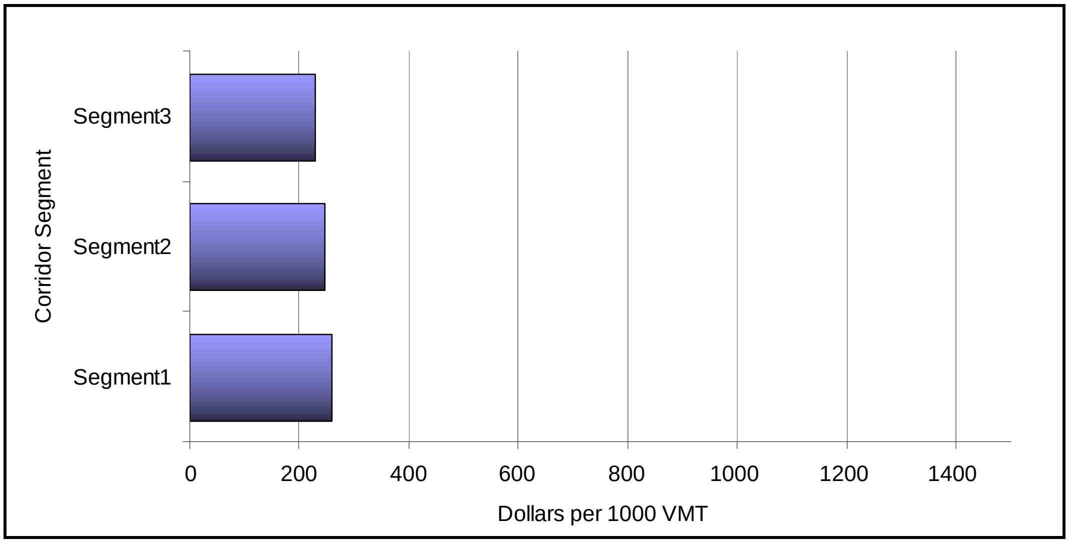


Figure 124. Willamina to Dundee (OR 18) Average Crash Costs for All Vehicles

Table 81 reports user costs for trucks and light vehicles and an overall average. Overall, operating costs represent about 40 percent of the corridor costs, travel time about 42 percent and crash costs 18 percent.

Table 81. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**380**	**1310**	**440**	**40%**
Travel Time Costs	**450**	**700**	**470**	**42%**
Crash Costs*			**200**	**18%**
		TOTAL USER COSTS	**1110**	**100%**
* based on national data used in HERS-ST				

Table 82 presents additional crash information for this corridor. There were 70 crashes on this corridor in 2010. About 4 percent of them were truck-involved. This corridor has a crash rate about half that of the statewide rate for highways with the same functional classification. This is consistent with the low amount of delay associated with incidents. There are 3 SPIS sites on this corridor that fall into the top 10 percent list of state SPIS.

Table 82. Willamina to Dundee (OR 18) 2010 Crash Statistics

Total Number of Crashes	70
Truck Involved Crashes (Percent Truck Involved)	3 (4.3%)
Corridor Crash Rate per 1 milllion VMT	0.64
Statewide Crash Rate (same functional class)	1.33
Corridor Average Crash Costs $ per 1000 VMT	200
Number of Top 10% SPIS Sites on Corridor	3
Truck Safety Corridor?	no

5.16 Corridor Performance: US20 Newport to I-5 Corridor

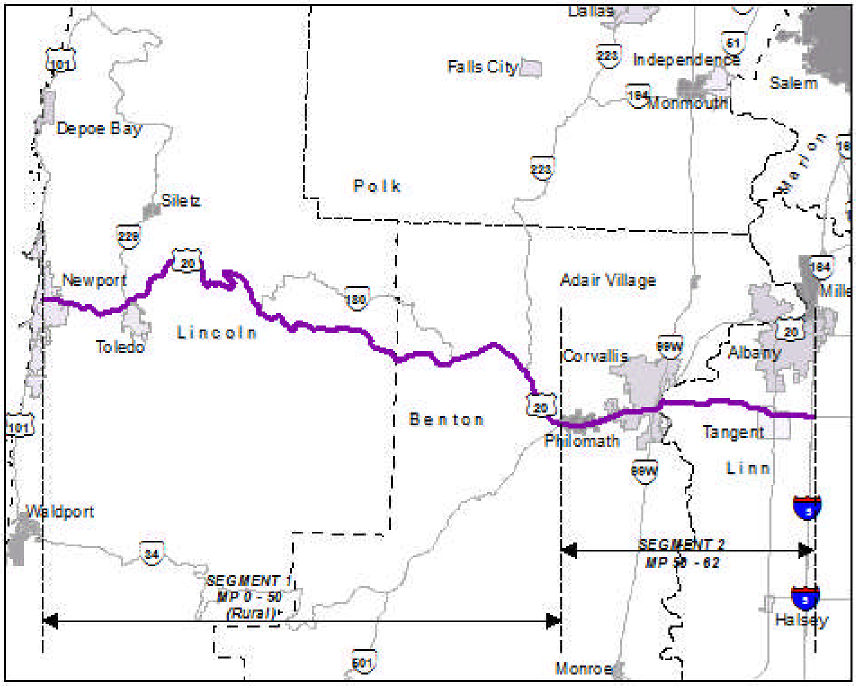


Figure 125. Segmented Map of Newport (US 20) to I-5 Corridor

5.16.1 Corridor Overview

This corridor extends from US101 in Newport to I-5 south of Albany. It consists of 2 ODOT highways, 33 and 210. The corridor is split into 2 segments for reporting purposes as illustrated in Figure 125. The corridor is 62 miles long. Average annual daily traffic volumes range from 6,700 to 16,500 vehicles. Trucks comprise 5 to 12 percent of the traffic volume. There do not appear to be any persistent capacity limitations on this corridor.

5.16.2 Economic Characteristics

Figure 126 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, Forest Wood Products and Clay, Minerals & Stone represent 2 to 3 percent of each group's movement across all 19 bottleneck corridors. In terms of weight, these same groups are the highest, but Clay, Minerals & Stone flows represent 5 percent of total flows and Forest Wood Products represents 4 percent on this corridor.

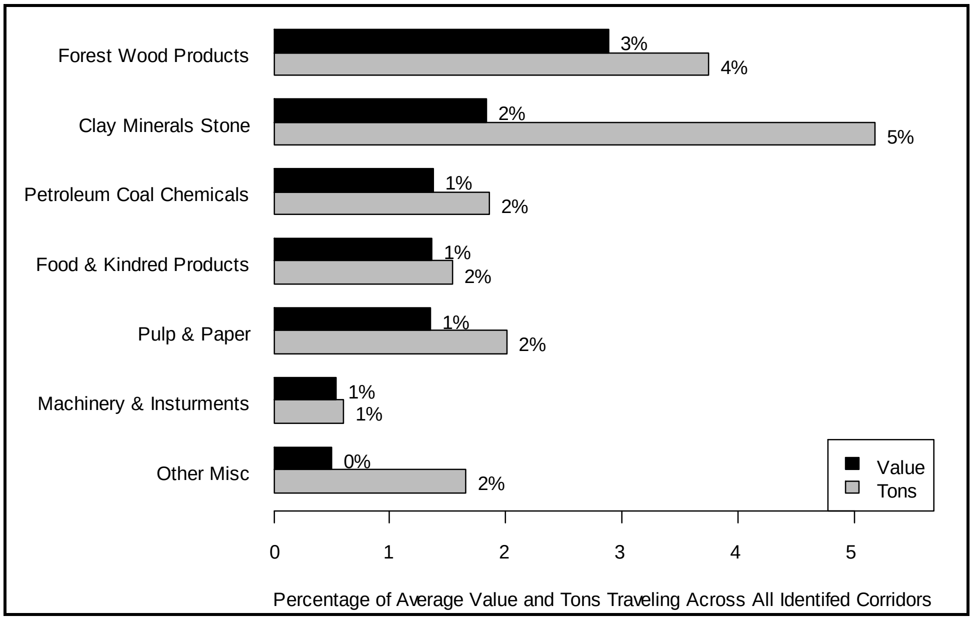


Figure 126. Newport (US 20) to I-5 Percentage of Average Value and Tons

Figure 127 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 4 industries using this corridor are Wood & Paper; Wholesale Trade; Ag Forest & Fish; and Machine & Metals, representing between 12 and 32 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Wood & Paper; and Wholesale Trade, representing between 16 and 45 percent of industry use across this corridor.

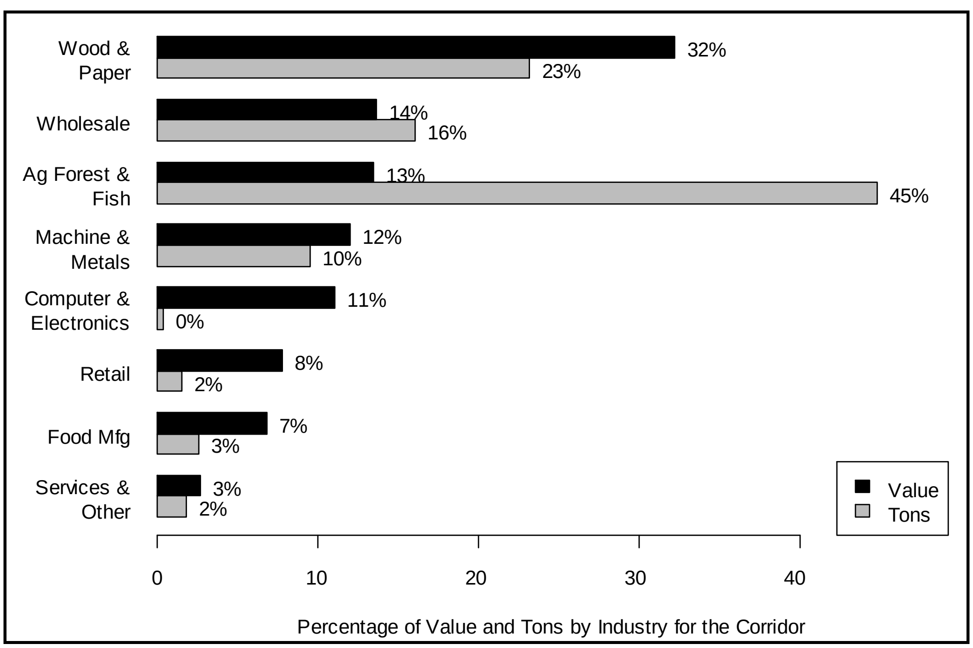


Figure 127. Newport (US 20) to I-5 Percentage of Value and Tons by Industry

5.16.3 Corridor Performance

Corridor performance metrics are presented for several areas of performance, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 128 illustrates corridor volume to capacity ratios and average annual daily traffic. Traffic volumes are higher in the urban areas, such as Newport, Philomath, reaching the highest flows between Corvallis and Albany/Tangent near I-5. Table 83 reports the share of truck traffic for this corridor.

Table 83. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	12 %	13%
Segment 2	8%	6%

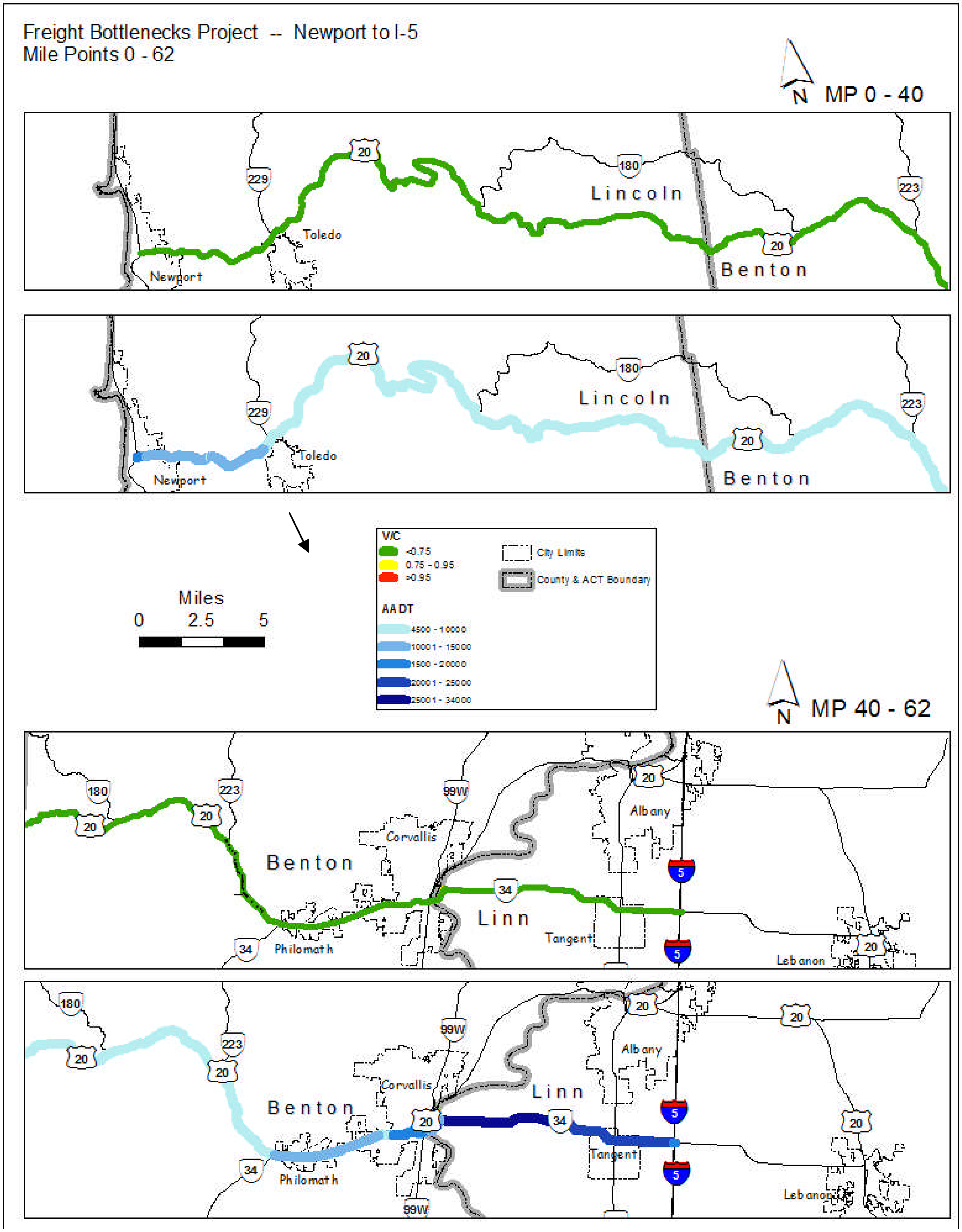


Figure 128. Freight Bottlenecks Project - Newport (US 20) to I-5

5.16.4 Corridor Geometrics

Table 84 reports the corridor geometrics for curvature and grade. Twenty-five percent of this corridor has curvature greater than 3.5 degrees and grades greater than 2.5 percent, which significantly affects truck operations. Twenty-four percent of the delay on this corridor is associated with roadway geometrics.

