Oregon Department of Transportation

Portland Region

2020

Traffic Performance Report

Oregon Department of Transportation: Region 1
December 2021

Oregon Department of Transportation

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Oregon Department of Transportation

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Region 1

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Overview

Purpose of this report

This 2020 Traffic Performance Report provides information on the health of the region's freeway system. It continues a baseline for long-term monitoring that will enable Oregon Department of Transportation (ODOT) to better understand the urban traffic mobility conditions of the freeway system.

Changes in the federal requirements for transportation planning, shrinking transportation revenues and new big data sources create a need to develop benchmarks for on-going performance monitoring.

ODOT manages the freeway system for safe, efficient and reliable operations. ODOT focuses on improvements at key locations to address congestion and safety hot spots. Improvements are guided by Oregon Highway Plan Policy 1G.1, which prioritizes the preservation and improvement of existing system functionality over additional freeway capacity or new facilities.

Advancements in traffic data collection methods have enabled ODOT to systematically collect, store, evaluate and monitor traffic conditions on all of its freeway corridors in the metro area. By monitoring key transportation performance indicators, ODOT can identify problems and effectively manage the system to better enable the movement of people, goods and services.

Measuring Performance

Key traffic performance areas that relate to urban mobility:

Congestion and bottlenecks

- Hours of congestion
- Vehicle hours of delay
- Travel time
- Speeds
- Recurring bottlenecks

Reliability

- AM, Mid-day, PM

Safety

- Frequency of crashes and non-crash incidents
- Crashes and non-crash incidents by time of day and type

Performance measures indicate the variety of **CHALLENGES** facing the region's freeway system:

ALL CORRIDORS EXPERIENCE SEVERE CONGESTION THROUGHOUT THE DAY

LACK OF TRAVEL TIME RELIABILITY on **ALL CORRIDORS**

Improved data

The 2020 report focuses on data to illustrate the performance of the freeeway system in 2019.

A few changes that were made from the 2018 Traffic Performance Report are:

- New data sources were used for the empirical freeway travel-time and speeds. The 2018 report utilized commercial HERE data while the 2020 report uses commercial INRIX XD data. More details on changes in the 2020 Traffic Performance Report can be found in the glossary.
- New refined data sources were used to more accurately capture freeway corridors within Region 1, slightly changing corridor lengths compared to the 2018 report.
- The 2020 report includes a new analysis of freeway Greenhouse Gas Emissions and potential reductions if operations improved.

TIME PERIODS REPORTED

TRAVEL TIME, SPEED AND RELIABILITY indicators are reported for the AM peak, Mid-day, and PM peak periods.

These time periods include enough time to capture the current peak periods and account for future growth into shoulder peak periods to allow for tracking of congestion.

Corridor-level management

ODOT implements cost-effective operational improvements that reduce crashes and delay, increase reliability and relieve congestion at recurring bottlenecks on the freeway system.

- ODOT Corridor Bottleneck Operations Study (CBOS) projects are cost-effective improvements, such as auxiliary lanes, to address safety and operations problems at specific, localized bottlenecks.
- ODOT's RealTime strategy is a toolbox of active traffic management technologies, designed to improve safety and reliability by providing variable advisory speed, queue warning, ramp metering and traveler information to manage congestion.
- The Transportation Management and Operations Center (TMOC) Program provides a single, regional point of contact for around-the-clock monitoring of transportation system operations and coordination of transportation related communications and services. TMOC specially trained personnel monitor freeway corridors and work in partnership with law enforcement, fire rescue and medical teams, and tow operators to provide safe and efficient traffic flow around an incident.

There are six freeway corridors in Region 1:

Traffic has reached a point of severe congestion and highly unreliable travel conditions during the peak periods

Congestion in the Portland metro area steadily increased in the last decade, with regional growth trends showing that these increases are likely to be sustained and expanded for the foreseeable future. Traffic in the Portland region has reached a point of severe congestion and highly unreliable travel conditions during the peak periods.

The Portland metro region encompasses portions of three counties and is the most urban and populous region in the state. According to the US Census Bureau, in 2019 the region had the 25th largest metro area population in the country and from 2010-2019, was 22nd on the list of US metro areas with the greatest number of new residents.[1] In 2019, Portland outpaced the national average for metro area job growth at 2%.[2] Portland International Airport served 19.9 million passengers and the Portland metro region had 8.8 million overnight visitor stays. Minimal expansion of the region's infrastructure has occurred over the past 30 years, resulting in the rapid increase of congestion as demand exceeds capacity on all of the region's freeway corridors. The region's infrastructure is now tasked with accommodating additional traffic as more residents travel for daily activities, more visitors come to recreate and more businesses need to move goods and services on the highway system.

The population growth trajectory is anticipated to accelerate in the coming decades, with a 23% population increase from 2.5 million to over 3 million residents between 2018 and 2040, and a 38% increase to 3.4 million residents by 2060.[3]

METRO AREA EMPLOYMENT HAS GROWN BY 2.0%

2.49 MILLION PEOPLE NOW CALL THIS REGION HOME

THERE HAS BEEN LESS THAN 1% GROWTH IN FREEWAY LANE MILES

TRAFFIC DEMAND EXCEEDS CAPACITY LEADING TO SEVERE CONGESTION AND UNRELIABLE TRAVEL TIME

REGIONAL FREEWAY COST OF CONGESTION IS $250 MILLION ANNUALLY

Regional impacts

Over the last decade, a strengthened local economy, increasing population and minimal investment for additional infrastructure contributed to increasing congestion, decreasing travel speeds, greater delays and unreliable trip times. Traffic congestion in the Portland region can now occur at any hour of the day, including mid-day and weekends; it is no longer only a weekday peak hour problem. On the average weekday, the entire region is congested for approximately 11.5 hours, or almost half of the day.

This traffic congestion directly affects freight in the region. In the past, freight relied on the congestion-free off-peak hours to move goods and services in the region. As the mid-day continues to be unreliable, freight has more problems meeting delivery schedules, resulting in increased shipping costs.

Overall, the number of incidents for the region's six freeway corridors increased in tandem with growing congestion.

Severely congested conditions

The Portland metro area has the most severe freeway system congestion in the state. Congestion is caused by conditions where demand exceeds capacity. This often occurs with lane reduction (I-5 at Rose Quarter from 3 to 2 lanes), older roadway design (I-5 at Interstate Bridge and Terwilliger curves) or significant on-ramp demand (I-205 at Airport Way). Congested conditions range from slowing (40-50 mph) to congested (30-40 mph) to severely congested (less than 30 mph).

The Portland region freeways have reached a state of severe congestion with travel being highly unreliable during the peak periods. For motorists making a trip during the PM peak and planning to get to their destination on time, they are expected to allot 2-3 times the amount of travel time as compared to a trip made during off-peak or free-flow travel. The system is highly sensitive to disruptions; even minor weather and incident events can flip the flow from stable to unstable and breakdown conditions. During severe congestion, it takes much longer for the system to recover to stable flow and there is regular rerouting of motorists through the local system to avoid congestion.

Managing congestion to improve safety - incident management

Effective incident management is vital to a high-functioning highway system and to the safety of incident responders. Studies show that 60-65% of urban congestion is caused by incidents and for every minute a freeway lane is blocked due to an incident, it results in 4 minutes of travel delay. Efficient incident response can lead to less traveler time spent in backups, fewer secondary crashes, insurance claims and less financial loss due to highway incidents.

The Traffic Incident Management (TIM) program is a tool ODOT Region 1 employs to directly address traffic congestion and incident delay and improve safety on the freeway system. The TIM team operates specially equipped vehicles to perform the functions of incident prevention, motorist assistance and incident management. Staff monitor freeways before, during and after peak commute periods, removing hazards and abandoned vehicles from travel lanes, medians and shoulders. Responders also assist motorists and clear disabled vehicles from travel lanes.

MAJOR EVENTS

This report uses quantitative data to tell the story of freeway traffic conditions. It helps to consider the data in context, such as major non-traffic events that may significantly impact traffic data.

Major events affecting traffic vary in scale and cause. The most common events are weather-related, such as major winter storms, flooding and landslides that may reduce traffic volume for a week or two. Forest fires have increased in frequency in recent years, with some causing major disruptions to travel, such as the Eagle Creek fire in 2017 which shut down over 30 miles of I-84[4] for more than three weeks.[5] Other events may be celebratory, such as during the Solar Eclipse in 2017 which prompted domestic and international travel to Oregon. Still other types of major events, such as a global financial or public health crises, can alter traffic volumes and daily commute patterns.

As a reminder, this report focuses on 2019, which was relatively free of major events (e.g. wildfires or winter storms) impacting travel on Portland-area freeways. Although no major events in 2019 had a notable affect on traffic, this report includes a preview of impacts from the COVID-19 pandemic in 2020 on pages 13-14.

Regional Bottlenecks

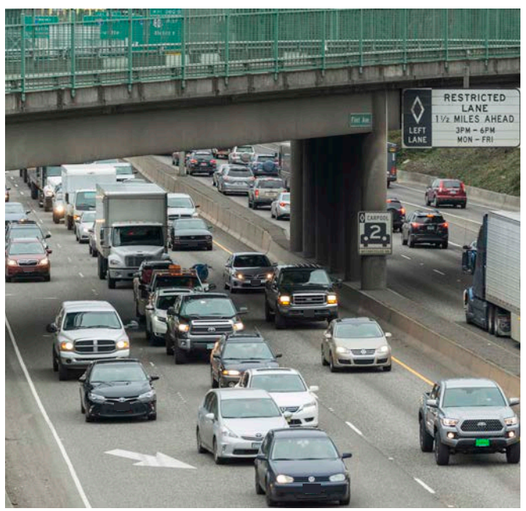
Traffic data indicates the region's travel speeds and travel time reliability are severely congested. The following are the performance indicators for the year 2019.

Region's corridors with slowest average weekday peak period speed (mph)

Source: INRIX data

2019 Average speeds (mph)				
Corridor Location	Posted Speed	AM	Mid-day	PM
I-5 NB	50-65	44.4	45.4	**26.5**
I-5 SB	50-65	45.9	48.8	**32.1**
I-84 EB	55-65	59.2	55.6	**45.4**
I-84 WB	55-65	**40.4**	52.0	44.4
I-205 NB	55-65	52.5	52.1	**29.2**
I-205 SB	55-65	50.2	55.3	**43.0**
I-405 NB	50	51.6	46.2	**21.1**
I-405 SB	50	41.2	45.1	**24.3**
US 26 EB	50-55	40.6	49.8	**40.2**
US 26 WB	50-55	57.6	59.1	**52.5**
OR 217 NB	50-55	41.2	53.4	**31.3**
OR 217 SB	50-55	37.4	44.8	**31.9**

Motorists on the freeway experience the slowest driving speeds in the PM peak period, with the exception of I-84 WB. This is the calculated average speed across all lanes for the entire corridor segment. The right lane in a bottleneck location often experiences much lower speeds.



Region's top recurring bottlenecks

These are the most severe recurring bottlenecks in the region in terms of duration and length

Source: INRIX data

Bottleneck location	2019
I-5 NB I-5 Interstate Bridge ▸ Capitol Hwy	11:15 AM-8:00 PM *8.75 hrs* *12.2 Miles*
I-5 SB I-84 ▸ Rosa Parks Way	7:15 AM-7:45 PM *12.5 hrs* *3.3 Miles*
I-5 SB Boone Bridge ▸ Carman Drive	2:45-6:45 PM *4.0 hrs* *8.1 Miles*
I-84 EB 33rd Ave ▸ I-5	10:30 AM-8:00 PM *9.5 hrs* *2.0 Miles*
I-84 WB I-5 ▸ 47th Ave	6:30 AM-7:00 PM *12.5 hrs* *3.2 Miles*
I-205 NB Glenn Jackson Bridge ▸ Sunnyside	12:30-7:30 PM *7.0 hrs* *11.3 Miles*
I-205 NB Abernethy Bridge ▸ I-5	2:30-6:45 PM *4.25 hrs* *8.3 Miles*
I-405 SB US 26 ▸ I-5	7:15-10:15 AM *3.0 hrs* *2.0 Miles* 2:00-6:45 PM *4.75 hrs* *2.0 Miles*
US 26 EB Vista Ridge Tunnel ▸ OR 217	6:00-11:45 AM *5.75 hrs* *8.1 miles* 11:45 AM-8:15 PM *8.5 hrs* *4.6 miles*
OR 217 NB Denney Rd ▸ I-5	7:15-9:15 AM *2.0 hrs* *4.7 miles* 2:45-6:45 PM *4.0 hrs* *3.8 miles*
OR 217 SB Hall Blvd ▸ Walker	11:45 AM-7:00 PM *7.25 hrs* *3.4 miles*

Recurring bottlenecks are freeway segments where traffic congestion regularly occurs and average speeds drop below 75% of free-flow speed.

Region's reliability

Top corridors with unreliable travel*

Source: INRIX data

	2019 Travel time buffer (minutes)		
Corridor location	AM	Mid-day	PM
I-5 NB	10.5	16.2	**29.7**
I-5 SB	7.5	14.5	**29.8**
I-205 NB	8.0	10.1	**26.2**
I-405 NB	0.3	1.4	**5.1**
I-405 SB	1.4	1.6	**3.5**
OR 217 NB	4.9	1.5	**6.1**
OR 217 SB	6.0	4.6	**7.1**

Motorists in these corridors experience the most variations in travel time, all of which fall within the PM peak period. Motorists have to buffer in the highest extra time per corridor length in order to ensure on-time arrival.

**Selection based on buffer time weighted for length of corridor*

BUFFER TIME is a measure of RELIABILITY; it is the EXTRA TIME or cushion a traveler must ADD TO THEIR TRIP to ensure ON-TIME ARRIVAL.

Corridors with highest planning travel time*

Source: INRIX data

	2019 Planning travel time (minutes)		
Corridor location	AM	Mid-day	PM
I-5 NB	45.8	50.7	**88.8**
I-5 SB	41.6	46.6	**78.5**
I-205 NB	38.3	40.6	**80.6**
I-405 NB	3.7	5.2	**13.4**
I-405 SB	5.6	5.4	**10.7**
OR 217 SB	17.3	13.9	**20.2**

Motorists driving in these corridors have the highest planning travel time per mile. Planning travel time is the sum of average travel time and buffer travel time. In order to make it to the destination on time, motorists have to allot more time to make the trip.

**Selection based on planning travel time weighted for length of corridor*

PLANNING TRAVEL TIME is the sum of AVERAGE TRAVEL TIME and BUFFER TIME.

Corridors with planning travel time higher during mid-day than AM peak period

Source: INRIX data

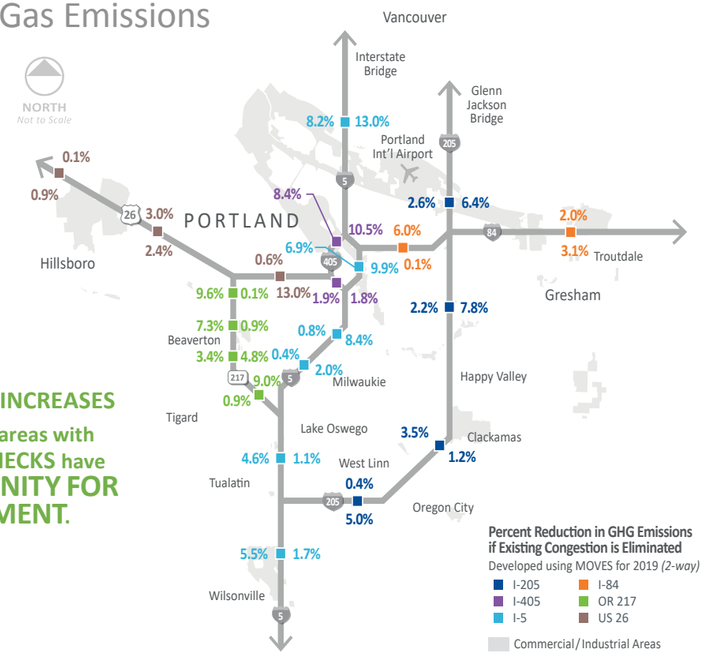
	2019 Planning travel time (minutes)		
Corridor location	AM	Mid-day	PM
I-5 NB	45.8	**50.7**	88.8
I-5 SB	41.6	**46.6**	78.5
I-84 EB	19.5	**21.3**	28.2
I-205 NB	38.3	**40.6**	80.6
I-405 NB	3.7	**5.2**	13.4

Peak periods are often thought of as being either in the AM or PM, correlating to motorists' commute to and from work. As congestion in the Portland metro region worsens, peak periods are extending into the mid-day. Motorists and freight drivers may have previously planned to avoid congestion by traveling in the mid-day, but instead are finding a longer mid-day planning travel time on these corridors.

