2022 STATEWIDE CONGESTION OVERVIEW

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Executive Summary

Supporting the daily activity of Oregon businesses and residents is key to the mission of the Oregon Department of Transportation (ODOT). Policymakers must make strategic choices about how, when and where resources are spent. Effective solutions require an understanding of how travel affects people's lives and the economy. When making transportation choices, businesses and people consider cost, time, safety, and reliability. It is important to understand the economic motivations behind travel, mobility and system performance in order to develop effective policies and strategic investment plans.

Role of the Economy

A well-functioning transportation system is foundational to a robust economy. Oregon has experienced significant economic growth over the last two decades:

- Population increased 25%, from 3.4 million people to 4.27 million.
- Employment increased 13%, from 1.6 million to 1.8 million.
- Vehicle-miles-traveled (VMT) in Oregon increased 9% between 2000 and 2021.

Household activity varies depending on characteristics such as household size, age, income, number of workers, and presence of children. According to the most recent 2009-2011 Oregon statewide household activity survey, about 55% of trips are for social/recreational activity, shopping and personal errands. Twenty-two percent are for work or work-related, while 23% are for school, school-related, or escorting others for their activity (e.g., children, elderly).

Commercial activity also varies depending on the characteristics of individual businesses and industries within which they operate. However, they all need access to workers, materials and services to support production activity, and markets where their goods and services are sold.

- *Heavy trucks* are used to move 70 % of Oregon freight, other freight modes such as rail, air and marine also depend on trucks for the first and last mile.
- *Medium trucks* are used for commercial activity - trade services such as plumbing, electricians, roofing, painting and other construction, local deliveries for e-commerce, groceries and nursery goods.
- 9% of total statewide VMT is from trucks.
- According to national research[1], 35% of total VMT is from commercial business travel (non-household), which includes light vehicles, medium and heavy trucks.

[1] https://www.nap.edu/resource/25334/interstate/assets/meeting6/1%20Travel%20Forecast/PolzinSteven.pdf

Performance Monitoring

Transportation roadway use can be quantified using metrics such as VMT and VMT per capita. Since year 2000, total statewide VMT has risen steadily, while per capita VMT has declined. Thus, the reduction in average VMT per person (per capita) has not been enough to compensate for new travel generated by growth in population and employment, which has led to increases in statewide VMT over time.

Increasing population and employment generated new travel demand, but Oregon lane miles have not increased at the same pace:

- 17% of statewide lane miles are owned by the state, state-owned lane miles increased 4.8% since 2000, 61% of total VMT occurs on state highways – 27% on interstate and 34% on non-interstate.
- 61% of statewide lane miles are owned by counties, county-owned lane miles increased 9.8% since 2000, and 19% of total VMT occurs on county highways and roads.
- 22% of statewide lane miles are owned by cities, city-owned lane miles increased 13% since 2000, and 20% of total VMT occurs on city streets.
- State highways carry 78% of heavy and medium truck VMT, county and city roads combined carry 22%,
- Heavy trucks make up 6.1% of statewide VMT and medium trucks make up 2.7% of statewide VMT.

Oregon's population is concentrated within metropolitan areas. In 2021, 64% of the population was located within the 8 metropolitan regions, 52% of state population is located within the three largest metropolitan regions of Portland, Salem-Keizer and Eugene-Springfield. Urban travel demand concentrated in metro regions increases the occurrence of congestion over time, especially in the Portland region that must accommodate about half of the state's new population. Travel costs fall into two main categories of time and money. Delay means higher time costs, but there comes a point where delay begins to impact reliability. Reliability is especially important for trips that require dependable arrival times, such as getting to work on time, personal appointments, freight delivery and customer appointments. There are multiple causes of congestion, making the identification of causes important for system performance monitoring and development of effective management strategies. Reliability is of particular importance to freight movement.

Public safety is woven into the fabric of all facets of the transportation system, representing a core aspect of the ODOT mission. Safety is an aspect of travel users take into account when making choices every day. Between 2010 and 2020 the average annual number of crashes statewide was 50,500, with fatal and serious injury crashes making up an average of 3.5% (1,770) of the total. About a third of these crashes are speed-related, over half involve use of drugs and/or alcohol. Since 2010 there has been a trend of increasing numbers of crashes involving fatal and serious injuries. The number of fatal and serious injury crashes involving pedestrians and bicycles has risen 31% since 2010.

While the Oregon economy has recovered from the COVID-19 induced recession, there remain several unknowns related to this historic event. Traffic volumes across the state changed in different way regionally, businesses continue to refine their work-from-home policies, and data collected during the pandemic revealed disparities across race and income in opportunities to work from home.

CONCLUSION

Oregon's growing economy means demands on the transportation system will continue into the future, but long-range investment strategies[2] do not include plans for adding major capacity. Quantifying use and performance of the transportation system provides information needed to develop the right solutions at the right time in the right locations. Investment will focus on utilizing current capacity more efficiently and effectively. Understanding the motivations behind transportation user choice helps inform development of effective public policy. Monitoring the effectiveness of transportation policy is complex, due to the strong correlation with economic market forces outside of public agency control. A suite of performance measures is required to understand the complex relationship between system use and the needs and behavior of people and businesses across the state. In a time of declining revenue streams and rising system use, it is more important than ever to develop effective ways to manage the transportation system and provide safe and affordable mobility options to preserve the quality of life in Oregon now and into the future.

[2] Long-range strategies are identified within the Oregon Transportation Plan, which is currently being updated, adoption expected summer of 2023: https://www.oregon.gov/odot/Planning/Pages/Oregon-Transportation-Plan-Update.aspx

INTRODUCTION

1.1 Travel Mobility

Supporting the daily lives of Oregon businesses and residents is key to the mission of the Oregon Department of Transportation (ODOT). Policymakers must make strategic choices about how and where resources are spent. Effective solutions require an understanding of how travel affects people's lives and the economy. It is important to understand the economic motivations behind travel, mobility and congestion in order to develop effective policies and strategic investment plans. As Oregon grows, congestion in urban centers rises, which impacts mobility.

Answering the question "what is mobility" is not as simple as it initially appears, mobility is not synonymous with transportation. The Mobility Lab[3] describes having mobility as having access to the places needed to fulfill a rich and satisfying life, such as a job, schools, medical services, shopping, parks, and personal amenities such as seeing your kid's game after work. In this sense, mobility means having quality transportation options enabling people to safely fulfill needs within budgets for time and money. Mobility from the commercial perspective means having access to workers, customers, goods and services needed to conduct business. Businesses are large consumers of goods and services, relying on the transportation system to provide access to markets to buy and sell at competitive prices. Freight movement plays a key role in competitively accessing markets.

Mobility directly impacts the quality of life for all Oregonians every day. Roadways are preserved and maintained by multiple agencies, ODOT, counties and cities, covering more than 79.8 thousand lane miles.[4] Oregon has over 4.3 million registered vehicles[5] and 3.6 million licensed drivers[6], which is about 85% of the state population in 2021. The ability for businesses, freight and people to move throughout the state depends on having robust transportation infrastructure.

Mobility means having quality transportation options that enable businesses and people to safely fulfill needs within budgets for time and money.

When making transportation choices, businesses and people consider cost, time, safety, and reliability. In order to support Oregon's quality of life, ODOT must understand factors underlying mobility so as to manage safety, develop effective means to optimize system performance, support a sustainable economy, while serving the needs of a diverse set of individual users.

[3] https://mobilitylab.org/2018/07/26/what-is-mobility/
[4] 2021 Oregon Annual Mileage Report: https://www.oregon.gov/odot/data/pages/road-assets-mileage.aspx#OMR
[5] 2021 Vehicle Registration by County: https://www.oregon.gov/odot/DMV/docs/2021_Vehicle_County_Registration.pdf
[6] 2021 Oregon DMV Driver Statistics: https://www.oregon.gov/odot/DMV/Pages/News/driver_stats.aspx

1.2 How Do We Evaluate Roadway Mobility?

The "ease" of moving on Oregon's highway system can be examined from several different vantage points:

- **Economy:** Economic activity generates demand for transportation systems. What factors impact travel demand? Why is a well-functioning transportation system important to the Oregon economy?
- **Quantity:** How many people use the freeway system? How much freight is transported on our freeways? Are businesses able to access workers and customers? Are customers able to access businesses?
- **Quality:** How well are people and goods being transported on the system? What is user perception of freeway operation? How reliable is the system - where is congestion associated with incidents, such as crashes, weather, and other activity?

Looking at mobility from multiple perspectives provides a more holistic view of system performance.

Section 2 of this report highlights the foundational role played by the Oregon economy, revealing different market forces related to day-to-day decisions impacting the overall use of the transportation system. Section 3 presents performance measures on the quantity and quality of system use and performance. Section 4 provides a brief overview of safety, focusing on crashes resulting in fatalities and serious injuries. Finally, Section 5 presents a summary overview of traffic patterns during the period impacted by COVID mandates.

1.3 Purpose of this Report

Managing the transportation system effectively is challenging and complex. Information on system performance will position ODOT to gain a deeper understanding of statewide mobility issues. Fact-based, data-driven reporting provides information supporting transportation policy development and long-range planning. The purpose of this report is to support data-driven development of transportation policy and investment, with a focus on three areas:

- Economic context - identify factors affecting transportation demand in a manner that informs policy development.
- Quantify system use - measure how much the system is used, provide context with respect to system capacity and condition.

- Measure quality - identify how well the system functions and identify congestion issues.

Data sources, technical methods and procedures have been developed and vetted for reporting on freeways, which is the focus of this report. This approach is designed for high-level statewide monitoring with the intent to inform long range planning efforts, such as the Oregon Transportation Plan[7] and Oregon Highway Plan[8]. This report can also support regional planning and analysis, such as the information prepared for the ODOT "Portland Region Traffic Performance Report"[9], which evaluates corridor performance. This type of reporting requires development of performance measures, high-quality observed data and technical methods to produce statistically valid results. This report presents information based on currently available data and reporting methods.

The purpose of this report is to support data-driven development of transportation policy and investment.

2 The Role of the Economy in Mobility

Is freeway mobility changing because Oregonians are making different business, lifestyle and travel choices, or are business, lifestyle and travel choices changing in response to congestion and delays on our freeways? It is likely both are occurring simultaneously. Complex economic relationships between freeway mobility and travel behavior are continually in flux and have long created challenges for transportation analysts. Land use characteristics such as density, accessibility, and travel mode connectivity influence where businesses and households choose to locate.

This section takes a look at several high-level indicators related to the movement of people, goods and services in Oregon. Economists refer to transportation as a "derived demand" because demand for transportation is mostly derived from demand to access goods and services. **Figure 1** illustrates how economic activity of households and businesses generates demand for transportation. Thus, the economy plays a very large role in the demands on the transportation system, while ODOT has very limited influence on transportation users' choice and economic behavior.

[7] https://www.oregon.gov/odot/planning/pages/plans.aspx
[8] https://www.oregon.gov/odot/planning/pages/plans.aspx#OHP
[9] 2020 report is available here: https://www.oregon.gov/odot/Projects/Project%20Documents/TPR-2020.pdf

FIGURE 1. TRANSPORTATION AS A DERIVED DEMAND

ECONOMIC ACTIVITY			
Household Production/Activity		**Business Production/Activity**	
Workers-Earn Income	Attend School	Hire Workers	Produce Goods
Consume Goods	Consume Services	Provide Services	Capital Investment

DERIVED DEMAND	
Household Demand for Trips:	**Business Demand for Trips**
Household trips by purpose:	Worker trips destined to job site
Work and work related	Service trips to customers
School and school related	Freight trips coming in and going out:
Social/Recreation	Within Oregon, outbound, inbound
Personal business	Freight by different modes
Shopping	Light, Medium & Heavy Vehicles
Escorting others to activities (kids, elderly	Rail, Air, Marine, & Pipeline

2.1 The Economy

Since 2001, the Oregon economy has been expanding faster than the national average[10], attracting more people, jobs and freight movement as it grows. **Table 1** reports vehicle-miles-traveled (VMT) by highway ownership and vehicle weight group. This information was compiled from the Oregon Highway Cost Allocation study time series, which defines light vehicles as weighing less than 10,000 pounds and heavy vehicles weighing more than 10,000 pounds. In 2020:

- 61% of total VMT occurred on state-owned highways[11], which account for 17% of lane miles.
- City and county roads carried 39% of total VMT, while accounting for 83% of Oregon lane miles.
- The majority of heavy vehicle VMT occurs on the state system (78%), while city and county roads carry the remaining 22%.
- 9% of overall VMT is from heavy vehicles - 11% of state-owned highway VMT is from heavy vehicles, 5% of non-state highway VMT is from heavy vehicles.

[10] Oregon Center for Public Policy: https://www.ocpp.org/2019/04/18/SWO-strong-economic-growth/ accessed 02/14/2020.

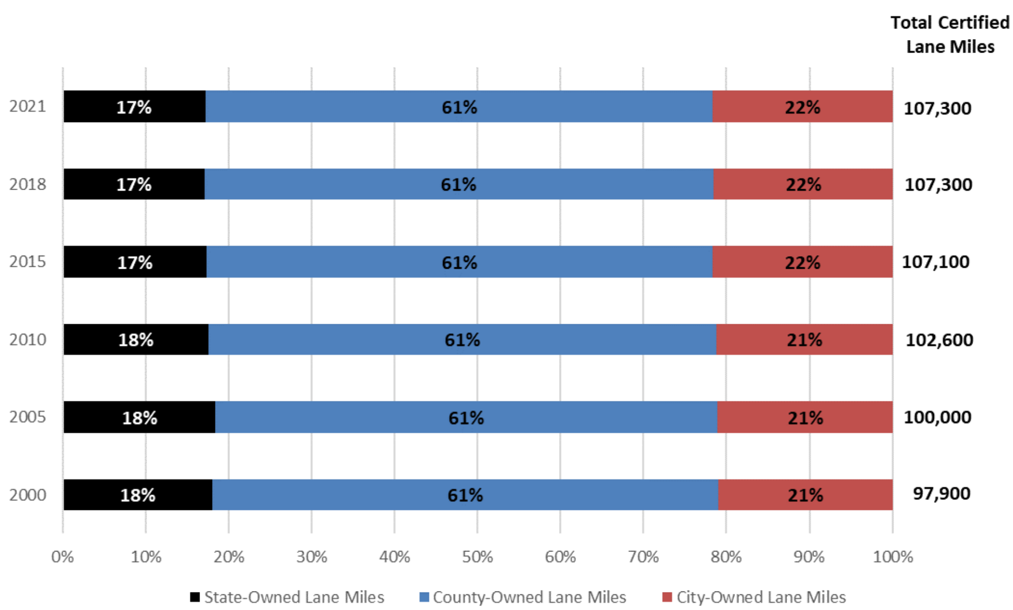
[11] This pattern has been consistent over time. Further detail can be found in Exhibit 4-4 of the 2011 Highway Cost Allocation Study Report available here: https://www.oregon.gov/das/OEA/Documents/2011report.pdf

TABLE 1. 2020 VEHICLE-MILES-TRAVELED BY HIGHWAY JURISDICTIONAL OWNERSHIP AND WEIGHT GROUP

	Total VMT, in millions	Percent of Total	Share of Lane Miles	Light Vehicles		Heavy Vehicles	
State Roads	**21,476**	**61%**	**17%**	19,062	60%	2,414	78%
Interstate	9,602	27%					
Non-Interstate	11,875	34%					
Local Roads	**13,553**	**39%**	**83%**	12,887	40%	666	22%
County Roads	6,484	19%	61%				
City Streets	7,070	20%	22%				
TOTAL All Roads	**35,029**	**100%**		**31,949**	**91%**	**3,080**	**9%**
Source: VMT - Highway Cost Allocation Study: 2019-2021 Biennium Table 4-2, Oregon Department of Administrative Services, Office of Economic Analysis; Lane Miles - Highway Performance Monitoring System, ODOT							

Major expansion of the national highway system ended with the completion of the Interstate system in 1992[12]. Since then, Oregon infrastructure investment has focused on relatively small enhancement projects designed to optimize system performance – especially in the areas of safety and reliability, but not adding large amounts of capacity. **Figure 2** reports lane miles by jurisdictional ownership between years 2000 and 2021. Total lane miles increased 9.6% since 2000, most of the change occurred on the local system to accommodate new housing and businesses.[13]

FIGURE 2. OREGON LANE MILES BY OWNERSHIP 2000-2021



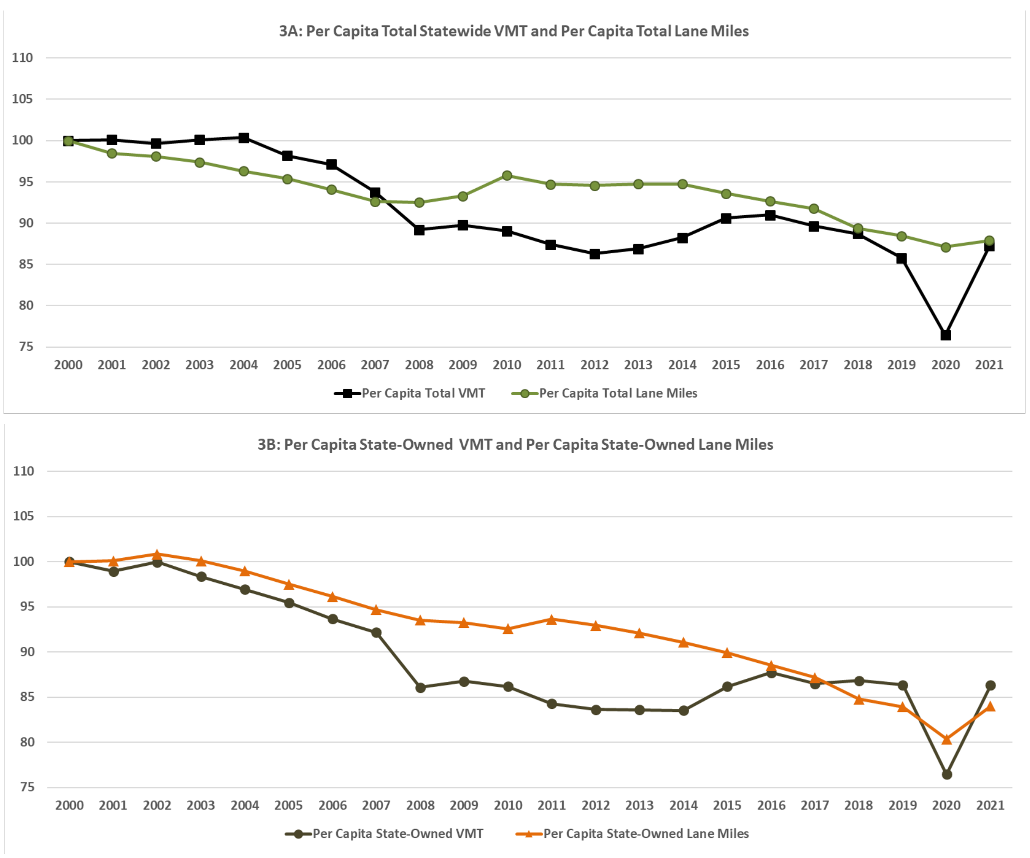
12 https://en.wikipedia.org/wiki/Interstate_Highway_System accessed 02/14/2020.

13 State-owned lane miles have changed a small amount over time, through a combination of jurisdictional transfers, changes in highway configuration and limited construction of new lane miles.

Figure 3A illustrates *total statewide* VMT and *total statewide* lane miles on all roads and highways over time relative to changes in population, reported as per capita VMT. The values are indexed to year 2000 to illustrate relative change over time. From 2000 to 2004 per capita statewide VMT was steady followed by a decreasing trend until 2012. From 2013 to 2016 per capita VMT increased but remained below 2000 levels. Between 2016 and 2019 per capita VMT declined 5 percentage points, followed by a large drop from the pandemic, and recovered to levels seen prior to the pandemic. The patterns observed after 2008 reveal lingering impacts of the Great Recession – total VMT declined while total population continued to rise, but more slowly than the past until 2012. By 2012 population growth rates began to rise, while VMT increased more slowly, resulting in an overall decline in per capita statewide VMT. While the pandemic resulted in a large drop in per capita VMT, 2021 levels were 2 percentage points higher than 2019.

Figure 3B illustrates per capita *state-owned* highway lane miles and per capita *state-owned* VMT. State-owned highway lane mile capacity accommodates 60% of statewide VMT, which has been a consistent pattern over time. State-owned per capita VMT and per capita lane miles have been on a declining trajectory since 2002. The Great Recession of 2007-2009 resulted in a decline in per capita VMT on state-owned highways lasting until 2014. After the Oregon economy recovered from the recession, per capita VMT rose 4 percentage points between 2014 and 2016, followed by a steady pattern through 2021, with the exception of the 2020 pandemic.

FIGURE 3. CHANGE IN PER CAPITA VMT AND PER CAPITA LANE MILES: 2000-2021 (INDEXED TO YEAR 2000)



2.2 Population and Employment

As the Oregon economy grows, greater demands are placed on state highways to accommodate rising levels of freight and people movement, while lane miles increase at a much lower rate. For this reason, the need to understand and optimize use of highways is key to supporting the Oregon economy and making effective investment decisions.

Historically Oregon has been growing faster than the national average. **Figure 4** illustrates change in population, employment and vehicle-miles-traveled for years 2000 through 2021. The data is indexed[14] to better illustrate change over time relative to year 2000. During this time, state population increased 25%[15], from 3.4 million to 4.27 million. The number of jobs in Oregon rose 13%[16], from 1.62 million to 1.87 million. Oregon's economy relies on the transportation system to get goods and services to markets, workers to jobs and consumers to marketplaces. This economic activity resulted in total statewide VMT increasing about 9% between 2000 and 2021[17]. Note that 2020 VMT was about 5% lower than year 2000 due to COVID-19 quarantine impacts. These patterns illustrate the role of the economy in travel demand and transportation system use.