There are restrictions on this corridor. At mile point 6 to 44 (ODOT highway 33) travel is restricted by length and/or width for non-divisible loads and/or heavy haul loads. Mile points 0 to 6 and 44 to 50 (ODOT highway 33) are restricted by weight and/or width for non-divisible loads and/or heavy haul loads.

Table 84. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**75%**	**16%**	**6%**	**1%**	**1%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**31%**	**45%**	**12%**	**13%**	**0%**	**0%**	**100%**

5.16.5 Corridor Delay and Reliability

Error! Reference source not found. **presents the average annual hours of delay per 1,000 vehicle miles traveled along this corridor. Congestion predominantly occurs in the Philomath and Corvallis areas as volumes rise on the corridor.** Table 85 reports 65 percent of the delay on this corridor is due to congestion. Eleven percent is associated with incident delay, while 24 percent is associated with roadway geometrics.

Table 85. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	**Incident Delay**	**Congestion Delay**	**Total Delay**
Rural	0.3	0.1	0.8	1.2
Urban	0.9	0.7	2.5	4.2
Total Corridor	0.4	0.2	1.1	1.7
Share of Total	24%	11%	65%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs whether there is one car or hundreds of cars on the road.

5.16.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 129, Figure 130, and Figure 131. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs are nearly double in the rural portion of the corridor, where there are roadway geometric traits affecting operations. Travel time costs are greater in the more urban area of the corridor, where volumes are higher and delay occurs. Crash costs are the smallest component of total user costs and very similar on the 2 segments. Total user costs for trucks are about 10 percent higher on Segment 1 of the corridor due to the higher truck operating costs.

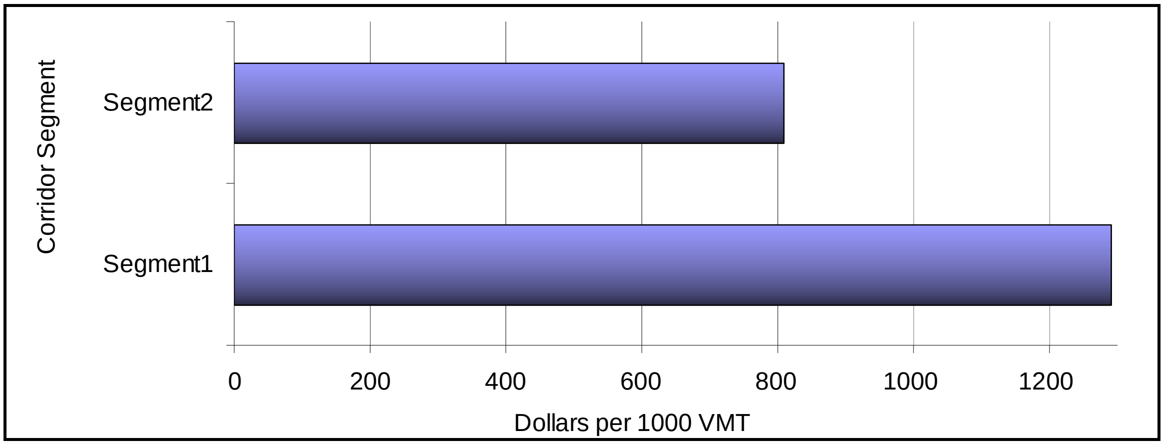


Figure 129. Newport (US 20) to I-5 Average Truck Operating Costs

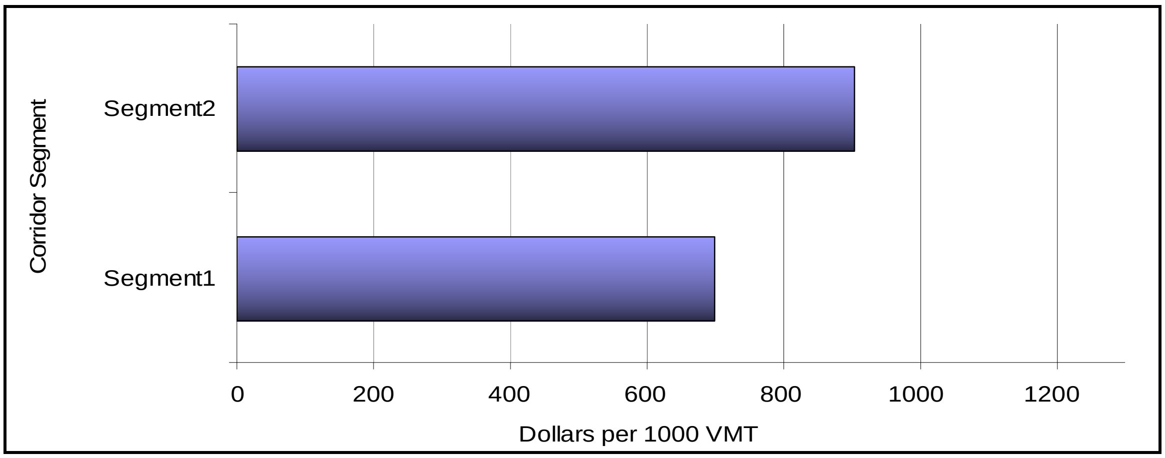


Figure 130. Newport (US 20) to I-5 Average Truck Travel Time Costs

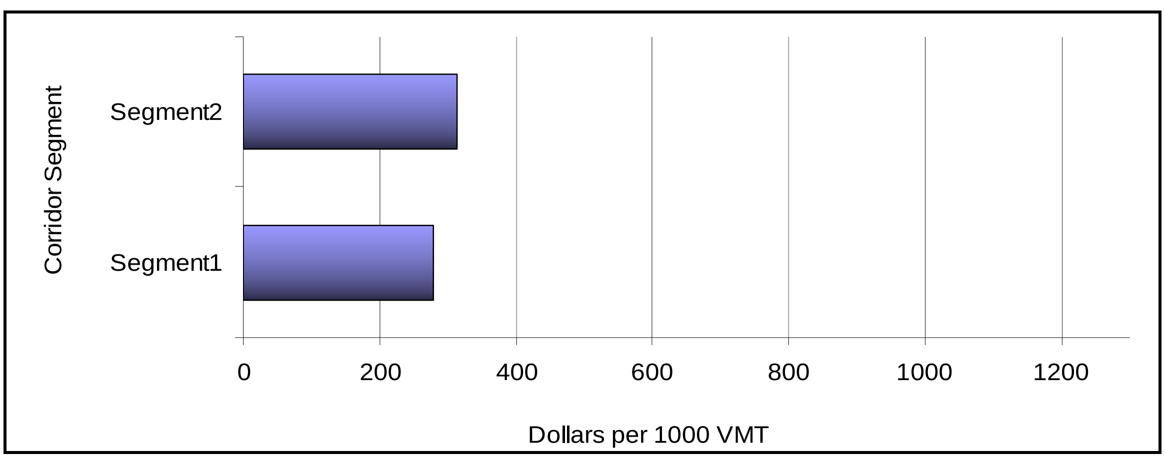


Figure 131. Newport (US 20) to I-5 Average Crash Costs for All Vehicles

Table 86 reports user costs for trucks and light vehicles. For all vehicles, operating costs represent 36 percent of the corridor costs, travel time 43 percent and crash costs 21 percent.

Table 86. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**346**	**1182**	**421**	**36%**
Travel Time Costs	**482**	**666**	**498**	**42%**
Crash Costs*			**254**	**22%**
		TOTAL USER COSTS	**1173**	**100%**
* based on national data used in HERS-ST				

Table 87 presents additional crash information for this corridor. There were 194 crashes on this corridor in 2010. About three percent of them were truck-involved. This corridor has a crash rate lower than the average rate of highways with the same functional classification. There are 8 SPIS sites on this corridor that fall into the top ten percent list of state SPIS sites.

Table 87. Newport (US 20) to I-5 2010 Crash Statistics

Total Number of Crashes	194
Truck Involved Crashes (Percent Truck Involved)	5 (2.6%)
Corridor Crash Rate per 1 milllion VMT	0.93
Statewide Crash Rate (same functional class)	1.33
Corridor Average Crash Costs $ per 1000 VMT	250
Number of Top 10% SPIS Sites on Corridor	8
Truck Safety Corridor?	no

5.17 Corridor Performance: OR99W Portland to Eugene

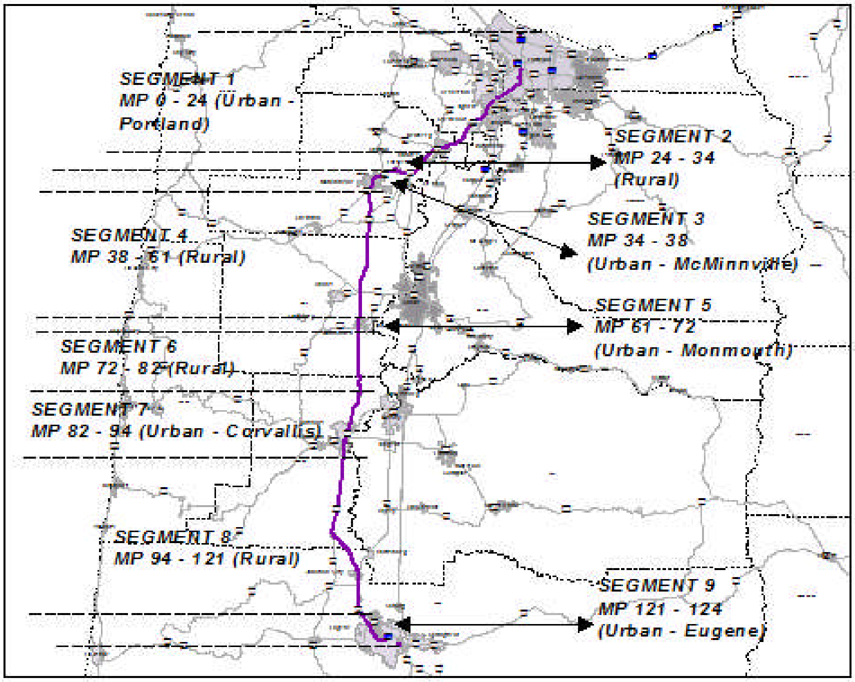


Figure 132. Segmented Map of Portland to Eugene (OR 99W) Corridor

5.17.1 Corridor Overview

Figure 132 illustrates the OR99 corridor running from the north in Portland running south to Eugene. This highway corridor is 124 miles long, about half the length is rural and half urban. Average annual daily traffic ranges between 7,400 and 21,000 vehicles. Truck share of traffic ranges from 5 to 14 percent of daily traffic. There are relatively high levels of congestion on sections of this corridor.

5.17.2 Economic Characteristics

Figure 133 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, the top 3 commodity groups are Clay, Minerals & Stone; Pulp & Paper; and Petroleum, Coal, & Chemicals, representing 4 percent of each group's movement across all 19 bottleneck corridors. In terms of weight, the top 3 groups are Clay, Minerals & Stone; Pulp & Paper; and Machinery & Instruments, representing between 3 and 7 percent of movement across all 19 corridors.