Annual Average Daily Traffic

The Annual Average Daily Traffic (AADT) two-way total volumes are presented for easy reference of traffic volume flow in 2019 on each freeway. Traffic volume data is collected by Automatic Traffic Recorders (ATRs) at specific areas along five of the six major freeways in Region 1. There are currently no ATRs on OR 217. Volumes tend to be the highest near the city center and along commuter routes, such as Interstate 5 which connects to Washington State and Salem.

Greenhouse Gas Emissions



CONGESTION INCREASES EMISSIONS; areas with lengthy BOTTLENECKS have more OPPORTUNITY FOR IMPROVEMENT.

In 2020, Governor Kate Brown made greenhouse gas (GHG) reduction and mitigation a top priority for the state by issuing Executive Order 20-04, which requires development of specific actions, strategies, and analysis across multiple state agencies. EO 20-04 specifically tasks ODOT with working to reduce the amount of GHG emissions resulting from our investments in and management of the state's transportation system. ***In response, ODOT is working to advance GHG mitigation strategies, including implementation of transportation electrification, alternative/low carbon fuels, and increasing accessibility to connected multi-modal transportation networks.***

In keeping with the focus of this report on freeway performance, including congestion and bottleneck areas, ODOT conducted analysis considering vehicle travel at all hours of the day (excluding weekends and holidays), including peak periods of traffic and times of free-flow conditions, to determine GHG emissions in each corridor and the impacts of traffic congestion on GHG emission rates. This is the first time ODOT has examined transportation emissions estimates across multiple corridors based on a mixture of observed speeds, the estimated mix of light-, medium-, and heavy-duty vehicles and modeled emission rates. See the Glossary for more information about the GHG analysis conducted and a description of the analysis methodology.

The single biggest driver of emissions, overall, is the number of vehicle miles traveled (VMT). Likewise, corridors with higher truck volumes also experience higher emission rates (measured in metric tons of CO2e per million vehicle miles traveled annually). Freeway congestion also directly correlates with increased GHG emissions. While the overall impact of areas with slower speeds was 2% of GHG emissions associated with freeway travel, the analysis indicated that corridors with slower speeds, due to more severe, recurring congestion bottlenecks, experience higher GHG emission rates than locations with higher peak period speeds. The network graphic above reflects the impact of slow speeds across the evaluated freeway corridor segments. Notable locations with an emissions surcharge of 10 percent or more include: I-5 in North Portland, the northern segment of I-405, and US 26 EB near the Vista Ridge Tunnel – all of which experience some of the slowest peak period speeds in the region.

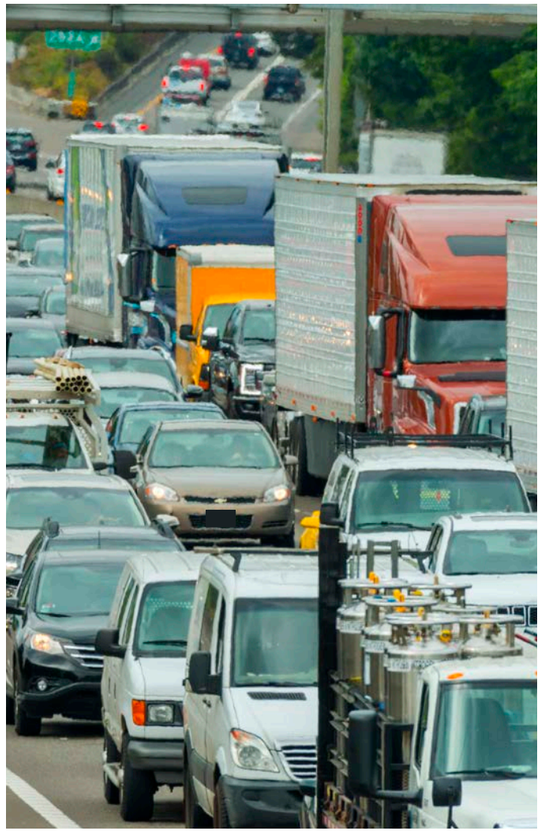
For more information about ODOT's emissions mitigation strategies, visit: https://www.oregon.gov/odot/Programs/Pages/Climate-Office.aspx.

Cost of Delay

Congestion is characterized by slower speeds, longer trip times and increased vehicle queuing on the available transportation network. The additional traffic burden of congestion affects a region's economy, resulting in a significant impact to employment. Truck deliveries connecting businesses throughout the state to the global marketplace are negatively impacted because of congestion. It is critical to continue to invest in the transportation network in order to protect andenhance the state's economy and quality of life. Additional investments would generate 8,300 jobs and $1.1 billion in non-monetary benefits in Oregon by year 2040.[6]

Many drivers experience the frustration of traffic congestion. This is caused by a few different factors, for example, limited capacity and the physical layout of the roadway. As the Portland metro region continues to grow, so will congestion, unless new tools are implemented. The daily cost of delay on freeways in the Portland metro region in 2019 was $1.2 million (delay refers to travel speeds below free-flow). This number reflects the cost of trucks and cars delayed on freeways and does not reflect the environmental impacts and health issues related to emissions.

Congestion can also affect a region's economy due to significant impact to employment. Businesses rely on efficient transportation to remain competitive in the global market. More than 346,400 jobs in Oregon are transportation-related or transportation-dependent,[7] meaning that congestion and lack of investment threaten the state's economic vitality.



Daily Cost of Delay		
Corridor Location	2019	Cost per Mile
I-5	$489K	$19K
I-84	$143K	$8K
I-205	$316K	$12K
I-405	$51K	$18K
US 26	$167K	$9K
OR 217	$81K	$12K

THE DAILY COST OF DELAY ON FREEWAYS IN THE PORTLAND METRO REGION IS **$1.2M** IN 2019

Evaluating new tools to manage congestion

In 2019, ODOT formed the Urban Mobility Office (UMO) to focus on comprehensive solutions to congestion, access and mobility issues, which affect quality of life and economic health. The UMO's immediate focus is developing and delivering innovative solutions for comprehensive congestion relief as directed by the Legislature in HB 2017 and HB 3055, including active development of a tolling and congestion pricing program.

The Toll Program is part of the Statewide Transportation Improvement Program and includes two planning projects: Interstate 205 in Clackamas County (OR 213 to Stafford Road) and a separate Regional Mobility Pricing Project that is considering the full corridor length of Interstate 5 in the Portland metro area and on I-205 extending from the limits of the I-205 toll project north to the Glenn Jackson Bridge and south to I-5. The planning/environmental analysis phase is expected to continue into 2022 for the I-205 Toll Project and 2023 for the Regional Mobility Pricing Project.

I-205 Tolling: During the past year, work has been focused on coordination with the Federal Highway Administration and partners, planning for the toll back office system, and coordination with the planned I-205 Abernethy Bridge reconstruction, seismic improvements and widening on I-205. ODOT initiated an Environmental Assessment for I-205 tolling under the federal National Environmental Policy Act during this period with modeling analysis and public engagement activities.

Regional Mobility Pricing Project: ODOT has initiated a federal Planning and Environmental Linkage (PEL) process under NEPA along I-5 in the Portland metro area. In December 2020, the Oregon Transportation Commission, under the direction of HB 2017, extended the toll corridor for this study to the full length of I-5 and I-205.

Upcoming ODOT and partner projects to address bottlenecks and safety hotspots

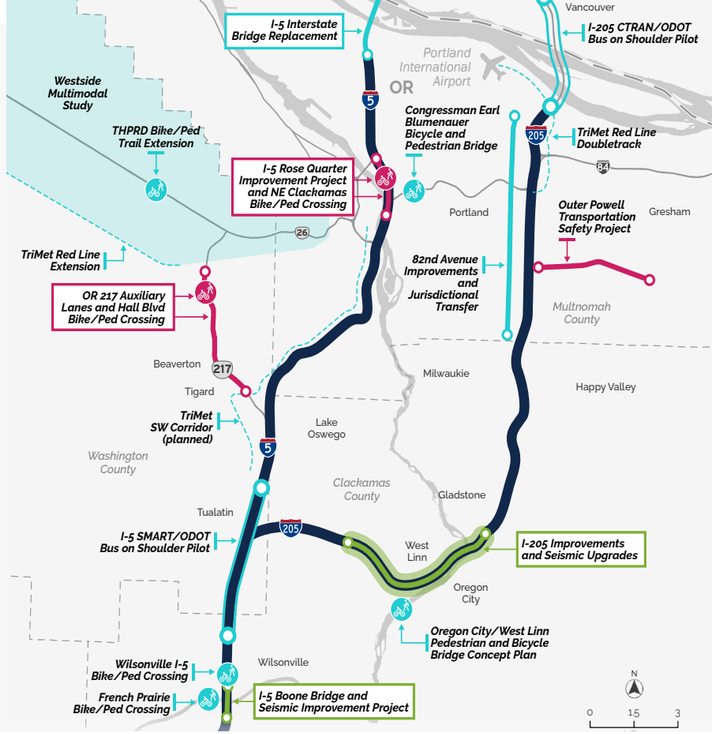
Comprehensive Congestion Management and Mobility Projects Map

Currently Funded by HB2017
- System Improvement Project
- Bike/Ped Crossing Project

Made Possible with HB3055
- System Improvement Project
- Regional Mobility Pricing Project
- I-205 Toll Project

Partner Project with ODOT Support
- System Improvement Project
- Bike/Ped Crossing Project
- Bus on Shoulder Pilot
- TriMet Project
- Multimodal Study

Note: Core project names are boxed



Evaluating the Benefits of Infrastructure Improvements

ODOT recently invested federal and state dollars into four freeway improvement projects designed to minimize existing congestion and prevent future bottlenecks. ODOT conducted a Before/After Study utilizing similar performance measures found in the Traffic Performance Report to analyze impacts of the improvements. Data from up to one year prior to construction compared to data from up to one year after the completion of construction prove a reduction in congestion and return on investment. This two-page spread shares a few highlights of each infrastructure improvement analyzed. For further information, please look to the appendix.

I-205 Northbound: I-84 Eastbound to Killingsworth Street

PROJECT CORRIDOR:

LENGTH: 1.05 mi

POSTED SPEED: 55 mph

CONSTRUCTION DATE: Dec 2017 – Aug 2019

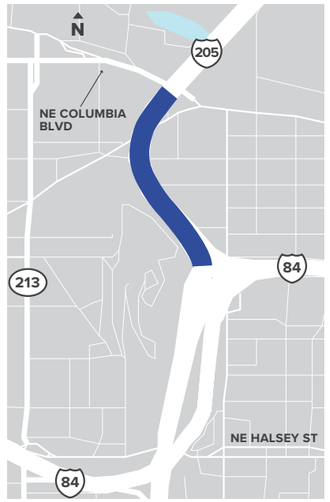
COST: $6.8M*

IMPROVEMENTS MADE:

- Added an auxiliary lane on I-205 northbound to connect the I-84 eastbound on-ramp to the US 30 Bypass West/ Killingsworth Street off-ramp.
- Added ODOT RealTime signs displaying traffic flow and roadway conditions.

11 MINUTE IMPROVEMENT IN TRIP RELIABILITY DURING THE PM PEAK

VALUE OF TIME SAVED: $6.7 MILLION ANNUALLY



RESULTS: This project included improvements over an approximately one-mile segment along northbound I-205. However, because congestion extended far to the south, the benefits are summarized over an approximately 11-mile segment (approximately Airport Way to OR 224) to capture the full impact of improvements.

I-205 Southbound: I-84 Eastbound to Powell Boulevard

PROJECT CORRIDOR:

LENGTH: 0.9 mi

POSTED SPEED: 55 mph

CONSTRUCTION DATE: Dec 2017 – Apr 2019

COST: $6.8M*

IMPROVEMENTS MADE:

- Added an auxiliary lane on I-205 southbound to connect the I-84 eastbound on-ramp to the Division Street/Powell Boulevard off-ramp.
- Added ODOT RealTime signs displaying traffic flow and roadway conditions.

HOURS OF CONGESTION: ↓2 HRS 45 MIN

VALUE OF TIME SAVED: $3 MILLION ANNUALLY

RESULTS: This project included improvements to a segment, just under one-mile long, along southbound I-205. But because congestion extended far to the north, the benefits are summarized over an approximately six-mile segment (approximately Foster Road to the Columbia River) to capture the full impact of improvements.

I-5 Southbound: Lower Boones Ferry Road to I-205

PROJECT CORRIDOR:

LENGTH: 1.9 mi

POSTED SPEED: 55 mph

CONSTRUCTION DATE: Feb 2018 – Oct 2018

COST: $10.4M*

IMPROVEMENTS MADE:

- Added a single south-bound auxiliary lane on I-5 from north of Lower Boones Ferry Road to I-205 to relieve congestion and reduce crashes.
- Reduced conflicts from merging movements and allowed for more direct connection for people travelling from OR 217 to I-205.

16 MINUTE IMPROVEMENT IN TRIP RELIABILITY DURING THE PM PEAK

VALUE OF TIME SAVED: $13.8 MILLION ANNUALLY

VEHICLE HOURS OF DELAY: ↓59%

CRASHES PER YEAR: ↓29%

RESULTS: This project was primarily intended to reduce congestion on I-5 southbound over a segment of just under two miles in length between Lower Boones Ferry Road and I-205. Travelers also experienced benefits upstream of this project, reaching as far as 3.2 miles up I-5 southbound and 1.3 miles up OR 217 southbound. This project represented the completion of efforts spanning nearly a decade to extend an auxiliary lane from the OR 217 southbound on-ramp to the I-205 off-ramp to lessen the impacts of traffic weaving between entrance and exit points in this area.

US 26: Cornelius Pass Road to 185th Avenue

PROJECT CORRIDOR:

LENGTH: 2.2 mi

POSTED SPEED: 55 mph

CONSTRUCTION DATE: Sep 2016 – Nov 2018

COST: $34.5 M*

IMPROVEMENTS MADE:

- Extended the third lane on US 26 in each direction between Cornelius Pass Road and 185th Avenue.
- Replaced the two US 26/ Rock Creek bridges with one bridge.
- Improved the north side of the US 26/ Cornelius Pass Road interchange by adding a second lane to the west-bound off-ramp.

RESULTS: This project included improvements to both directions of US 26 between Cornelius Pass Road and 185th Avenue. However, benefits shown below are for eastbound traffic conditions only.

AVERAGE WEEKDAY TRAVEL SPEED PM PEAK IN THE (3-6PM) +6.5MPH

VEHICLE HOURS OF DELAY: ↓53%

CRASHES PER YEAR: ↓30%

*I-5 and I-205 costs only include elements required in order to construct the auxiliary lanes (i.e., costs do not include paving outside the extents of the auxiliary lanes). The cost for US 26 is the full project cost as all project elements were required in order to add the lane, including the noise wall and bridge work.

Covid-19 Impacts on Region 1 Freeways

The long-term impacts of Covid-19 quarantines and restrictions and the resulting transportation impacts are still in a transition phase as the economy recovers, too new to be completely understood on a medium- to long-term timeline. There were noticeable impacts on travel demand over the course of 2020, with traffic volumes falling by over 40% at the peak of the statewide order to shelter-in-place. However, traffic volumes rebounded rather quickly when restrictions were lifted. At the conclusion of 2020, traffic in Portland was back to 80-90% of it's pre-Covid levels. Past observations have shown that economic activity is highly correlated with traffic in the Portland region. The stronger the economy, the higher the traffic volumes. As the economy continues to fluctuate in response to Covid-19 policies at the local and statewide level, regional traffic volumes are anticipated to fluctuate.