Over the last two decades there were three recessions: one in 2001 (8 months), the Great Recession of 2007-2009 (18 months) and the COVID-19 induced recession starting March of 2020. During a recession, employment declines and population growth typically slows. Since 2000, total VMT increased until 2004, declined less than 1% in 2005 and rose about half a percent in 2006. From 2007 to 2012 VMT declined during the Great Recession and the economic recovery period. As an export dependent economy, Oregon tends to recover later than the nation overall. By 2012 the Oregon economy was in full recovery from the recession: population began to grow at a higher rate and employment began rising faster than population. VMT rose until 2016 and plateaued until 2018, followed by a drop in 2019 and the 2020 decline due to the COVID-19 pandemic[18]. Post pandemic VMT rose to the same level seen in 2018. Recessions and other shocks to the system, such as COVID-19, can reduce travel demand. Thus, understanding economic conditions is important to understanding system demand.

[14] To learn more about indexing data, see Federal Reserve Bank of Dallas webpage: https://www.dallasfed.org/research/basics/indexing.aspx

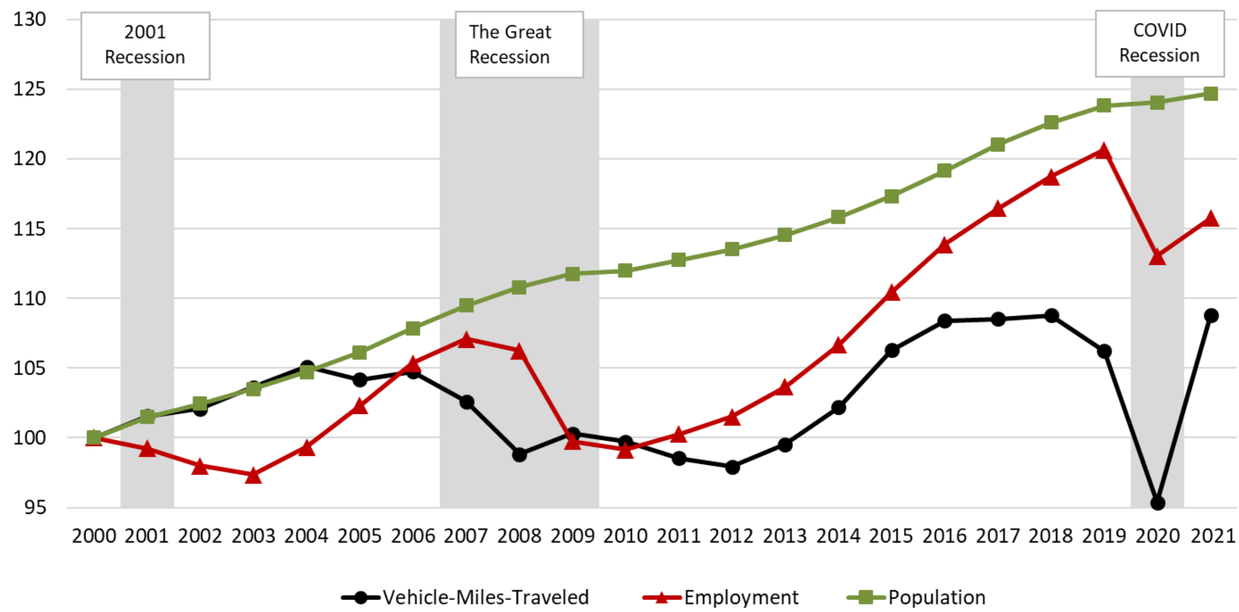
[15] PSU Population Research Center Current Population Estimates data series

[16] Oregon Employment Department, Current Employment Statistics data series.

[17] FHWA Highway Statistics, Table VM-2;

[18] See COVID-19 Traffic Monitoring Reports here: https://www.oregon.gov/odot/Data/Pages/Traffic-Counting.aspx#covid19trafficreports

Figure 4. Oregon Population, Employment and Total VMT Over Time: 2000-2021 (Indexed to Year 2000)



A growing economy generates more travel. Between 2010 and 2020 over 437,000 additional people reside in Oregon. These people utilize the transportation system to access jobs, goods and services. **Table 2** provides an example illustrating how increased population results in additional travel. In this example, additional VMT in 2020 can be attributed to travel generated by new residents since 2010. The challenge is to support a growing economy by effectively managing the transportation system within current funding streams, while assessing trade-offs associated with competing goals related to safety, equity, climate change, reliability, and efficiency. Because most of the population growth occurs within Metropolitan Planning Organizations (MPOs), congestion in the urban areas will continue to be an area of focus.

TABLE 2

EXAMPLE: Between 2010 and 2020:	
437,000	Oregon Population Increase (2)
2.6	Ave HH size (2)
168,100	Number of households
2020 Travel Generated by New Population since 2010	
8.9	Ave Daily household trips (1)
61	Average Daily miles traveled (1)
1,496,100	Total daily trips generated (1)
546,076,500	Total annual trips generated
10,254,100	Estimated daily trip miles generated
3,742,746,500	Estimated annual trip miles generated
82%	Proportion of trips via Auto (1)
32,298,000,000	2020 Statewide VMT (3)
10%	2020 Share of Statewide VMT
Source: (1) Oregon Household Travel Survey 2009-2011, (2) Census, (3) ODOT	

While population growth has occurred in both rural and urban areas of Oregon, the majority of the population increase occurred in metropolitan areas. **Table 3** reports Oregon population for years 2000, 2010 and 2021. Population is broken out by MPO and non-MPO to reveal the range in growth patterns across the state. It is important to understand regional population growth patterns in order to plan for future demands on the transportation system.

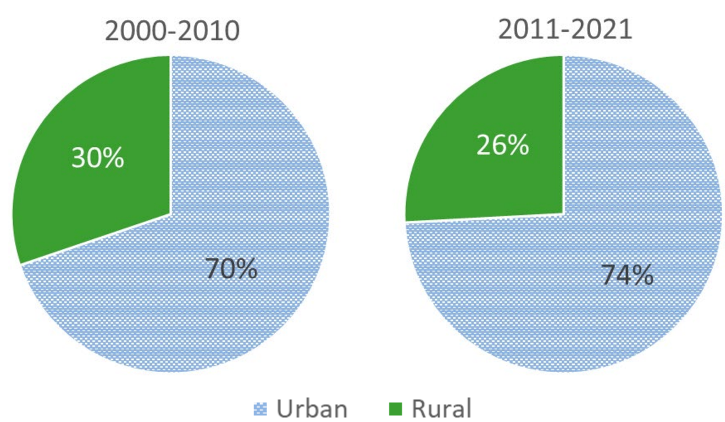
TABLE 3. OREGON POPULATION FOR YEARS 2000, 2010 AND 2021

MPO	Census 2000 Population	Census 2010 Population	Change Since 2000	Percent Change Since 2000	July 1, 2021 Estimate	Change Since 2010	Percent Change Since 2010	2021 % of State Population
Albany MPO	50,985	57,714	6,729	13%	66,942	9,228	16%	2%
Bend MPO	62,248	85,107	22,859	37%	111,380	26,273	31%	3%
Corvallis MPO	59,644	65,311	5,667	10%	71,566	6,255	10%	2%
Eugene-Springfield MPO	229,377	249,800	20,423	9%	275,247	25,447	10%	6%
Middle Rogue MPO	51,782	56,560	4,778	9%	61,769	5,209	9%	1%
Rogue Valley MPO	149,770	167,895	18,125	12%	187,388	19,493	12%	4%
Portland Metro	1,322,621	1,502,867	180,246	14%	1,703,024	200,157	13%	40%
Salem-Keizer MPO	216,377	243,500	27,123	13%	274,388	30,888	13%	6%
Total All Metropolitan Areas	2,142,803	2,428,754	285,951	13%	2,751,705	322,951	13%	64%
Total Other Cities and Rural Areas	1,278,596	1,402,320	123,724	10%	1,514,855	112,535	8%	36%
Oregon Statewide	3,421,399	3,831,074	409,675	12%	4,266,560	435,486	11%	100%
Source: Census 2000 – US Census Bureau; 2010 - 2020 Population Estimates – Population Research Center, Portland State University								

- Between 2010 and 2021, 74% of statewide population growth chose to live in Oregon's 8 MPOs. In year 2021, 64% of total statewide population is located in MPOs, while 36% located in other cities and rural areas.
- Portland Metro grew 14% between 2000 and 2010 and another 13% since 2010. In 2021 Portland Metro contained 40% of statewide population and absorbed 46% of statewide population growth since 2010.
- Other MPOs located in the Willamette Valley including Salem-Keizer, Eugene-Springfield, Corvallis and Albany, which contained 16% of statewide population in 2021 and absorbed 16% of statewide population growth since 2010.
- Rogue Valley MPO grew 12% between 2000 and 2010 and another 12% since 2010. In 2021 Rogue Valley MPO accounted for 4% of statewide population.
- The Bend MPO has been growing the fastest in terms of percentage change, increasing 37% in population between 2000 and 2010 and 31% since 2010. In 2021 Bend accounted for 3% of statewide population.
- Middle Rogue MPO grew 9% between 2000 and 2010 and another 9% since 2010. In 2021 Middle Rogue MPO accounted for 1% of statewide population.

Figure 5 summarizes the information from Table 3 into the proportion of population growth locating in MPOs and non-MPO areas consisting of small cities and rural regions. Between 2000 and 2010, 70% of new population located themselves in MPO areas, which increased to 74% the last decade. Between 2000 and 2010 smaller cities and rural areas attracted 30% of Oregon's new population, which declined to 26% between 2011 and 2021.

FIGURE 5. PROPORTION OF OREGON POPULATION GROWTH: MPO AND NON-MPO, 2000-2010 AND 2011-2021



2.3 Human Behavior: Moving People and Goods

A growing population places additional demands on the highway system as people partake in household activity, such as commuting to work, shopping, household errands, escorting children to school and activities, and recreational travel. A growing economy also places additional demands on the system as businesses hire more workers, demand for services rise, and more freight is moved between businesses and to final markets. Most of Oregon's MPOs are located along the I-5 corridor, with the exception of Bend. For this reason, it is no surprise to see congestion rising on the urban sections of the interstate freeway system. This is especially true for the Willamette Valley, which contains about 70% of state population on 12% of the state land[19] area.

2.3.1 Household Travel

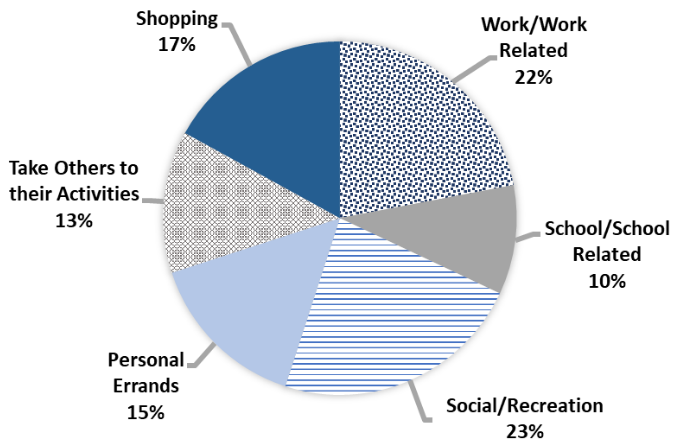
On an average weekday, households make about 9 trips per day[20]. The number of trips varies by household characteristics, such as age of household members, household size, household income, number of workers, presence of children, and availability of vehicles. The specific purpose of travel

[19] https://en.wikipedia.org/wiki/Willamette_River: Willamette River drainage basin is 11,478 square miles in size and the state of Oregon is 97,466 square miles.

[20] Stacey Bricka (2019), *Personal Travel in Oregon: A Snapshot of Daily Household Travel Patterns*. Accessible on Oregon Department of Transportation website: https://www.oregon.gov/ODOT/Planning/Documents/OHAS-Daily-Travel-In-Oregon-Report.pdf.

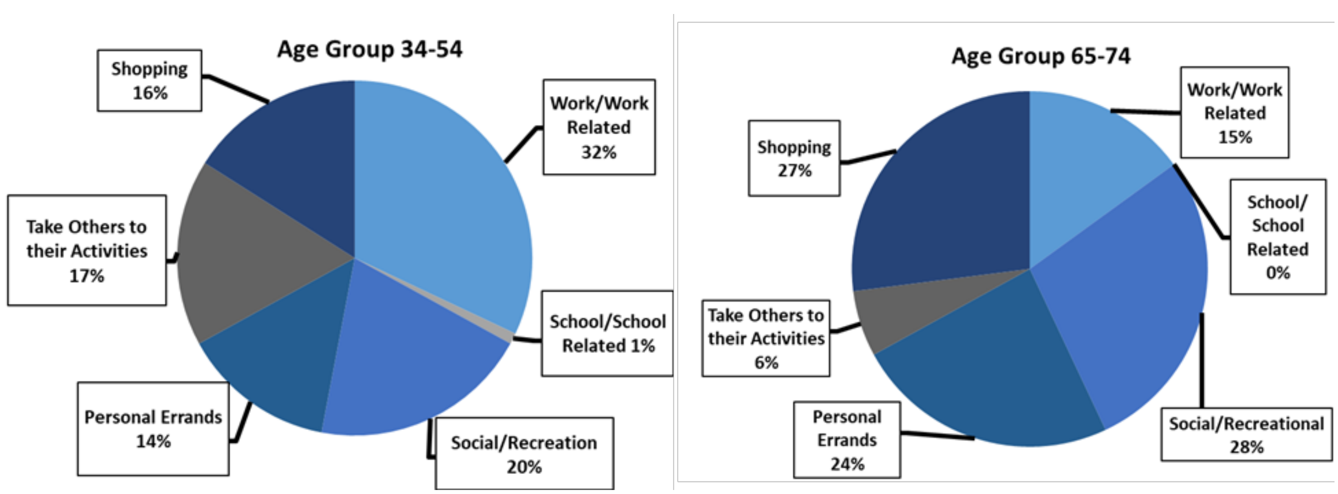
varies as well, where some trips are mandatory and others more flexible in terms of time-of-day or day-of-week. **Figure 6** illustrates the average proportion of household trips by purpose statewide.

FIGURE 6. HOUSEHOLD TRAVEL TRIP PURPOSE – STATEWIDE AVERAGE WEEKDAYS



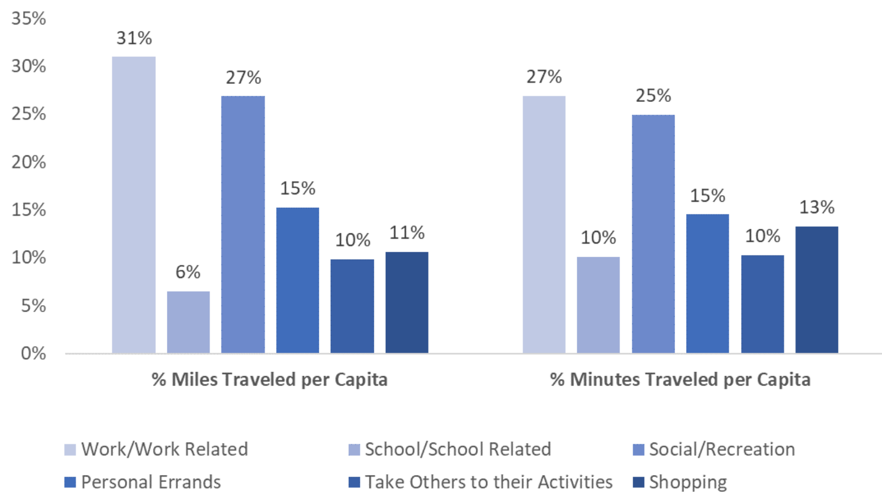
As Oregon's population ages, the overall statewide patterns may change. **Figure 7** illustrates how age impacts travel by comparing two age groups: ages 34-54 and ages 65-74. People in the age group 34-54 have a large share of trips related to work and taking others to their activities, making up nearly half of all trips. People in the age group of 65-74 have a large share of trips related to social/recreation and shopping, making up 55% of all trips. Thus, travel patterns vary by household characteristics and these differences are important to understand when developing transportation policy. Travel patterns are continuously changing as new modes become more competitive or attractive, such as ride-services (Uber, Lyft), e-bikes, and e-scooters. Utilization of existing options are also likely to change as the system matures, such as bicycling, walking, public transit and rising use of online shopping and telecommuting.

FIGURE 7. SHARE OF TRIPS BY PURPOSE FOR AGE GROUPS 34-54 AND 65-74



Household trips vary in terms of time and distance. **Figure 8** illustrates the variation in patterns by distance and travel time for average weekday travel. Work-related travel is typically longer in terms of time and distance, social/recreational trips follow a similar pattern. School-related trips are generally the shortest in terms of distance, since households are typically located fairly close to schools. Trips involving personal errands, shopping and taking others to activities as a group make up nearly 40% of travel in terms of both time and distance, but each trip has different needs related to reliability and the ability to avoid congested periods. This reveals the complexity associated with managing the highway system and developing public policy to meet the diverse needs of personal travel. Every person faces the same 24-hour time budget, which plays a key role in travel and activity choices.

FIGURE 8. TRAVEL TIME AND DISTANCE BY TRIP PURPOSE



COVID-19 quarantines and related restrictions prompted an increase in telecommuting. The Oregon Employment Department published results from their pre-pandemic 2018 survey[21] of employer-provided benefits, stating:

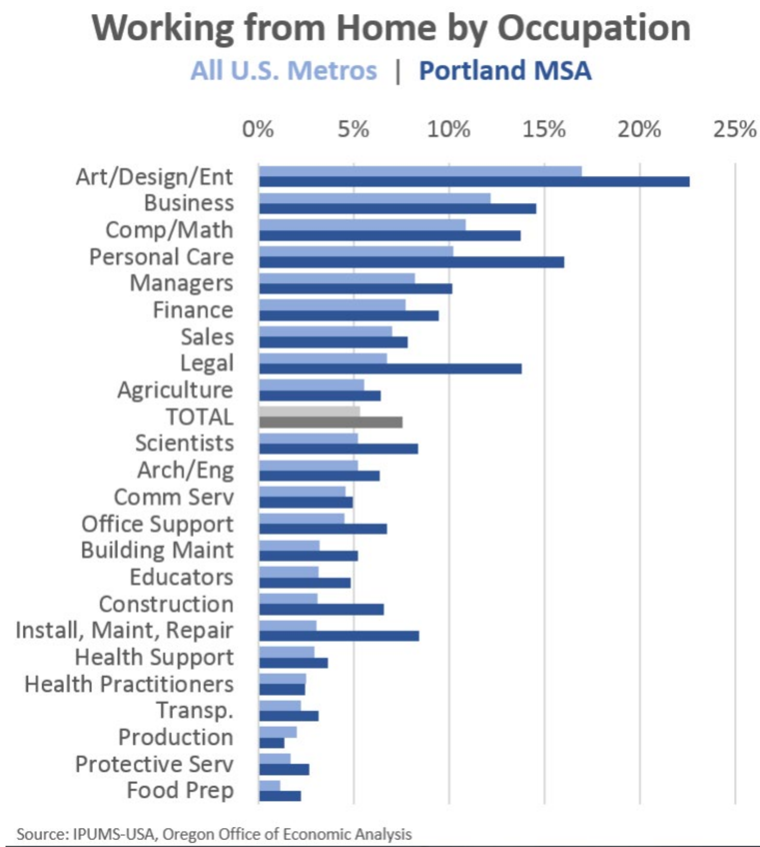
> *A relatively small share of employers offered this benefit to full-time (15%) and part-time (7%) employees. U.S. Census Bureau data from 2017 showed 7.3 % of Oregon workers did their jobs from home. While telecommuting may be a less common benefit, the prevalence of remote workers appeared to be more common in Oregon than other states.*

The Office of Economic Analysis (OEA) explored the topic of working from home[22], noting that one third of self-employed worked from home, while about half of people who work from home are self-employed. Oregon ranks as the second highest telecommuting state after Colorado, followed by Vermont, Utah, Montana, and Washington. Based on Census data, OEA found the Bend MPO had the

[21] Employer-Provided Benefits: Offerings, Enrollment, and Rising Costs, January 2019, Oregon Employment department, accessed February 2022;
[22] Office of Economic Analysis, Department of Administrative Services, January 16, 2019 post "Working from Home"

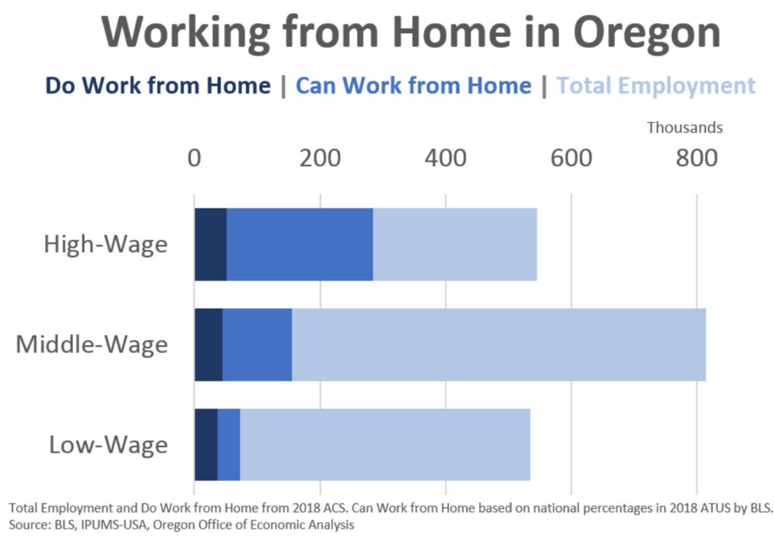
highest telecommute rate in the nation (12%), Medford MPO the fourth highest rate (10%), and Corvallis the fifteenth highest rate (8%). Portland Metro's rate of working from home was 7.7%, Eugene was 6.4% and Salem 6.0%. OEA also evaluated people working from home by occupation, presented in **Figure 9**.