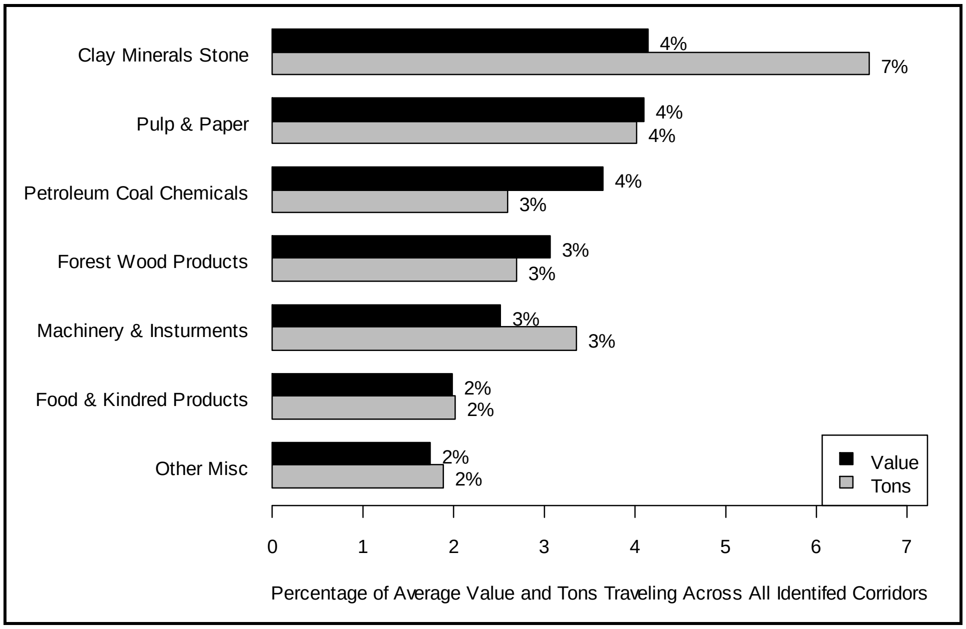


Figure 133, Portland to Eugene (OR 99W) Percentage of Average Value and Tons

Figure 133 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Machine & Metals; Computer & Electronics; and Wholesale Trade, representing between 19 and 24 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Wholesale Trade, and Machine & Metals; representing between 19 and 37 percent of industry use across this corridor.

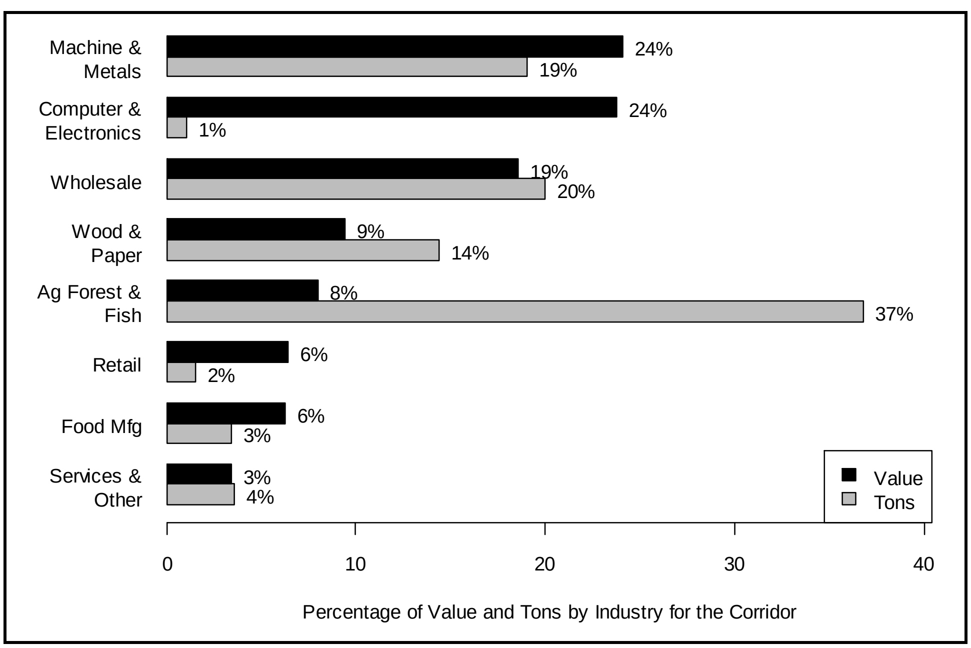


Figure 134. Portland to Eugene (OR 99W) Percentage of Value and Tons by Industry

5.17.3 Corridor Performance

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Table 88 reports the truck share of traffic on this corridor. The area between McMinnville and Corvallis has the largest share of truck traffic, an area that has significant congestion.

Table 88. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1 (Portland)	5%	5%
Segment 2	7%	8%
Segment 3 (McMinnville)	7%	7%
Segment 4	12%	13%
Segment 5 (Monmouth)	14%	14%
Segment 6	12%	11%
Segment 7 (Corvallis)	7%	7%
Segment 8	10%	1%
Segment 9 (Eugene)	7%	7%

Figure 135 illustrates the traffic volumes for this corridor. There are several locations where volumes are consistently operating at capacity in the urban areas of the corridor, where traffic volumes are relatively high. The longest section of persistent capacity issues is in the Tigard area, Newberg/Dundee, Monmouth, Corvallis, and Eugene.

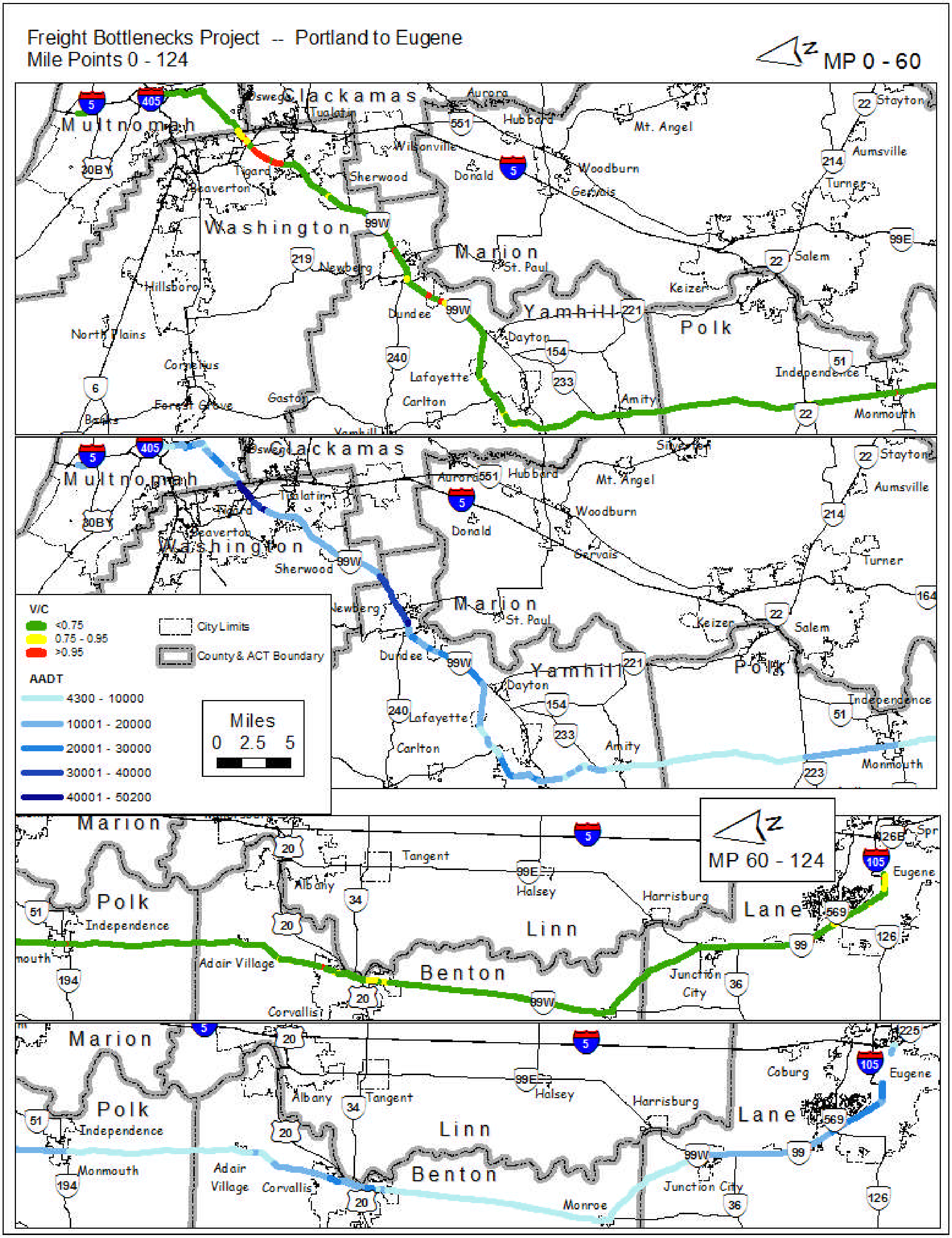


Figure 135. Freight Bottlenecks Project - Portland to Eugene

5.17.4 Corridor Geometrics

Table 89 reports the corridor geometrics for curvature and grade. About 6 percent of this corridor has curvature over 3.4 degrees. About 17 percent of the corridor has grades greater than 2.5 percent. Nearly 38 percent of corridor delay is attributed to roadway geometrics.

Table 89. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**93%**	**5%**	**1%**	**1%**	**1%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**53%**	**30%**	**12%**	**5%**	**0%**	**0%**	**100%**

5.17.5 Corridor Delay and Reliability

Figure 136 presents the annual average hours of delay per 1000 vehicle miles traveled. The locations with the most delay are in the urban areas along the corridor. However, a fairly large portion of this corridor has high levels of delay when compared to other corridors. This long corridor has a variety of reasons for delay along the corridor. Developing a performance strategy will require detailed traffic analysis.

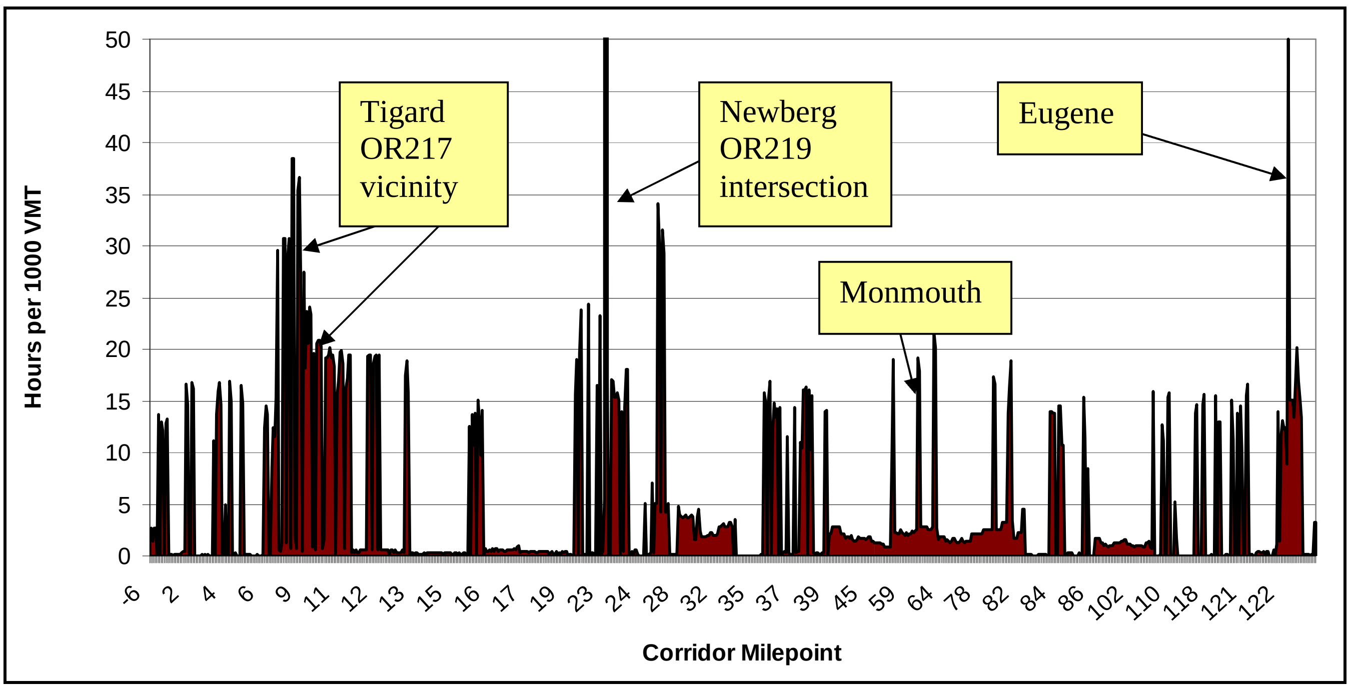


Figure 136. Annual Average Delay - Hours per 1000 VMT

Table 90 presents the breakdown of corridor delay. For the corridor overall, about 56 percent of delay is due to congestion, about 6 percent due to incidents. Roadway curvature and grade account for about 38 percent of total delay.

Table 90. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural	0.4	0.2	1.9	2.5
Urban	2.8	0.3	3.3	6.4
Total Corridor	1.9	0.3	2.8	4.9
Share of Total	38%	6%	56%	100%

* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs whether there is one car or hundreds of cars on the road.

5.17.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 137, Figure 138, and Figure 139 for all 9 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Segments 1, 3, 5, 7 and 9 are urban segments, the others rural. In general, truck operating costs are lower in the urban areas relative to the neighboring rural segments.

Travel time costs are very close to urban area operating costs, a relationship not observed on other corridors. In general, travel time costs are lower on the rural segments of the corridor relative to the neighboring urban segments. Crash costs are relatively low compared to the other users' costs. Higher crash costs are associated with the rural segments of the corridor.