Percent Change in Weekday Traffic Volume between 2019 and 2020

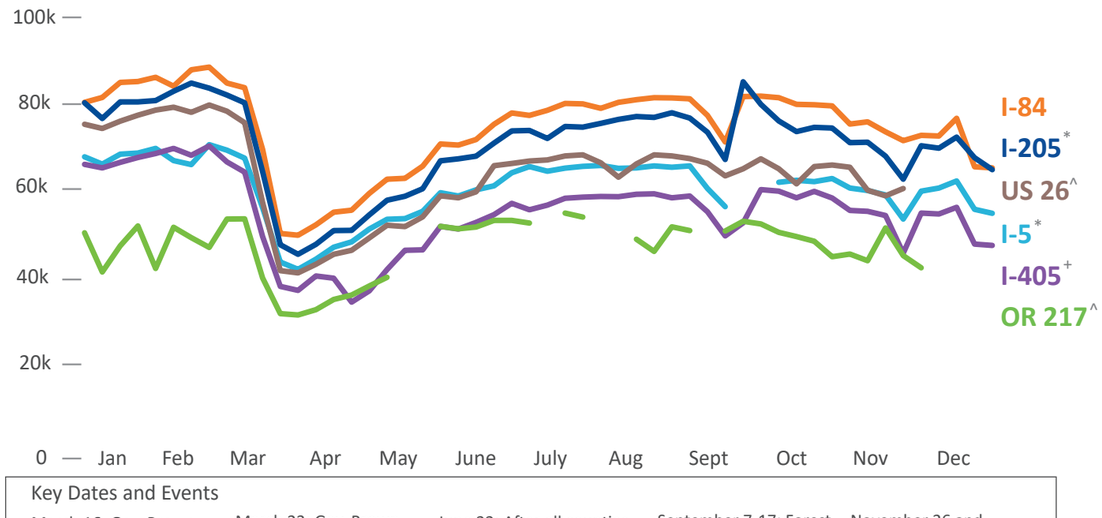
Source: ODOT

Corridor Location	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
I-5 NB	+1%	+5%	-39%	-35%	-25%	-16%	-14%	-12%	-9%	-11%	-13%	-11%
I-5 SB	+1%	+5%	-41%	-36%	-28%	-18%	-12%	-11%	-5%	-12%	-13%	-15%
I-84 EB	+1%	+14%	-37%	-34%	-26%	-17%	-12%	-10%	-4%	-7%	-14%	-15%
I-84 WB	0%	+21%	-36%	-33%	-23%	-12%	-5%	-4%	-2%	-3%	-8%	-9%
I-205 NB	-1%	+10%	-41%	-37%	-28%	-17%	-12%	-10%	-10%	-9%	-12%	-14%
I-205 SB	-13%	-3%	-42%	-38%	-28%	-18%	-15%	-12%	-10%	-8%	-14%	-15%
I-405 NB	-4%	+10%	-45%	-46%	-29%	-22%	-18%	-15%	-14%	-17%	-22%	-20%
I-405 SB	-5%	+7%	-44%	-42%	-43%	-23%	-17%	-14%	-14%	-15%	-20%	-17%
US 26 EB	-2%	+8%	-43%	-40%	-31%	-18%	-15%	-12%	-11%	-10%	-17%	-16%
US 26 WB	-1%	+10%	-47%	-43%	-35%	-20%	-20%	-15%	-14%	-17%	-20%	-19%
OR 217 NB	-1%	-1%	-37%	-39%	No Data	No Data	-14%	-11%	-5%	-14%	-14%	-18%
OR 217 SB	-1%	-3%	-35%	-35%	No Data	No Data	-10%	-10%	-10%	-14%	-11%	-14%

Weekday traffic volumes on freeways in Region 1 significantly dropped due to Covid-19 in mid-March, averaging a 40% decrease compared to the same time period in 2019. Traffic volume started to rebound on most corridors in April, and continued to increase in May and June. By summer, weekday traffic volume on freeways in 2020 averaged a 10-15% decrease compared to 2019. Some corridors even increased to less than a 10% difference between 2019 and 2020 in September and October. At the end of 2020, traffic volumes remained between 15-20% below 2019 traffic volumes with the exception of I-5 NB and I-84 WB where traffic volumes increased to about 10% below 2019 volumes.

Average Weekday Traffic Volume in 2020 by Freeway Corridor

Source: ODOT



Key Dates and Events

March 16: Gov. Brown institutes first round of restrictions due to Covid-19, including closing schools, closing recreational facilities and prohibiting indoor dining

March 23: Gov. Brown issues a stay-at-home order as the majority of businesses transition to remote work, all public facilities close and daycare facilities and schools close indefinitely

June 22: After all counties reopen to at least Phase 1 of restrictions, traffic volumes plateau

September 7-17: Forest fires in and around Region 1 affect traffic volumes due to evacuation orders and hazardous air quality

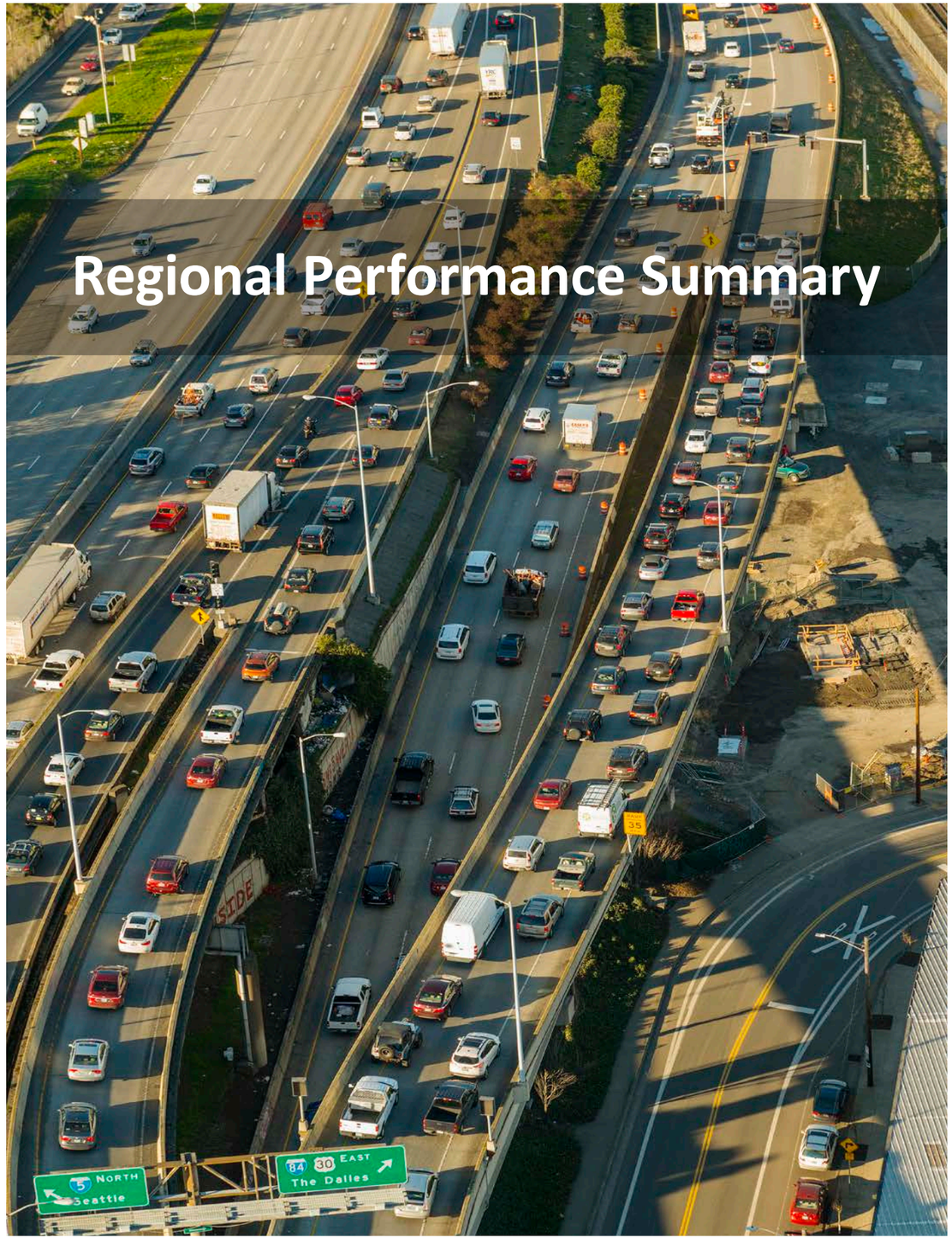
November 26 and December 24-31: Traffic volumes decrease during the Thanksgiving, Christmas and New Years holidays

** The Interstate Bridge Trunnion Replacement Project from September 20-September 29 temporarily removed traffic recording sensors resulting in a lack of data for I-5 while increasing volume on I-205 due to the I-5 closure.*
^ Data sensor outages resulting in a lack of data sporadically over the course of the year.
+ Construction along I-405 in the spring impacted traffic volumes.

Expectations

Long-range transportation forecasts attempt to take historical trends and extrapolate them into the future. It is important that the trends be observable over a period of time so that their long-term impact can be more accurately assessed. Until the region can get back to a stable level of economic activity, we won't be able to fully assess the extent of any long-term changes in travel behavior that might arise from the Covid-19 pandemic. This includes any significant moves towards tele-working and/or changes to regional transit system use. Absent compelling evidence that a new 'normal' has emerged, past experience has shown that assuming a return to pre-pandemic traffic volumes is both prudent and reasonable when planning for the medium- and long-term. ODOT will continue to track the impacts of Covid-19 on traffic conditions in Region 1.

Regional Performance Summary



Congestion

Performance indicators region-wide are compiled data from all freeway corridors. This is an overview of how the regional system is performing on the average weekday in 2019, not indicative of individual corridor performance.

The Portland region's freeways are experiencing SEVERE CONGESTION throughout the day, leading to EXTENSIVE DELAYS for travelers.

Daily Vehicle Miles Traveled (DVMT)

(Weekday Average in Millions)

12.5

DVMT is the cumulative number of miles traveled by all motorists on freeways. DVMT can be used as a measure of throughput. Generally, throughput will begin to decline as the system breaks down and drivers' tolerance for congestion is reached.

Daily Vehicle Hours Delay (DVHD)

(Combined Hours)

46.3K

DVHD is the total travel delay experienced by motorists on the freeways during an average weekday. Free-flow travel time was used as the congestion threshold for estimating DVHD, that is, any speeds below free-flow were used to indicate delay.

Hours of Congestion (HOC)

(Daily Hours)

23.0

HOC for the regional level is based on the average HOC reported for all corridors in both directions. This means that on an average weekday, the entire region is congested for 11.5 hours, or almost half the day.

Peak Period Speed

(MPH)

AM	Mid-day	PM
47	51	35

Average speeds and travel times are general measures of congestion. Speeds are well-below free flow speeds during AM and PM Peak Periods.

Peak Period Travel Time

(Minutes)

AM	Mid-day	PM
253	233	339

Average speeds and travel times are general measures of congestion. Free flow travel time (no congestion) would take 194.5 minutes to travel through the corridors. Clearly the region is congested throughout the day, with the PM Peak Period being the worst.

Reliability (Buffer Time)

(Minutes)

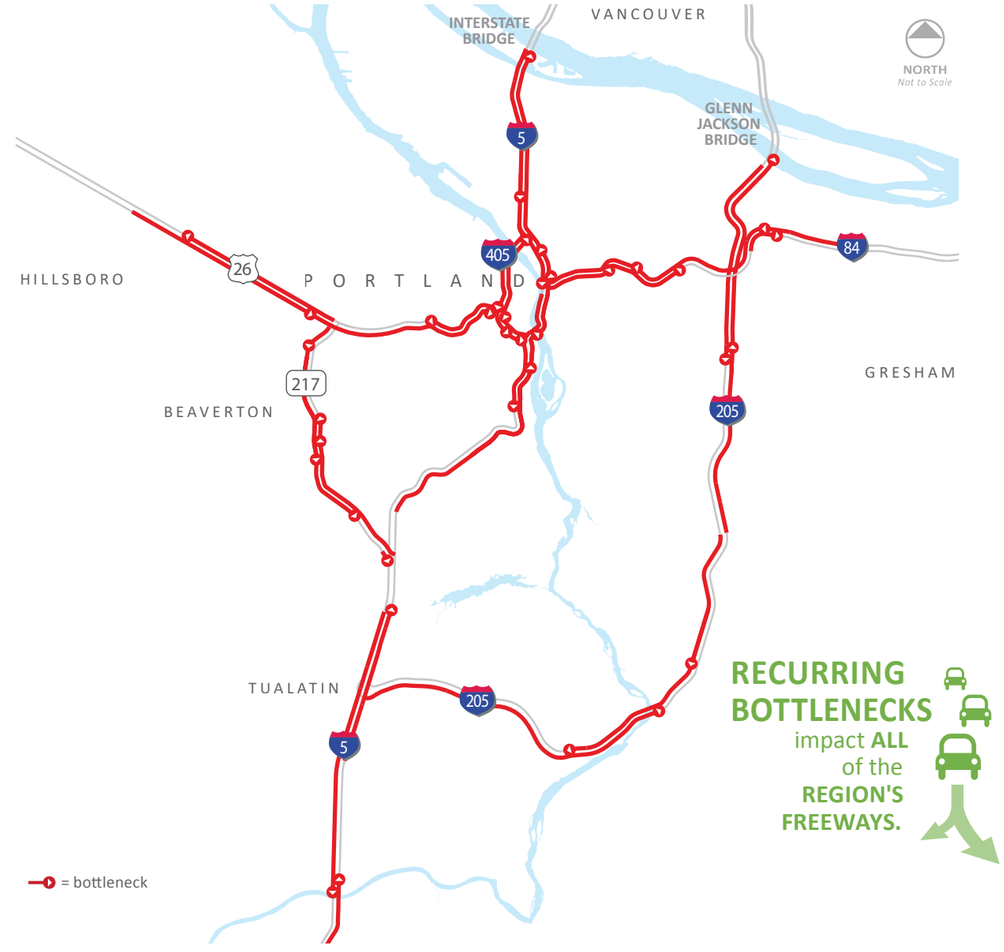
AM	Mid-day	PM
11	13	27

Regional trip reliability, or buffer time, in the PM peak is the worst, exceeding AM and mid-day reliability by about two times. While peak period speed and travel time are worse in the AM, mid-day buffer time exceeds AM buffer time, indicating a lack of reliable travel for motorists and freight drivers seeking off-peak opportunities.

Bottlenecks

Bottlenecks

2019
Source: INRIX data



RECURRING BOTTLENECKS impact **ALL** of the **REGION'S FREEWAYS.**

Recurring bottlenecks are freeway segments where traffic congestion regularly occurs. These areas are where motorists expect and routinely experience travel delays and slow speeds.

In 2019, recurring bottlenecks impacted all of the region's freeways throughout the day.

BOTTLENECKS occur during **ALL THREE PEAK PERIODS, CAUSING MAJOR DELAYS.**

Freight

Interstate Freight Routes

The major freight routes in Portland region are the interstate freeways: I-5, I-84, I-205 and I-405.

I-5 carries the highest freight volume, ranging from 11,700 to 20,800 trucks per day. It is the major north-south corridor for long-haul freight movement. In the northern corridor, it serves Port of Portland facilities and Portland International Airport. In the southern corridor, it serves the Tualatin-Wilsonville industrial area.

I-84 has freight volumes ranging from 7,600 to 11,600 trucks per day. It is the only interstate for east-west freight movement. It serves the Troutdale industrial area, Port of Cascade Locks, Port of Hood River, and adjacent states.

I-205 carries the second highest freight volume, ranging from 7,000 to 13,900 trucks per day. It also functions as a north-south corridor for long-haul freight movement. In the northern corridor, it serves the Portland airport and the Columbia industrial area. In the southern corridor, it serves the Oregon City and Clackamas industrial areas.

I-405 has freight volumes ranging from 10,400 to 10,900 trucks per day. It functions as an inter-urban freight route for the west side and US 30 industrial areas.

Freeway Freight Routes

US 26 and OR 217 are the two freeways that provide freight access to Washington County.

US 26 has freight volumes ranging from 3,300 to 7,200 trucks per day. It provides the east-west freight connection from the interstate system to western Washington County. Because of the location of high-tech industries in the Hillsboro area, freight from these industries are low-volume but high-value commodities.

US 26 is restricted from hauling hazardous material at the Vista Ridge Tunnel. Trucks carrying hazardous material are required to use OR 217 or Cornelius Pass Road.

OR 217 provides a north-south freeway freight route connecting Washington County freight to US 26 and I-5. It has freight volume of 4,200 to 4,300 trucks per day.

The major freight routes are also the most congested corridors, experiencing the highest level of delays and unreliable travel time.

Commodity Flows

Regional congestion and travel delay impact businesses throughout the state, threatening national and international competitiveness.[8] Buffer times in the mid-day period on the major freight routes are now consistently higher than in the AM peak period indicating ongoing issues with reliability of freight delivery to and through the Portland region throughout the day.

Many business owners report that they have changed to staggered shifts, added evening and overnight operations and are increasing operations during off-peak hours, with some delivery shifts now starting as early as 2 a.m.[9]

CONGESTION AFFECTS THE REGION'S ECONOMY, resulting in **REDUCED ECONOMIC COMPETITIVENESS** because businesses are **UNABLE TO RELIABLY MOVE** their goods and services.