FIGURE 9. PRE-PANDEMIC WORK FROM HOME



Early in the COVID outbreak, OEA assembled information on working from home by income group. **Figure 10** presents workers working from home, workers who can work from home and total employment by three wage groups of high-wage, middle-wage and low-wage. This reveals the potential for telecommuting, while making the point that opportunities vary across industries and occupations. There are more jobs lacking the opportunity to telework than jobs offering this option.

FIGURE 10. PRE-PANDEMIC WORK FROM HOME



Employers incur costs associated with on-site work locations, which means some jobs are likely to shift to more telework as businesses find ways to maintain productivity while reducing business costs. However, there are indications that some employers are reducing their work-from-home programs as COVID phases out, reasons include less opportunity for innovation and creativity from teams and poor productivity[23].

Telecommuting is not an option for most jobs and the overall impact over time is not expected to be large. While working from home is rising, it continues to be a small proportion of workers. Other sources are monitoring work from home, but most agree that it is too early to know how this will play out. The University of Minnesota posted an article in October 2021 quoting League of Minnesota Cities Executive Director David Unmacht saying:

> *Transformational change is happening, but we can't yet conclude what the end game will be. The impact of the pandemic was very different from city to city, even among cities of the same size across the state depending on their economic conditions, organization, and leadership.*[24]

More information related to impacts from the COVID-19 pandemic are presented in section 5.0 of this report.

2.3.2 Freight and Commercial Travel

Commercial travel is the other distinct category of highway users. The majority of this travel is to move freight and provide business services. As an export-dependent economy, freight movement plays a major role in Oregon. Firms follow logistic management techniques designed to operate supply chains effectively and efficiently. Companies strive to get their goods to market in the most cost-effective

[23] https://www.nbcnews.com/business/business-news/why-are-big-companies-calling-their-remote-workers-back-office-n787101 , accessed 02/23/2022.
[24] Hubert K. Humphrey School of Public Affairs, University of Minnesota, "Fad of Future: The Post-Pandemic Outlook for Remote Work and Transportation," October 7, 2021; accessed online February 15, 2022.

manner by minimizing overhead, inventory and cost-per-order processing. These firms follow logistic strategies with the ultimate goal of meeting the desires of customers at the lowest feasible cost. Logistic strategies vary by industry, commodity and individual firms. Information regarding freight logistics is difficult to obtain, firms operate in competitive markets and keep operational details private. Thus, analytical capabilities are less for commercial activity relative to household travel.

The U.S. Department of Transportation describes the impact of congestion on freight movement, saying:

> "*Congestion affects economic productivity in several ways. American businesses require more operators and equipment to deliver goods when shipping takes longer, more inventory when deliveries are unreliable, and more distribution centers to reach markets quickly when traffic is slow. Likewise, both businesses and households are affected by sluggish traffic on the ground and in the air, reducing the number of workers and job sites within easy reach of any location*."[25]

In 2021, 310.5 million tons of freight valued at $343 billion moved within, to and from Oregon via truck, rail, air, marine, pipeline, and combinations of these modes.[26] **Figure 11** illustrates the proportion of freight commodity flows by direction, including domestic, import and export flows.

By value:

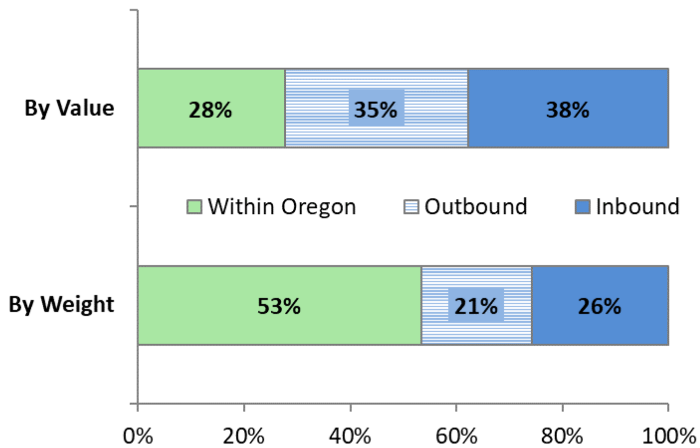
- 28% of total commodity flows starts and ends within Oregon,
- 35% leaves the state for other domestic and foreign destinations,
- 38% enters the state originating from external locations.

By weight:

- 53% of total commodity flows start and end within the state,
- 21% leaves the state heading to domestic and foreign destinations,
- 26% enters the state originating from external locations.

[25] FHWA: https://ops.fhwa.dot.gov/freight/freight_analysis/freight_story/index.htm, accessed December 2022.
[26] Commodity flow data obtained from the Freight Analysis Framework 5.4.1 Summary Statistics for Oregon: https://faf.ornl.gov/faf5/SummaryTable.aspx . Source data is in 2017 dollars and inflation adjusted to 2021 using Western U.S. CPI published in the Oregon DAS-OEA Revenue Forecast.

Figure 11. Oregon Commodity Flows by Direction, 2021



Many different commodities move from, to and within Oregon. **Table 4** reports the top ten freight commodities of Oregon in 2021 in terms of value by direction.[27] Fifty-nine percent of commodities originating and destined within Oregon are represented by the top ten categories, dominated by the top 5 categories of mixed freight, wood products, electronics, motorized vehicles, and machinery. Seventy-one percent of commodities from Oregon shipped to locations outside of the state fall within ten categories, with the top 6 categories represent 55% of total outbound flows. Sixty-seven percent of commodities originating outside of Oregon, both domestic and foreign, fall within the top ten categories, with the top 6 making up about half of the total flows.

Table 4. Oregon's Top Ten Commodity Flows by Value, 2021

Within Oregon	Share of Total	Outbound	Share of Total	Inbound	Share of Total
Mixed freight	13%	Electronics	15%	Electronics	13%
Wood prods.	8%	Motorized vehicles	9%	Machinery	9%
Electronics	7%	Machinery	9%	Motorized vehicles	8%
Motorized vehicles	5%	Mixed freight	9%	Pharmaceuticals	7%
Machinery	5%	Wood prods.	7%	Mixed freight	7%
Plastics/Rubber	4%	Other foodstuffs	7%	Misc. mfg. prods.	7%
Gasoline	5%	Precision instruments	4%	Textiles/leather	5%
Misc. mfg. prods.	4%	Other ag prods.	4%	Coal, n.e.c.*	4%
Other ag prods.	4%	Textiles/leather	4%	Other foodstuffs	4%
Other foodstuffs	4%	Misc. mfg. prods.	4%	Plastics/rubber	3%
Top 10 total share	59%	**Top 10 total share**	71%	**Top 10 total share**	67%

* n.e.c. = not elsewhere classified, Source Freight Analysis Framework 5.4.1

[27] Commodity flow data obtained from the Freight Analysis Framework Summary Statistics for Oregon: https://faf.ornl.gov/faf5/SummaryTable.aspx . Commodities are classified into 41 different categories.

Efficient freight movement relies on an integrated transportation system designed to utilize efficiencies provided by different modes. Freight mode choice for each commodity depends on cost, reliability, time sensitivity, fragility, and other factors. **Table 5** reports the share of freight movement by transportation mode for 2021. Whether looking at freight in terms of weight or value, trucks currently move about 70% of Oregon freight. Pipeline and Rail tend to move heavy commodities of lower value, while commodities shipped by multiple modes are lighter in weight and higher in value. Constraints on movement for one mode or facility can create additional pressures on other parts of the system. The Oregon Freight Plan[28] explores issues affecting all modes of freight transportation and identifies strategies to optimize system performance.

TABLE 5. OREGON SHARE OF FREIGHT FLOWS BY TRANSPORT MODE, 2021

	By Weight	By Value
Truck	70%	71%
Pipeline	15%	3%
Rail	6%	2%
Multiple Modes & Mail	6%	18%
Marine	2%	2%
Air (includes truck-air)	< 1%	3%
Other/Unknown	< 1%	< 1%
Total	100%	100%
Source: FHWA Freight Analysis Framework 5.4.1		

Oregon is a trade-dependent state. **Table 6** presents Oregon's top five trade partners. Forty-three percent of commodities by value move internally between Oregon businesses and manufacturers. Washington is Oregon's largest trade partner, buying 19% of commodities by value. California is the second largest trade partner, buying 14% of Oregon commodities by value. Altogether, the top five trade partners, including Oregon businesses, represent 81% of traded commodities measured by value. Looking at traded commodities by weight, 72% are traded internally to Oregon. California has the largest share of Oregon commodities by weight, 11%. Washington is next in line, purchasing 10% of Oregon commodities by weight. Altogether, the top five trade partners, including Oregon businesses, represent 96% of traded commodities measured by weight.

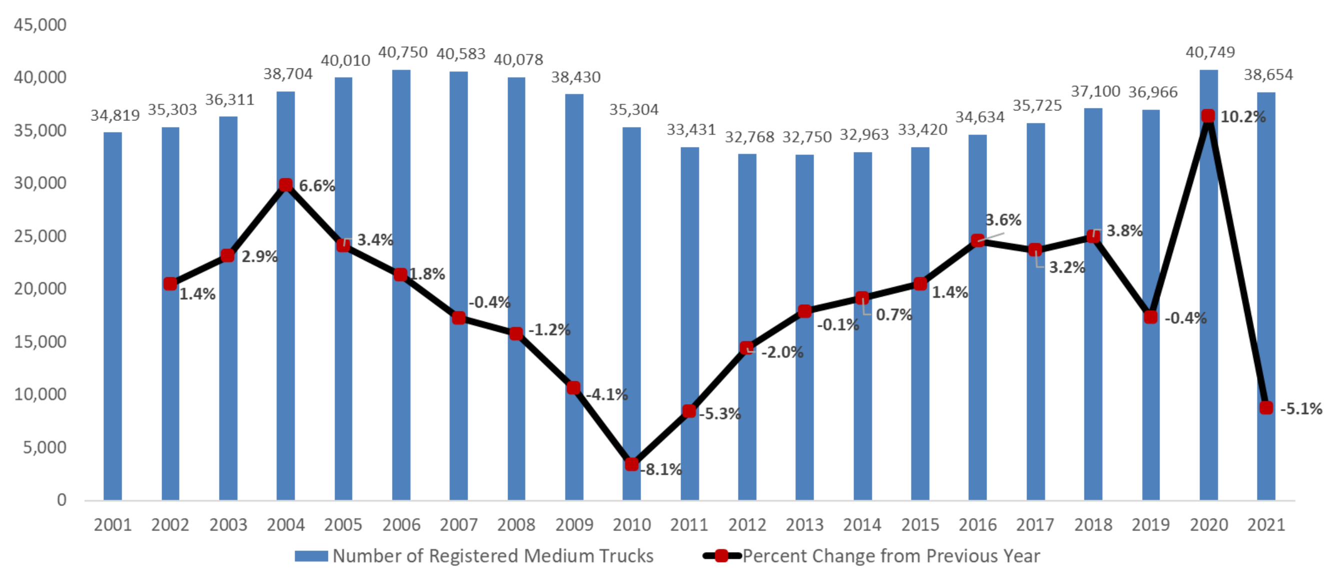
TABLE 6. OREGON'S TOP 5 TRADING PARTNERS – BY VALUE AND WEIGHT, 2021

Commodities From Oregon To:	By Value	Commodities From Oregon To:	By Weight
Oregon (internal trade)	43%	**Oregon (internal trade)**	72%
Washington	19%	**California**	11%
California	14%	**Washington**	10%
Idaho	2%	**Idaho**	2%
Texas	2%	**Arizona**	1%
Top 5 Share of Total	81%	**Top 5 Share of Total**	96%
Source: FHWA Freight Analysis Framework 5.4.1			

[28] Oregon Freight Plan, adopted 2011, amended 2017; https://www.oregon.gov/ODOT/Planning/Documents/OFP-2017-Amended.pdf

Medium-sized commercial vehicles are another distinct sector of transportation users. These vehicles are owned and operated by firms conducting day-to-day business using vehicles weighing less than 26,000 pounds.[29] Some commercial travel occurs using passenger vehicles, but there is virtually no available data revealing light-vehicle commercial travel separate from household travel. Other commercial travel is conducted using medium trucks. Examples of businesses using medium trucks include services for plumbing, electricians, roofing, other trade services, local deliveries for daily business production (e.g., fresh produce for grocery stores and restaurants), other construction-related, mail and small package delivery. **Figure 12** presents medium truck registrations since 2001, including the percent change from the previous year. Registration levels for commercial trucks are strongly correlated with economic conditions. The early 2000's Oregon was recovering from a recession, following this event medium truck registrations peaked in year 2006. The Great Recession began the end of year 2007, where the number of medium truck registrations begin to decline and hit a low point in 2010. As Oregon came out of the recession the number of medium registrations began to rise until 2018. 2020 registrations rose to the same level seen in 2006, followed by a 5% reduction the following year.

FIGURE 12. MEDIUM TRUCK REGISTRATION COUNT AND ANNUAL CHANGE, 2001-2021



Source: https://www.oregon.gov/ODOT/DMV/docs/ "**YEAR**"_Vehicle_County_Registration.pdf"

[29] DMV defines this category of medium sized trucks as used for carrying loads other than passengers. Full detailed description is available online: https://www.oregon.gov/ODOT/DMV/docs/Oregon_Vehicle_Reg_Stat_Reports.pdf

Table 7 presents a summary of annual truck VMT on all Oregon highways for years 2007 to 2022. The most notable change over time is in the share of medium truck VMT. The share of total VMT for this group changed from 646 million miles in 2007 to 961 million miles in 2022, rising from 1.8% of total VMT to 2.7%.

TABLE 7. ANNUAL TRUCK VEHICLE MILES TRAVELED 2007-2022, MILES IN MILLIONS

	2007	2009	2011	2013	2015	2017	2019	2022
Medium Trucks	646	559	625	780	805	940	958	961
Share of Total VMT	1.8%	1.6%	1.7%	2.3%	2.2%	2.5%	2.6%	2.7%
Heavy Trucks	2,145	1,740	1,843	1,955	2,044	2,182	2,213	2,126
Share of Total VMT	5.7%	4.8%	5.1%	5.8%	5.7%	5.9%	6.1%	6.1%
Total	2,791	2,299	2,468	2,735	2,849	3,122	3,171	3087
Share of Total VMT	7.5%	6.4%	6.8%	8.1%	7.9%	8.5%	8.6%	8.8%

Source: Oregon Highway Cost Allocation Studies, Exhibit 4-1, year 2022 is an estimate, 2021 values are not reported.

The transportation system is the Oregon economy in motion. People travel to access jobs, services and goods. Businesses travel to access customers and depend on the transportation system to access employees and the goods and services needed to conduct their business activity. Each person, business, commodity, and industry have different needs and expectations from the transportation system. Accommodating a variety of needs while maintaining safety within a constrained budget requires strategic decision making and acknowledgement of required trade-offs. All economic "agents" must balance trade-offs, whether it is done by households, businesses or public agencies. Developing a good understanding of the underlying economic motivations and decision criteria utilized by transportation system users supports informed investment decisions.

The transportation system is the Oregon economy in motion.

3 PERFORMANCE MEASURES

3.1 Quantity: How much is Moving?

Measures of "**quantity**" report the overall use of the highway system. These measures include:

- Annual Vehicle Miles Travelled (VMT) – the annual number of miles travelled by all vehicles.
- VMT Per Capita –the annual number of miles travelled by all vehicles divided by the population. This broad measure reveals the amount of travel occurring relative to population, providing information on whether people are traveling more or less on average or whether there is more travel overall due to a growing population.
- Annual Truck VMT– annual number of miles travelled by trucks.
- Truck VMT Per Capita – the annual number of heavy truck miles travelled divided by the population. This broad measure reveals the amount of commercial travel occurring relative to

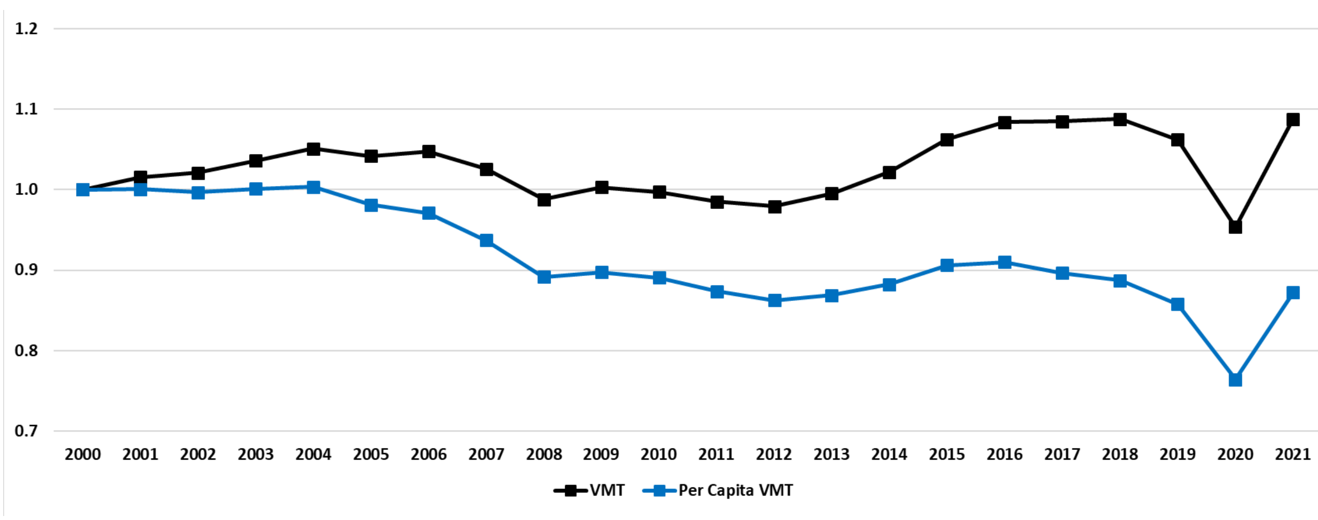
population, providing information on whether the amount of freight moving is rising more or less relative to the population overall.

3.1.1 Annual Vehicle Miles Travelled

Figure 13 presents statewide annual VMT and VMT per capita side-by-side to illustrate how overall VMT and per capita VMT are linked to the Oregon economy. The Great Recession of 2008 was followed by annual population growth rates below 1% through 2013. Oregon's economy is trade dependent, which means when the national economy is strong, Oregon typically grows faster than the national average. In recessionary times, Oregon typically takes longer to recover, which was the case for the 2008 recession. Less economic activity means fewer miles traveled in general. VMT for 2008 to 2012 was equal to or less than 2000 levels. Lower population growth and declining VMT resulted in declining per capita VMT between 2008 and 2012.

By 2014 both VMT and population growth began to rise. However, per capita VMT growth increased more slowly than VMT and population. This pattern indicates there has been some reduction in the number of trips or distances traveled by system users. There are a variety of factors that could be contributing to this emerging pattern, such as rising traffic congestion, concentration of growth in urban areas with closer access to goods and services, an aging population, more efficient freight logistics, and online access to goods and business services. However, 2021 post pandemic VMT rose to a level 2.4% higher than 2019. Time will reveal whether this is a longer-term trend, or a localized post pandemic rebound.

FIGURE 13. STATEWIDE VMT AND PER CAPITA VMT OVER TIME: 2000-2021 (INDEXED TO YEAR 2000)



3.1.2 Truck VMT

As an economy expands with increasing population and employment, more freight movement occurs. The Oregon Highway Cost Allocation Study (HCAS)[30] is conducted every two years and reports VMT by

[30] https://www.oregon.gov/das/OEA/Pages/hcas.aspx , accessed December 2022, Table 4-1

vehicle weight categories. **Figure 14** illustrates truck VMT since 2007 for heavy and medium trucks using HCAS data[31]. The values are indexed to 2007 to compare current levels to pre-recession levels. Total truck VMT declined 19% by 2009 due to the recession, illustrating the strong link between freight and economic conditions. However, heavy truck VMT reached prerecession levels by 2017, but medium truck VMT increased above prerecession levels after 2011. Since 2017 total truck VMT has remained stable, heavy truck VMT in 2022 is about the same as 2007 levels, while medium truck VMT has increased a small amount.