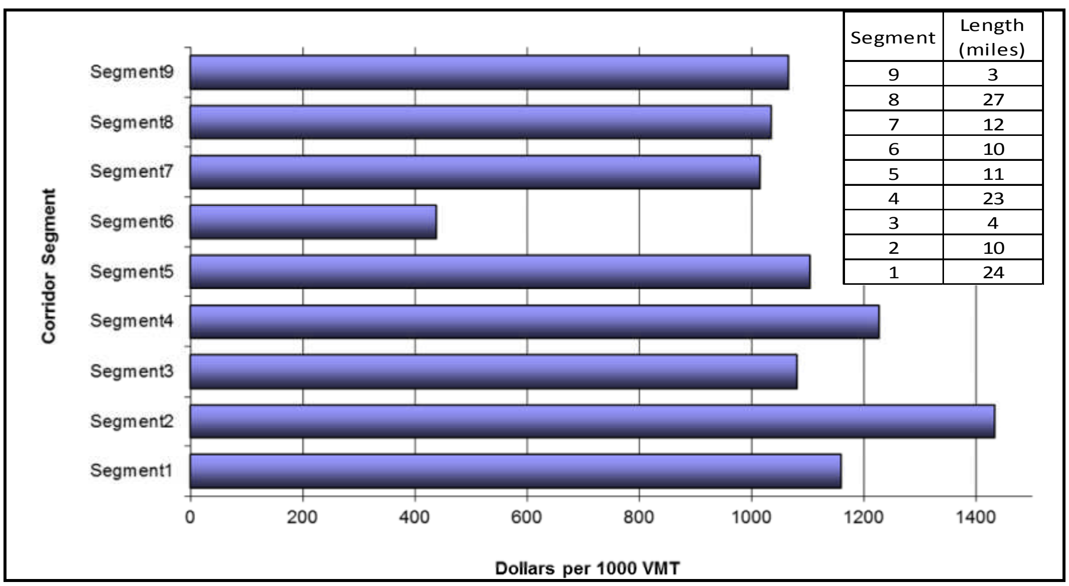


Figure 137. Portland to Eugene (OR 99W) Average Truck Operating Costs

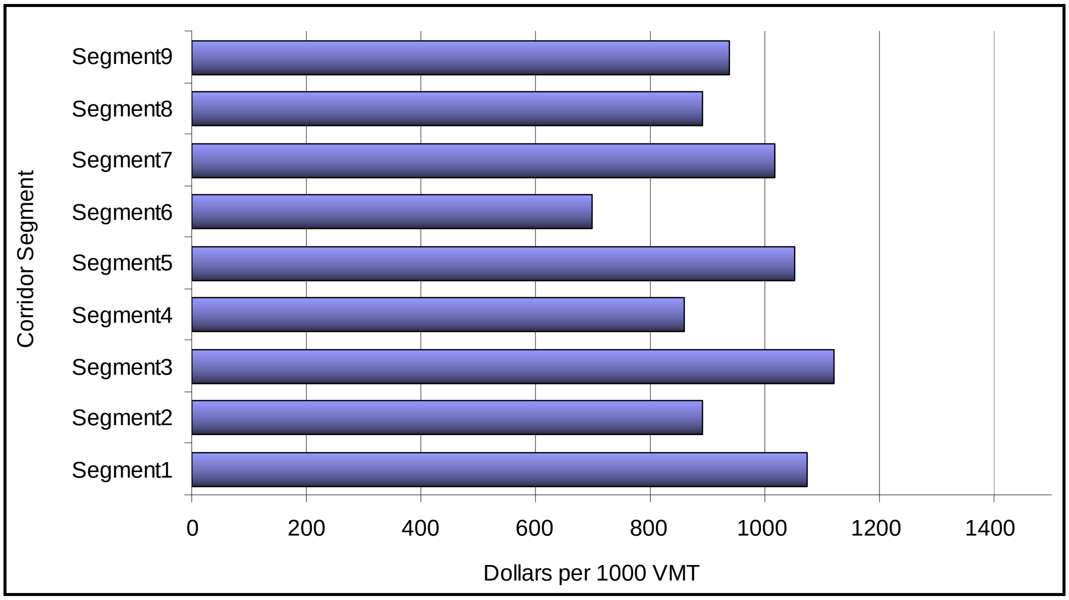


Figure 138. Portland to Eugene (OR 99W) Average Truck Travel Time Costs

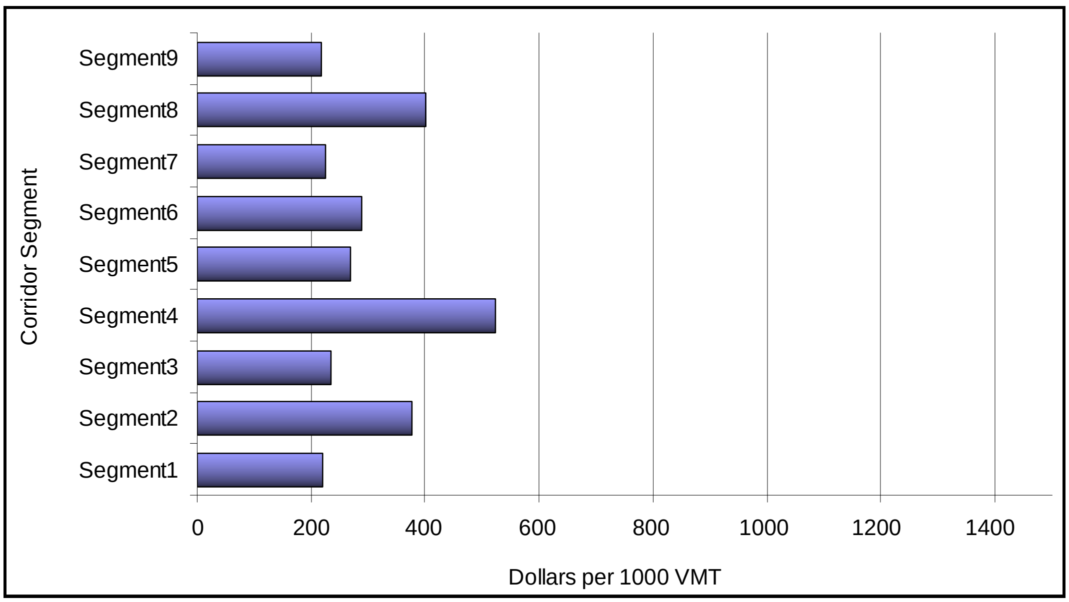


Figure 139. Portland to Eugene (OR 99W) Average Crash Costs for All Vehicles

Table 91 presents the average user costs by type for all vehicles on the entire corridor. Overall, crash costs make up 19 percent of total user costs. Travel time costs are nearly 50 percent, while operating costs make up about 34 percent of the total user costs.

Table 91. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	**Heavy Vehicles**	**All Vehicles**	**% of total**
Vehicle Operating Costs	**382**	**1254**	**448**	**34%**
Travel Time Costs	**617**	**857**	**635**	**48%**
Crash Costs*			**246**	**19%**
		TOTAL USER COSTS	**1329**	**100%**
* based on national data used in HERS-ST				

Table 92 presents additional crash information for this corridor. There were 1,255 crashes in this corridor in 2010. Less than 2 percent of them involved a truck. This corridor has a crash rate above the statewide average for highways with the same functional classification. There are 53 SPIS sites that fall into the top 10 percent list of state SPIS sites on this corridor.

Table 92. Portland to Eugene (OR 99W) 2010 Crash Statistics

Total Number of Crashes	1255
Truck Involved Crashes (Percent Truck Involved)	20 (1.6%)
Corridor Crash Rate per 1 milllion VMT	1.76
Statewide Crash Rate (same functional class)	1.25
Corridor Average Crash Costs $ per 1000 VMT	250
Number of Top 10% SPIS Sites on Corridor	53
Truck Safety Corridor?	no

5.18 Corridor Performance: OR 217 Beaverton to Tigard

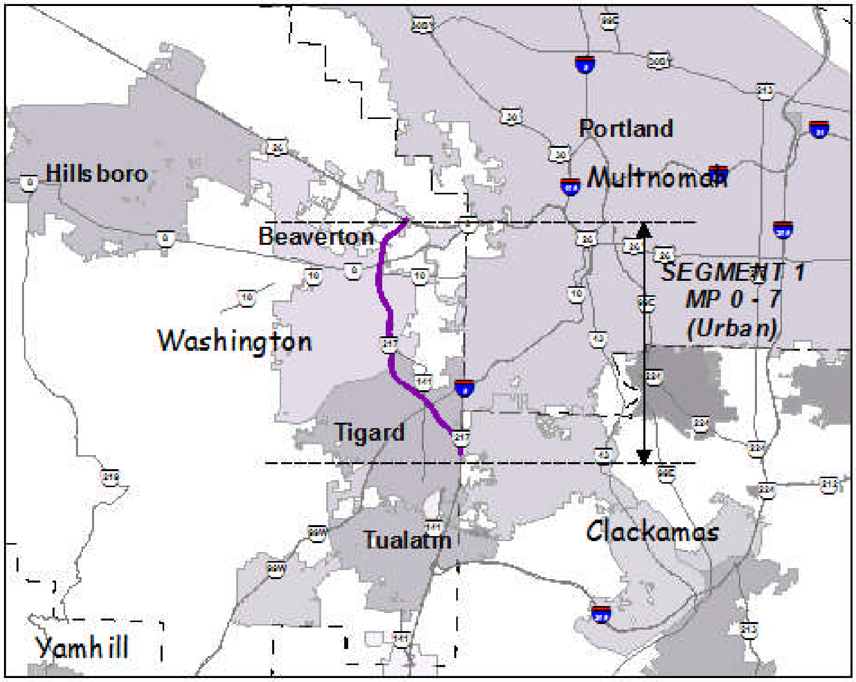


Figure 140. Segmented Map of Beaverton to Tigard (OR 217) Corridor

5.18.1 Corridor Overview

Figure 140 illustrates the OR217 corridor running between Beaverton and Tigard, west of Portland. This corridor is 7 miles long and urban. Average annual daily traffic ranges between 22,000 and 61,000 vehicles. Trucks represent about 4 percent of daily traffic.

5.18.2 Economic Characteristics

Figure 141 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, the top 4 groups are Pulp & Paper; Petroleum, Coal, & Chemicals; Clay Minerals & Stone; and Machinery & Instruments, representing between 10 and 12 percent of each group's movement across all 19 bottleneck corridors. In terms of weight, Machinery & Instruments and Other Misc. are the 2 highest groups, moving 9 to 10 percent of each group's movement along this corridor. The remaining commodity groups move about 8 percent of their goods in terms of weight via this corridor.

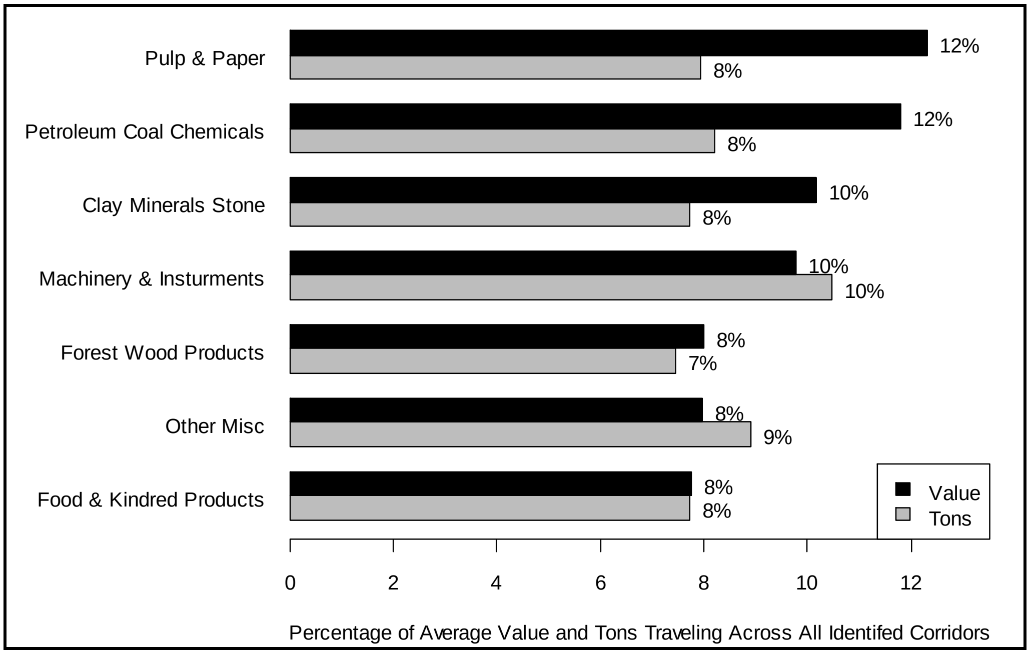


Figure 141. Beaverton to Tigard (OR 217) Corridor Percentage of Average Value and Tons

Figure 142 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Computer & Electronics, Wholesale Trade, and Machine & Metals; representing between 14 and 44 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Wholesale Trade; and Machine & Metals; representing between 17 and 31 percent of industry use across this corridor.