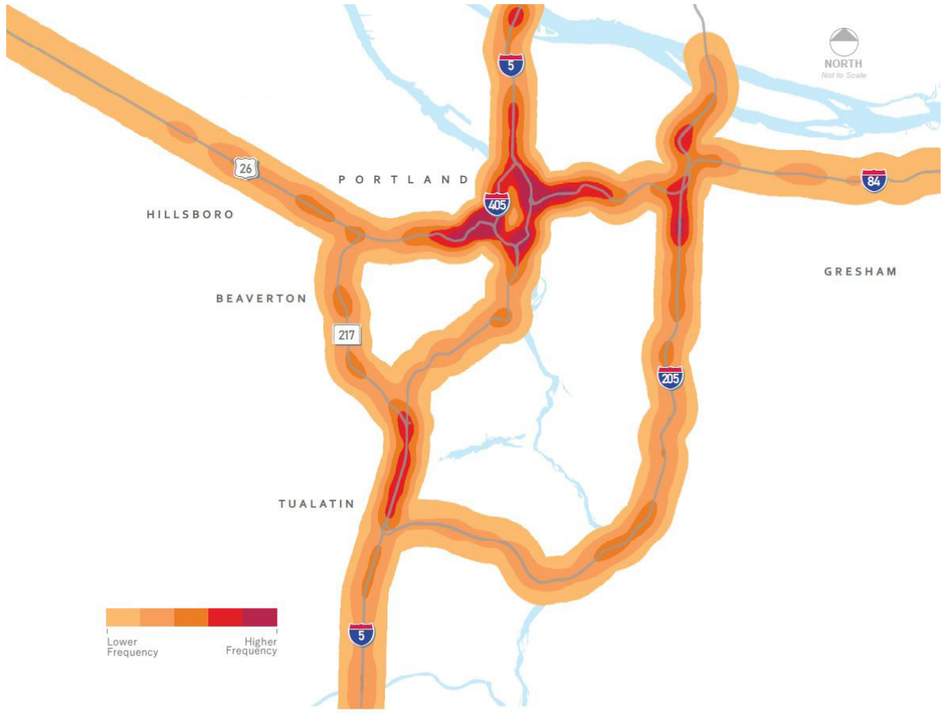
This results in increases to labor expenses, as operators need to hire additional drivers to cover the new shifts. These late-night shifts have potential to increase driver fatigue.

The region's top commodities by value are electronics, motorized vehicles, transportation equipment, machinery, textiles and chemical products and preparations, while the top commodities by weight are wood products, gravel and crushed stone, nonmetallic mineral products, cereal grains and other prepared foodstuffs, fats, and oils.

TRUCKS ARE THE MAIN LINK in the system, **CONNECTING BUSINESSES** throughout the state to the **GLOBAL MARKETPLACE** and providing the **"LAST MILE" CONNECTION** to inter-modal facilities.[10]

Safety

Crashes
2015-2019
Source: ODOT
ODOT crash trends are looked at over a 5-year period



Freeway high-crash hot-spots exist in areas with major system-to-system interchanges and at interchange entrance and exit ramps with high-traffic volumes.

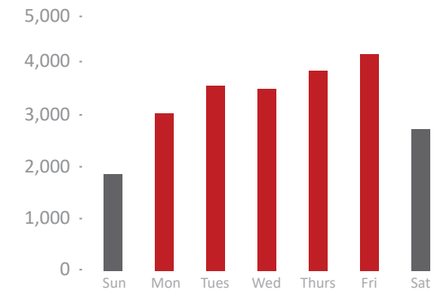
The majority of these crashes tend to be rear-end and side-swipe crashes in stop-and-go traffic conditions caused by recurring bottlenecks.

The Safety Priority Index System (SPIS) is a method for identifying high-crash locations on state highways based on crash frequency, rate, and severity. Specific SPIS sites are identified in the Corridor sections of this report.

Freeway crash hot-spots are directly related to areas of high congestion and recurring bottleneck locations. Crashes have declined or stabilized at locations where targeted improvements have been made to address operations and safety problems.

Bottleneck locations cause crash HOT-SPOTS which, in turn, further exacerbate congestion.

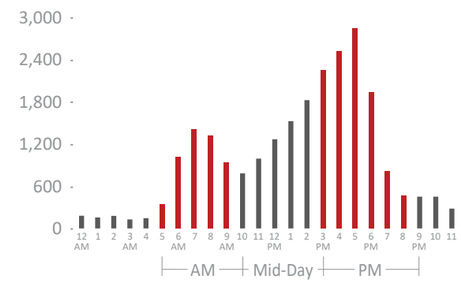
Freeway crashes by day of the week
2015-2019
Source: ODOT



Freeway crash frequency is found to be higher weekdays than weekends, with the exception of US 26 EB. Friday has the highest crash frequency in the region.

Higher traffic volumes at the end of the week result in HIGHER NUMBERS OF CRASHES on average.

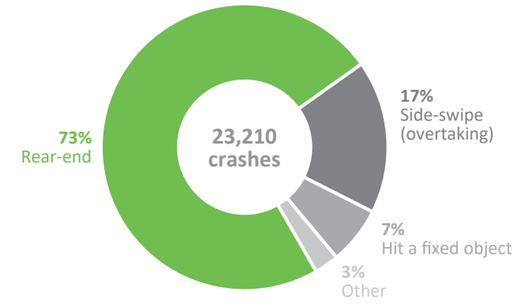
Crashes increase during rush hour
2015-2019, total crashes by time of day
Source: ODOT



More cars and congestion on the road correlate to more crashes. Crashes are more than twice as likely to occur during the PM peak period. As congestion increases and reliability degrades, the number of crashes will rise proportionally.

CRASH FREQUENCY INCREASES during congested peak periods.

Crashes by type
2015-2019
Source: ODOT



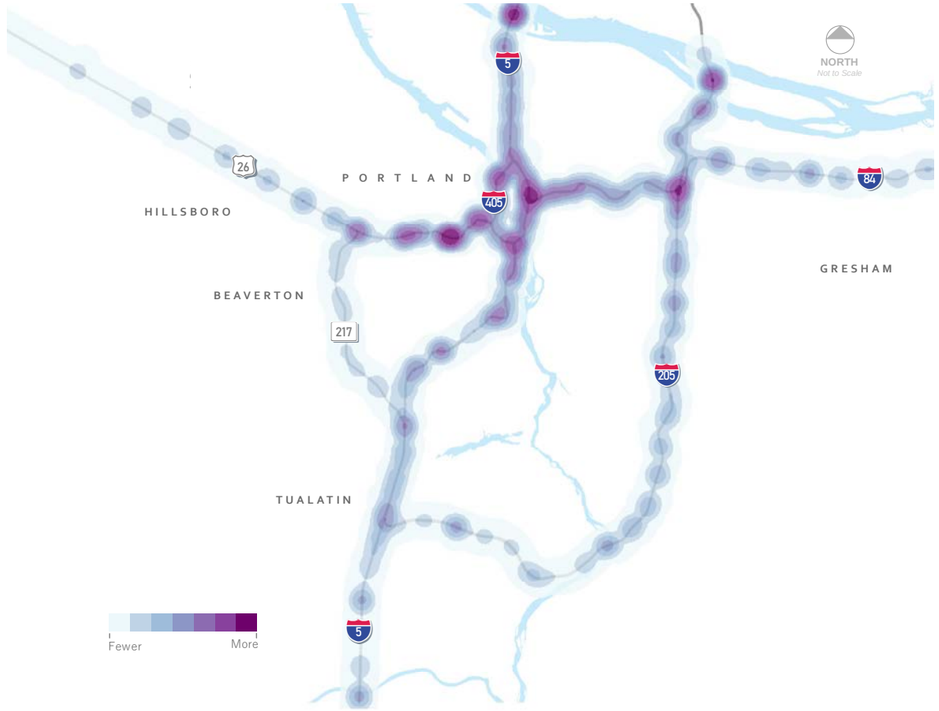
Rear-end and side-swipe crashes account for 90 percent of total crashes on the freeways; this is directly related to the stop-and-go conditions during congested peak periods.

Most REAR-END and SIDE-SWIPE CRASHES generally happen at recurring bottleneck locations.

Incidents

Incidents (Non-Crash)

2015-2019
Source: ODOT
ODOT crash trends are looked at over a 5-year period



Freeway incidents exist in areas with major system-to-system interchanges and at interchange entrance and exit ramps with high-traffic volumes. The majority of these incidents tend to be disabled vehicles and hazardous debris in stop-and-go traffic conditions.

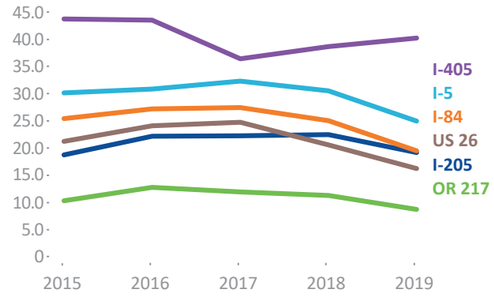
Freeway incident hot-spots are directly related to areas of high congestion and recurring bottleneck locations.

The frequency that non-crash incidents occur is higher on I-405, I-5, I-84 and US 26, which could be attributed to closely spaced interchanges and/or congestion.

Incident HOT-SPOTS are correlated to areas of high congestion and recurring bottleneck locations.

Freeway incidents (non-crash) by corridor

2015-2019, incidents per lane mile
Source: ODOT

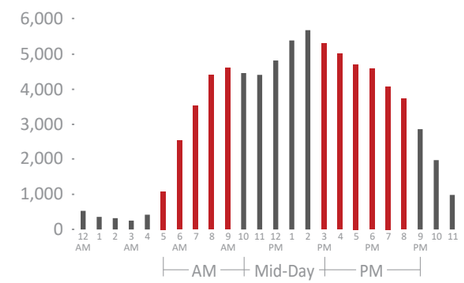


Corridors with higher levels of congestion and volumes have increased incidents. The majority of the incidents per lane mile are remaining the same or slightly decreasing.

Heavily traveled major corridors tend to have HIGHER NUMBERS OF INCIDENTS on average.

Incidents (non-crash) by time of day

2015-2019, total incidents by time of day
Source: ODOT

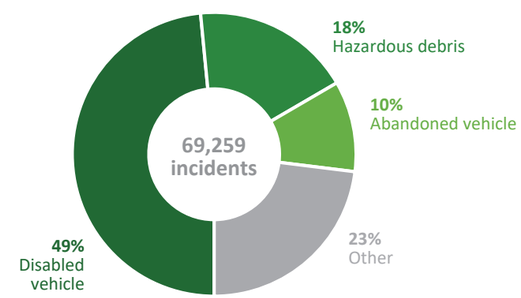


During the end of the mid-day and the shoulder PM peak period, the number of incidents is highest.

INCIDENT FREQUENCY INCREASES during mid-day and shoulder PM peak periods, contributing to congestion and less reliable travel.

Incidents (non-crash) by type

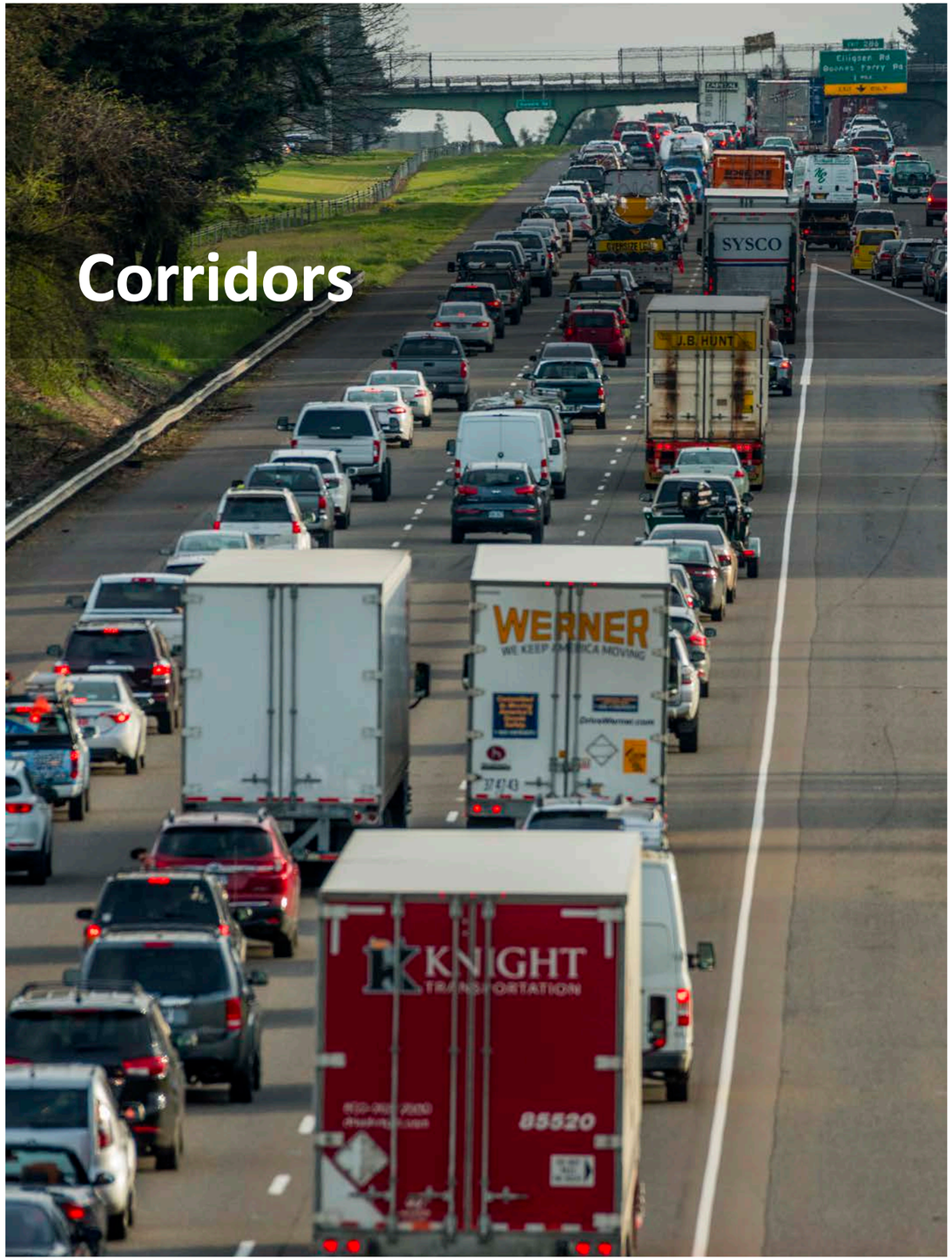
2015-2019
Source: ODOT



About half of the incidents occurring on the roadways are disabled vehicles, followed by hazardous debris and abandoned vehicles.

The corridors with the highest number of DISABLED VEHICLES are I-5 and US 26.

Corridors



The performance of each corridor is described in detail in this section.

Congestion and bottlenecks

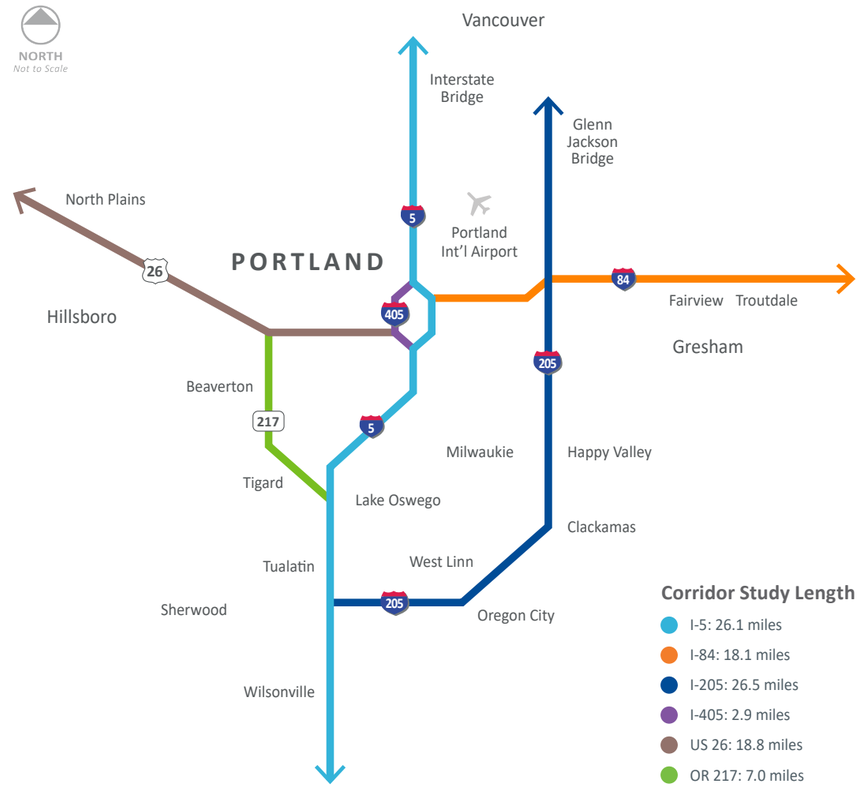
- Hours of congestion
- Vehicle hours of delay
- Travel time
- Speeds
- Recurring bottlenecks

Reliability

- AM
- Mid-day
- PM

Safety

- Crash frequency
- Crashes by time of day
- Crashes by type
- Non-crash incidents frequency
- Non-crash incidents by time of day
- Non-crash incident clearance time



I-5 Corridor Dashboard

Introduction

I-5 is the major spine running north and south through the center of the region. It carries the highest number of vehicles and has direct connections to all other regional freeways except US 26. I-5 is one of the longest corridors in the region at 26.1 miles in length and provides one of two routes over the Columbia River.

I-5 is an international link from Canada to Mexico carrying major freight and through traffic to all of the major cities on the West Coast. Many of the long distance trips are picking up or dropping off freight from the industrial areas in the region. This long-distance connection is especially critical for the Portland region and statewide businesses who rely on the corridor to fulfill daily business needs.