FIGURE 14. CHANGE IN TRUCK VMT 2007-2022 (INDEXED TO YEAR 2007)

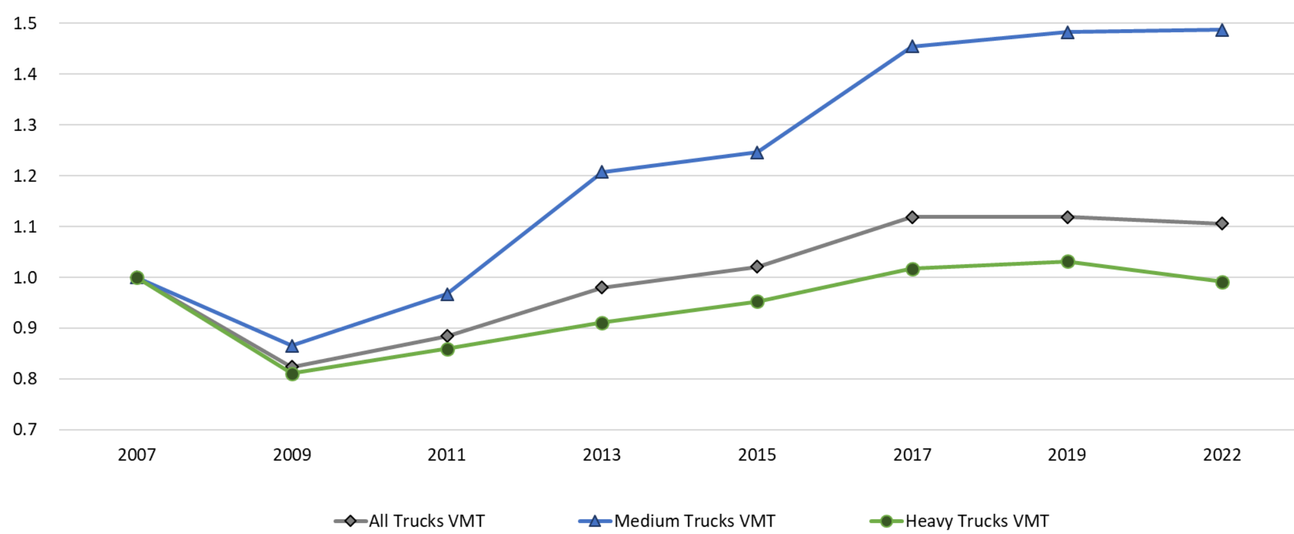
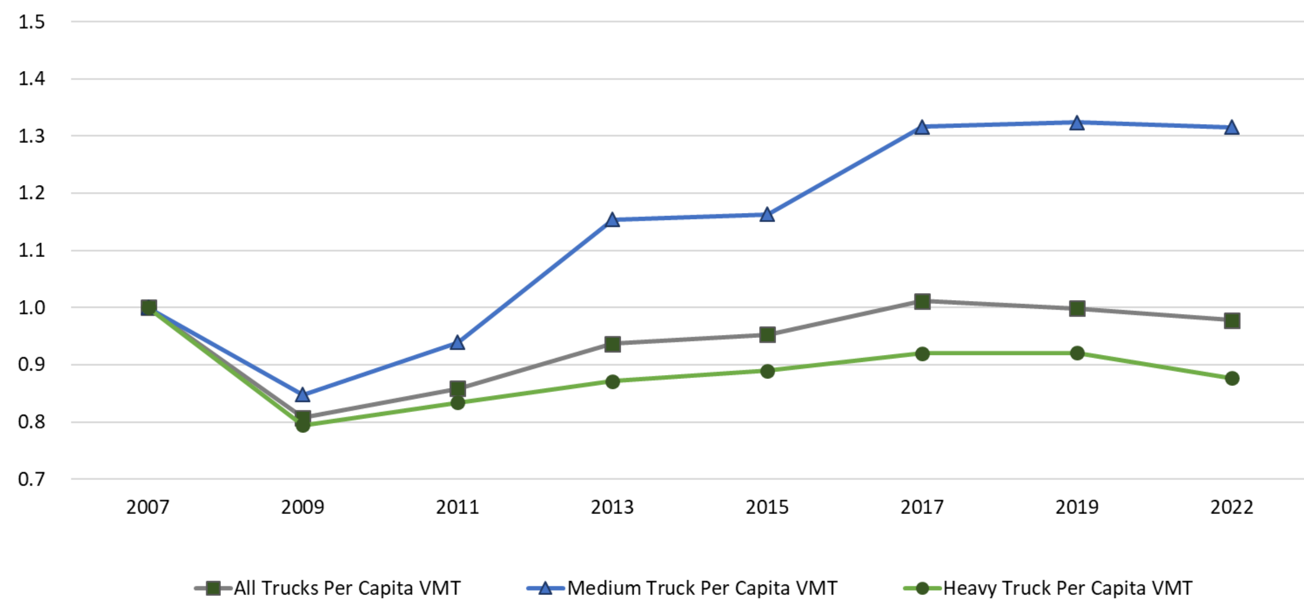


Figure 15 presents *per capita* truck VMT to account for the increase in population and assess changes in average per person truck VMT. This reveals overall truck per capita VMT is 2% below 2007 levels. Heavy truck per capita VMT is 12% lower than 2007 levels, while medium truck per capita VMT is 32% above 2007 levels and has been at this level since 2017.

[31] This data was also provided earlier in Table 7.

FIGURE 15. CHANGE IN PER CAPITA TRUCK VMT 2007-2022 (INDEXED TO 2007)



In addition to these observed trends are emerging trends with very little data available for analysis. For example, car sharing and ride-share services, such as Uber and Lyft, are expected to impact household vehicle ownership and use. It will be important to monitor this over time. Continued growth in e-commerce is expected to impact the number of trucks on the road. Obtaining observed data for medium trucks is key to determining the net impacts of e-commerce on statewide VMT. There is currently debate as to whether e-commerce reduces VMT by eliminating household shopping trips or increases VMT by generating more delivery trips that are not replacing household trips. It is also important to note the impacts may vary by region.

3.2 Quality: What conditions are experienced by road users?

Measures of "quality" relate to the travel experience, primarily focused on traffic congestion and system reliability. Various factors influence congestion, which can be broadly classified into two types. The first type of congestion is the general everyday congestion typically occurring due to capacity constraints in the morning and afternoon peak periods. This is referred to as *recurring congestion*. Sections of highway where vehicles must merge onto or diverge off of the roadway, locations where the demand is greater than the capacity, or in weaving sections where traffic is both trying to enter or exit from the highway are examples of recurring congestion. Locations with these patterns may be referred to as bottlenecks.

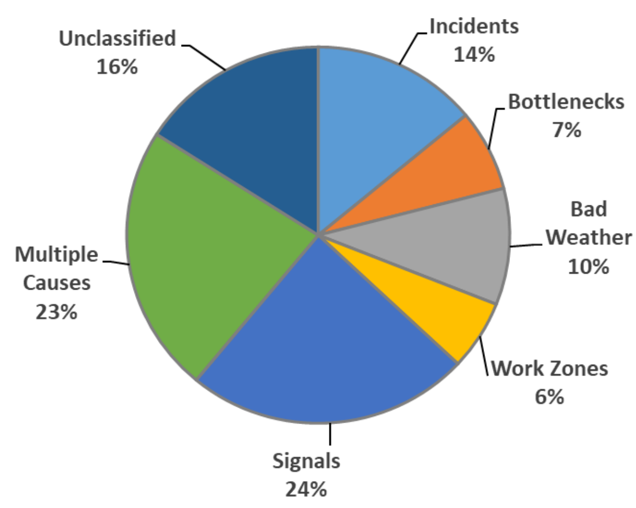
The second type is *non-recurring congestion*. This type of congestion is due to temporary, unexpected events, such as crashes, vehicle breakdowns, inclement weather, work zones, signal timing, and special events causing delay and stop-n-go traffic conditions. This type of congestion impacts system reliability, which is a key component of system quality. Predictable delay can be adapted to by users, while unpredictable delay impacts activity requiring timeliness, such as on-time delivery, on-time services and arriving at work or appointments on time.

Figure 16 illustrates a breakdown of congestion causes in Oregon for 2021[32]. Recurring congestion due to bottlenecks (capacity constraints and high demand) make up 7% of total congestion. Non-recurring congestion can be attributed to poor signal timing (24%), weather (10%), incidents (14%), work zones (6%), and other multiple causes. Understanding the distinction between recurring and non-recurring congestion is important when developing effective solutions.

ODOT uses several different approaches to optimize system performance in order to maintain and enhance mobility:

- **Safety improvements** – safety projects reduce crashes and incidents, which reduces fatalities, personal injuries and property damage; fewer crashes and incidents translate into reduced congestion and improved reliability.
- **Optimize use of infrastructure** – investments directed towards maximizing current infrastructure performance, such as locations with traffic weaving and merging.
- **Manage the traffic network efficiently** - use of infrastructure is optimized by leveraging new technology and traffic operations to improve system performance[33], maximizing throughput and reliability; traffic control centers employ technology to provide timely information to highway users and help them choose alternative modes and routes to avoid congestion.
- **Support multi-modal transportation options** - Oregon ranks among the top states for numbers of walk, bike, ride-transit, telecommute and shared-rides; multimodal transportation options reduce reliance on single-occupancy vehicles, while improving the health of Oregonians through active modes and promoting environmental benefits.

FIGURE 16. BREAKDOWN OF CAUSES OF CONGESTION, OREGON 2021



[32] https://www.oregon.gov/odot/Data/Pages/RITIS.aspx,
[33] http://www.oregon.gov/ODOT/MCT/Documents/MobilityProcedureManual.pdf

Developing solutions to resolve traffic congestion is complex. No single solution will eliminate congestion, but there are methods to manage it. Implementing effective solutions necessitates developing multiple performance measures, when combined they create multidimensional information that can be used to develop effective solutions to manage and optimize system performance.

As Oregon grows, more people and freight are squeezed onto a transportation system that is not expanding at the same pace. As long as the Oregon economy continues to grow, traffic congestion will be a transportation issue and closely monitoring conditions will be required to manage it effectively.

This report relies on the following metrics to measure congestion and reliability:

- **Average Annual Daily Traffic/Capacity (AADT/C)** – average annual daily traffic (AADT) divided by peak hour capacity (C) identifies where large-scale congestion occurs and enables ODOT to monitor locations over time for spreading beyond a typical two-hour peak period. This measure was developed as a Key Performance Measure[34] for mobility reported by ODOT annually. AADT/C is measured using observed traffic volumes and applying FHWA methods required for the Highway Performance Monitoring System annual submittal. This measure reports conditions for highways on the National Highway System (NHS).
- **Travel Time Index (TTI) –** this congestion measure compares the peak period travel time to free-flow travel time. The higher the TTI, the longer the travel times and higher the congestion. For example, a TTI of 2.0 indicates that a trip that takes ten minutes in light traffic will take 20 minutes in congested conditions. The Travel Time Index is calculated using proprietary speed data available for purchase from private vendors. For this study ODOT used INRIX data by utilizing the RITIS[35] platform. For this report, only conditions on interstate highways are reported.
- **Planning Time Index (PTI) –** this reliability measure represents the total travel time users should account for in order to be on time 95% of the time relative to free-flow travel time. The lower the PTI, the more reliable the travel time will be. For example, a PTI of 3.0 indicates that a trip taking ten minutes in light traffic should plan for 30 minutes to ensure arriving on time with 95% confidence. The Planning Time Index is calculated using proprietary speed data available for purchase from private vendors. ODOT used INRIX data via the RITIS platform for this study, reporting conditions for interstate highways only.

3.2.1 Peak Period Congestion: AADT/C

ODOT measures statewide mobility in order to link state policy and investment decision to highway performance. The objective is to monitor progress towards meeting mobility goals for highways on the National Highway System (NHS)[36]. The traditional approach using traffic volume to highway capacity

[34] More information is available online: https://www.oregon.gov/odot/performmang/pages/index.aspx

[35] https://www.oregon.gov/odot/Data/Pages/RITIS.aspx

[36] The National Highway System is a network of strategic highways within the United States, including the interstate highway system and other roads and highways serving major airports, ports, rail or truck terminals, railway stations, pipeline terminals and other strategic transportation facilities. Highways were assigned this designation through the National Highway System Designation Act of 1995.

ratios (V/C) does not reveal the extent or duration of congested periods beyond the peak periods. AADT/C measures average daily congestion beyond the peak period, capturing the duration and "intensity" of congestion[37] and providing insight into the entire average day experiencing congestion.

As the AADT/C value increases, it reflects rising congestion levels, indicating peak-period congestion is spreading to adjacent hours. The measure applies to lane miles, not centerline miles, accounting for system capacity relative to demand. The data used to calculate this measure comes from the annual Highway Performance Monitoring System data submittal to FHWA[38], which includes information for all highways on the national highway system.

Six levels of congestion are used to evaluate AADT/C. These levels are based on categorizations developed for the Oregon Congestion Management System[39] and presented in **Table 8**.

TABLE 8. AADT/C SCALE OF VALUES FOR MEASURING CONGESTION

Color	Interpretation	AADT/C
Green	Uncongested traffic flow;	Less than 7
Yellow	Low to moderate congestion, transitional phase when traffic is moving, but capacity is impacted by minor disruptions such as incidents or weather;	7 – 8.99
Orange	Congested conditions occurring regularly and declining reliability;	9 – 9.99
Red	Congested and transitioning to very congested;	10 – 11.99
Purple	Very congested and transitioning to extremely congested and expanding to more hours of the day.	12+

Figures 17 and 18 provide colorized maps of congestion levels represented by AADT/C color coding for year 2021. The maps reveal state highway congestion occurs in the larger metropolitan areas, where Portland has the highest congestion levels, Salem/Keizer and Eugene/Springfield have congested conditions as well. **Figure 18** provides a closer look at congestion locations for these 3 MPOs on the NHS.

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[37] FHWA, "Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation", September 1, 2005, https://ops.fhwa.dot.gov/congestion_report/

[38] The HPMS was developed to measure the scope, condition, performance, use and operating characteristics of the Nation's highways. This data is also used to determine the apportionment of Federal-aid Highway Program funds to states as well as serves as the primary data source for the biennial "Conditions and Performance Report" to U.S. Congress, which supports the development and evaluation of the FHWA's legislative, program and budget planning activities.

[39] Between the years 2001 and 2014, the Congestion Management System (CMS) was the primary management system tool used to identify and monitor congestion across the Oregon State Highway System network. The CMS process calculated roadway capacities and output different performance measures in a useful manner that enabled decision-makers to evaluate highway system needs and improvements. One of the primary elements of CMS was the AADT/C metric.

In 2019 37% of the Portland Metro region NHS highways were classified as congested using this measure. Medium-sized urban areas of Salem/Keizer and Eugene/Springfield were experiencing increasing congested lane miles. Smaller MPOs such as Albany, Bend, Corvallis, Grants Pass and Rogue Valley (Medford area) had segments of the system transitioning from minor congestion to congested conditions. Congestion dropped during 2020 due to the pandemic and began to rise as traffic volumes increased in 2021 as the state moved towards post-pandemic economic recovery.

Table 9 reports 2021 data presented in **Figures 17 and 18**, but also includes 2019 data to illustrate the difference pre- and post-pandemic. Statewide congested lane miles were 35% lower in 2021 than 2019. The largest decline was in the Willamette Valley. Portland Metro had a 38% decrease in congested lane miles, shifting from 400 congested lane miles in 2019 to 246 in 2021. Salem/Keizer congested lane miles were 21% lower than 2019, Eugene/Springfield 19% lower, and Albany 17% lower.

Southern Oregon MPO patterns were the opposite, congested lane miles in Grants Pass and Medford are higher in 2021 relative to 2019, total congested lane miles increased from a combined 4.2 miles to 7.1 miles. Bend congested lane miles increased 2% from 2019 levels. Other urbanized areas, congested lane miles were 11% lower in 2021, while rural highway congestion levels were 35% lower.

TABLE 9. CONGESTED NATIONAL HIGHWAY SYSTEM (NHS) LANE MILES BY REGION, 2019 AND 2021

Region	Total NHS Lane Miles	Congested Lane Miles 2019	Congested Lane Miles 2021	Percent Change between 2019 and 2021
Albany	93	3.9	3.3	-17%
Bend	76	4.0	4.1	2%
Corvallis	59	0.6	0.6	0%
Eugene/Springfield	199	16.5	13.4	-19%
Grants Pass	169	3.5	4.7	32%
Medford	253	0.7	2.4	257%
Metro	1,070	400.8	246.5	-38%
Salem/Keizer	190	17.8	14.0	-21%
Other Urbanized	1,125	15.1	13.5	-11%
Rural	7,877	31.4	20.0	-36%
Total Oregon National Highway System (NHS)*	11,111	494.3	322.4	-35%

*Excludes lane miles in Oregon that are part of Longview and Walla Walla MPOs in Washington

Monitoring this performance measure over time will reveal whether peak period congestion is spreading to other time periods, as well as increasing in severity over time. However, this measure alone tells an incomplete story. Other measures are needed to understand and monitor congestion over time.

FIGURE 17. CONGESTED LANE-MILES PER AADT/C – STATEWIDE, 2021

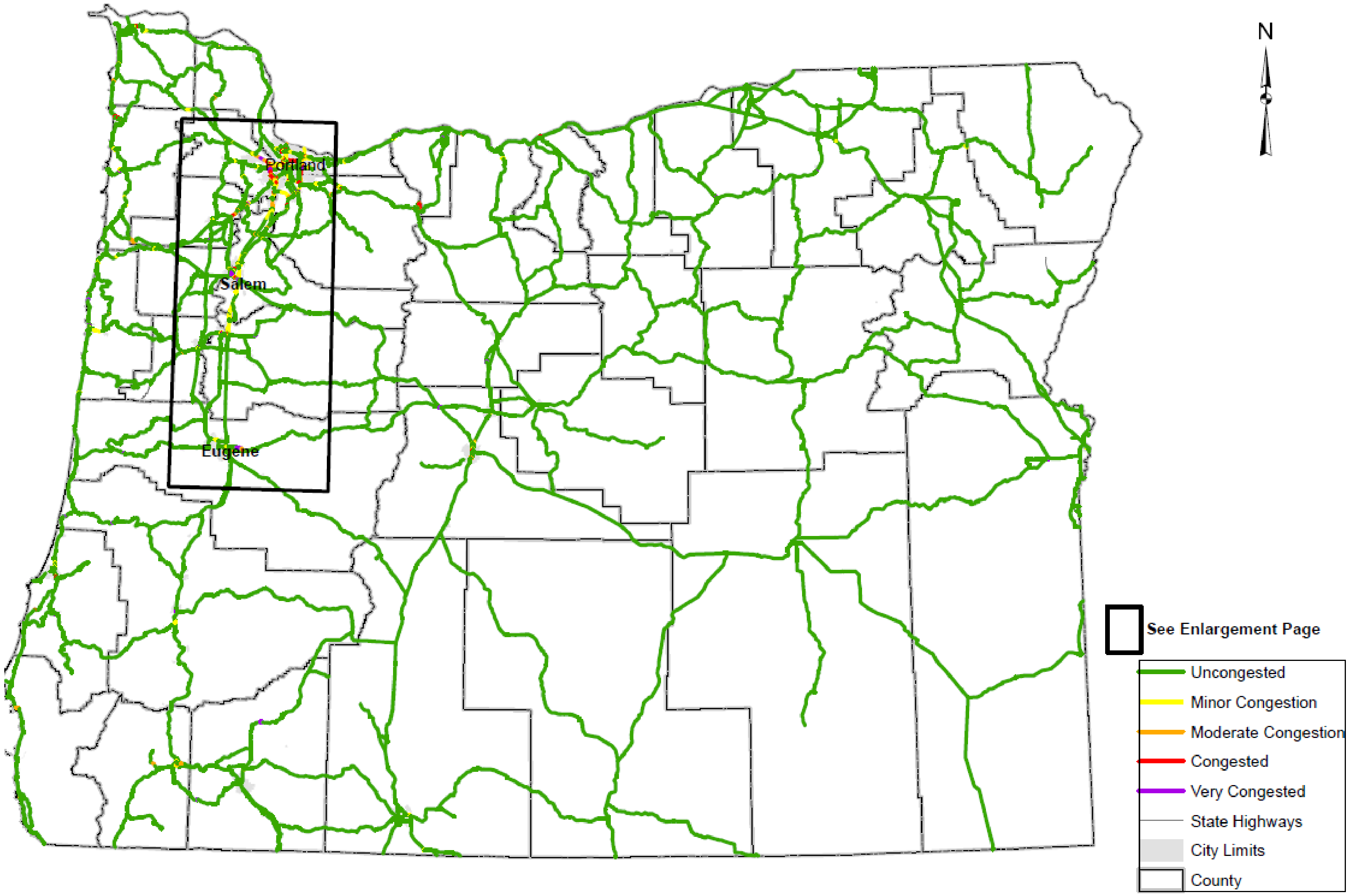
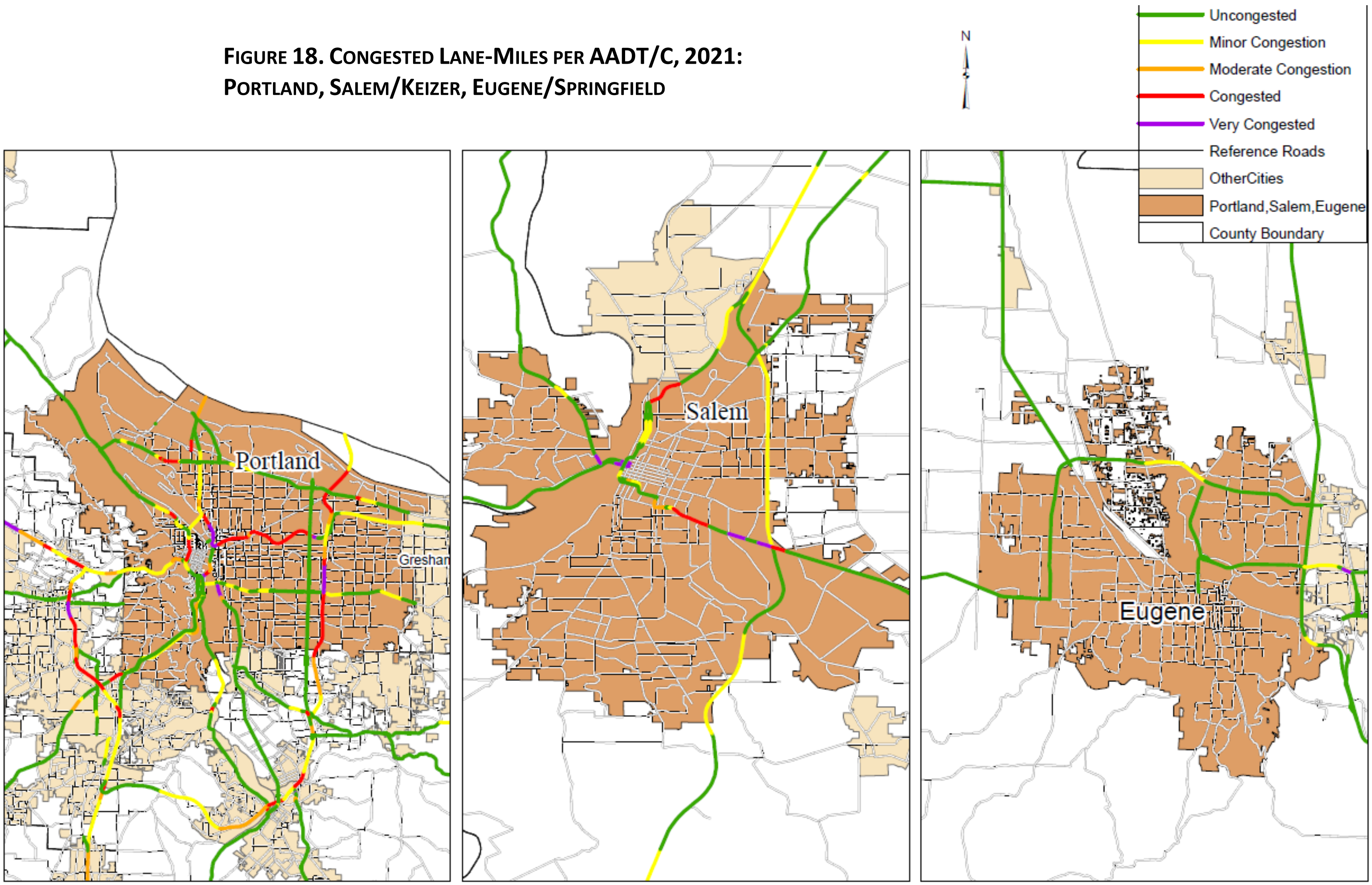


FIGURE 18. CONGESTED LANE-MILES PER AADT/C, 2021: PORTLAND, SALEM/KEIZER, EUGENE/SPRINGFIELD



3.2.2 Congestion: Travel Time Index

Availability of vehicle probe-based travel time data supports use of travel time indices to measure congestion levels. A common index used nationally by state and federal agencies to measure congestion is the Travel Time Index (TTI). This congestion measure compares the peak period travel time to free-flow travel time. The higher the TTI value, the longer the average travel times and greater the congestion. This measure accounts for *recurring delay* – delay that is predictable and expected due to high demand, such as peak periods. For this report, INRIX traffic data via the RITIS platform was used to calculate the TTI for the interstate system. In future reports the goal is to expand TTI reporting to non-interstate highways. TTI values are calculated for each segment of the interstate highway system by direction, then categorized to a level of congestion following the ranges listed in **Table 10**.