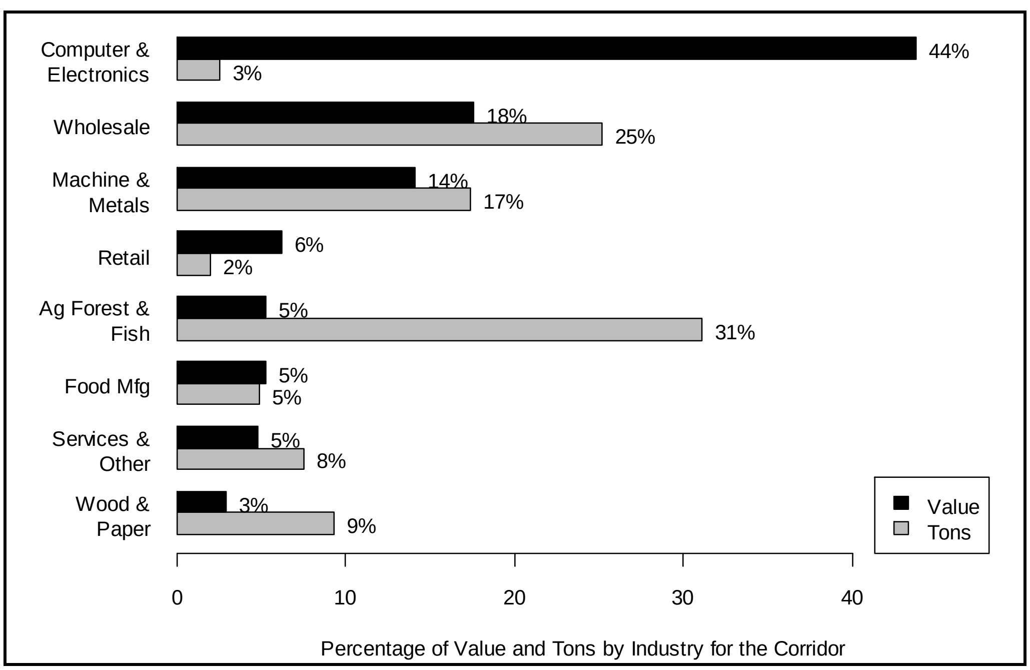


Figure 142. Beaverton to Tigard (OR 217) Corridor Percentage of Value and Tons by Industry

5.18.3 *Corridor Performance*

Corridor performance metrics are presented for several areas, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Table 93 reports the share of trucks on this corridor. Figure 143 illustrates the traffic volumes for this corridor. Volumes are steadily high along the length of the corridor. This corridor is consistently operating at capacity.

Table 93. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	**Daily Vehicle Miles Traveled (Share of VMT)**
Corridor	4 %	5%

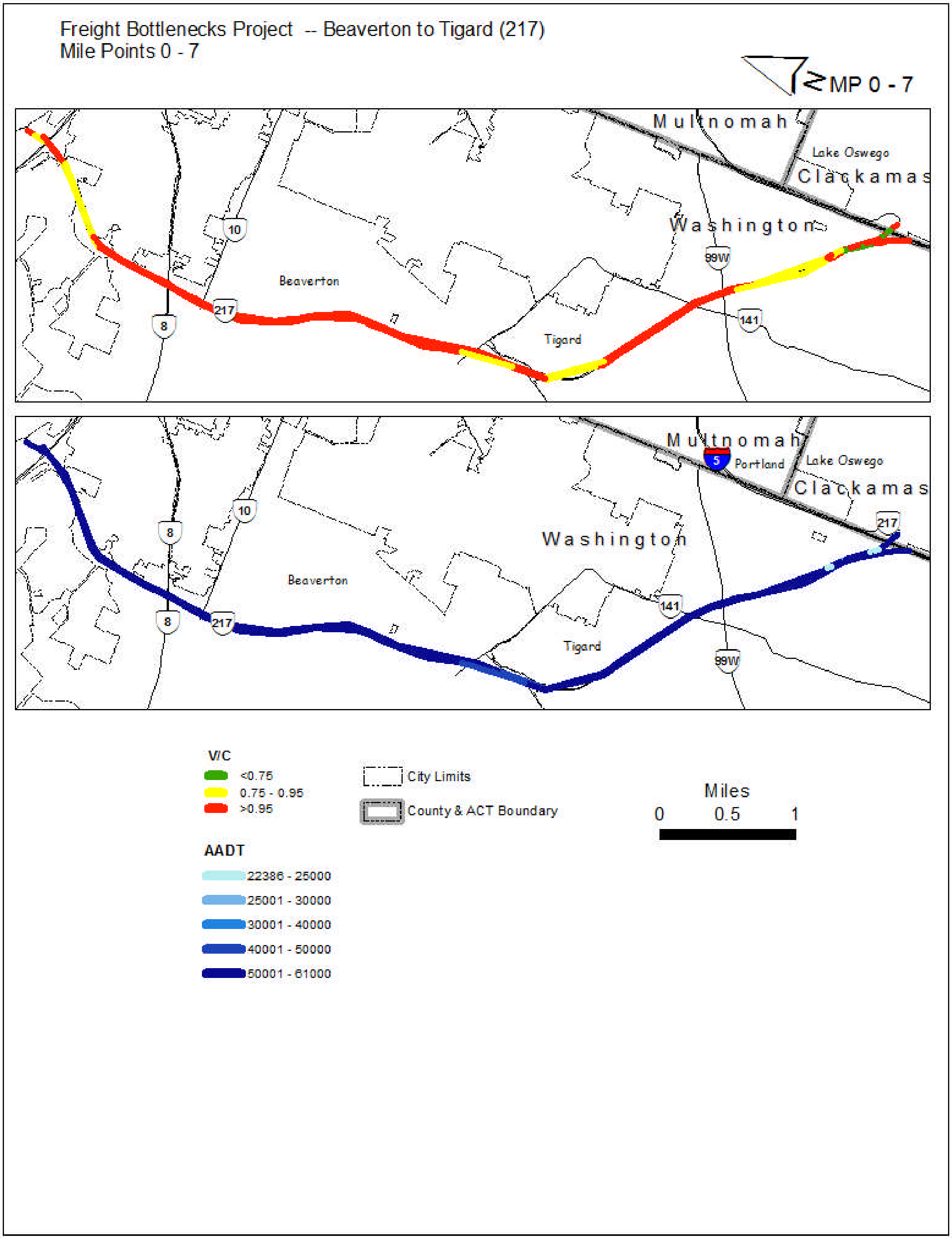


Figure 143. Freight Bottlenecks Project - Beaverton to Tigard (OR 217)

5.18.4 Corridor Geometrics

Table 94 reports the corridor geometrics for curvature and grade. Eight percent of this corridor has curvature greater than 3.5 degrees. Sixty-two percent of the corridor has grades greater than 2.5 percent, which affects truck operations.

Table 94. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**92%**	**6%**	**3%**	**0%**	**0%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**7%**	**31%**	**11%**	**51%**	**0%**	**0%**	**100%**

5.18.5 Corridor Delay and Reliability

Figure 144 presents the annual average hours of delay per 1000 vehicle miles traveled. This corridor is congested with brief drops in congested conditions on an annual average delay basis. On a day-to-day basis this level of delay is typically associated with lower levels of reliability.

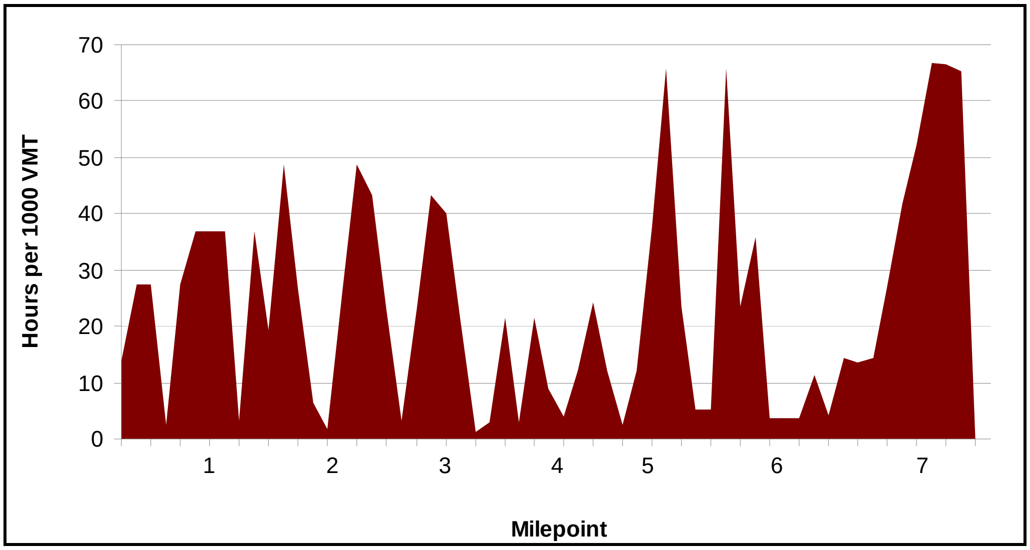


Figure 144. Average Annual Delay – Hours per 1000 VMT

Table 95 reveals over 60 percent of the delay is due to incidents, confirming that reliability is an issue for this corridor, a trait common for areas operating at capacity. Congested conditions alone account for 37 percent of corridor delay. Roadway geometrics do not cause significant delay on this corridor.

Table 95. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	**Incident Delay**	**Congestion Delay**	**Total Delay**
Rural (0 miles)	0.0	0.0	0.0	0.0
Urban (15)	0.1	11.0	6.6	17.7
Total Corridor	0.1	11.0	6.6	17.7
Share of Total	1%	62%	37%	100%
* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs whether there is one car or hundreds of cars on the road.				

5.18.6 User Costs

Truck operating costs are reported in Figure 145 and travel time costs in Figure 146 for the entire corridor. Among the 3 user costs, truck travel time is the largest, about 20 percent higher than operating costs. Figure 147 illustrates crash costs, which are a relatively small component of total user costs.

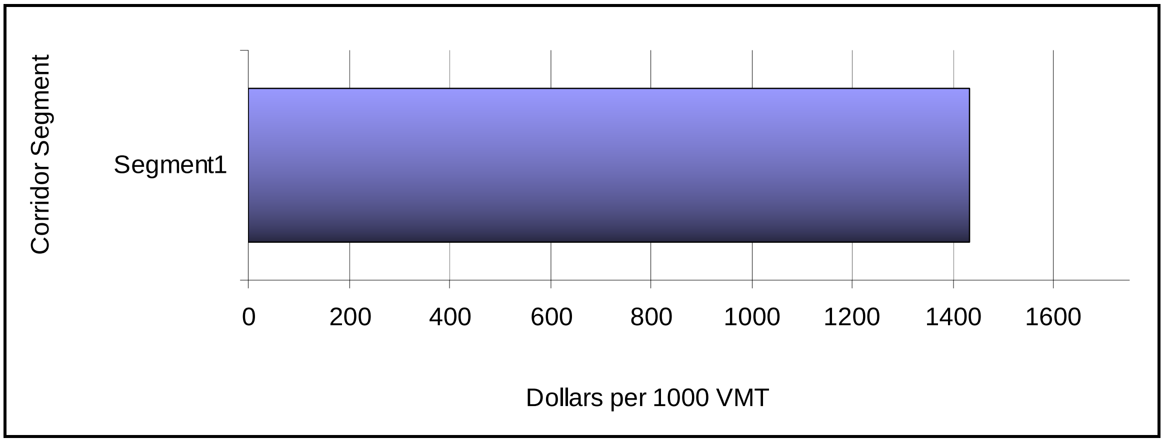


Figure 145. Beaverton to Tigard (OR 217) Corridor Average Truck Operating Costs

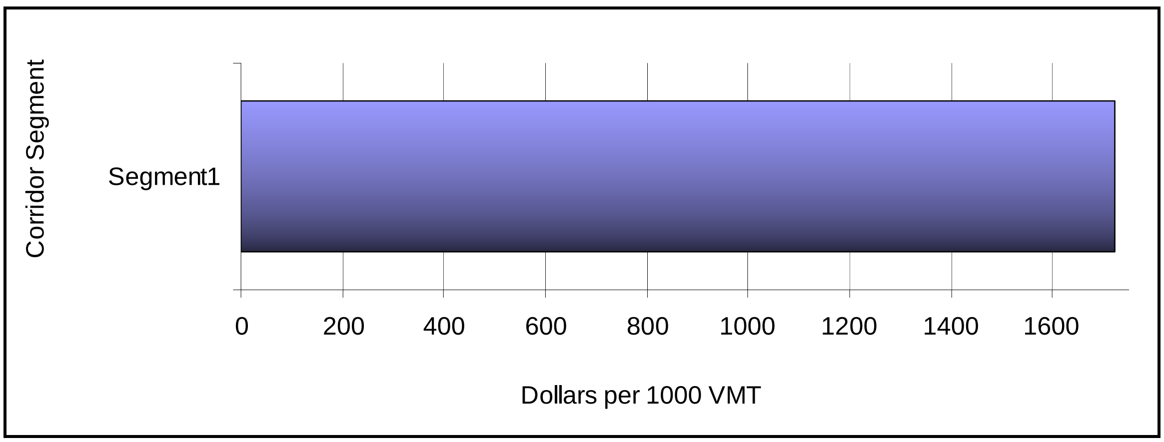


Figure 146. Beaverton to Tigard (OR 217) Corridor Average Truck Travel Time Costs

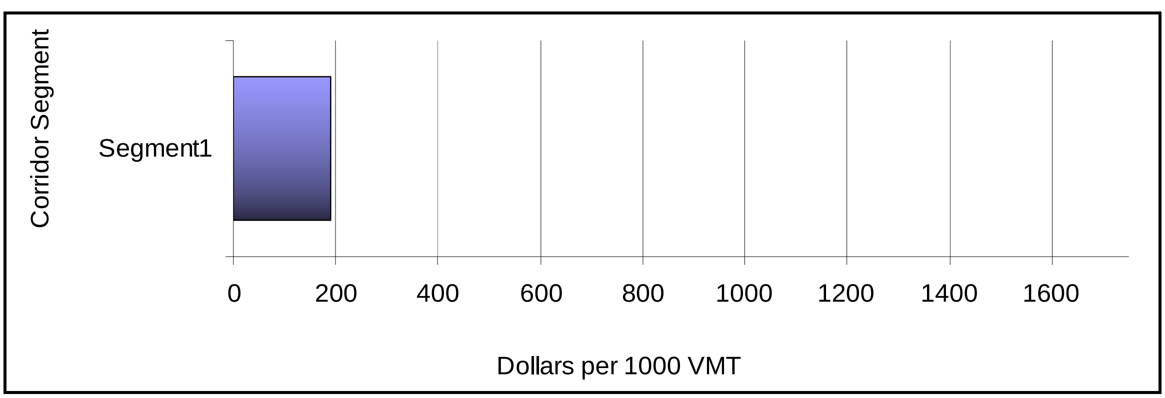


Figure 147. Beaverton to Tigard (OR 217) Corridor Average Crash Costs for All Vehicles

Table 96 reports user costs for trucks alongside light vehicles. Congested conditions cause travel time costs to be high for all vehicles in this corridor. Sixty-five percent of the total user costs are related to travel time, where 24 percent are associated with vehicle operating costs and 11 percent with crash costs.