I-5 is also one of two corridors in the region (along with I-205) included in the Regional Mobility Pricing Project. This study is considering tolling in the full corridor length of I-5 and I-205 in the Portland metro area. The planning and environmental analysis phase for this study is expected to continue into 2023.

Recent/Current Improvements

Auxiliary lane

- I-5 SB: Lower Boones Ferry Road to I-205 Exit (completed in 2018, complementing the Carman Drive to Lower Boones Ferry Road auxiliary lane completed in 2012).
- I-5 NB Lower Boones Ferry Exit: widen ramp to accommodate two-lane exit (completed in 2018).

Active Traffic Management

- I-5 NB and SB: I-405 to the Interstate Bridge (completed 2020)
- I-5 NB and SB: Bus on Shoulder Pilot (2021)

Upcoming Improvements

Active Traffic Management

- I-5 NB and SB: Capitol Highway to Corbett Ave (2023)

Corridor Improvements

- I-5 at Rose Quarter: extending an auxiliary lane on I-5 SB to run continuously from Greeley to Morrison. A new NB auxiliary lane would be added to connect the I-84 on-ramp to the Greeley off-ramp.
- Interstate Bridge Replacement: Planning and Environmental Phase (2019-2024)
- I-5 Boone Bridge Replacement: Planning and Environmental Phase (2022-2024)

FREIGHT MOBILITY

I-5 has the highest truck volumes in the Portland region. Truck volume accounts for 9% to 14% of total traffic with a daily volume of 11,700 to 20,800 trucks. The top value commodities transported on I-5 are transportation equipment, motorized/other vehicles (including parts) and machinery, while top tonnage commodities are wood products and prepared foodstuffs (including fats and oils).

I-5 corridor highlights

Traffic

I-5 is the corridor with the highest number of daily vehicle miles traveled in the Portland metro region with one of the highest daily hours of congestion. On an average weekday in 2019, the daily vehicle miles traveled in the northbound direction was 1,852,000 and in the southbound direction was 1,839,000.

In the northbound direction, the weekday daily average for hours of congestion was 13.5 hours and the daily weekday vehicle hours of delay was 10,200. In the southbound direction, the weekday daily average for hours of congestion was 13.3 hours and the daily weekday vehicle hours of delay was 7,800.

Congestion and bottlenecks

Free-flow speed is calculated to be 63.5 mph with a free-flow travel time of 25 minutes for both NB and SB.

The most congested conditions occurred during the PM peak. In the NB direction, the average travel time for the corridor is 59 minutes in 2019, more than double free-flow travel time. In the SB direction, the average travel time for the corridor is 49 minutes in 2019, approximately double the free-flow travel time.

I-5 has more bottlenecks than any other corridor and bottlenecks occurred in both directions throughout the AM peak period, mid-day period, and PM peak period.

In the NB direction, between the Marquam Bridge and the Interstate Bridge there are multiple recurring bottlenecks with differing durations that overlap and extend from 6:30 a.m. to 8:00 p.m. In the SB direction, the most significant recurring bottleneck between Broadway and Rosa Parks begins in the AM and extends into the mid-day and PM, totaling over twelve hours of congestion during the day. These extended hours of congestion in both directions pose significant problems for freight.

Reliability

Reliability on the I-5 corridor is problematic in both directions and during all peak periods. When calculating the reliable travel time (the average travel time combined with the buffer time needed to ensure on-time arrival), the AM and mid-day periods are nearly double free-flow travel time and the PM peak period is more than triple free-flow travel time. Reliable travel time is consistently worse in the NB direction than the SB direction across peak periods. But travelers along I-5 must always allot a considerable amount of time to ensure they reach their destination on-time.

Calculating Reliable Travel Time on I-5

Distance: 26.1 miles
Free-flow Travel Time: 25 minutes

Worst Case: I-5 NB during 2019 PM Peak

	Average Travel Time	59 minutes
+	Buffer Travel Time	30 minutes
=	Reliable Travel Time	89 minutes

Safety

The crash trend is usually directly related to congestion and the reliability of the corridor. Crashes by time of day are concentrated during the mid-day through PM peak periods, which also are the most unreliable travel periods. Crashes by day of the week are highest on Fridays.

The majority of the total crashes on I-5 are rear-end (73 percent) and side-swipe/overtaking (19 percent), which are typical of congested conditions. The number of non-crash incidents has decreased, the majority of such incidents are disabled vehicles (49 percent).

I-5 Corridor Dashboard

Daily Vehicle Miles Traveled (DVMT)

I-5 has the highest DVMT in the region, which is partly attributable to the length and high traffic volumes of the corridor. DVMT is very similar for both NB and SB directions.

I-5 NB	1,852,000
I-5 SB	1,839,000

Daily Vehicle Hours Delay (DVHD)

I-5 has the highest combined DVHD in the region. DVHD on I-5 in the NB direction is significantly higher than in the SB direction, which can be attributed to the multiple, lengthy bottlenecks occurring in the AM, Mid-day, and PM hours.

I-5 NB	10,200
I-5 SB	7,800

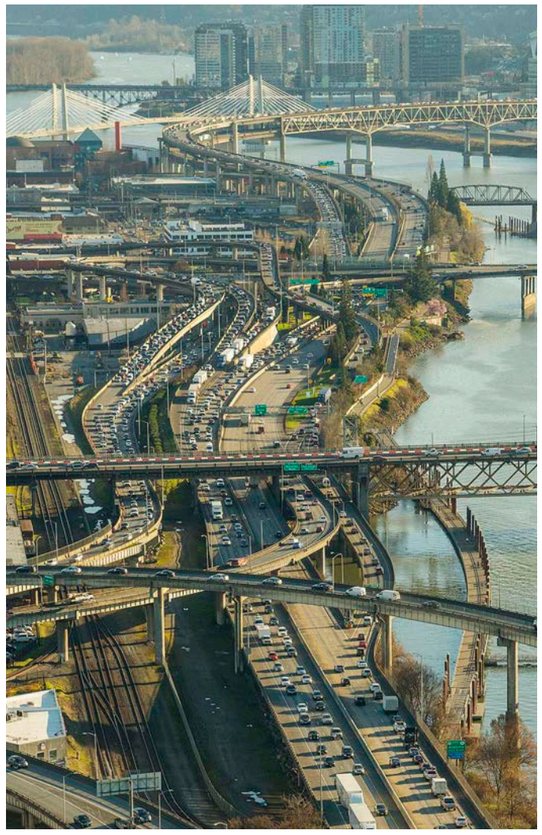
Hours of Congestion (HOC)

I-5 has the highest HOC in the region, with both NB and SB directions congested for more than half the day. The HOC are based on the longest duration bottleneck in the corridor.

I-5 NB	13.50
I-5 SB	13.25

Peak Period Speed

I-5 has some of the slowest speeds across all peak periods, particularly in the PM peak period. Speeds in the NB direction are consistantly slower than in the SB direction. Mid-day speeds are slightly better than AM speeds in both directions. In the PM peak period, speeds drop below 50% of free-flow conditions.



Speed *(in mph)*

	Year	Free-flow	AM peak	Mid-day	PM peak
I-5 NB	2019	63.5	43.5	46.2	26.1
I-5 SB	2019		45.7	48.7	30.3

Reliability

Peak Period Travel Times and Buffer Time

AM
AM travel time and buffer time indicate congestion on I-5 in both directions, particularly NB. In both directions, average travel time is approximately 10 minutes longer than free-flow travel time. Buffer time is slightly worse in the NB direction. Average planning time in either direction for the corridor approaches two times the free-flow travel time.

Mid-day
Mid-day travel time is similar to AM travel time, approximately 10 minutes longer than free-flow. Mid-day buffer time surpasses AM buffer time, creating an average planning time that is two times the free-flow travel time.

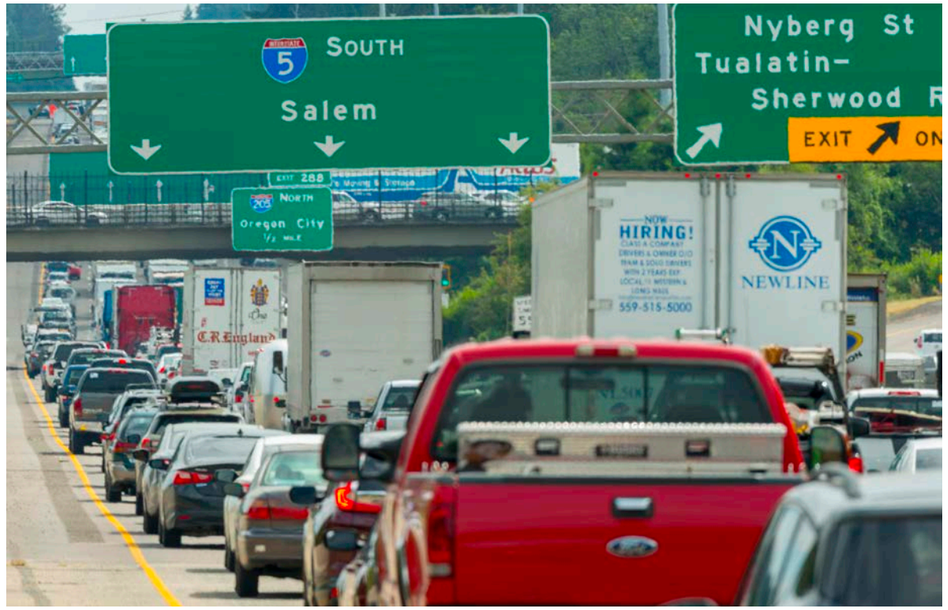
PM
PM travel time and buffer time show severe congestion in both directions of the corridor. In the NB direction, an average travel time of more than double free-flow with an exceedingly high buffer time results in more than triple the necessary planning time. While average travel time is slightly better in the SB direction, total planning time is triple the free-flow travel time.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
I-5 NB	2019	25	35.3	10.5	45.8	34.5	16.2	50.7	59.1	29.7	88.8
I-5 SB	2019		34.1	7.5	41.6	32.1	14.5	46.6	48.8	29.8	78.5

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

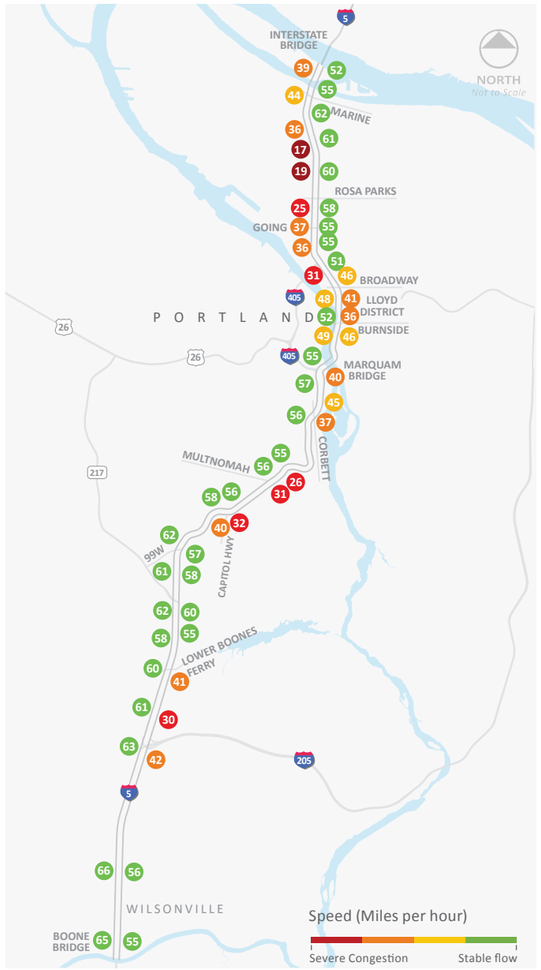
B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).



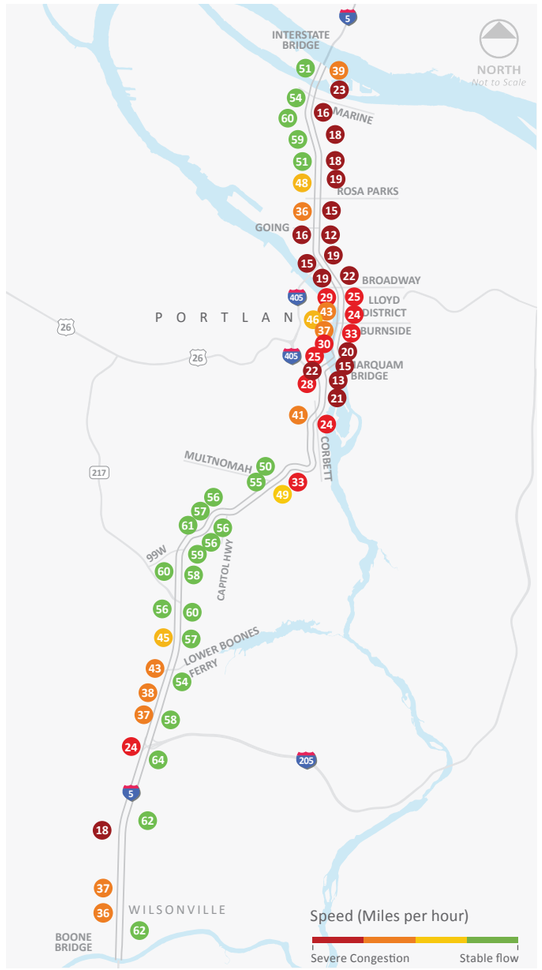
I-5 Corridor Dashboard

2019 average speed (mph)

AM weekday
7:00 a.m. to 9:00 a.m.
Source: INRIX data



PM weekday
4:00 p.m. to 6:00 p.m.
Source: INRIX data



AM WEEKDAY

SB direction slows through the city center from the Interstate Bridge.

NB direction slows from the Rose Quarter to Capital Highway and from Lower Boones Ferry Road past the I-205 interchange.

PM WEEKDAY

SB direction slows from Terwilliger to Rosa Parks Blvd and from the Boone Bridge to OR 217.

NB direction slows from the Interstate Bridge to Capitol Highway, especially from the Interstate Bridge to the Marquam Bridge through the Rose Quarter.

I-5 bottlenecks

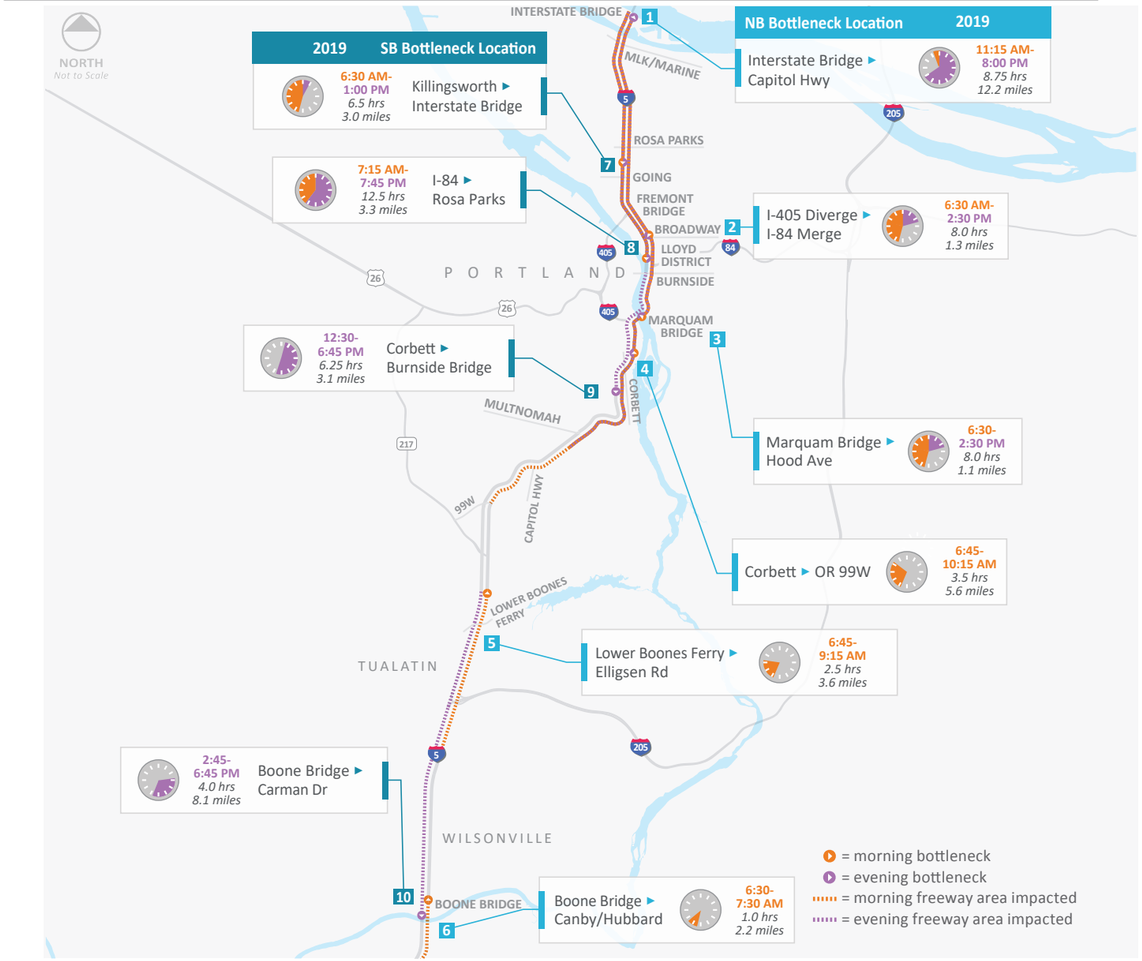
I-5 corridor has the most bottlenecks (10) of any freeway in the Portland region. The amount, queue length, and duration of bottlenecks on I-5 illustrates severe congestion on this corridor, particularly in the northbound direction where mutliple bottlenecks overlap.