TABLE 10. TRAVEL TIME INDEX CONGESTION CLASSIFICATION CATEGORIES: FREEWAYS

Congestion Level	Travel Time Index Value	Interpretation
No Congestion	Less than 1.2	Average travel speed is no less than 10% below posted speed
Moderate Congestion	1.2 ≤ TTI < 1.5	Average travel speed is between 10% to 30% below posted speed
Heavy Congestion	1.5≤ TTI <2.0	Average travel speed is between 30% and 50% below posted speed
Severe Congestion	Greater than or equal to 2.0	Average travel speed is below half the posted speed limit

The TTI results in this report provide insight into highway congestion during the average weekday afternoon (PM) peak period. TTI was calculated for the interstate highways, and a select number of freeways including the Sunset Highway US26 (west of Portland), OR126 (Springfield segment) and the Beltline Highway OR569 (Eugene) for the PM peak period of 4 pm to 6 pm. **Figure 19** illustrates PM peak period congestion statewide in 2021. The majority of congestion occurs in the Portland region. Eugene-Springfield has congestion as well, but Salem-Keizer and Albany MPOs on I-5 do not have measurable congestion using this index.

FIGURE 19. STATEWIDE TRAVEL TIME INDEX 2021, PM PEAK PERIOD 4 PM - 6 PM

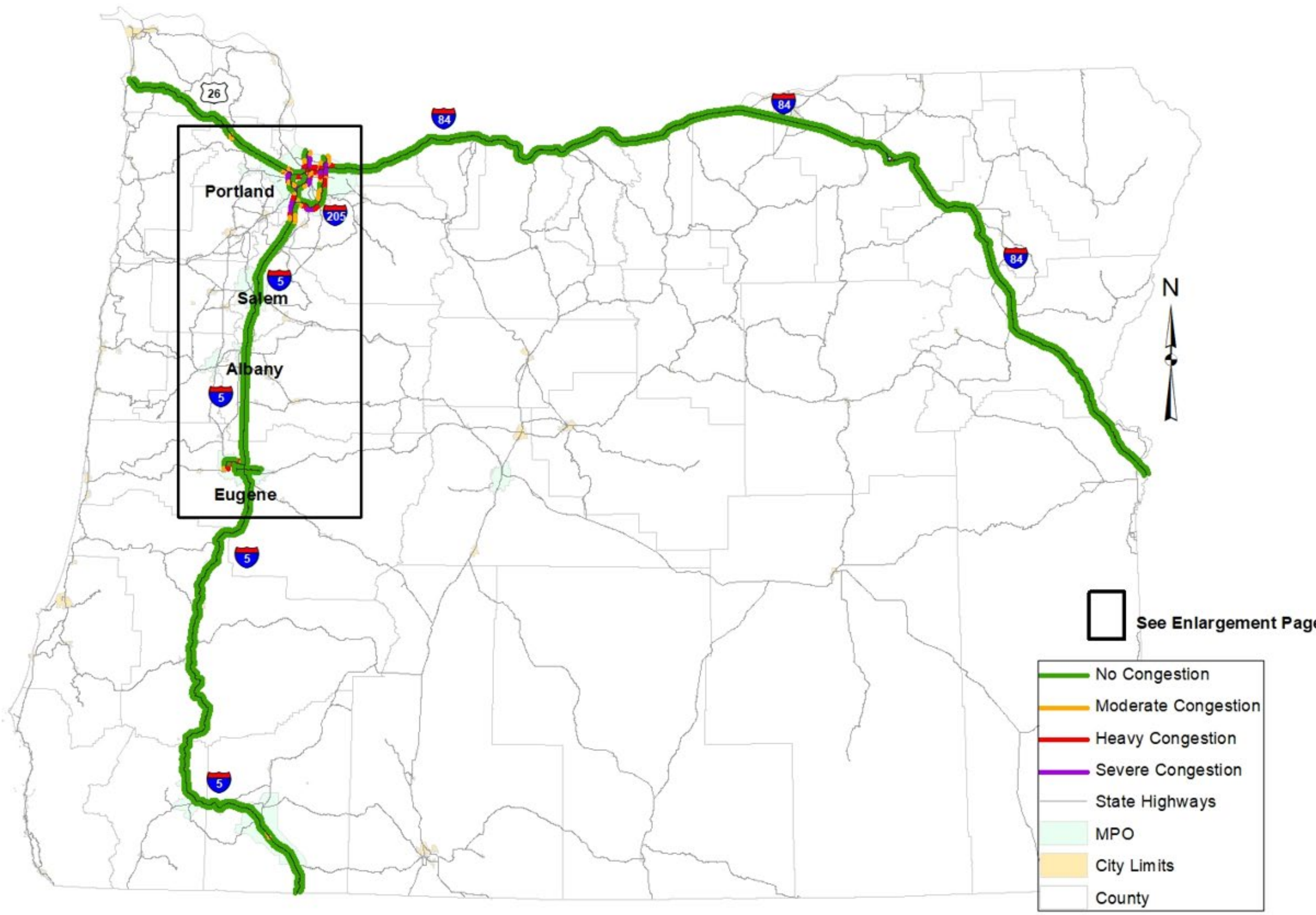


Figure 20 illustrates PM peak period congestion for the Portland region. The Travel Time Index reveals extensive areas of congestion during the afternoon peak period. In the vicinity of central Portland, congestion is severe in both directions on I-5, I-84 and I-405. Northbound traffic on I-5 leaving Portland experiences severe congestion. Southbound I-5 traffic leaving Portland has moderate to no congestion until the OR217 interchange. I-84 between I-5 and I-205 is heavy to severely congested for eastbound traffic, westbound becomes congested midway between the two freeways. I-84 has heavy congestion westbound as traffic nears I-205. I-205 has heavy to severe congestion that varies by direction with sections of moderate to no congestion. The intersection of I-205 with I-84 is severely congested on I-205 in both directions. US26 has congestion in both directions, the most severe segments are eastbound between the OR2017 interchange and I-405.

FIGURE 20. PORTLAND REGION, TRAVEL TIME INDEX 2021, PM PEAK PERIOD 4 PM - 6 PM

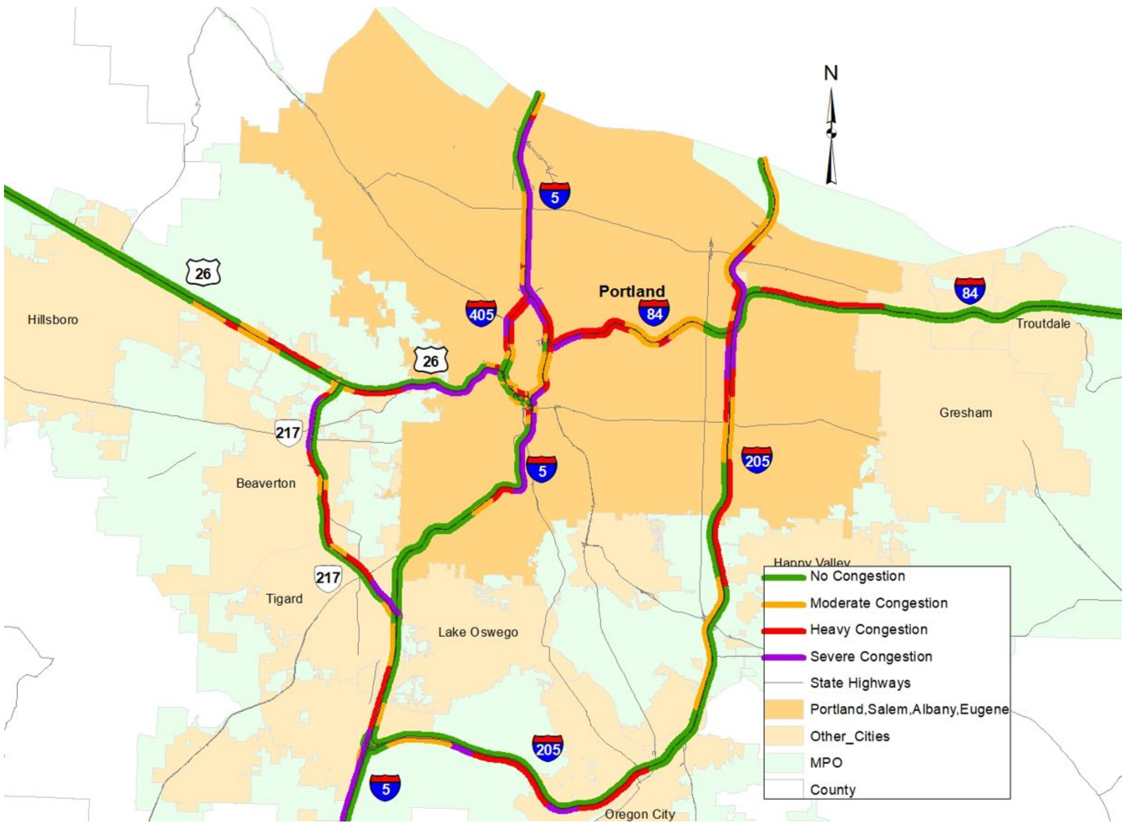
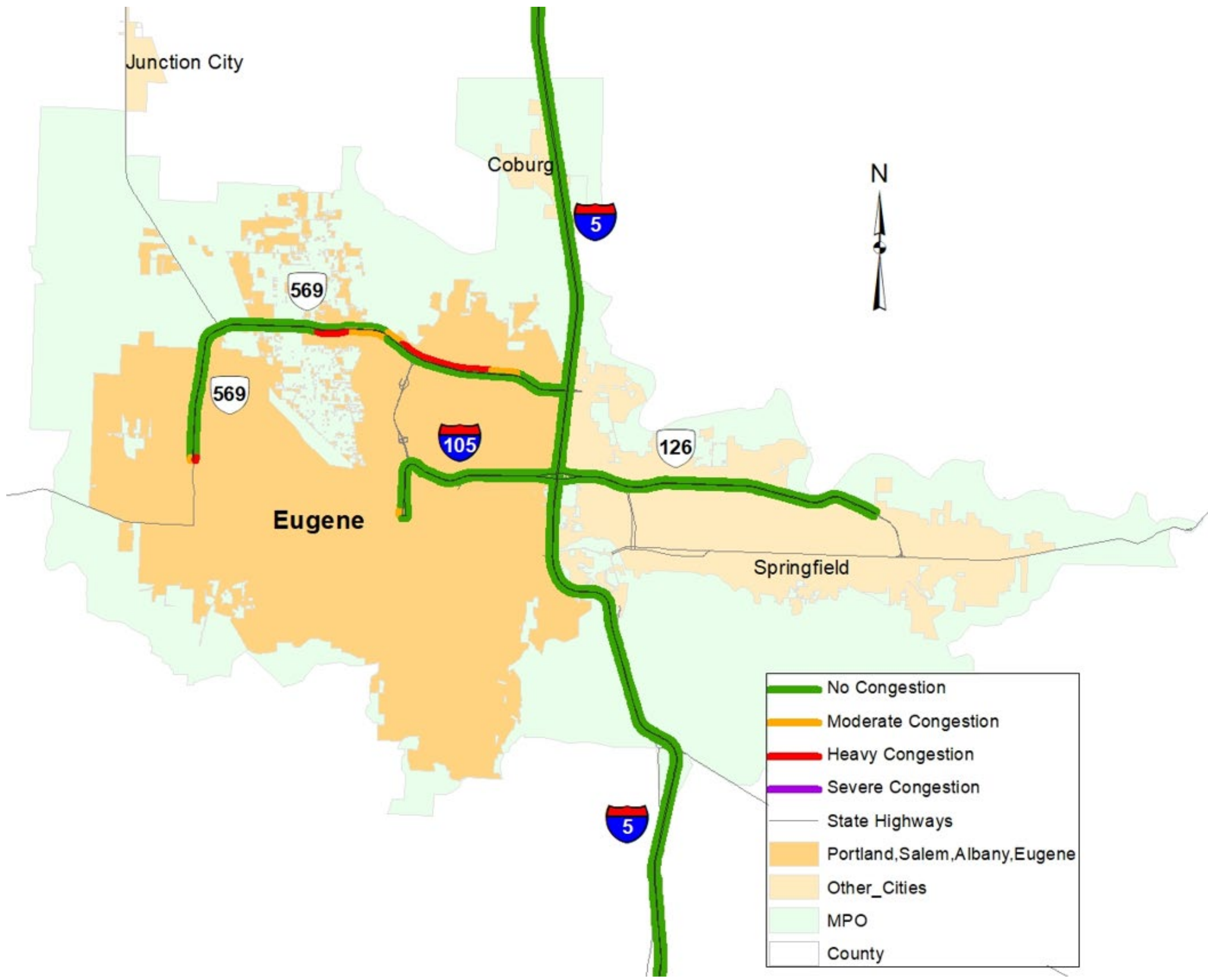


Figure 21 illustrates PM peak period congestion for the Eugene-Springfield region. While I-5 does not have congestion, the Randy Papé Beltline highway (OR569) has heavy congestion on segments westbound and eastbound, as well as the west endpoint of the highway.

FIGURE 21. EUGENE-SPRINGFIELD REGION, TRAVEL TIME INDEX 2021, PM PEAK PERIOD 4 PM - 6 PM



The TTI is a useful tool to identify the most congested locations. It is a data-driven method to monitor changes in system performance statewide over time. This is a relatively new reporting capability dependent upon access to vehicle speed data, which is expected to provide expanded reporting capabilities in the future.

3.2.3 Reliability: Planning Time Index

Where the Travel Time Index measures congestion occurring repeatedly caused by high demand, the Planning Time Index (PTI) measures *variation* in travel time caused by unexpected events, such as crashes, vehicle breakdowns, work zones, and inclement weather causing delay and stop-n-go conditions. This reliability measure represents the total travel time users should account for in order to be on time 95% of the time relative to free flow travel time. The lower the PTI, the more reliable the travel time will be. Variability in travel times day-to-day reflects system reliability. This is often referred to as non-recurring congestion, which is random and unpredictable. This form of congestion makes it challenging to plan trips requiring punctuality.

When people travel, they may need to plan based on the worst days, not the average day, to ensure on-time arrival. Travelers usually include some extra travel time for regularly planned trips, such as commuting to work. However, some trips require punctuality, such as catching a plane flight, making a freight delivery, servicing customers on-site, attending personal appointments or seeing your child's game after school. These trips may require extra time to guarantee on-time arrival. The PTI is designed to measure system reliability and the extra time needed to ensure punctuality. It reflects the total time travelers should include to ensure they arrive on-time knowing there may be unexpected delay. As with the TTI, the PTI is calculated using INRIX speed data. PTI values are calculated for each highway segment by direction, then categorized as a level of reliability following the ranges listed in **Table 11**.

Table 11. Planning Time Index Congestion Classification Categories: Freeways

Reliability Level	Planning Time Index Value	Interpretation
Reliable	Less than 1.33	Average travel speed is no less than 25% below posted speed
Moderately Unreliable	1.33 ≤ PTI < 2.0	Average travel speed is between 25% to 50% below posted speed
Highly or Extremely Unreliable	Greater than or equal to 2.0	Average travel speed is at least 50% below the posted speed limit

The PTI was calculated for the PM peak period of 4 pm to 6 pm. **Figure 22** illustrates PM peak period reliability statewide for 2021. The Portland region has the majority of unreliable lane miles, but there are also unreliable sections in Salem-Keizer, Albany, and Eugene-Springfield. Non-metropolitan sections of the interstate system do not have locations exhibiting reliability issues during the afternoon peak period.

FIGURE 22. STATEWIDE PLANNING TIME INDEX 2021, PM PEAK PERIOD 4 PM – 6 PM

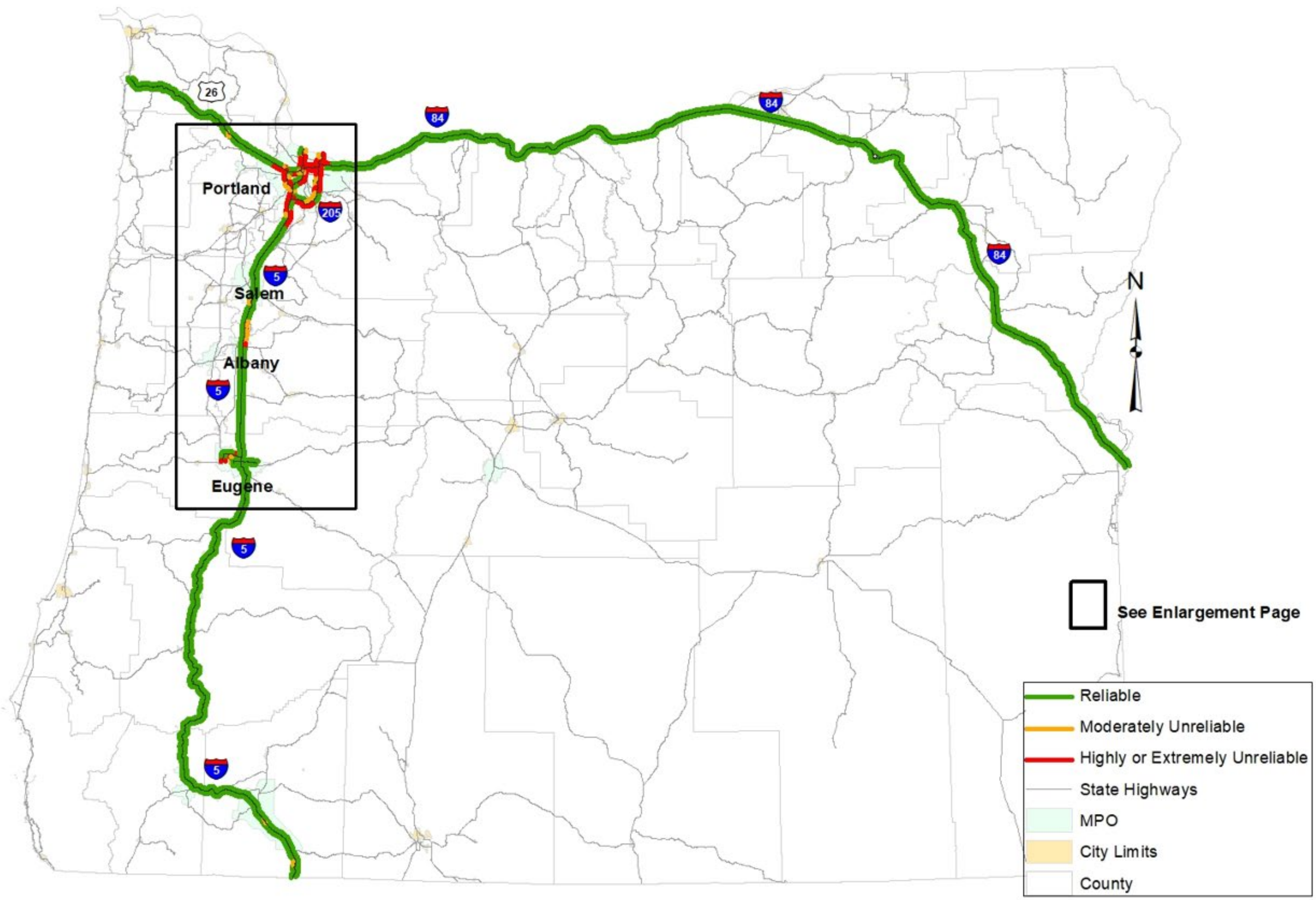


Figure 23 illustrates reliability for the Portland region during the afternoon peak period. The PTI reveals a majority of freeway lane miles in this region are unreliable. Segments identified as reliable using this metric are represented in green, but they are bounded by moderately unreliable segments transitioning to extremely unreliable segments.