Table 96. Total Corridor Average User Costs - Dollars per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	**346**	**1439**	**396**	**24%**
Travel Time Costs	**1054**	**1626**	**1080**	**65%**
Crash Costs*			**178**	**11%**
		TOTAL USER COSTS	**1654**	**100%**
* based on national data used in HERS-ST				

Table 97 presents additional crash information for this corridor. There were 203 crashes reported on this corridor in 2010. Two percent of the crashes had truck involvement. The overall crash rate for this corridor is lower than the statewide average rate for a highway in this functional classification. There are 3 SPIS sites that fall into the top 10 percent list of state SPIS sites on this corridor.

Table 97. Beaverton to Tigard (OR 217) 2010 Crash Statistics

Total Number of Crashes	203
Truck Involved Crashes (Percent Truck Involved)	4 (2%)
Corridor Crash Rate per 1 milllion VMT	0.66
Statewide Crash Rate (same functional class)	0.78
Corridor Average Crash Costs $ per 1000 VMT	180
Number of Top 10% SPIS Sites on Corridor	3
Truck Safety Corridor?	no

5.19 Corridor Performance: US101 Reedsport (OR38) to Coos Bay (OR42)

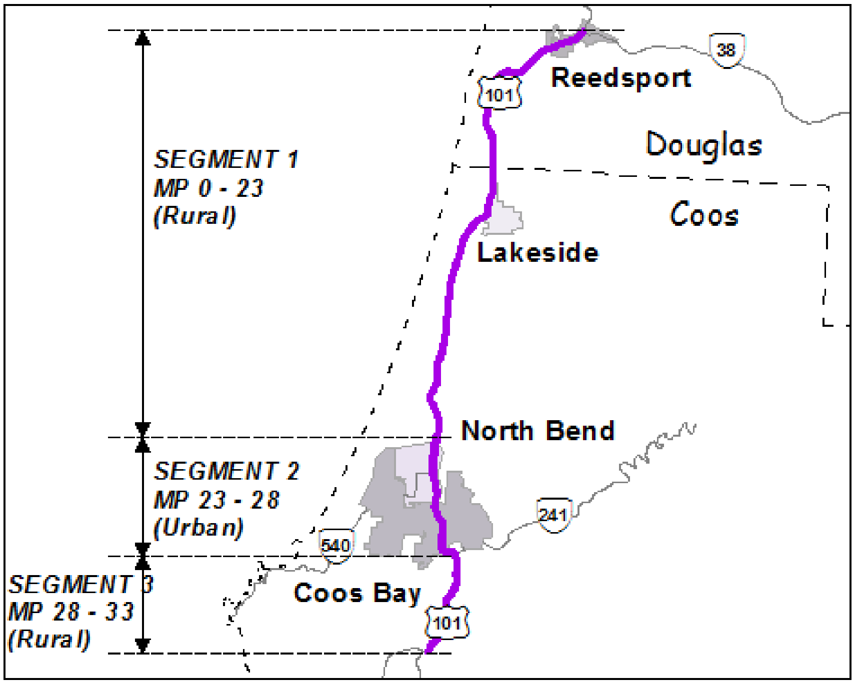


Figure 148. Segmented Map of US 101 Reedsport (OR 38) to Coos Bay (OR 42) Corridor

5.19.1 Corridor Overview

This section of US101 extends from the north at the Reedsport intersection with OR38 and the OR42 intersection south of Coos Bay. This corridor consists of ODOT highway 9. The corridor is split into 3 segments for reporting purposes, as illustrated in Figure 148. Segments 1 and 3 are rural and Segment 2 is urban. The corridor is 33 miles long. Average annual daily traffic volumes range from 8,800 to 11,000 vehicles. Trucks comprise between 8 and 10 percent of the traffic volume. There are not persistent issues related to capacity on this corridor when assessing average annual daily patterns.

5.19.2 Economic Characteristics

Figure 149 illustrates commodities moving along this corridor. This figure reports the corridor share of all commodity flows moving along all 19 bottleneck corridors. Flows are reported by value and weight. In terms of value, the top 2 commodity groups are Clay, Minerals & Stone and Forest Wood Products, representing 4 to 5 percent of each group's movement across all 19 bottleneck corridors. In terms of weight, the same 2 groups are at the top, representing 4 to 7 percent of movement along all 19 corridors.

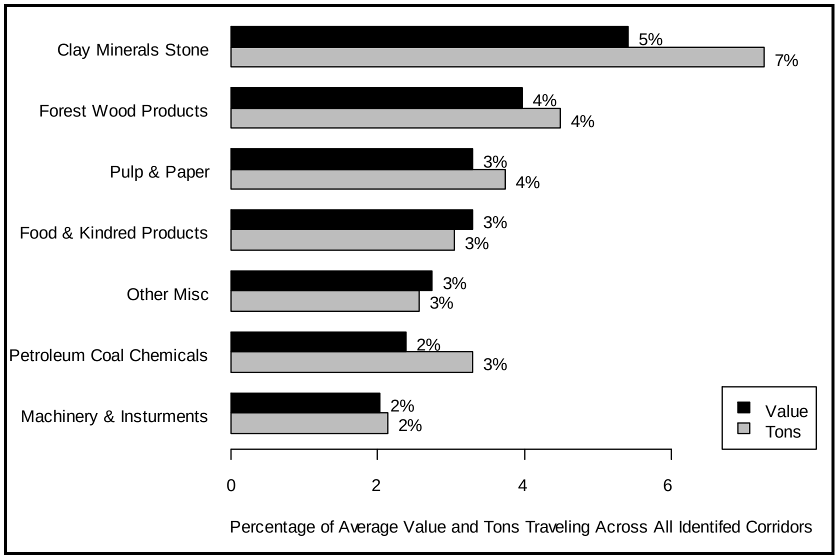


Figure 149. Reedsport to Coos Bay Corridor Percentage of Average Value and Tons

Figure 150 illustrates industry reliance on this corridor for commodity movement, where commodities are either inputs to production or final goods going to market. This figure reports the share of industry use of commodity flows moving along this corridor only, thus the shares sum to 100. Flows are reported by value and weight.

In terms of value, the top 3 industries using this corridor are Wholesale Trade; Wood & Paper; and Machine & Metals, representing between 16 and 23 percent of industry use across this corridor. In terms of weight, the top 3 industries using this corridor are Ag Forest & Fish; Machine & Metals; and Wood & Paper, representing between 17 and 37 percent of industry use across this corridor

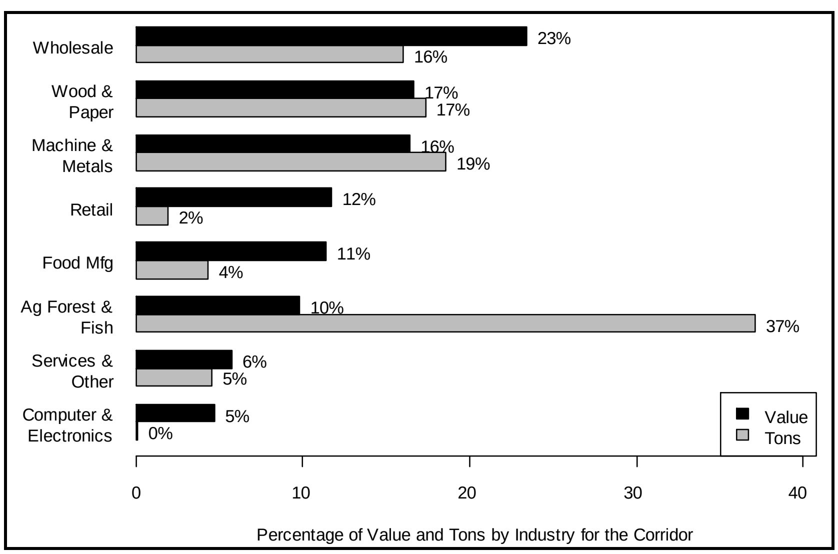


Figure 150. Reedsport to Coos Bay Corridor Percentage of Value and Tons by Industry

5.19.3 Corridor Performance

Corridor performance metrics are presented for several areas of performance, including:

- Traffic volumes,
- Volume to capacity ratios,
- Corridor geometrics ,
- Delay and reliability,
- User costs: operational, time, crashes; and
- Crash Incidents: total number of crashes, share of crashes truck related, accident rate, number of SPIS sites.

Figure 151 illustrates corridor volume to capacity ratios and average annual daily traffic. Traffic volumes are higher in the urban areas of Reedsport, North Bend and Coos Bay. Sections of this corridor are operating at capacity within the Coos Bay city limits and at the intersection of US101 and OR42 where a lane is dropped. In general there is sufficient capacity on this corridor, with some limitations affecting capacity, such as lanes dropped, curves and grade. Truck share of traffic falls between 8 to 10 percent, as indicated in Table 98.

Table 98. Truck Share of Average ADT and Daily VMT

	Average Annual Daily Traffic (Share of vehicles)	Daily Vehicle Miles Traveled (Share of VMT)
Segment 1	9%	9%
Segment 2	8%	9%
Segment 3	10%	10%

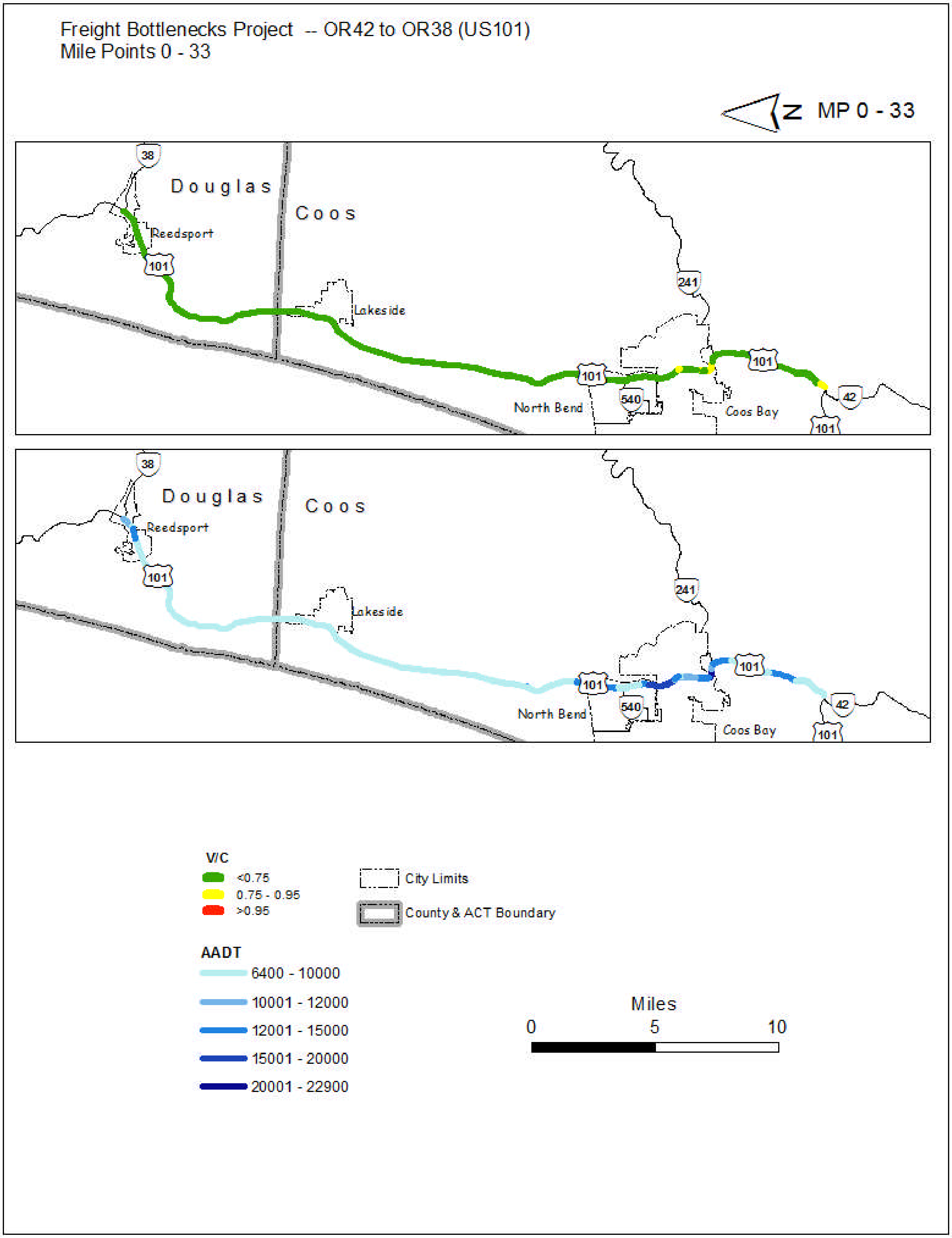


Figure 151. Freight Bottlenecks Project - Reedsport to Coos Bay

5.19.4 Corridor Geometrics

Table 99 reports the corridor geometrics for curvature and grade. Twenty percent of this corridor has curvature greater than 3.5 degrees. Twenty-one percent of the corridor has grades greater than 2.5 percent. This is consistent with the 34 percent share of delay associated with corridor geometric characteristics.