The most significant northbound I-5 bottlenecks occur at the Interstate Bridge, Rose Quarter, Marquam Bridge/I-84, and Terwilliger Curves. They are caused by a variety of factors including freeway interchanges, geometry and lane drops.

The most significant southbound I-5 bottlenecks occur at the Interstate Bridge, Rose Quarter, and Boone Bridge. Overlapping queues result in more than twelve hours of congestion between Washington State and Downtown Portland.

How to Read a Bottleneck Map
Bottlenecks are labeled first by their "head," or location where the congestion begins to clear, and then by their "tail," or the distance congestion extends behind the "head".
Bottlenecks may have different queue lengths for peak periods and often overlap with each other during peak periods.

Duration of bottlenecks
2019
Source: INRIX data

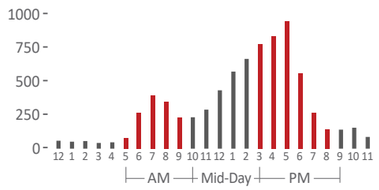


I-5 Corridor Dashboard

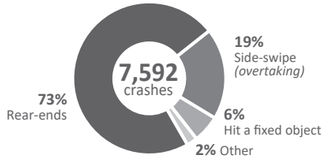
I-5 safety

I-5 had almost 7,600 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe (overtaking) crashes, which mainly occurred in the PM peak commute period. These types of crashes are typically the result of congestion. SPIS sites were identified based on crash frequency, crash rate and crash severity. There were 22 top 10 percent 2018 SPIS sites along the corridor.

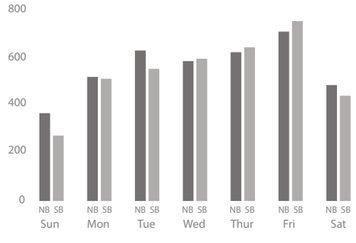
Total crashes by time of day
2015-2019
Source: ODOT



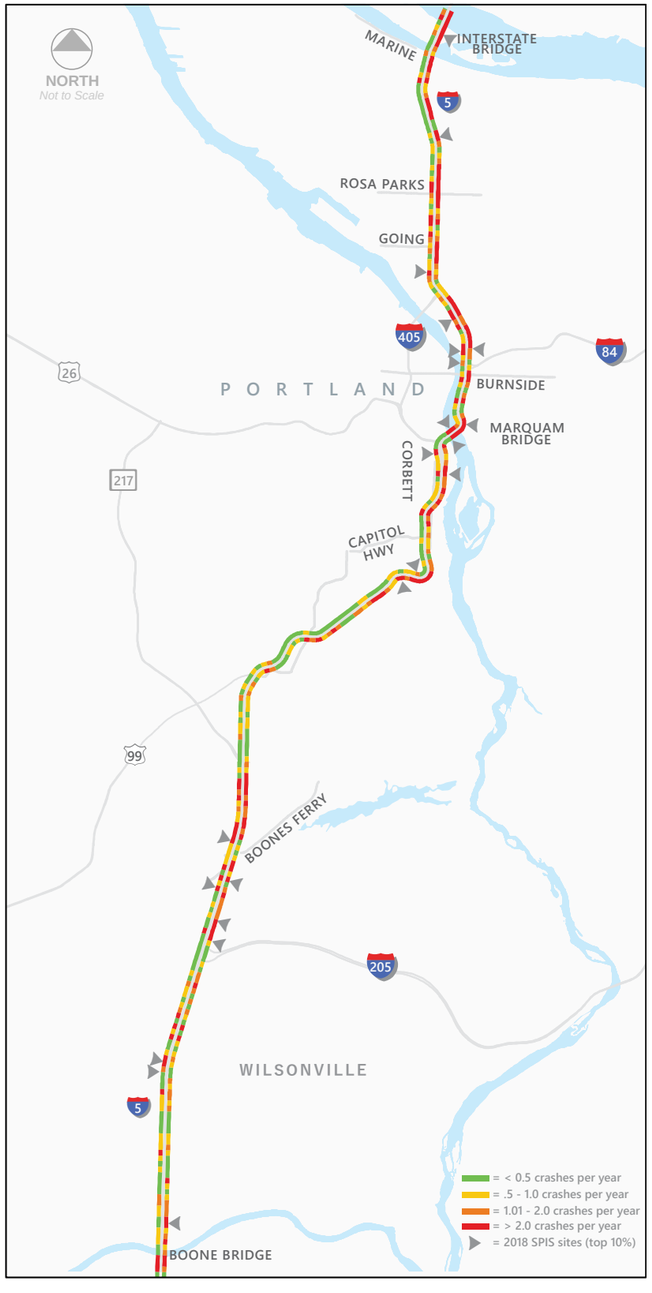
Type of crash
2015-2019
Source: ODOT



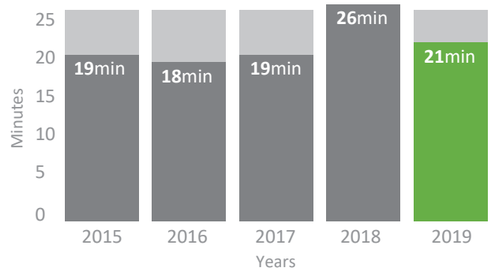
Total crashes by day of the week
2015-2019
Source: ODOT



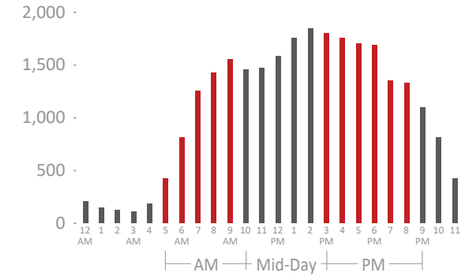
Crash frequency per 10th of a mile
2015-2019
Source: ODOT



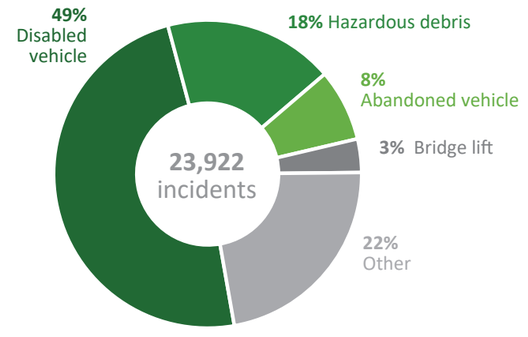
Incidents (non-crash) clearance times
2015-2019
Source: ODOT



Incident (non-crash) frequency by time of day
2015-2019, total incidents by time of day
Source: ODOT



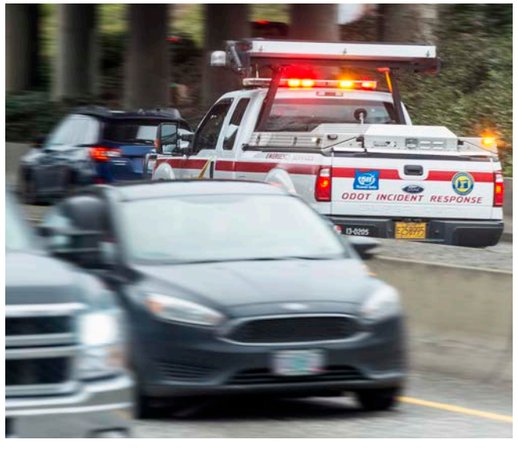
Incidents (non-crash) by type
2015-2019
Source: ODOT



The average time to clear an incident on I-5 is approximately 21 minutes. The top-left graph shows clearance times in minutes from 2015 through 2019. The response time for an incident depends on the nature of the incident. The major non-crash incident areas on I-5 are between the Marquam Bridge and Fremont Bridge, and the Interstate Bridge.

More cars and congestion on the road correlate to more incidents. There is a higher number of incidents occurring in the late mid-day and PM peak period, exacerbating congestion and unreliability in the corridor.

Disabled vehicle incidents account for 49 percent of non-crash incidents on I-5. This is followed by hazardous debris (18%) and abandoned vehicles (8%).



I-84 Corridor Dashboard

Introduction

I-84 is the only interstate east-west route in the Portland region connecting downtown Portland to the Columbia River Gorge, Central and Eastern Oregon, and other states east of Oregon. I-84 is the primary access point to the regional job-rich lands of the Columbia Corridor. The Columbia Corridor is the single largest industrial area in the state of Oregon. It covers 22,600 acres, or 28 square miles. The Corridor stretches 18.1 miles along the Columbia River from the Rivergate Industrial District on the Willamette River to the Troutdale Industrial District on the Sandy River.

The Blue, Red, and Green light rail lines run adjacent to I-84 between I-5 and I-205, and the Union Pacific Railroad parallels the corridor, providing alternative travel modes for goods and people.

Recent/Current Improvements

Active Traffic Management

- I-84 WB and EB: I-5 to I-205 (completed in 2018)

Road Treatments

- I-84 EB & WB: Install shoulder rumble strips (2021)

Upcoming Improvements

Paving Projects

- I-84 EB & WB: Fairview to Marine Drive, including a signal upgrade at NE 238th Ave (2022)
- I-84 EB & WB: between I-205 and 181st (2022)

FREIGHT MOBILITY

I-84 is a primary east-west interstate freight route with the third highest truck volume in the Portland region. Truck volume on I-84 accounts for approximately 5% to 21% of total traffic, with a daily volume of 7,600 to 11,600 trucks. The top value commodities transported on I-84 are machinery, electronics and other electrical equipment and components, and office equipment. The top tonnage commodities transported in the corridor are wood products.

I-84 corridor highlights

Traffic

I-84 is a congested corridor wth an average of twelve hours of congestion in both directions. On an average weekday in 2019, the daily vehicle miles traveled in the eastbound direction was 1,061,000 and in the westbound direction was 1,007,000.

In the eastbound direction, the weekday daily average for hours of congestion was 9.5 hours and the daily weekday vehicle hours of delay was 1,400. In the westbound direction, the weekday daily average for hours of congestion was 12.8. hours and the daily weekday vehicle hours of delay was 3,900.

Congestion and bottlenecks

Free-flow speed is calculated to be 63.3 mph with a free-flow travel time of 17 minutes for both EB and WB.

The segment of I-84 between I-5 and I-205 experiences the most congestion. In this segment, congestion is directional, with WB congestion occurring in the AM and PM and EB congestion occurring in the PM only. The most congested conditions in 2019 occurred on I-84 EB from 10:30 a.m. to 8:00 p.m. (9.5 hours).

In the PM peak, the average travel time for the corridor was 24 minutes for both directions. There is a bottleneck on I-84 WB from 47th Ave that extends to I-205 between 6:15 a.m. and 10:30 a.m. and a second bottleneck on I-84 WB from I-5 to 47th Ave between 6:30 a.m. and 7:00 p.m.

Reliability

Reliability on the I-84 corridor is a problem throughout all peak periods. In the westbound direction, average travel times are consistently higher than free-flow travel times with a buffer time ranging from six minutes to more than twelve minutes. In the eastbound direction, congestion mainly occurs in the PM peak. As reliability degrades throughout the day, it affects drivers' ability to reach their destinations on time.

Calculating Reliable Travel Time on I-84

Distance: 18.1 miles
Free-flow Travel Time: 17.0 minutes

Worst Case: I-84 WB during 2019 PM Peak

	Average Travel Time	**25 minutes**
+	**Buffer Travel Time**	**12 minutes**
=	**Reliable Travel Time**	**37 minutes**

Safety

The crash trend is usually directly related to congestion and the reliability of the corridor. Crashes by time of day are concentrated during the AM and PM peak periods, which also are the most unreliable travel periods. Crashes by day of the week and by direction show the majority of crashes occur in the WB direction and at the end of the work week. The majority of crashes on I-84 are rear-end (74 percent) and side-swipe/overtaking (16 percent), which are typical of congested conditions. The number of non-crash incidents is high, with the majority of such incidents on I-84 being disabled vehicles (56 percent).

I-84 Corridor Dashboard

Daily Vehicle Miles Traveled (DVMT)

I-84 DVMT continues to increase over time, with now more than a million miles each day. DVMT is very similar for both EB and WB directions, implying that both directions lead to frequent destinations for vehicles.

I-84 EB	1,061,000
I-84 WB	1,007,000

Daily Vehicle Hours Delay (DVHD)

I-84 DVHD demonstrates how the location of I-84 relative to the city center impacts traffic. DVHD on I-84 in the WB direction is more than double that of the EB direction.

I-84 EB	1,440
I-84 WB	3,880

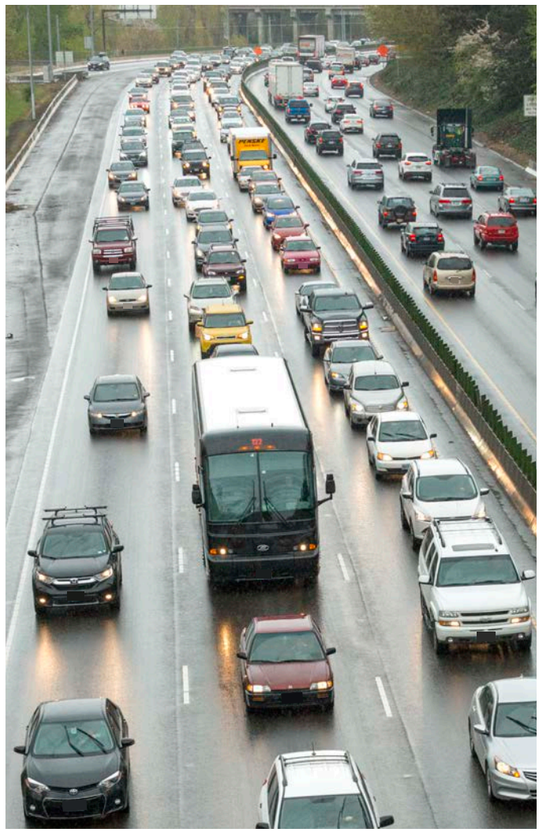
Hours of Congestion (HOC)

I-84 HOC illustrate severe congestion in the corridor, with almost half the day congested in both directions.

I-84 EB	9.50
I-84 WB	12.75

Peak Period Speed

Peak period speed on I-84 varies depending on direction. In the AM, as motorists head into Portland, peak period speed WB is significantly lower than peak period speed EB. In the PM, peak period speed is equally slow in either direction. While traffic east of I22nd Ave is usually freeflowing, traffic in between the I-5 interchange and I-205 interchange is severely congested for several hours of the day.



Speed *(in mph)*

	Year	Free-flow	AM peak	Mid-day	PM peak
I-84 EB	2019	63.3	59.2	55.6	45.4
I-84 WB	2019		40.4	52.0	44.4

Reliability

Peak Period Travel Times and Buffer Time

AM
AM travel time and buffer time indicate significant congestion on I-84 in the westbound direction (towards the city center), resulting in a reliable travel time more than double free-flow travel time. In the eastbound direction, average travel time is slightly above free-flow and the buffer time is negligible.

Mid-day
Mid-day travel time in the eastbound direction is slightly higher than in the AM. Mid-day travel time in the westbound direction is better than in the AM or PM, but still includes a buffer time of more than six minutes, indicating a lack of reliability westbound no matter the time of day.