FIGURE 23. PORTLAND REGION PLANNING TIME INDEX 2021, PM PEAK PERIOD 4 PM – 6 PM

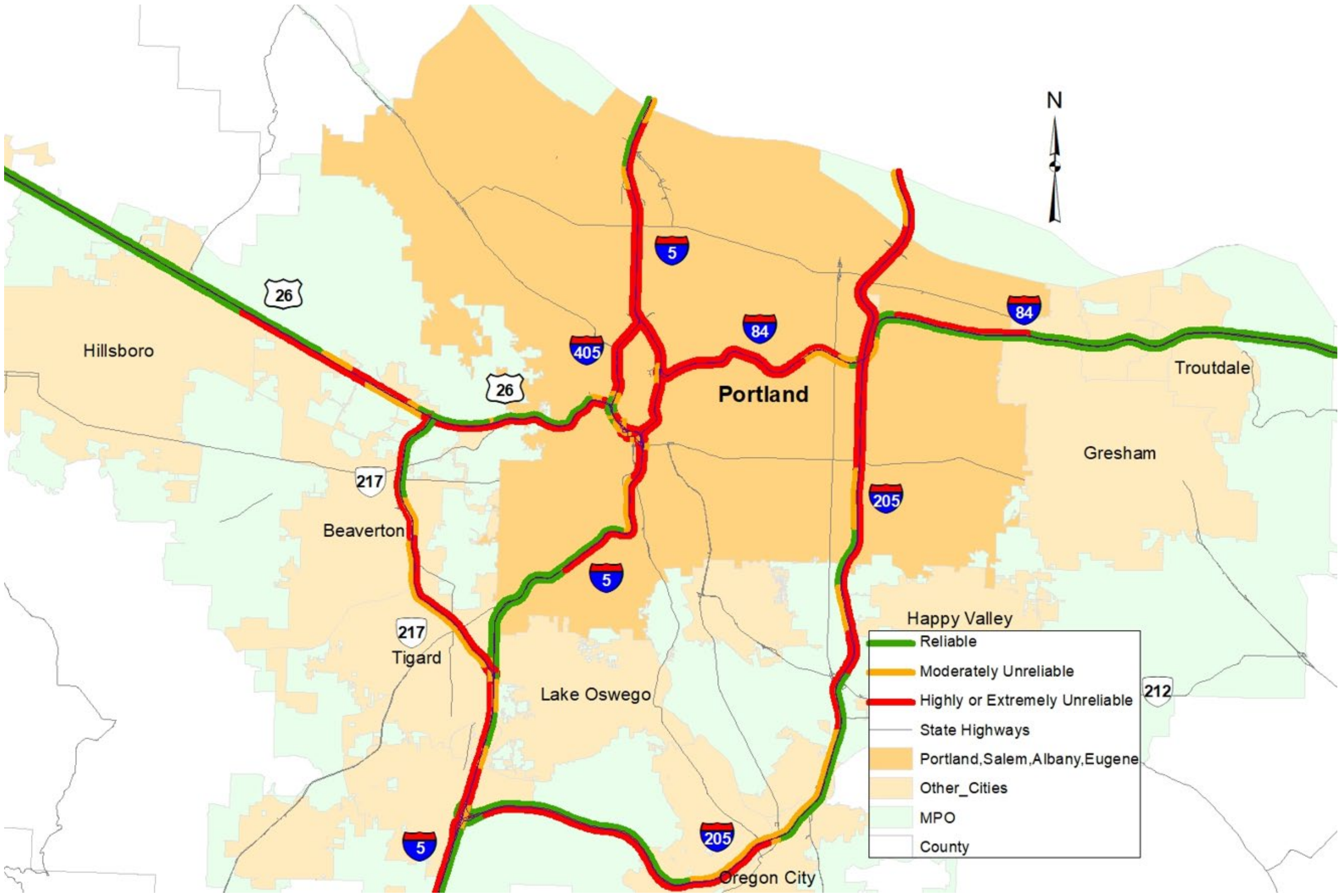


Figure 24 illustrates the PTI for Salem-Keizer and Albany on I-5. I-5 through Salem is predominantly reliable. The southbound fringe of southern Salem is moderately unreliable during PM peak period. One Albany segment of I-5 northbound is extremely unreliable north of the US20 interchange, which becomes moderately unreliable along the Millersburg boundary and beyond the Jefferson exit.

FIGURE 24. SALEM-KEIZER AND ALBANY REGION PLANNING TIME INDEX 2021, PM PEAK PERIOD 4 PM – 6 PM

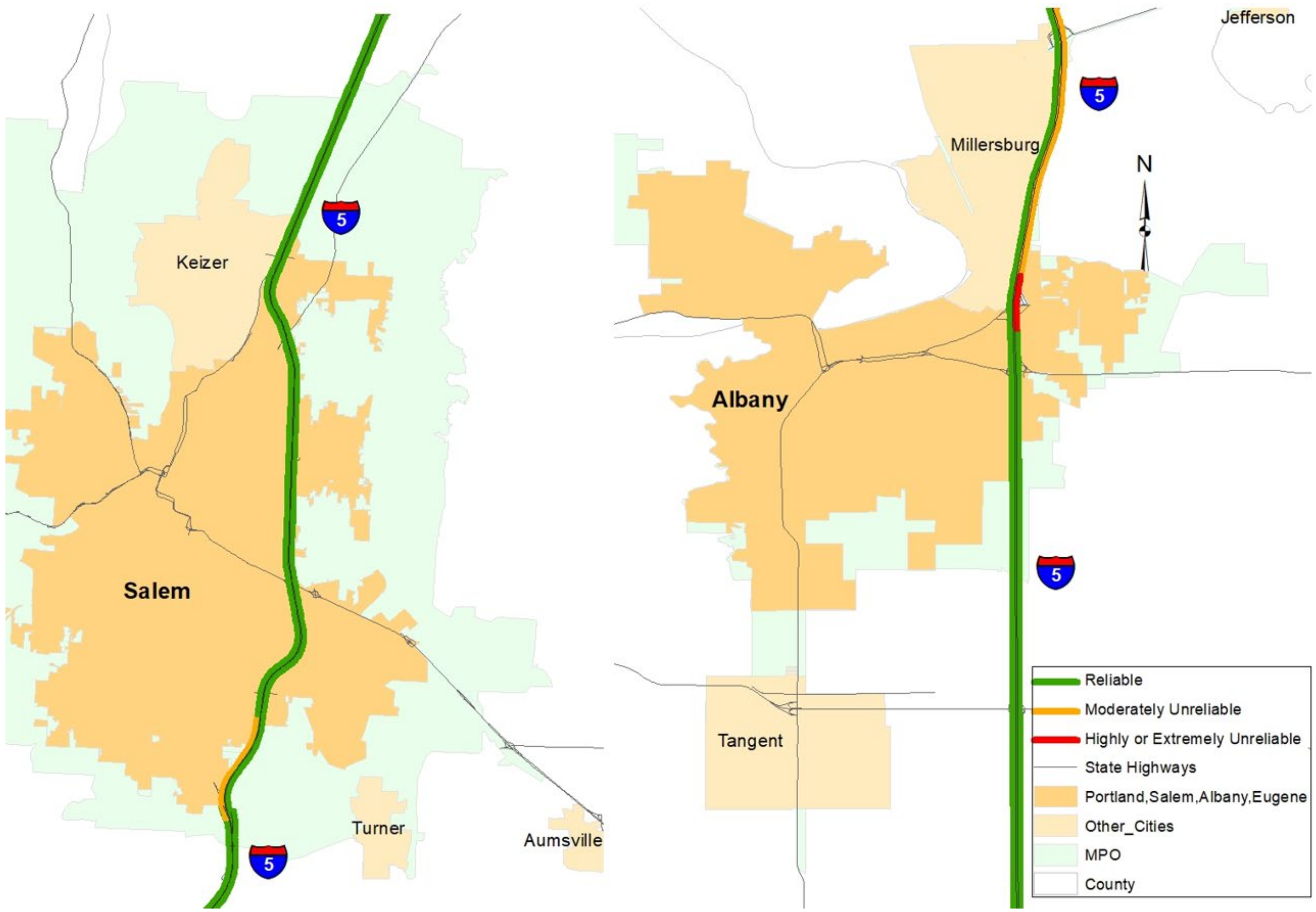
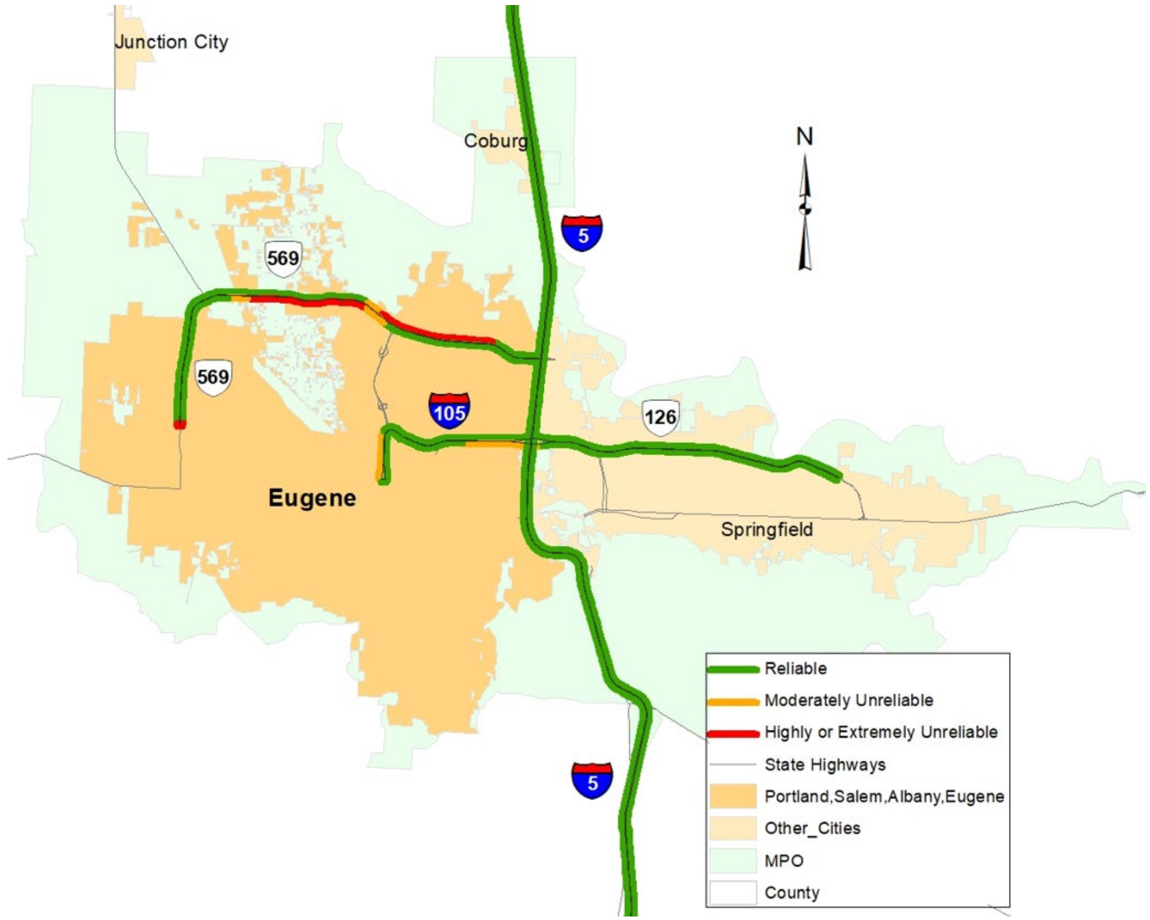


Figure 25 illustrates the PTI for Eugene-Springfield. While the I-5 section through the region is reliable, I-105 has segments in both directions that are moderately unreliable. The Randy Papé Beltline highway (OR 569) has segments that are extremely unreliable during peak periods in both directions, as well as the west end of the highway when entering Eugene.

FIGURE 25. EUGENE-SPRINGFIELD REGION PLANNING TIME INDEX 2021, PM PEAK PERIOD 4 PM – 6 PM



3.2.4 Truck Reliability

Freight movement within Oregon relies heavily on the highway system, 70% of freight moves by truck and 78% of heavy truck VMT occurs on the state highway system. Developing performance measures specifically designed to identify freight mobility is challenging at best – observed truck data is hard to obtain, the few existing sources have limited detail due to the confidential nature of a competitive industry. Transporting freight requires reliable travel times, predictable congestion can be planned for in delivery schedules. Unpredictable congestion results in late deliveries, firms incur penalty fees and risk losing customers. Unreliable travel times require firms to adapt by putting more trucks on the road to deliver the same quantity of goods on time, cargo typically stored in trucks on the road are stored in warehouses as the number of daily stops a truck can make declines. This increases the cost of freight transportation, which is passed on to businesses and consumers. Rising costs erode Oregon's competitive advantage, creating risk to our export dependent economy.

It is important to understand that commercial travel has different patterns of travel by time-of-day and day-of-week. Public policy aimed at household travel must consider potential impacts to commercial users.

Daniel Murray, current senior vice president and past director of research for the American Transportation Research Institute (ATRI) explains:

> *"From a freight perspective, the quintessential requirement for succeeding in a global, just-in-time economy is the ability to plan trips, deliveries, and transactions down to hours and minutes—rather than days and weeks. This makes reliability one of the single most important performance measures from a private sector perspective."*[40]

Trucks moving freight operate on the same highway system used by cars and busses moving people. Congestion and unreliable performance affect all highway users alike. Measures such as the Travel Time Index and Planning Time Index reveal the worst locations. Resolving these problem locations will help all highway users. There are specific freight bottleneck locations that have been identified within Oregon in the "Oregon Freight Highway Bottleneck Project Final Report"[41]. There have been national bottleneck studies as well, including the American Transportation Research Institute's (ATRI) "2021 Top 100 Truck Bottlenecks"[42] where Portland is listed as having the 28th and 89th worst locations in the nation.

When it comes to measuring the impacts of congestion and unreliable conditions on medium trucks and other commercial travel, very little is known due to a lack of data reporting on these specific users. However, commercial travel makes up a large proportion of overall VMT. According to national

[40] Public Roads, Volume 68, Issue 3, page 56.
[41] https://www.oregon.gov/ODOT/Planning/Documents/FHBL_Final-Report.pdf
[42] https://truckingresearch.org/2021/02/23/2021-top-truck-bottlenecks/

research[43], an estimated 35% of total VMT is from commercial travel and 65% is household travel. Ten percent of national VMT is heavy trucks and 25% is light/medium truck commercial travel. It is important to understand that commercial travel has different patterns of travel by time-of-day and day-of-week. Public policy aimed at managing congestion must consider impacts to household travel such as commuting, commercial travel and freight movement.

4 TRAFFIC SAFETY

Supporting traffic safety is a core aspect of the ODOT mission. Each year the agency prepares a safety Performance Plan[44] containing a vast array of information. This report highlights a few key aspects of highway safety because of the impacts to Oregon users' quality of life. For more extensive information on safety, see the ODOT Safety website[45] and All Roads Transportation Safety Program[46].

Safety is an aspect of travel users take into account when making choices every day. For this report, the focus is on reporting fatal and serious injury crashes and relevant trends. Between 2010 and 2020 the average annual number of crashes statewide was 50,500, with fatal and serious injury crashes making up an average of 3.5% of the total.[47]

Figure 26 illustrates the annual number of fatality crashes since 2010 accompanied by the fatality rate and change in statewide VMT over time. The crash fatality rate has been steadily increasing since 2010, while VMT has remained fairly steady.

[43] https://www.nap.edu/resource/25334/interstate/assets/meeting6/1%20Travel%20Forecast/PolzinSteven.pdf
[44] ODOT 2022 Performance Plan: https://www.oregon.gov/odot/Safety/Documents/2022PerformancePlan.pdf
[45] https://www.oregon.gov/ODOT/Safety/pages/index.aspx
[46] https://www.oregon.gov/odot/Engineering/Pages/ARTS.aspx
[47] For more information, see the ODOT Crash Statistics & Reports website: https://www.oregon.gov/odot/data/pages/crash.aspx

FIGURE 26. OREGON CRASH FATALITIES AND FATALITY RATES, 2010-2020

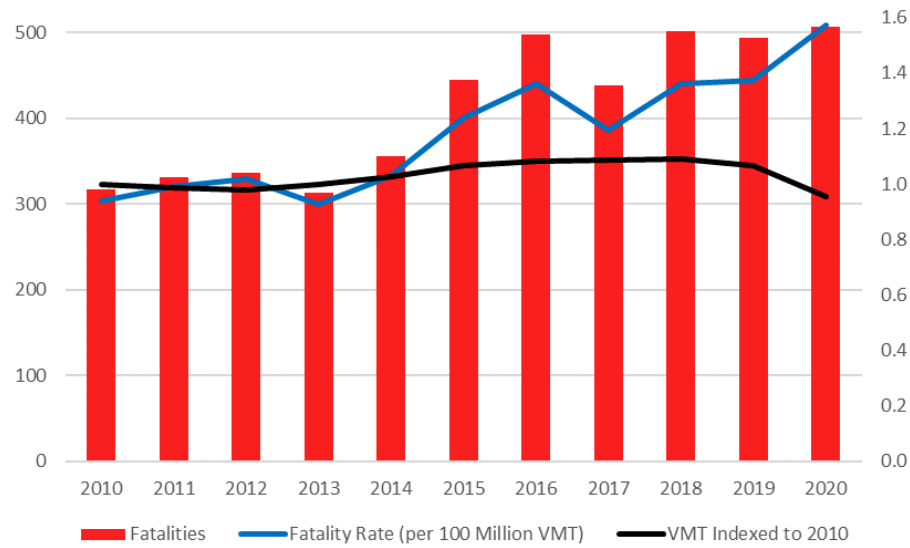


Table 12 provides a detailed look into the cause of fatal crashes. Speed related crashes averaged 35% of all fatal crashes over the last decade, ranging between 29% - 41% for specific years. Fatal crashes flagged for alcohol involvement averaged 38% of the total fatal crashes for years 2010-2015 and 36% for 2016-2020. Fatal crashes flagged for involvement of alcohol and/or other drugs (including marijuana) have been steadily increasing over the last decade, ranging from 43% in 2010 to 63% for 2019 and 2020. The proportion of these crashes averaged 49% for years 2010-2015 and 58% for 2016-2020. This is a fairly strong indicator of an emerging trend. There appears to be a similar trend for fatal crashes flagged for distracted driving. The average proportion of all fatal crashes attributed to distracted driving averaged 4% for years 2010-2015 and increased to 8% for years 2016-2020.

TABLE 12. FATAL CRASH SUMMARY, 2010-2020*

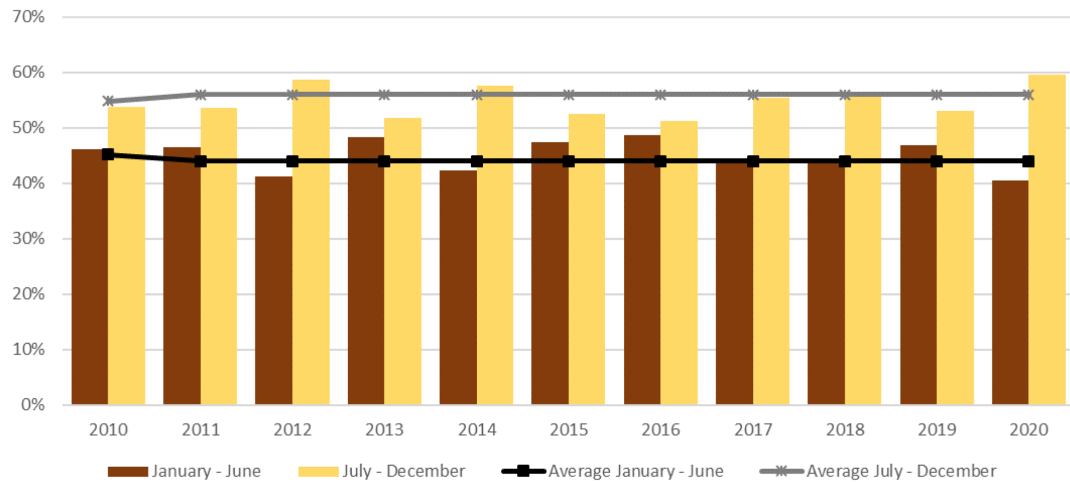
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	11 Year Average
Speed-Related Crashes	35%	37%	31%	39%	39%	31%	41%	38%	29%	30%	33%	35%
Alcohol Involved (No Drugs Identified)	33%	37%	37%	41%	35%	43%	34%	37%	34%	38%	35%	37%
Alcohol and/or Other Drugs Involved (including Marijuana)	43%	46%	49%	54%	48%	54%	47%	57%	62%	63%	63%	53%
Distracted Driving	5%	5%	3%	3%	3%	3%	6%	7%	10%	7%	8%	5%
**these categories are not mutually exclusive and do not sum to 100%*												

Figure 27 illustrates the number of fatal and serious injury crashes for the first half and second half of each year since 2010.[48] On average, about 44% of those crashes occur during the first half of the year, while 56% occur during the second half of the year. However, fatal and serious injury crashes in the

[48] There are multiple reasons for differences that are not evident when looking at the crash data alone, such as differences in reporting (Law Enforcement), missing crash reports, underreporting events, and lower traffic volumes. For more detail, see the ODOT Crash Statistics & Reports website: https://www.oregon.gov/odot/data/pages/crash.aspx

first half of 2020 were below average (40%) and the lowest for the 2010-2020 period. The second half of 2020 was above average (60%) and the highest since 2010.

FIGURE 27. PROPORTION OF ANNUAL FATAL AND SERIOUS INJURY CRASHES BY TIME OF YEAR, 2010-2020



The Oregon Transportation Safety Action Plan (TSAP)[49] uses "emphasis areas" to provide a framework for ODOT to meet Federal requirements for project and program prioritization. To meet the goal of improving safety, each emphasis area in the TSAP is evaluated for opportunities to reduce fatalities and serious injuries. On average, each year roadway departure, intersections, pedestrian and bicycle involved crash emphasis areas account for more than 80% of all fatal and serious injury crashes statewide. Over the last decade the distribution of fatal and serious injury crashes for those emphasis area's have remained fairly stable. **Figure 28** illustrates the average proportion of fatal and serious injuries by emphasis area for 2016-2020. In the case of crashes involving pedestrians and bicycles at intersections and roadway departures, there is overlap across multiple emphasis areas representing an average of 13% of fatal and serious injury crashes.