Table 99. Corridor Geometric Summary

Degree of Curvature	**0 - 3.4**	**3.5 - 5.4**	**5.5 - 8.4**	**8.5 - 13.9**	**14 - 27.9**	**28+**	
Proportion of Miles	**80%**	**9%**	**7%**	**2%**	**1%**	**0%**	**100%**
Degree of Grade	**0-.4%**	**.5-2.4%**	**2.5-4.4%**	**4.5-6.4%**	**6.5-8.4%**	**>8.5%**	
Proportion of Miles	**41%**	**39%**	**14%**	**7%**	**0%**	**0%**	**100%**

5.19.5 Corridor Delay and Reliability

Figure 152 presents the average annual hours of delay per 1,000 vehicle miles traveled along this corridor. Delay predominantly occurs in Reedsport at the intersection of OR38 and Winchester Avenue and several sections in Coos Bay. Table 100 reveals over half of the delay is due to congestion, while 45 percent is due to roadway geometrics and 4 percent with incident delay.

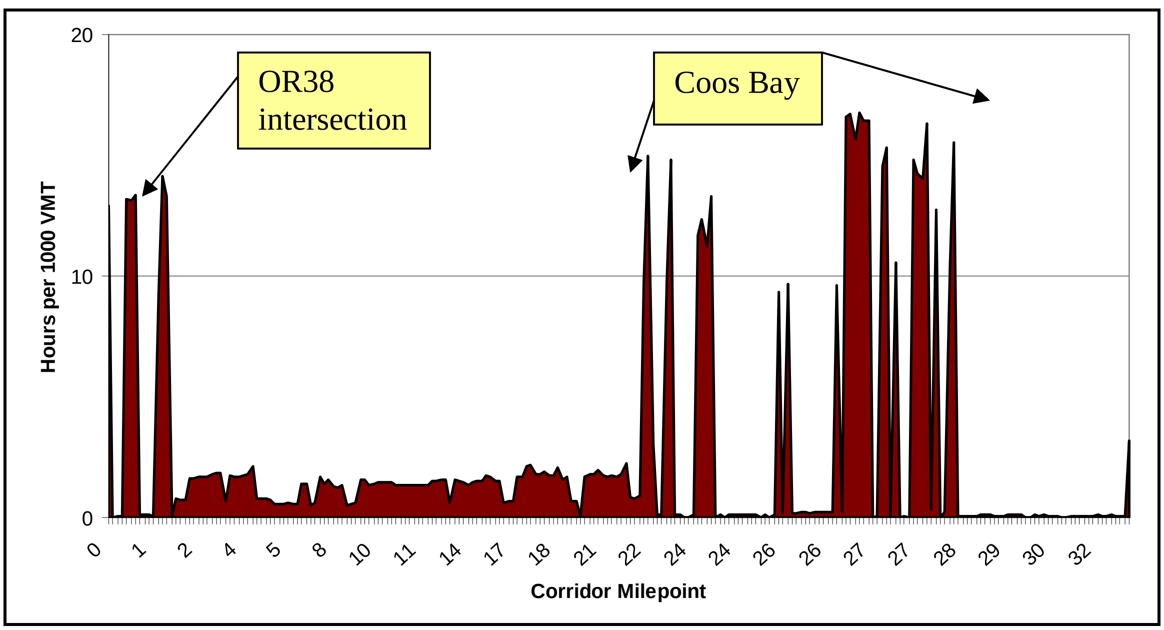


Figure 152. Annual Average Delay for All Vehicles - Hours per 1000 VMT

Table 100. Corridor Reliability - Hours of Delay per 1000 VMT

	Zero Volume Delay*	Incident Delay	Congestion Delay	Total Delay
Rural	0.0	0.1	0.4	0.5
Urban	3.2	1.0	4.3	8.4
Total Corridor	1.1	0.4	1.8	3.3
Share of Total	34%	12%	54%	100%
* This is delay caused by speed reduction related to grade and curvature of the road. This delay occurs regardless of traffic volume.				

5.19.6 User Costs

Truck operating costs, travel time costs and crash costs are presented in Figure 153, Figure 154, and Figure 155 for the 3 corridor segments. Costs are presented as dollars per 1000 VMT in order to compare the segments side-by-side. Truck operating costs are higher in the rural segments of the corridor than the urban segment, especially in Segment 1 which has a larger proportion of the higher grade sections. Travel time costs are highest in the urban Segment 2 that experiences delay. Crash costs are lowest in the urban segment and the smallest user cost category for this corridor.

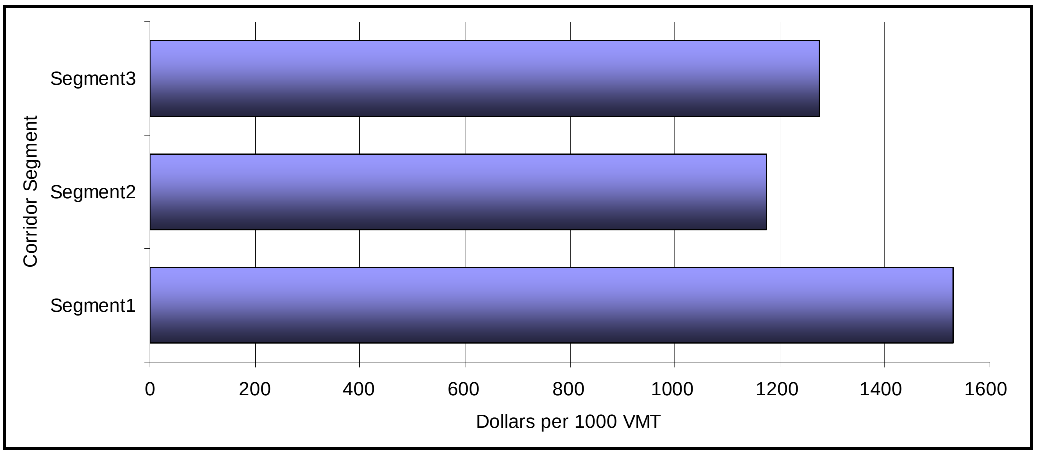


Figure 153. Reedsport to Coos Bay Average Truck Operating Costs

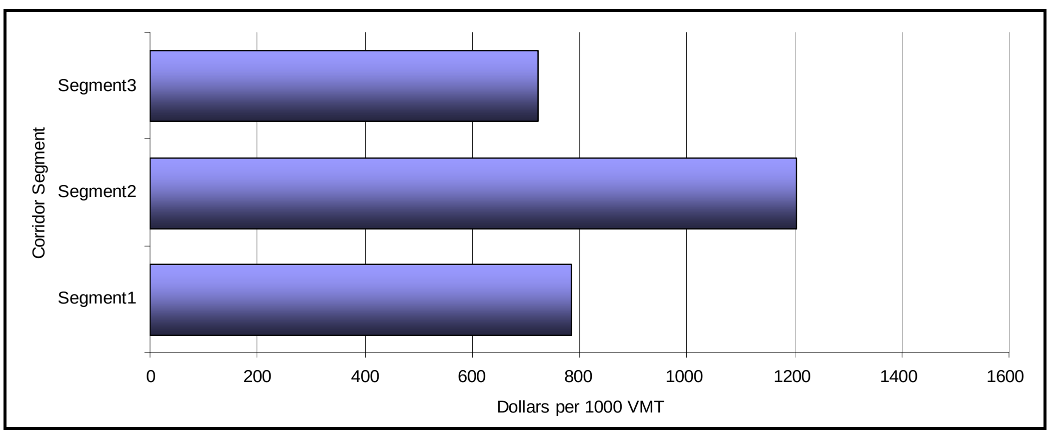


Figure 154. Reedsport to Coos Bay Average Truck Travel Time Costs

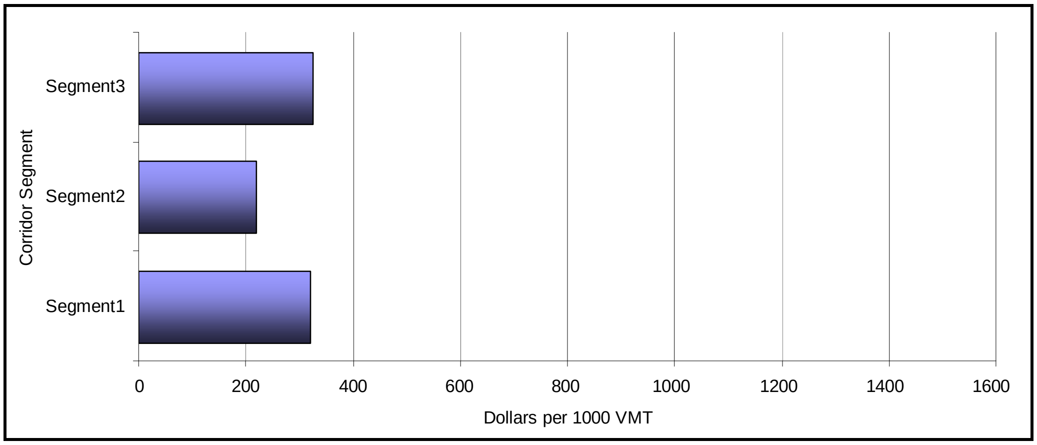


Figure 155. Reedsport to Coos Bay Average Crash Costs for All Vehicles

Table 101 reports user costs for trucks and light vehicles and corridor average. Overall, operating costs represent about 34 percent of the corridor costs, travel time about 44 percent and crash costs 21 percent.

Table 101. Total Corridor Average User Costs - Dollar per 1000 VMT

	Light Vehicles	Heavy Vehicles	All Vehicles	% of total
Vehicle Operating Costs	380	1820	600	42%
Travel Time Costs	560	730	580	41%
Crash Costs*			250	17%
		TOTAL USER COSTS	1430	100%
* based on national data used in HERS-ST				

Table 102 presents additional crash information for this corridor. There were 149 crashes on this corridor in 2010. About 5 percent of them were truck-involved. This corridor has a crash rate about the same as that of the statewide rate for highways with the same functional classification. There are 4 SPIS sites on this truck safety corridor that fall into the top 10 percent list of state SPIS.

Table 102. Reedsport to Coos Bay 2010 Crash Statistics

Total Number of Crashes	149
Truck Involved Crashes (Percent Truck Involved)	8 (5%)
Corridor Crash Rate per 1 milllion VMT	1.05
Statewide Crash Rate (same functional class)	1.00
Corridor Average Crash Costs $ per 1000 VMT	250
Number of Top 10% SPIS Sites on Corridor	4
Truck Safety Corridor?	yes

6.0 LESSONS LEARNED

This analysis represents a new approach to identifying problem areas on the highway system specifically related to freight flows. This data-driven approach builds off of previous work done for the Oregon Freight Plan. The methodology was developed to accommodate a periodic update effort. Preparation for updating this study should address the following:

- HPMS data quality control issues resolved – missing segment data needs to be filled in and errors need to be corrected. ODOT Data Section has not implemented a robust QA/QC process for the new HPMS submittal format. Given priorities and workload, it is not clear when such a process will be implemented. If this process is not in place before the update of this study occurs, time needed for this task must be built into the project schedule.

- HPMS input file for HERS-ST needs to be created. This was a task identified by the Transportation Data Section, but it was not completed by the time this study was conducted. Given priorities and workload, it is not clear when this task will be completed. If the data are not available in a compatible format for HERS, additional time will be required to resolve this issue. There are several options:

    1. Manually produce the HERS-ST input file

    2. Create new process to generate metrics directly from HPMS data

    3. Develop a process to update key elements of the HERS-ST input data, similar to the methodology followed for this study

- Inquire into the date that HERS-ST will be revised to import the new HPMS submittal database as an input file. The new HPMS format is incompatible with the current version of HERS-ST. HERS-ST is an important tool for system-wide evaluation and performance measures. The incompatible formatting requires many labor hours to update the data, making the tool more costly to use.

- Conduct analysis for all state freight route corridors for the next update.

- Incorporate truck GPS data into the next update of this study. ODOT expects to have some form of GPS data available for truck performance measures. Extra time may be necessary to build into the schedule to accommodate development of new metrics.

7.0 ANALYSIS TEAM

This analysis required a team of people working closely together in order to meet the objectives of this analysis within the ambitious timeline and working through the process of discovery:

Transportation Planning Analysis Unit

Rich Arnold, P.E., Senior Transportation System Analysis Engineer

Alex Bettinardi, P.E., Senior Integrated Analysis Engineer

Brian Dunn, P.E., Manager

Becky Knudson, Senior Transportation Economist

Beth Pickman, Transportation Analyst

Freight Mobility Unit

Michael Bufalino, Manager

Robin Marshburn, Transportation Planner

Oregon Freight Advisory Committee

Sub-committee on Freight Bottlenecks

APPENDIX A HIGHWAYS AS MAIN STREET TABLE

This is a list of cities with a study corridor traveling through the city limits.