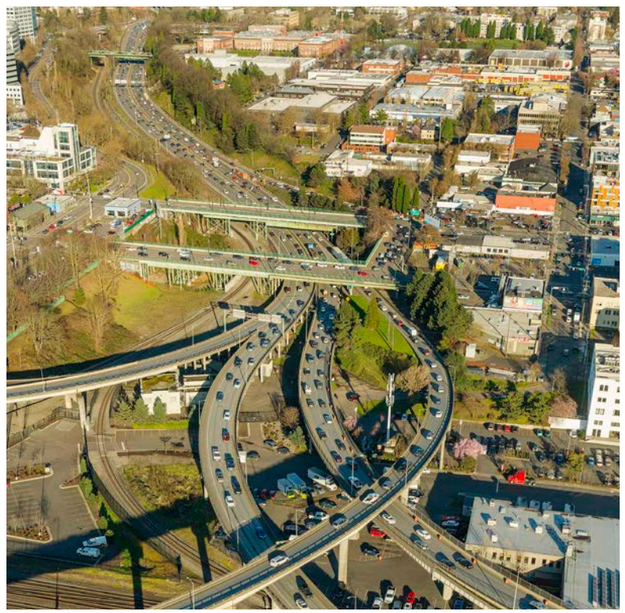
PM
PM travel time and buffer time show severe congestion in both directions of the corridor. In the eastbound direction, an elevated average travel time and buffer time of over four minutes results in a reliable travel time of more than ten minutes above free-flow. In the westbound direction, a buffer time of more than twelve minutes results in the highest reliable travel time for the corridor.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
I-84 EB	2019	17	18.3	1.2	19.5	19.5	1.8	21.3	23.9	4.3	28.2
I-84 WB	2019		26.9	7.9	34.8	20.9	6.1	27.0	24.5	12.4	36.8

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).



I-84 Corridor Dashboard

2019 average speed (mph)

AM weekday
7:00 a.m. to 9:00 a.m.
Source: INRIX data

AM WEEKDAY

WB direction slows from the city center to I-205.

PM weekday
4:00 p.m. to 6:00 p.m.
Source: INRIX data

PM WEEKDAY

EB direction slows from I-205 to I-5.

WB direction slows from I-5 to 33rd Avenue and at the I-205 split.

I-84 bottlenecks

I-84 bottlenecks are caused by junctions with or queue extensions from other facilities (I-5 and I-205). As the main connector between Eastern Oregon and Downtown Portland, bottlenecks exist near the city center at all times of the day as motorists commute.

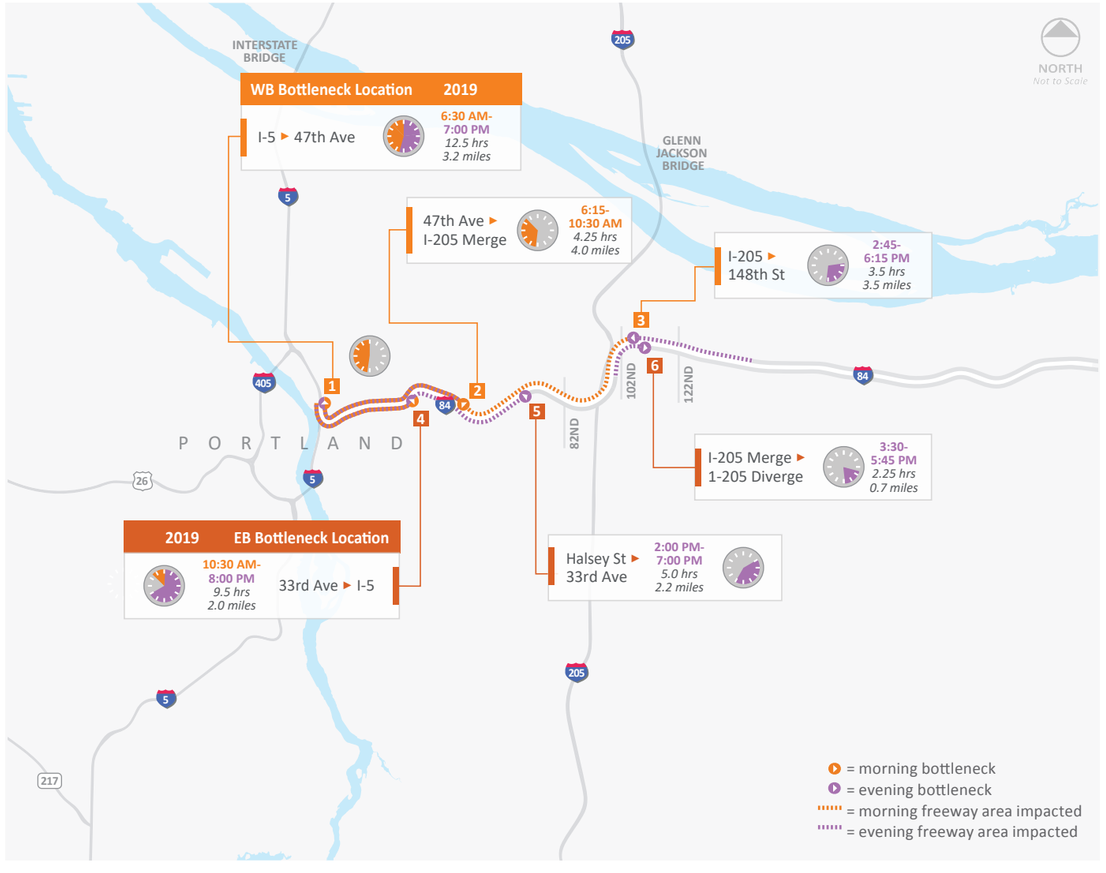
At I-5, bottlenecks exist WB across all peak periods, extending back to the I-205 interchange in the AM peak period, and in the EB direction during the mid-day and PM peak periods.

At I-205, queues extend back onto I-84 due to merge and weave capacity issues for I-84 EB to I-205 NB and I-84 WB to I-205 NB.

A single bottleneck EB from Halsey to 33rd Ave is caused by a confluence of on- and off-ramps and not by freeway-to-freeway interchanges.

How to Read a Bottleneck Map
Bottlenecks are labeled first by their "head," or location where the congestion begins to clear, and then by their "tail," or the distance congestion extends behind the "head".
Bottlenecks may have different queue lengths for peak periods and often overlap with each other during peak periods.

Duration of bottlenecks
2019
Source: INRIX data

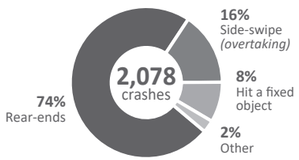


I-84 Corridor Dashboard

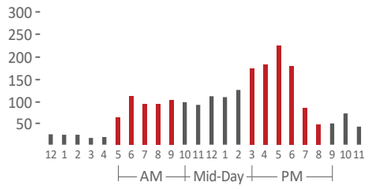
I-84 safety

I-84 had slightly more than 2,000 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe (overtaking) crashes, which mainly occurred in the AM and PM peak commute period. These types of crashes are typically the result of congestion. SPIS sites were identified based on crash frequency, crash rate and crash severity. There were ten top 10 percent 2018 SPIS sites along the corridor, most of which were located in the section between I-5 and I-205 where congestion is highest.

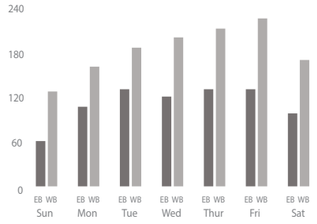
Type of crash
2015-2019
Source: ODOT



Total crashes by time of day
2015-2019
Source: ODOT

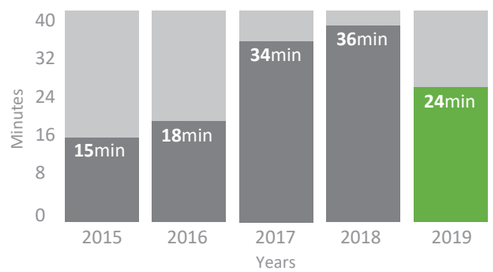


Total crashes by day of the week
2015-2019
Source: ODOT

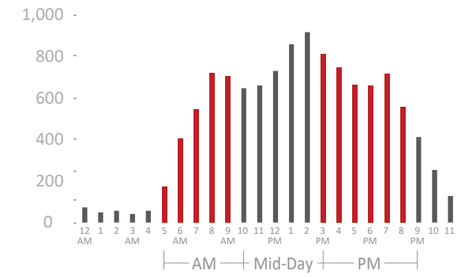


Crash frequency per 10th of a mile
2015-2019
Source: ODOT

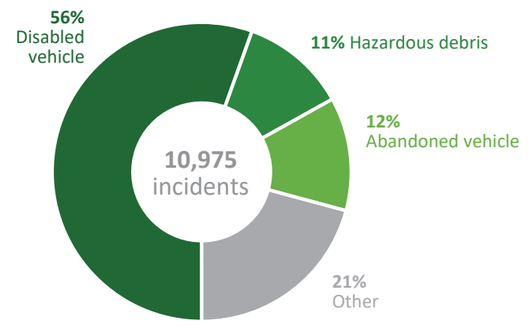
Incidents (non-crash) clearance times
2015-2019
Source: ODOT



Incident (non-crash) frequency by time of day
2015-2019, total incidents by time of day
Source: ODOT



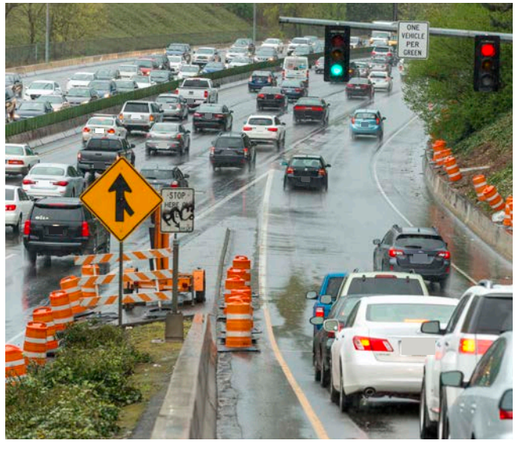
Incidents (non-crash) by type
2015-2019
Source: ODOT



The average time to clear an incident on I-84 is approximately 24 minutes. The top-left graph shows clearance times in minutes from 2015 through 2019. The response time for an incident depends on the nature of the incident. The major non-crash incident areas on I-84 are near the I-5 interchange and between 12th Avenue and 33rd Avenue.

More cars and congestion on the road correlate to more incidents. There is a higher number of incidents late mid-day to the PM peak period.

Disabled vehicle incidents account for 56 percent of non-crash incidents on I-84. This is followed by hazardous debris (11%) and abandoned vehicles (12%).



I-205 Corridor Dashboard

Recent/Current Improvements

Active Traffic Management

- I-205 NB and SB: Glenn Jackson Bridge to Johnson Creek Boulevard (2019)
- I-205 NB and SB: I-5 to OR 213 (2020)
- I-205 NB and SB: Bus on Shoulder Pilot (2020)

Auxiliary Lane

- I-205 NB: I-84 EB entrance to the Killingsworth Street exit (2019)
- I-205 SB: I-84 EB entrance to the Washington Street/ Stark Street exit (2019)
- I-205 NB: Powell Boulevard entrance to the I-84 WB entrance (2019)
- I-205 NB: Sunrise to Sunnybrook (2020)

Introduction

I-205 is one of the longest corridors in the region, at 26.5 miles in length, providing one of two routes over the Columbia River in the Portland metro region. I-205 continues north and connects back to I-5 near Salmon Creek, Washington, connecting the East Portland metro area to the Tualatin/Sherwood industrial area, Clackamas industrial area, and Portland International Airport, making it a corridor of economic importance in the Portland region and Oregon.

I-205 from the Willamette River near Oregon City to I-5 was constructed as a four-lane interstate. Consistent with regional planning, ODOT has widened the freeway to six lanes from I-5 to Stafford Road. The only remaining four-lane section is from Stafford Road to OR 99E. A project is planned to widen this section to six lanes.

The Red and Green light rail lines run adjacent to I-205 from Gateway Transit Station to the airport and from Gateway to Clackamas Town Center, respectively.

I-205 is one of two corridors in the region (along with I-5) included in the Regional Mobility Pricing Project. In addition, the I-205 Toll project is currently in an environmental phase, considering variable rate tolling of all lanes on I-205 near the Abernethy Bridge. The planning and environmental analysis phase for this project is expected to conclude in 2022.

Upcoming Improvements

Tolling

- I-205 Toll Project: Planning and Environmental Phase (2020-2022)

Infrastructure Improvements

- I-205 Improvement Project: Stafford Road to OR 213, including widening and seismic improvements to the Abernethy Bridge (design underway)

FREIGHT RELIABILITY

I-205 is a primary north-south interstate freight route providing an east-side alternative to I-5. I-205 carries the second highest truck volume in the Portland region with a daily volume of 7,000 to 14,000 trucks. This accounts for about 8% of total traffic on I-205. The top value commodities transported are motorized and other vehicles (including parts). The top tonnage commodities transported are wood products and gravel and crushed stone.

I-205 corridor highlights

Traffic

On an average weekday in 2019, the daily vehicle miles traveled in the northbound direction was 1,751,000 and in the southbound direction was 1,813,000.

In the northbound direction, the weekday daily average for hours of congestion was 10.8 hours and the daily weekday vehicle hours of delay was 7,900. In the southbound direction, the weekday daily average for hours of congestion was 7.5 hours and the daily weekday vehicle hours of delay was 3,800.

Congestion and bottlenecks

Free-flow speed is calculated to be 61 mph with a free-flow travel time of 25 minutes for both NB and SB directions.

The most congested conditions occurred during the PM peak, with the average speed in the NB direction among the lowest in the region. In the NB direction, the average travel time for the corridor is always longer than free-flow travel time, and more than double in the PM peak. In the SB direction, the average travel time for the corridor is always longer than free-flow travel time.

The most severe recurring bottleneck on I-205 NB was between Division and Sunnyside, lasting over 10 hours over the AM and PM peak periods. In the PM peak, the bottleneck starts further north at the Glenn Jackson Bridge, resulting in a queue that is over 11 miles long.

In the SB direction, the most significant recurring bottleneck extended from Powell Boulevard to the Airport Way. This bottleneck occurred from 2:30 p.m. to 6:30 p.m.

Reliability

Reliability on I-205 remains an issue apart from recently improved sections of the corridor. For both directions of I-205 in the AM peak and mid-day, the reliable travel time hovers around forty minutes. For the PM peak, reliable travel time in the northbound direction is nearly eighty-seven minutes, or more than triple free-flow travel time. In the southbound direction, reliable travel time in the PM peak is nearly fifty-seven minutes, or slightly more than double free-flow travel time. Travelers in this corridor have to plan ahead to ensure on time arrival at their destinations due to congestion.

Calculating Reliable Travel Time on I-205

Distance: 26.5 miles
Free-flow Travel Time: 25 minutes

Worst Case: I-205 NB during 2019 PM Peak

	Average Travel Time	54 minutes
+	**Buffer Travel Time**	26 minutes
=	**Reliable Travel Time**	81 minutes

Safety

Crashes by time of day are concentrated during the PM peak period, which is also the most unreliable travel period. Crashes by day of the week and direction show more crashes occur in the NB direction and at the end of the work week. The majority of total crashes on I-205 are rear-end (70 percent) and side-swipe/overtaking (16 percent), which are typical of congested conditions. Disabled vehicles and hazardous debris account for a majority of non-crash incidents on I-205 (36 percent and 29 percent respectively).

I-205 Corridor Dashboard

Daily Vehicle Miles Traveled (DVMT)

Congestion is steady on I-205 with a DVMT higher than the region average. DVMT is very similar for both NB and SB directions, implying that both directions lead to frequent destinations for vehicles.

I-205 NB	1,751,000
I-205 SB	1,813,000

Daily Vehicle Hours Delay (DVHD)

I-205 DVHD varies significantly depending on the direction of travel. DVHD on I-205 in the NB direction is more than double the DVHD in the SB direction, which can be attributed to the multiple, lengthy bottlenecks occurring throughout the day.

I-205 NB	7,930
I-205 SB	3,800

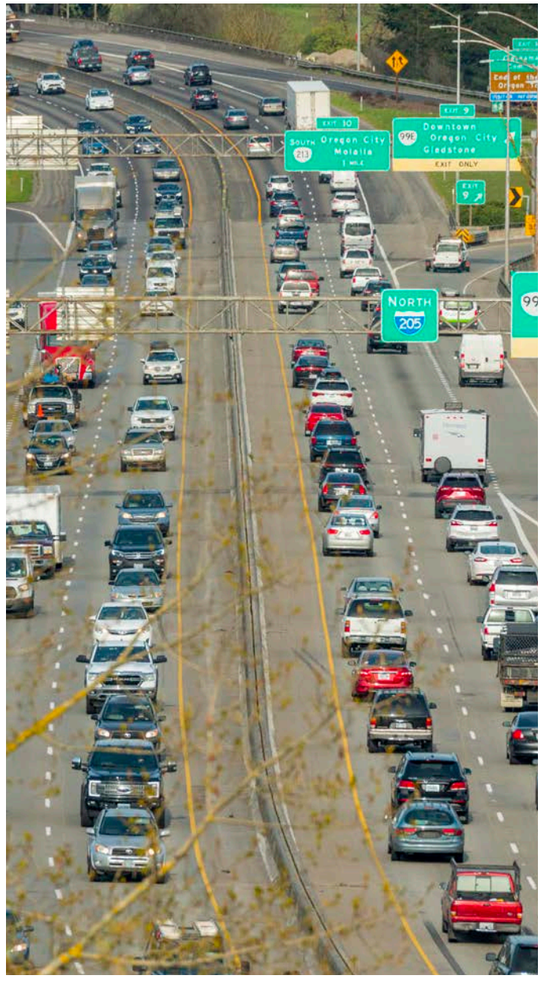
Hours of Congestion (HOC)

I-205 has HOC similar to I-84 and US 26, with nearly half the day experiencing congestion in both directions.