FIGURE 28. STATEWIDE 5-YEAR AVERAGE PROPORTION OF FATAL AND SERIOUS INJURY CRASHES BY SAFETY EMPHASIS AREA 2016-2020

[49] https://www.oregon.gov/odot/Safety/Documents/Draft_2021_Oregon_TSAP_Public_Review.pdf, accessed 06/29/2022

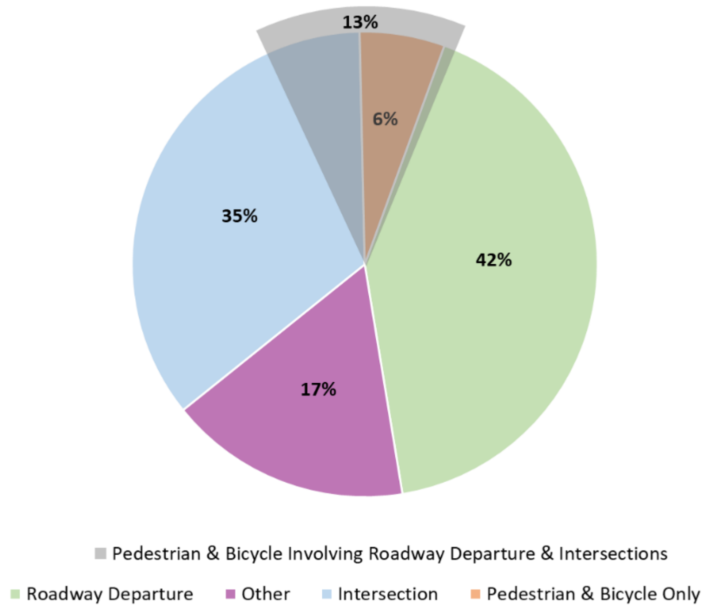


Table 13 provides further detail of fatal and serious injury crashes by emphasis area over the last decade. Roadway departures, which typically occur under rural conditions, result in the most frequent fatal and serious injury crashes, followed by intersection crashes which typically occur in more urban areas. While year to year patterns are relatively stable, the overall fatal and serious injury crash trends are increasing. Pedestrian involved fatal and serious injury crashes ranged between 9% - 11% over the last decade. Bicycle involved fatal and serious injury crashes ranged between 3% - 5%. Motorcycle involved fatal and serious injury crashes ranged between 13% - 17%.

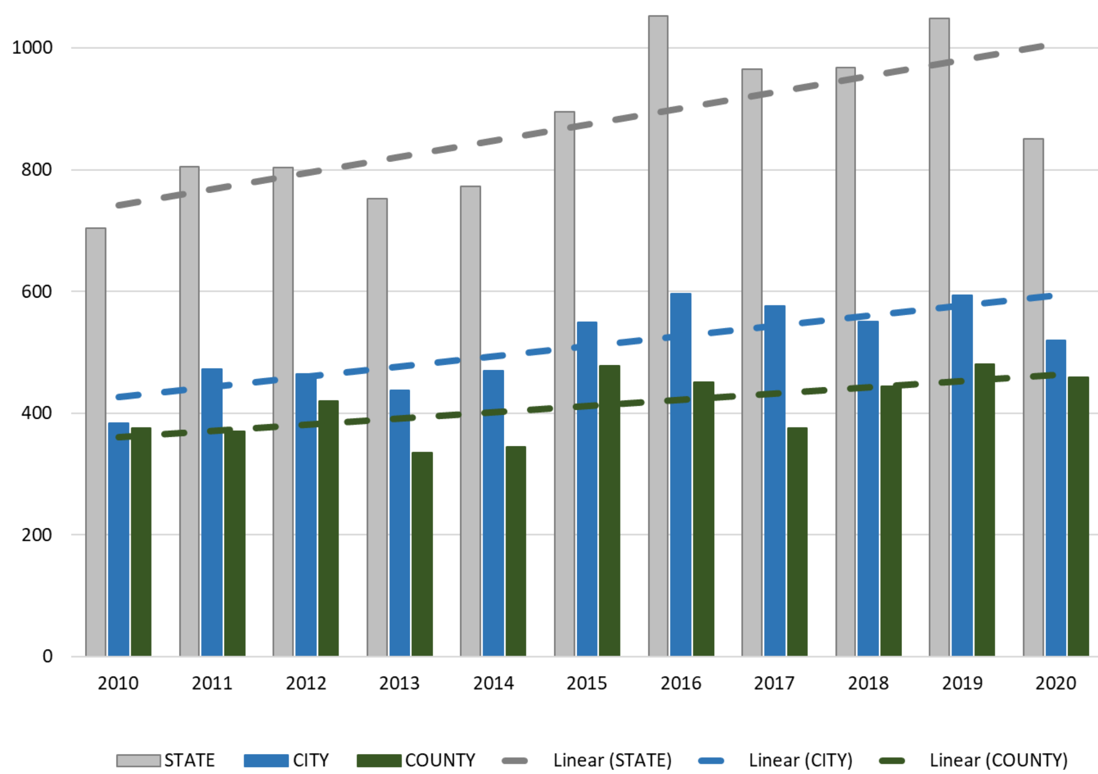
TABLE 13. DETAILED BREAKOUT OF FATAL AND SERIOUS INJURY CRASHES BY SAFETY EMPHASIS AREA, 2010-2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Roadway Departure	**45%**	**44%**	**44%**	**44%**	**40%**	**41%**	**40%**	**43%**	**41%**	**41%**	**44%**
Ped/Roadway Dep	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Bike/Roadway Dep	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Motorcycle/Roadway Dep	6%	6%	6%	6%	5%	6%	5%	5%	6%	5%	6%
Other	38%	36%	36%	37%	34%	35%	34%	36%	34%	36%	37%
Intersection	**34%**	**35%**	**34%**	**37%**	**38%**	**36%**	**37%**	**34%**	**35%**	**37%**	**35%**
Ped/Intersection	4%	4%	5%	5%	6%	4%	5%	4%	4%	4%	5%
Bike/Intersection	2%	3%	3%	3%	3%	2%	2%	2%	2%	1%	2%
Motorcycle/Intersection	4%	5%	6%	5%	4%	5%	4%	4%	5%	5%	5%
Other	25%	23%	21%	23%	25%	25%	26%	25%	25%	26%	23%
Pedestrian Involved*	11%	10%	10%	10%	10%	10%	10%	10%	10%	9%	11%
Pedestrian Non-Roadway Departure & Non-Intersection	**6%**	**5%**	**5%**	**4%**	**4%**	**5%**	**4%**	**5%**	**5%**	**4%**	**5%**
Bicycle Involved*	3%	5%	5%	4%	5%	4%	3%	3%	3%	3%	3%
Bicycle Non-Roadway Departure & Non-Intersection	**1%**	**1%**	**1%**	**1%**	**1%**	**2%**	**1%**	**1%**	**1%**	**1%**	**1%**
Motorcycle Involved*	14%	15%	17%	16%	14%	15%	14%	13%	16%	14%	14%
Motorcycle Non-Roadway Departure & Non-Intersection	**4%**	**4%**	**5%**	**4%**	**4%**	**4%**	**5%**	**4%**	**5%**	**4%**	**4%**
Other	**10%**	**11%**	**11%**	**10%**	**13%**	**12%**	**12%**	**13%**	**13%**	**13%**	**11%**
Total (sum of values in **bold**)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

* not mutually exclusive, pedestrian, bicycle, and motorcycle involved crashes can occur as part of roadway departure, intersection and other crash types.

Figure 29 illustrates a continuing trend of increasing numbers of crashes involving fatal and serious injuries since 2010. State highway crashes are increasing faster than crashes on city streets and county roads, but all three are seeing an overall increase in frequency illustrated by the linear trend lines. The proportion of fatal and serious injury crashes statewide is also increasing. In 2010, 3.3% of all crashes involved fatal and serious injuries, which increased to 4.2% in 2019 and 4.8% in 2020. While the total number of statewide crashes decreased 24% in 2020 relative to 2019, total crashes between 2010 and 2019 increased 14%.

FIGURE 29. STATEWIDE FATAL AND SERIOUS INJURY CRASHES BY FACILITY OWNERSHIP



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Crashes	44,093	49,049	49,798	49,494	51,244	55,156	60,048	57,726	50,150	50,128	38,141
Proportion of Fatal and Serious Injury Crashes	3.3%	3.4%	3.4%	3.1%	3.1%	3.5%	3.5%	3.3%	3.9%	4.2%	4.8%

Figure 30 illustrates the proportion of fatal and serious injury crashes involving pedestrians and bicycles by jurisdiction. On average, about half of fatal and serious injury crashes involving bicyclists and pedestrians occur on city streets; for state highways the range is 32% to 44%, while county roads have the lowest proportion of fatal and serious injury crashes ranging between 6% - 12% since 2010.

Table 14 provides further detail by listing the actual number of fatal and serious injury crashes involving pedestrians and bicycles since 2010, which have increased 31% since 2010. However, the overall proportion of statewide fatal and serious injury crashes involving pedestrians and bicycles has remained relatively steady ranging between 12% - 15% of statewide fatal and serious injury crashes.

FIGURE 30. CRASHES INVOLVING PEDESTRIANS AND BICYCLISTS BY FACILITY OWNERSHIP: 2010 - 2020

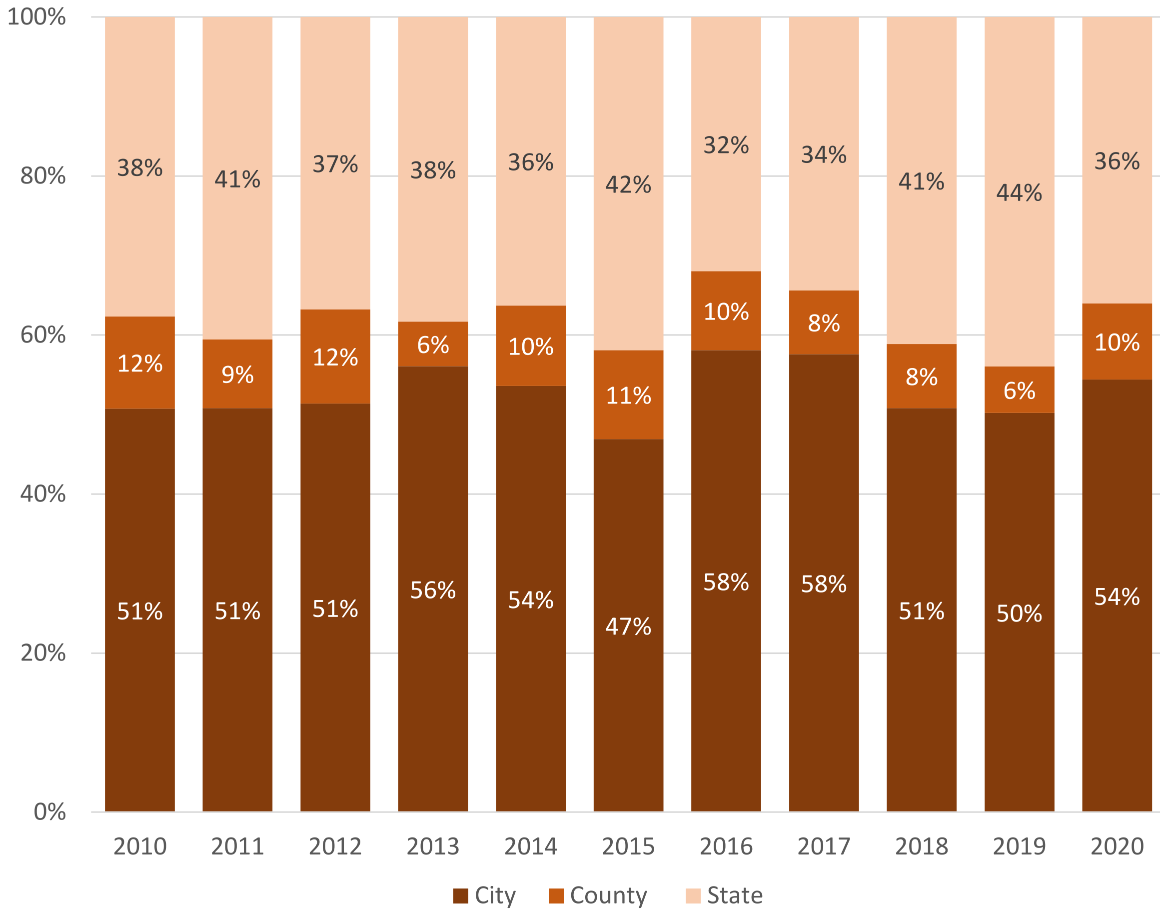


TABLE 14. FATAL AND SERIOUS INJURY CRASHES INVOLVING PEDESTRIANS AND BICYCLES: 2010-2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Number of Statewide Fatal and Serious Injury Crashes Involving Pedestrians and Bicycles	199	244	253	214	237	260	272	250	248	257	261
Change in Number of Statewide Fatal and Serious Injury Crashes Involving Pedestrians and Bicycles (Indexed to Year 2010)	100%	123%	127%	108%	119%	131%	137%	126%	125%	129%	131%
Proportion of Statewide Fatal and Serious Injury Crashes Involving Pedestrians and Bicycles	14%	15%	15%	14%	15%	14%	13%	13%	13%	12%	14%

Figure 31 illustrates how crashes statewide vary by facility ownership[50]. On average over that last 5 years, 54% of crashes involving pedestrians or bicycles occur on city streets, 38% on state highways and 8% on county roads.

FIGURE 31. CRASHES INVOLVING PEDESTRIANS AND BICYCLISTS: STATEWIDE 5-YEAR AVERAGES BY FACILITY OWNERSHIP, 2016-2020

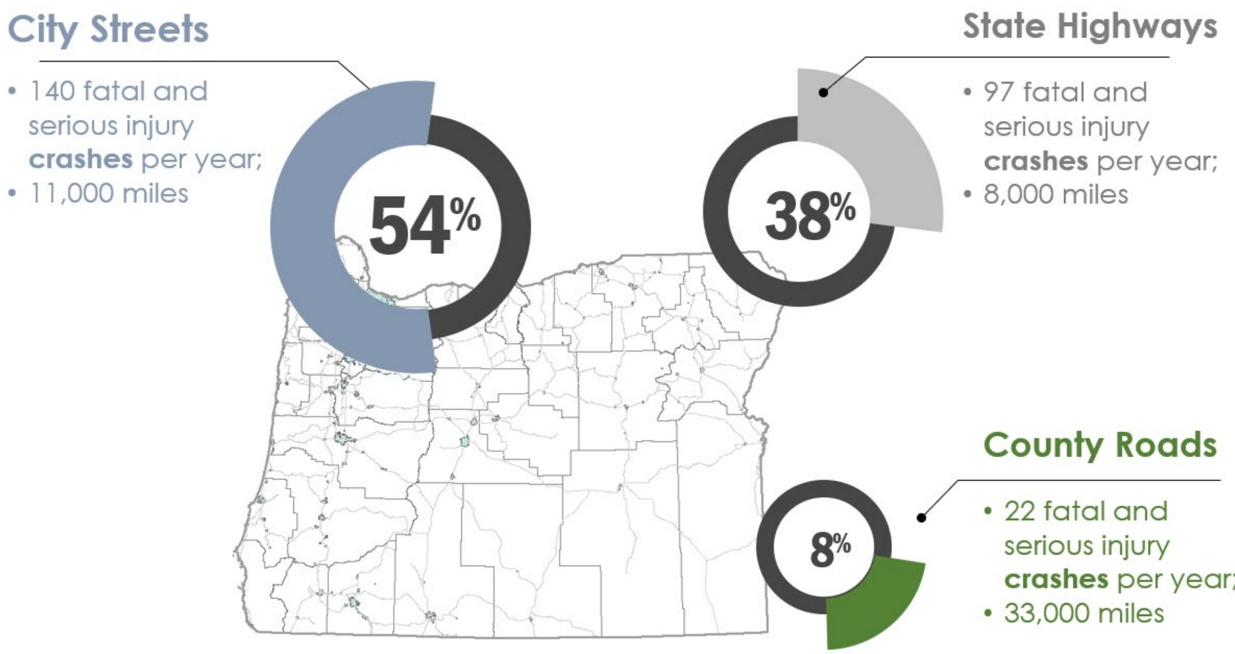


Figure 32 illustrates the average 2016 - 2020 statewide fatal and serious injury crashes involving pedestrians and bicycles by facility ownership. **Table 15** provides a detailed look at the five-year period visualized in **Figure 32**. Over the last five years, half of these crashes occur within the Portland Metro area. Albany, Corvallis, Eugene-Springfield, and Salem-Keizer combined account for 16% of the total.

[50] Miles are centerline miles taken from "2020 Oregon Mileage Report", https://www.oregon.gov/odot/Data/pages/road-assets-mileage.aspx#OMR

FIGURE 32. FATAL AND SERIOUS INJURY CRASHES INVOLVING A PEDESTRIAN OR BICYCLE: 2016-2020

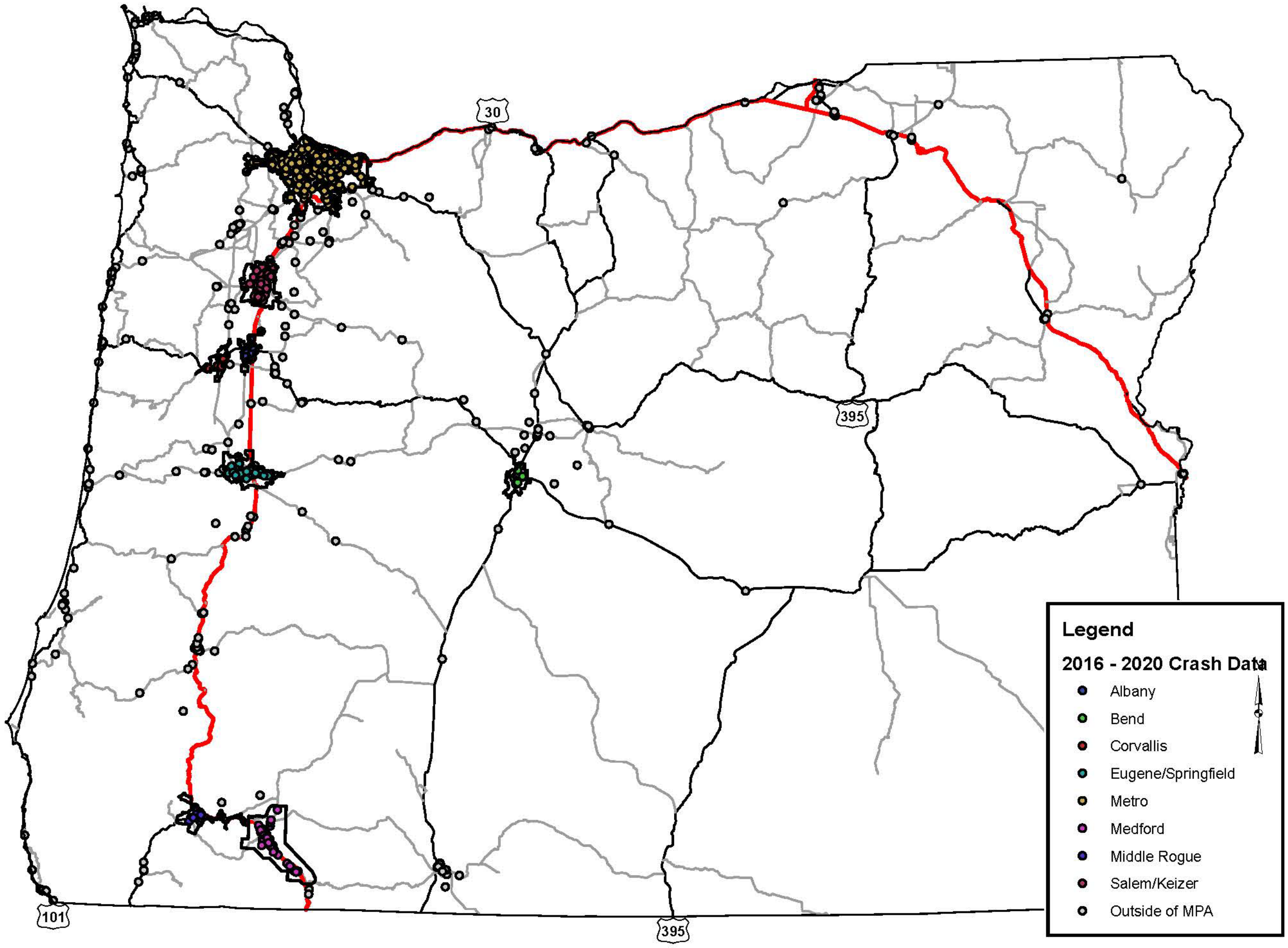


TABLE 135. FATAL AND SERIOUS INJURY CRASHES INVOLVING A PEDESTRIAN OR BICYCLE: 2016-2020

Urban Area	2016	2017	2018	2019	2020	5-Year Total
Albany	7	3	3	2	9	24
Bend	6	7	3	1	3	20
Corvallis	7	3	4	5	5	24
Eugene/Springfield	12	11	13	18	16	70
Medford	12	9	12	15	11	59
Portland Metro	153	135	118	116	125	647
Grants Pass	3	8	2	7	3	23
Salem/Keizer	14	17	17	18	20	86
Other Cities	33	36	51	42	39	201
Rural (outside city limits)	25	21	25	33	30	134
Total Crashes	**272**	**250**	**248**	**257**	**261**	**1288**

Table 16 reveals the number of alcohol, drug and/or marijuana involved pedestrian and bicycle fatalities, statewide, has increased steadily over the last five years. There is evidence that the increase in unhoused persons may be an emerging factor in rising pedestrian fatalities, but statewide data is currently insufficient for reporting at this time. However, the Portland Bureau of Transportation (PBOT) noted in their 2021 Portland Traffic Crash Report[51] 70% of pedestrian deaths within the city were unhoused community members. This may be an emerging pattern to watch for into the future.