Freight Corridors Serving as City Main Street					
Freight Bottleneck Route	**Place**	**County**	**Highway**	**Route**	**Posted Speed**
FR01_CannonBeach_Portland_2010	Elsie	Clatsop	Sunset 0047	US26	55
FR01_CannonBeach_Portland_2010	Manning	Clatsop	Sunset 0047	US26, OR47	50
FR02_LincolnCity-Salem_2010	Otis Junction	Lincoln	Salmon River 0039	OR18	45
FR02_LincolnCity-Salem_2010	Rose Lodge	Lincoln	Salmon River 0039	OR18	50
FR02_LincolnCity-Salem_2010	Valley Junction	Polk	Salmon River 0039	OR18, OR22	45
FR02_LincolnCity-Salem_2010	Fort Hill	Polk	Salmon River 0039	OR18, OR22	45
FR02_LincolnCity-Salem_2010	Winona	Polk	Salem Dallas Hwy NW 0030	OR22	50
FR03_Reedsport-I5_2010	Reedsport	Douglas	Umpqua 0045	OR38	25
FR03_Reedsport-I5_2010	Scottsburg	Douglas	Umpqua 0045	OR38	40
FR03_Reedsport-I5_2010	Green Acres	Douglas	Umpqua 0045	OR38	45
FR03_Reedsport-I5_2010	Elton	Douglas	Umpqua 0045	OR38	30
FR03_Reedsport-I5_2010	Drain	Douglas	Umpqua 0045	OR38	25
FR04_CoosBay-Roseburg_2010	Norway	Coos	Coos Bay-Roseburg 0035	OR42	55
FR04_CoosBay-Roseburg_2010	Myrtle Point	Coos	Coos Bay-Roseburg 0035	OR42	30
FR04_CoosBay-Roseburg_2010	Camas Valley	Douglas	Coos Bay-Roseburg 0035	OR42	45
FR04_CoosBay-Roseburg_2010	Tenmile	Douglas	Coos Bay-Roseburg 0035	OR42	55
FR04_CoosBay-Roseburg_2010	Winston	Douglas	Coos Bay-Roseburg 0035	OR42	30
FR05_Eugene-US97_2010	Pleasant Hill	Lane	Willamette 0018	OR58	45
FR05_Eugene-US97_2010	Oakridge	Lane	Willamette 0018	OR58	35
FR06_Salem-Bend_2010	Mehama	Marion	N Santiam Hwy SE 0162	OR22	45
FR06_Salem-Bend_2010	Mill City	Marion	N Santiam Hwy SE 0162	OR22	40
FR06_Salem-Bend_2010	Gates	Marion	N Santiam Hwy SE 0162	OR22	45
FR06_Salem-Bend_2010	Detroit	Marion	N Santiam Hwy SE 0162	OR22	40
FR06_Salem-Bend_2010	Idanha	Marion	N Santiam Hwy SE 0162	OR22	40
FR06_Salem-Bend_2010	Marion Forks	Marion	N Santiam Hwy SE 0162	OR22	50
FR06_Salem-Bend_2010	Sisters	Deschutes	McKenzie 0016	OR242, OR126, US20	20
FR06_Salem-Bend_2010	Tumalo	Deschutes	McKenzie-Bend 0017	US20	45
FR07_Portland-Madras_2010	Haig	Multnomah	Mt Hood 0026	US26	35
FR07_Portland-Madras_2010	Sandy	Clackamas	Mt Hood 0026	US26	25
FR07_Portland-Madras_2010	Shortys Corner	Clackamas	Mt Hood 0026	US26	55
FR07_Portland-Madras_2010	Firwood	Clackamas	Mt Hood 0026	US26	55
FR07_Portland-Madras_2010	Alder Creek	Clackamas	Mt Hood 0026	US26	55
FR07_Portland-Madras_2010	Wildwood	Clackamas	Mt Hood 0026	US26	45
FR07_Portland-Madras_2010	Wemme	Clackamas	Mt Hood 0026	US26	45
FR07_Portland-Madras_2010	Zigzag	Clackamas	Mt Hood 0026	US26	45
FR07_Portland-Madras_2010	Rhododendron	Clackamas	Mt Hood 0026	US26	40
FR07_Portland-Madras_2010	Warm Springs	Jefferson	Warm Springs 0053	US26	45
FR08_Washington-California(US97)_2010	Moro	Sherman	Sherman 0042	US97	25
FR08_Washington-California(US97)_2010	Grass Valley	Sherman	Sherman 0042	US97	30
FR08_Washington-California(US97)_2010	Shaniko	Sherman	Sherman 0042	US97	40
FR08_Washington-California(US97)_2010	Madras	Jefferson	The Dalles-California 0004	US97, US26	25
FR08_Washington-California(US97)_2010	Terrebonne	Deschutes	The Dalles-California 0004	US97	35
FR08_Washington-California(US97)_2010	Redmond	Deschutes	The Dalles-California 0004	US97	45
FR08_Washington-California(US97)_2010	Bend	Deschutes	The Dalles-California 0004	US97	45
FR08_Washington-California(US97)_2010	La Pine	Deschutes	The Dalles-California 0004	US97	35
FR08_Washington-California(US97)_2010	Crescent	Klamath	The Dalles-California 0004	US97	40
FR08_Washington-California(US97)_2010	Chemult	Klamath	The Dalles-California 0004	US97	40

Freight Corridors Serving as City Main Street, cont'd					
Freight Bottleneck Route	**Place**	**County**	**Highway**	**Route**	**Posted Speed**
FR08_Washington-California(US97)_2010	Klamath Falls	Klamath	The Dalles-California 0004	US97	55
FR09_Bend-Ontario_2010	Bend	Deschutes	Central Oregon 0007	US20, US395	45
FR09_Bend-Ontario_2010	Hines	Harney	Central Oregon 0007	US20, US395	35
FR09_Bend-Ontario_2010	Burns	Harney	Central Oregon 0007	US20, US396	25
FR09_Bend-Ontario_2010	Juntura	Malheur	Central Oregon 0007	US20	35
FR09_Bend-Ontario_2010	Vale	Malheur	Central Oregon 0007	US20, US26	25
FR09_Bend-Ontario_2010	Ontario	Malheur	Central Oregon 0007	OR201	45
FR10_California-Washington(I5)_2010	Medford	Jackson	Pacific 0001	I-5	55
FR10_California-Washington(I5)_2010	Central Point	Jackson	Pacific 0001	I-5	55
FR10_California-Washington(I5)_2010	Myrtle Creek	Douglas	Pacific 0001	I-5, OR99	50
FR10_California-Washington(I5)_2010	Cottage Grove	Lane	Pacific 0001	I-5	55
FR10_California-Washington(I5)_2010	Eugene	Lane	Pacific 0001	I-5	60
FR10_California-Washington(I5)_2010	Springfield	Lane	Pacific 0001	I-5	60
FR10_California-Washington(I5)_2010	Salem	Marion	Pacific 0001	I-5, OR99E	60
FR10_California-Washington(I5)_2010	Tualatin	Washington	Pacific 0001	I-5	55
FR10_California-Washington(I5)_2010	Lake Oswego	Clackamas	Pacific 0001	I-5	55
FR10_California-Washington(I5)_2010	Tigard	Washington	Pacific 0001	I-5	55
FR10_California-Washington(I5)_2010	Portland	Multnomah	Pacific 0001	I-5	50
FR11_Portlans-Ontario(I84)_2010	Portland	Multnomah	Columbia River 0002	I-84, US30	55
FR11_Portlans-Ontario(I84)_2010	Gresham	Multnomah	Columbia River 0002	I-84, US30	60
FR11_Portlans-Ontario(I84)_2010	Fairview	Multnomah	Columbia River 0002	I-84, US30	60
FR11_Portlans-Ontario(I84)_2010	Wood Village	Multnomah	Columbia River 0002	I-84, US30	60
FR11_Portlans-Ontario(I84)_2010	Troutdale	Multnomah	Columbia River 0002	I-84, US30	60
FR12_EastPortland(I205)_2010	West Linn	Clackamas	E Portland Freeway 0064	I-205	55
FR12_EastPortland(I205)_2010	Oregon City	Clackamas	E Portland Freeway 0064	I-205	55
FR12_EastPortland(I205)_2010	Gladstone	Clackamas	E Portland Freeway 0064	I-205	55
FR12_EastPortland(I205)_2010	Portland	Multnomah	E Portland Freeway 0064	I-205	55
FR12_EastPortland(I205)_2010	Maywood Park	Multnomah	E Portland Freeway 0064	I-205	55
FR13_Astoria-Portland_2010	Astoria	Clatsop	Lower Columbia River 0092	US30	25-45
FR13_Astoria-Portland_2010	Westport	Clatsop	Lower Columbia River 0092	US30	40
FR13_Astoria-Portland_2010	Clatskanie	Columbia	Lower Columbia River 0092	US30	30-45
FR13_Astoria-Portland_2010	Rainier	Columbia	Lower Columbia River 0092	US30	30-45
FR13_Astoria-Portland_2010	Deer Island	Columbia	Lower Columbia River 0092	US30	50
FR13_Astoria-Portland_2010	Columbia City	Columbia	Lower Columbia River 0092	US30	50
FR13_Astoria-Portland_2010	St Helens	Columbia	Lower Columbia River 0092	US30	35-50
FR13_Astoria-Portland_2010	Scappose	Columbia	Lower Columbia River 0092	US30	35-40
FR13_Astoria-Portland_2010	Burlington	Multnomah	Lower Columbia River 0092	US30	50
FR13_Astoria-Portland_2010	Portland	Multnomah	Lower Columbia River 0092	US30	35-50
FR14_Medford-KlamathFalls_2010	n/a		Lake of the Woods 0270	OR140	
FR15_Willamina-Dundee_2010	McMinnville	Yamhill	Salmon River 0039	OR18	45
FR16_Newport-I5_2010	Newport	Lincoln	Corvallis-Newport 0033	US20	30-45
FR16_Newport-I5_2010	Toledo	Lincoln	Corvallis-Newport 0033	US20	45
FR16_Newport-I5_2010	Philomath	Benton	Corvallis-Newport 0033	US20, OR34	25-45
FR16_Newport-I5_2010	Corvallis	Benton	Corvallis-Newport 0033	US20, OR34	45
FR16_Newport-I5_2010	I-5 intersection	Linn	Corvallis-Lebanon 0210	OR34	40
FR17_Portland-Eugene(OR99W)_2010	Portland	Multnomah	Pacific Highway West 0091	OR99W	35-45
FR17_Portland-Eugene(OR99W)_2010	Tigard	Washington	Pacific Highway West 0091	OR99W	35-40

Freight Corridors Serving as City Main Street, cont'd					
Freight Bottleneck Route	**Place**	**County**	**Highway**	**Route**	**Posted Speed**
FR17_Portland-Eugene(OR99W)_2010	King City	Washington	Pacific Highway West 0091	OR99W	40-45
FR17_Portland-Eugene(OR99W)_2010	Tualatin	Washington	Pacific Highway West 0091	OR99W	45
FR17_Portland-Eugene(OR99W)_2010	Sherwood	Washington	Pacific Highway West 0091	OR99W	45
FR17_Portland-Eugene(OR99W)_2010	Yamhill	Washington	Pacific Highway West 0091	OR99W	25-45
FR17_Portland-Eugene(OR99W)_2010	Dundee	Washington	Pacific Highway West 0091	OR99W	35-45
FR17_Portland-Eugene(OR99W)_2010	Lafayette	Washington	Pacific Highway West 0091	OR99W	40-45
FR17_Portland-Eugene(OR99W)_2010	McMinnville	Yamhill	Pacific Highway West 0091	OR99W	35-50
FR17_Portland-Eugene(OR99W)_2010	Amity	Yamhill	Pacific Highway West 0091	OR99W	30-40
FR17_Portland-Eugene(OR99W)_2010	Rickreall	Yamhill	Pacific Highway West 0091	OR99W	35-50
FR17_Portland-Eugene(OR99W)_2010	Monmouth	Polk	Pacific Highway West 0091	OR99W	30-45
FR17_Portland-Eugene(OR99W)_2010	Lewisburg	Benton	Pacific Highway West 0091	OR99W	40-50
FR17_Portland-Eugene(OR99W)_2010	Corvallis	Benton	Pacific Highway West 0091	OR99W, US20, OR34	25-50
FR17_Portland-Eugene(OR99W)_2010	Monroe	Benton	Pacific Highway West 0091	OR99W	30-45
FR17_Portland-Eugene(OR99W)_2010	Junction City	Lane	Pacific Highway West 0091	OR99W	30-45
FR17_Portland-Eugene(OR99W)_2010	Eugene	Lane	Pacific Highway West 0091	OR99W, OR126	30-45
FR18_Beaverton-Tigard(OR217)_2010	n/a		Beaverton-Tigard 0144	OR217	
FR19_OR42-OR38(US101)_2010	Reedsport	Douglas	Oregon Coast 0009	OR42, OR38(US101)	30-40
FR19_OR42-OR38(US101)_2010	Winchester Bay	Douglas	Oregon Coast 0009	OR42, OR38(US101)	45
FR19_OR42-OR38(US101)_2010	North Bend	Douglas	Oregon Coast 0009	OR42, OR38(US101)	30-45
FR19_OR42-OR38(US101)_2010	Coos Bay	Douglas	Oregon Coast 0009	OR42, OR38(US101)	20-40