TABLE 16. EMERGING TRENDS RELATED TO PEDESTRIAN AND BICYCLE FATALITIES: DRUGS AND ALCOHOL, 2016-2020

	2016	2017	2018	2019	2020
Alcohol, drugs and/or marijuana involved Pedestrian and Bicycle Fatalities	45%	49%	63%	61%	64%

5 COVID-19 PANDEMIC IMPACTS

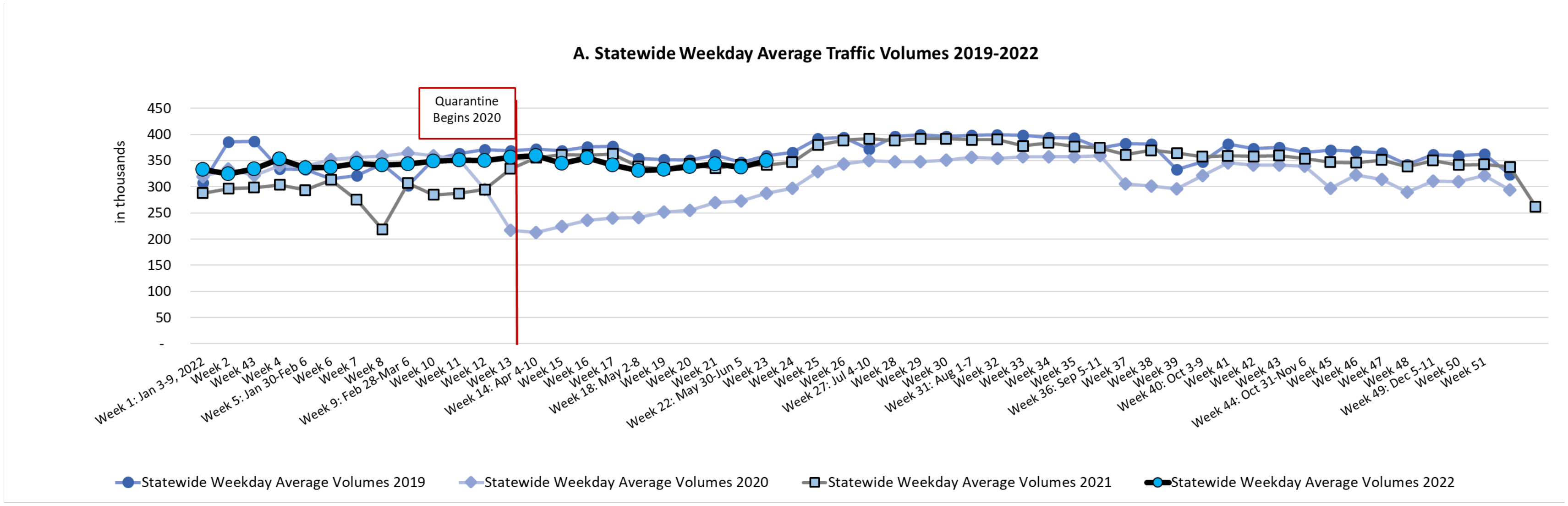
5.1 Traffic Volumes

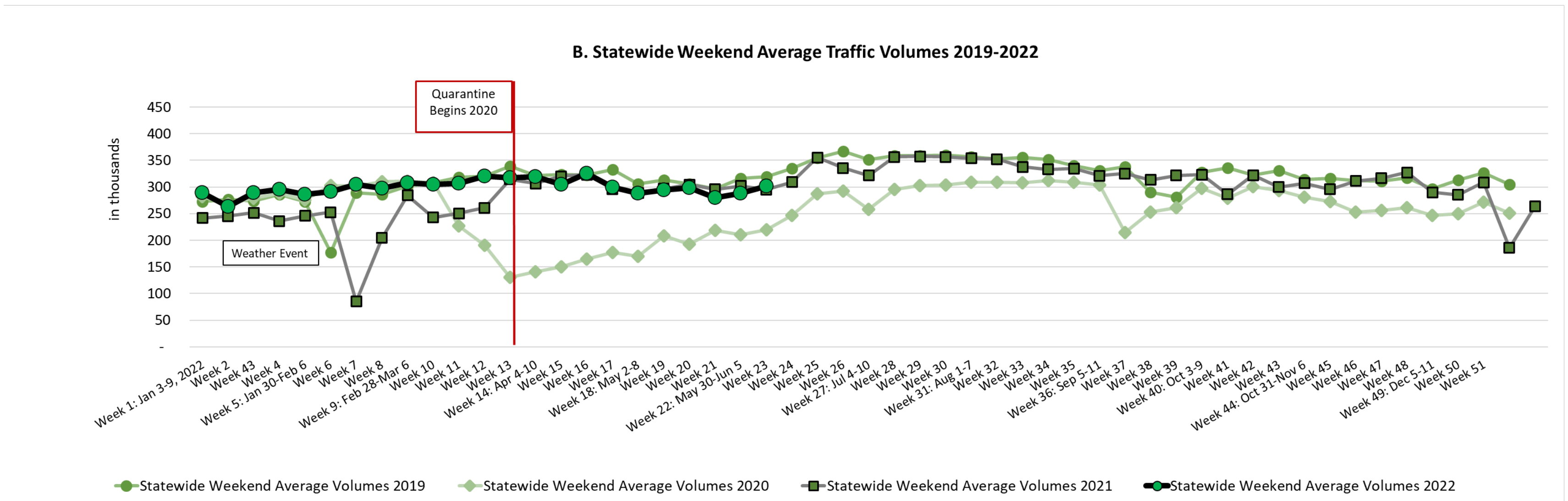
March 2020 introduced a major shock to Oregon and the U.S. as mandates designed to mitigate spread of the COVID-19 virus were put into action. Schools closed, many businesses closed or offered limited services, workers were laid off, others were able to telecommute, daycare centers closed, and workers had to find ways to continue working with kids at home. Supply chains were disrupted by large numbers of workers calling in sick, medical industry workers putting in long hours to provide care, truck drivers delivering supplies while businesses they relied on for food and shelter were closed. This was the largest pandemic since the Spanish flu of 1918, which killed 675,000 people in the U.S. over two years[52]. To-date, the COVID-19 pandemic has killed double that of the Spanish flu, over 1.1 million deaths in the U.S. since early 2020[53].

From April 2020 to July 2021 ODOT prepared a report monitoring traffic volumes statewide[54]. Thirty-eight locations were monitored across 13 state highway corridors for weekday and weekend traffic flows. **Figure 33** illustrates traffic volumes from this report, including additional observed data gathered for monitoring through mid-June of 2022. Since April 2021, total traffic volumes have been very close to 2019 levels for the remainder of the year. Traffic volumes continued to follow this pattern and monitoring ceased after mid-June 2022.

[51] "Saving Lives with Safe Streets: Vision zero Traffic Crash Report 2021," accessed online July 7/25/2022: https://www.portland.gov/sites/default/files/2022/traffic-crash-report-2021.pdf
[52] https://www.cdc.gov/flu/pandemic-resources/1918-commemoration/1918-pandemic-history.htm accessed 3/20/2023
[53] https://covid.cdc.gov/covid-data-tracker/#trends_weeklydeaths_select_00 accessed 3/20/2023.
[54] "Observed Statewide Traffic Volume Patterns Related to COVID-19 Monitoring", 35 reports are available online here: https://www.oregon.gov/odot/Data/Pages/Traffic-Counting.aspx#covid19trafficreports

FIGURE 33. AVERAGE WEEKDAY AND WEEKEND TRAFFIC VOLUMES: 2019-2022





5.2 Travel Speeds

The initial reduction in travel mid-March 2020 had a large impact on traffic speeds in the Portland region. Major corridors in the Portland region were monitored for speeds, which are presented in **Table 17** for March and April of 2020[55]. In the third week of March schools were closed. The following week statewide COVID-19 quarantine restrictions were put into place. This transition period between normal operations week 2 of March 2020 and quarantine mandates reduced traffic volumes enough to eliminate afternoon peak hour congestion and speeds increased to posted speed, in some cases exceeding it. More detail on speed monitoring is available from the COVID monitoring reports.

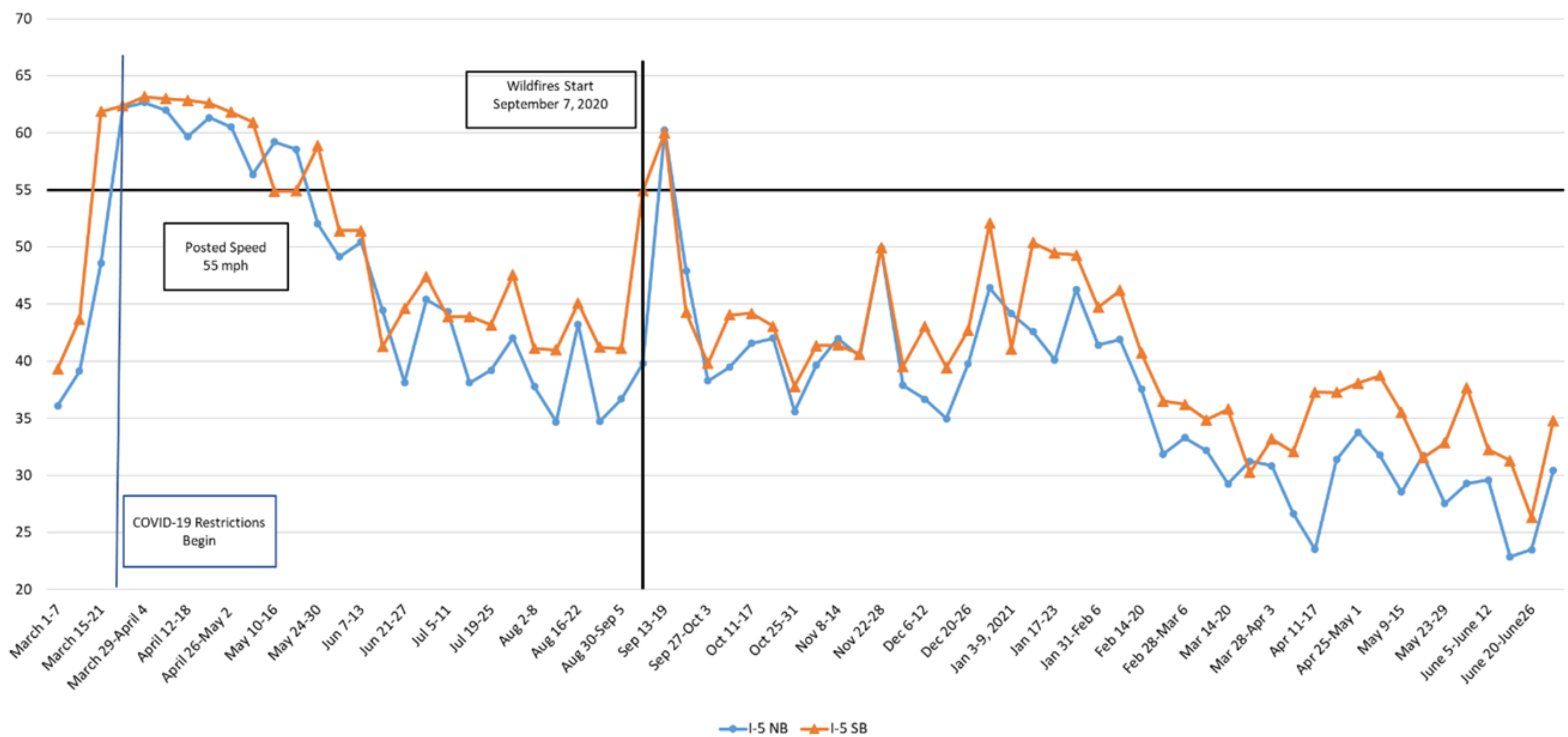
TABLE 17. PORTLAND REGION SPEEDS ON STATE HIGHWAYS: WEEKDAYS AT 4PM – 5PM, MARCH AND APRIL 2020

Week	I-5		I-205		I-405		I-84		US-26		OR217	
	NB	SB	NB	SB	NB	SB	EB	WB	EB	WB	NB	SB
March 1-7	33	38	36	43	35	29	45	51	41	50	42	38
March 8-14	35	42	40	53	34	32	46	49	43	54	48	38
March 15-21	46	60	61	62	55	53	56	62	61	62	60	60
March 22-28	60	60	62	62	51	56	60	61	61	62	61	61
March 29-April 4	60	61	63	63	49	57	61	62	60	63	61	61
April 5-11	60	61	62	62	50	57	61	63	61	62	61	62
April 12-18	58	61	61	62	56	57	61	62	61	62	56	61
April 19-25	60	61	62	62	56	54	59	62	60	62	60	60
April 26-May 2	59	60	62	62	56	54	61	62	60	61	60	60

By summer of 2020, speeds began declining as traffic volumes increased and congestion began to return. **Figure 34** illustrates average weekday speeds on I-5 in the Portland region between March 2020 and June 2021 by direction northbound (NB) and southbound (SB)[56]. By June 2020 speeds began falling below posted speed and held steady until mid-February. This was followed by a further decline in speeds in both directions, but northbound traffic experienced the lowest speeds during afternoon peak hour. While many COVID restrictions remained in place, the number of people out and about was clearly increasing.

[55] Ibid, May 15, 2020 report
[56] Ibid, July 9, 2021 report

FIGURE 34. INTERSTATE-5: AFTERNOON PEAK HOUR SPEEDS (4-5 PM), MARCH 2020 THROUGH JUNE 2021 BY DIRECTION

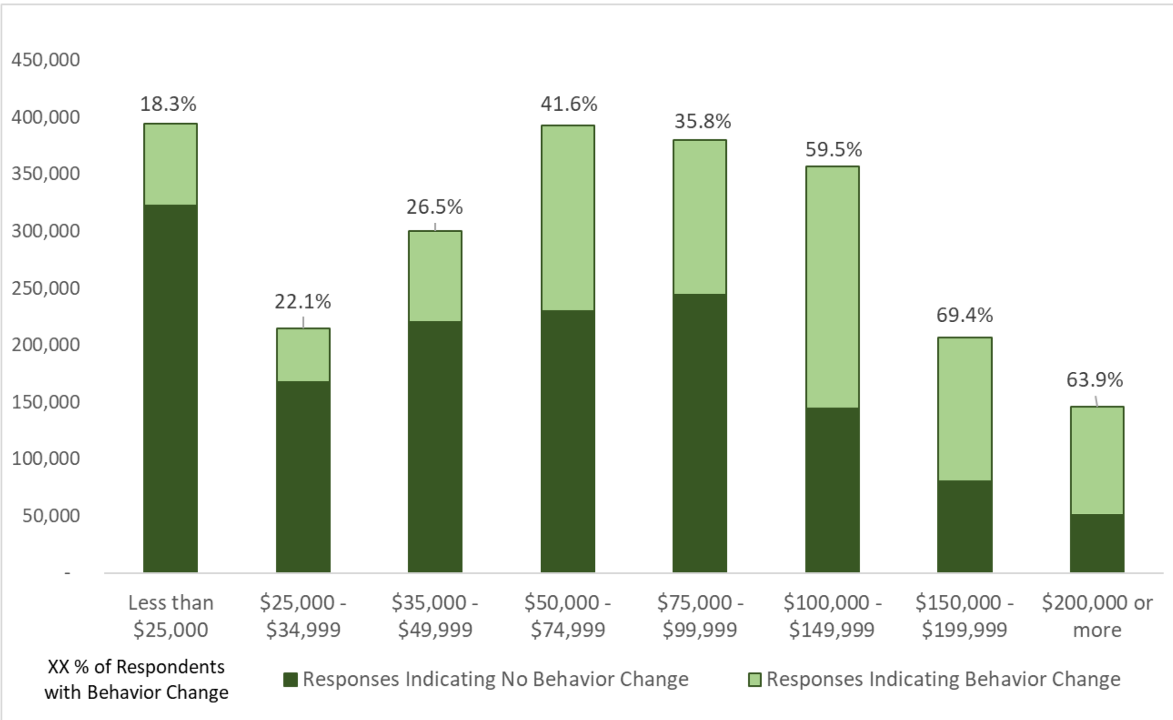


5.3 Work from Home

The extreme drop in traffic volumes after quarantine mandates were initially implemented gave hope to some that telework could resolve congestion. However, the rise in traffic volumes since June of 2020 and decrease in highway speeds indicate otherwise.

The Bureau of Transportation Statistics provides insight into telework by income for Oregon during the pandemic. **Figure 35** illustrates how the telecommute response varied by household income levels. The data reveals changes in telecommuting behavior increases as income rises.

FIGURE 35. PERSONS AGE 18+ IN HOUSEHOLDS WHERE AT LEAST 1 PERSON SUBSTITUTED IN-PERSON WORK FOR TELEWORK DUE TO COVID-19 BY INCOME GROUP: OREGON - WEEK 13 AUGUST 19-31, 2020



National data sources also reveal there is racial disparity in telework opportunities. **Figure 36** combines income and race to illustrate how income distribution by race varies and the same is true across occupations and industries, which impacts workers ability to telecommute[57]. Such details are important to understand when developing new policies aimed at reducing VMT and congestion. For people earning annual incomes below $50,000:

- 34% of Hispanics report teleworking opportunities,
- 44% of Black non-Hispanics report teleworking opportunities,
- 18% of Asian non-Hispanics report teleworking opportunities,
- 28% of White non-Hispanics report teleworking opportunities,

[57] RSG Inc., Transportation Insights Panel webinar - January 26, 2022: https://rsginc.com/covid-19-transportation-insights-panel/

- 37% of mixed-race report teleworking opportunities.

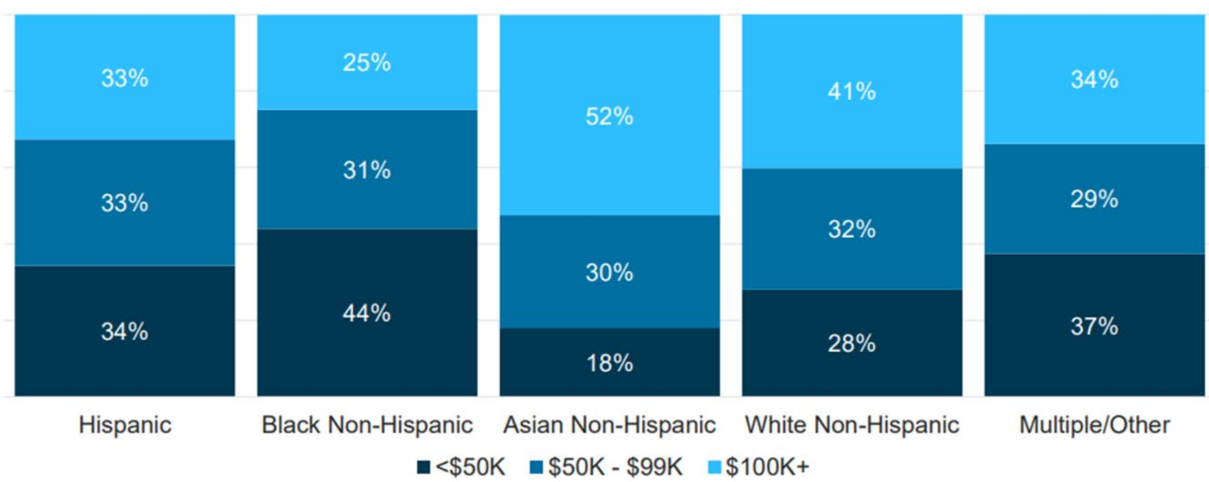
For people earning annual incomes of $50,000 to $99,000:

- 33% of Hispanics report teleworking opportunities,
- 31% of Black non-Hispanics report teleworking opportunities,
- 30% of Asian non-Hispanics report teleworking opportunities,
- 32% of White non-Hispanics report teleworking opportunities,
- 29% of mixed-race report teleworking opportunities.

For people earning annual incomes of $100,000 or more:

- 33% of Hispanics report teleworking opportunities,
- 25% of Black non-Hispanics report teleworking opportunities,
- 52% of Asian non-Hispanics report teleworking opportunities,
- 41% of White non-Hispanics report teleworking opportunities,
- 34% of mixed-race report teleworking opportunities.

FIGURE 36. RACIAL DISPARITY IN TELEWORK OPPORTUNITIES



6 CONCLUSION

The transportation system is the Oregon economy in motion. The objective is to enable people to safely access jobs, services and goods for the current and future growing population, an important thing to note since Oregon population is growing faster than the national average. Businesses depend on the transportation system to access employees, customers and the goods and services needed to conduct their business activity. Every person, business, commodity, and industry has different needs from the transportation system. Accommodating a variety of needs while maintaining safety within a constrained budget requires strategic decision making and acknowledgement of necessary trade-offs.

All economic “agents” must balance trade-offs, whether it is done by households, businesses or public agencies. Establishing a good understanding of the underlying economic motivations and decision criteria utilized by transportation system users supports development of effective solutions and informed investment decisions.

Oregon’s growing economy means demands on the transportation system will continue into the future. Long range investment strategies do not include adding major capacity. Investment will focus on utilizing current capacity more efficiently and effectively. Understanding the motivations behind transportation user choice helps inform development of public policy. Quantifying use of the transportation system provides information needed to develop the right solutions at the right time in the right locations. Access to observed data supports monitoring system performance, revealing crash locations and severity, traffic congestion, and overall system performance over time. In a time of declining revenue streams from traditional sources, increasing fatalities and serious injuries, and rising system use, it is more important than ever to develop effective ways to manage the transportation system and provide safe and affordable mobility options to preserve the quality of life and economic opportunity in Oregon now and into the future.