I-205 NB	10.75
I-205 SB	7.50

Peak Period Speed

I-205 NB in the PM Peak has one of the lowest average speeds in the region indicative of persistent severe congestion, with speeds in AM and Mid-day ranging from slow to congested. In the SB direction, Mid-day speeds are slightly better than the AM Peak, and slow down in the PM Peak.



Speed *(in mph)*

	Year	Free-flow	AM peak	Mid-day	PM peak
I-205 NB	2019	63.5	52.5	52.1	29.2
I-205 SB	2019		50.2	55.3	43.0

Reliability

Peak Period Travel Times and Buffer Time

AM
AM travel time and buffer time indicate nearly equal congestion on I-205 in both directions, with average travel time approximately 5 minutes above free-flow travel time. Reliable travel time in either direction for the corridor is well above the free-flow travel time.

Mid-day
Mid-day travel time is similar to AM travel time, approximately 10 minutes above free-flow. Mid-day buffer time is slightly higher than AM buffer time, still resulting in reliable travel time well-above free-flow travel time.

PM
PM travel time and buffer time show severe congestion in both directions of the corridor. In the NB direction, an average travel time more than double free-flow with a buffer time also exceeding free-flow results in a reliable travel time more than triple the free-flow travel time. Average travel time is better in the SB direction but still results in reliable travel time double the free-flow travel time.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
I-205 NB	2019	25	30.3	8.0	38.3	30.5	10.1	40.6	54.4	26.2	80.6
I-205 SB	2019		31.7	8.8	40.5	28.8	10.8	39.5	37.0	19.6	56.6

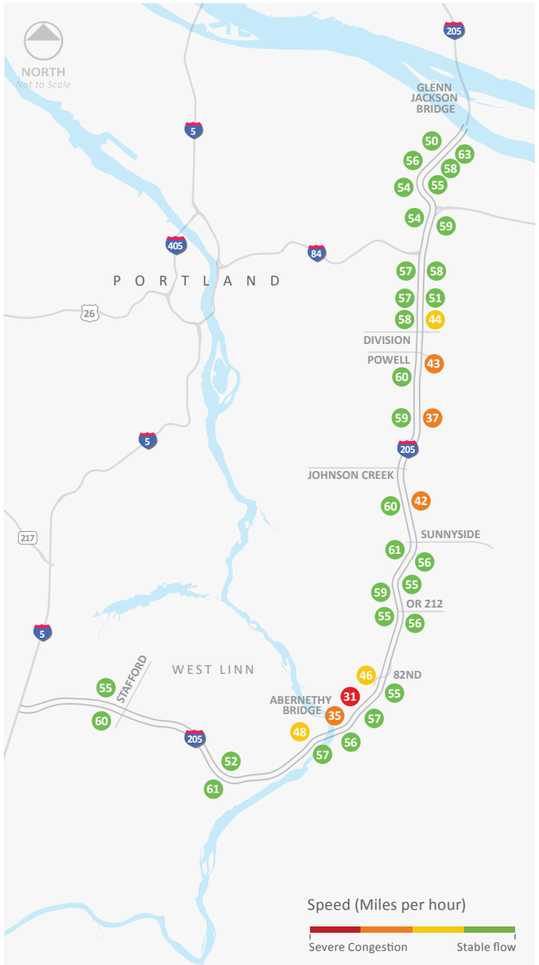
A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

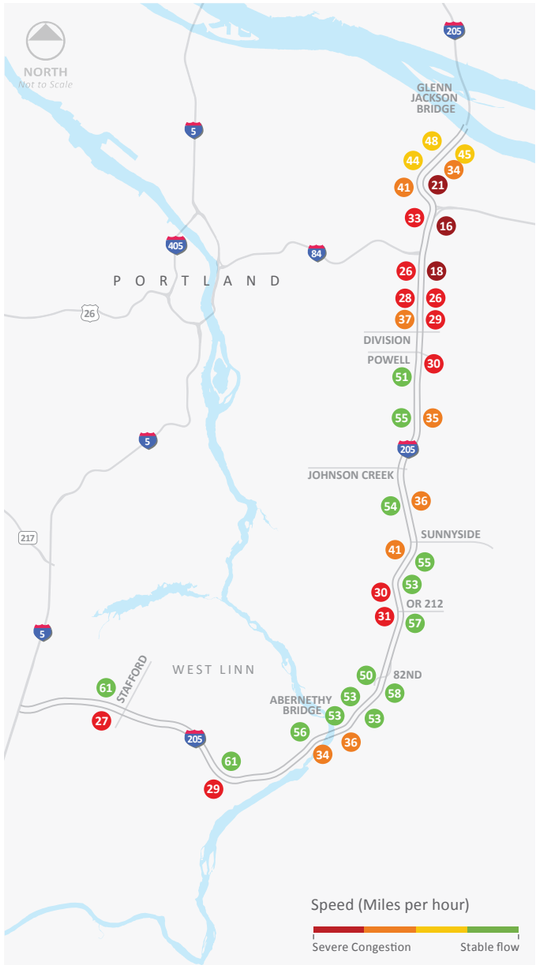
I-205 Corridor Dashboard

2019 average speed (mph)

AM weekday
7:00 a.m. to 9:00 a.m.
Source: INRIX data



PM weekday
4:00 p.m. to 6:00 p.m.
Source: INRIX data



AM WEEKDAY

SB direction slows from West Linn to 82nd Avenue.

NB direction slows from Division Street to Johnson Creek Boulevard.

PM WEEKDAY

SB direction slows in two general areas: Powell Boulevard to Glenn Jackson Bridge and 82nd Avenue through Sunnyside Road.

NB direction slows in two general areas: Abernethy Bridge to I-5 and Glenn Jackson Bridge to Sunnyside.

I-205 bottlenecks

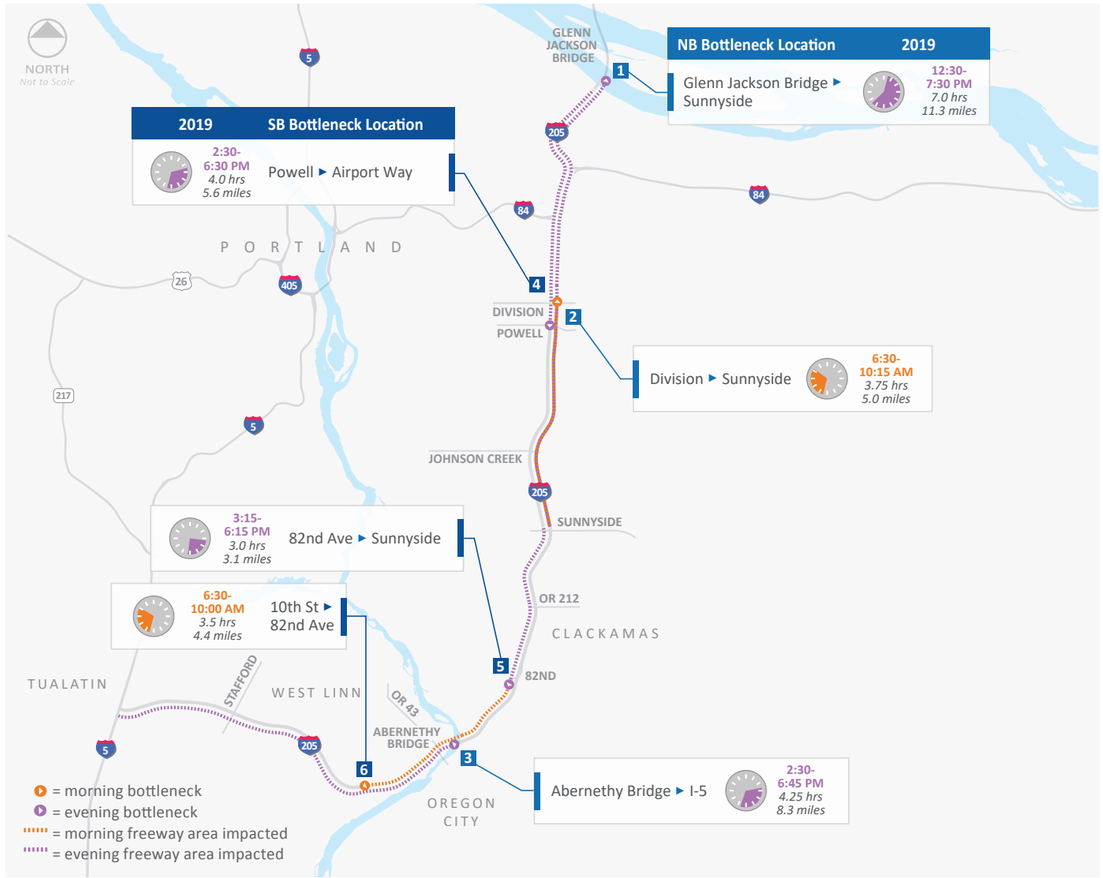
I-205 has six primary bottlenecks, three in each direction. Mutltiple bottlenecks are opposing by time of day and direction, such as AM congestion in the southbound direction across the Abernethy Bridge and PM congestion in the northbound direction across the Abernethy Bridge.

The NB I-205 bottlenecks are at Glenn Jackson Bridge, Division/Powell and Abernethy Bridge. The Glenn Jackson Bridge is congested for seven hours and reaches back to Sunnyside, representing the longest duration and queue length in the northbound direction.

The SB bottlenecks occur at Powell, 82nd Ave, and 10th St. The Powell bottleneck has the longest queue length and duration, encompassing the entire PM peak period and extending back to Airport Way.

How to Read a Bottleneck Map
Bottlenecks are labeled first by their "head," or location where the congestion begins to clear, and then by their "tail," or the distance congestion extends behind the "head".
Bottlenecks may have different queue lengths for peak periods and often overlap with each other during peak periods.

Duration of bottlenecks
2019
Source: INRIX data

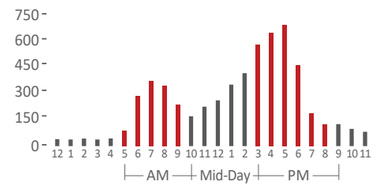


I-205 Corridor Dashboard

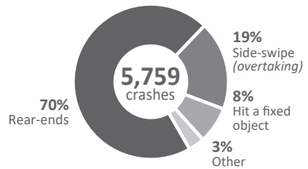
I-205 safety

I-205 had nearly 6,000 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe (overtaking) crashes, which mainly occur in the AM and PM peak commute periods. These types of crashes are typically the result of congestion. SPIS sites were identified based on crash frequency, crash rate and crash severity. There were 16 top 10 percent 2018 SPIS sites along the corridor.

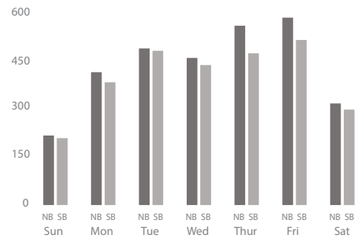
Total crashes by time of day
2015-2019
Source: ODOT



Type of crash
2015-2019
Source: ODOT

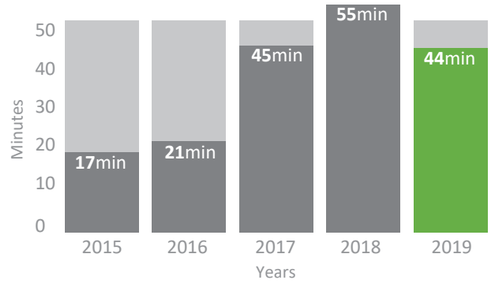


Total crashes by day of the week
2015-2019
Source: ODOT

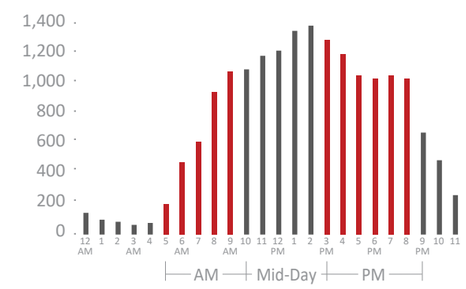


Crash frequency per 10th of a mile
2015-2019
Source: ODOT

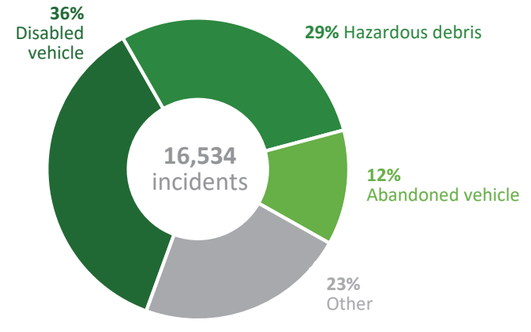
Incidents (non-crash) clearance times
2015-2019
Source: ODOT



Incident (non-crash) frequency by time of day
2015-2019, total incidents by time of day
Source: ODOT



Incidents (non-crash) by type
2015-2019
Source: ODOT



The average time to clear an incident on I-205 is approximately 44 minutes. The top-left graph shows clearance times in minutes from 2015 through 2019. The response time for an incident depends on the nature of the incident. The major non-crash incident areas on I-205 include the Glenn Jackson Bridge and the I-84 interchange.

More cars and congestion on the road correlate to more incidents. There is a higher number of incidents happening in the mid-day and PM peak period, exacerbating congestion in the corridor.

Disabled vehicle incidents account for 36 percent of non-crash incidents on I-205. This is followed by hazardous debris (29%) and abandoned vehicles (12%).

I-405 Corridor Dashboard

Introduction

Located on the west side of the Willamette River in Portland, I-405 is the west-side inner loop to I-5. It is the shortest interstate freeway in Portland with a total length of 4.2 miles in the densest part of downtown. For the purposes of this report, the study area of I-405 is 2.9 miles, excluding the interchanges with I-5. Most of the freeway was built below-grade, with sixteen overhead structures spanning the freeway. I-405 has eight interchanges which result in very short and closely spaced merge and diverge areas. Due to these constraints, the posted speed is 50 mph, which is 5-15 mph below other corridors in the Portland region.

I-405 connects I-84, US 26, US 30 and I-5. I-405 is heavily affected by traffic on I-5 and US 26, and as a result, is regularly congested. This effect is felt beyond I-405; any trips on the freeway system from the western metro area to the east side must use this route; for example, those traveling from Hillsboro to Portland International Airport.

The corridor has the highest number of crashes per mile in the Portland region; this is caused by high volumes of traffic weaving in short distances. Due to the limited right-of-way and constrained geometry, congestion and safety improvements are challenging.

Recent/Current Improvements

Active Traffic Management

- I-405 NB and SB: I-5 Marquam Bridge to I-5 Fremont Bridge (construction completed 2018)
- I-5 NB: I-405 to Marine Drive, adding VMS and VAS signs on the I-405 SB on ramp from Kerby Ave (2021)

Infrastructure Investments

- I-405 NB and SB: Repair or replace freeway and bridge joints at ramps (2020)
- I-405 NB and SB: Flanders Crossing (pedestrian/bike bridge) across I-405 (2021)

FREIGHT MOBILITY

I-405 is an urban interstate connector, linking I-5, US 26, and US 30. Truck volume accounts for approximately 8% to 9% of total traffic on I-405, with a daily volume of 10,400 to 10,900 trucks. The top value commodities transported on I-405 are textiles, leather, and articles of textiles or leather, as well as motorized and other vehicles (including parts). The top tonnage commodities transported are cereal grains and gravel and crushed stone.

I-405 corridor highlights

Traffic

I-405 is a severely congested corridor with extremely high traffic volumes despite the short length of the corridor. On an average weekday in 2019, the daily vehicle miles traveled in the northbound direction was 163,000 and in the southbound direction was 174,000.

In the northbound direction, the weekday daily average for hours of congestion was 5.5 hours and the daily weekday vehicle hours of delay was 1,000. In the southbound direction, the weekday daily average for hours of congestion was 7.5 hours and the daily weekday vehicle hours of delay was 900.

Congestion and bottlenecks

Free-flow speed is calculated to be 53.5 mph with a free-flow travel time of about three minutes for both NB and SB.

The most congested conditions in 2019 occurred during the PM peak. In the PM peak, the average travel time for the corridor in the NB direction is over 13 minutes and in the SB direction is more than 10 minutes. This is more than triple the free-flow travel time. Because this is a short corridor, the travel time degradation and duration may not seem significant, but I-405 has the slowest speed among all freeway corridors. The average speed in the PM peak drops to 21-24 mph in both directions.

In the NB direction, the most severe recurring bottleneck is at the Fremont Bridge, extending to the US 26 junction. This bottleneck lasts from 1:45 p.m. to 7:00 p.m. In the SB direction, the most significant recurring bottleneck extends from the south I-5 junction to the Fremont Bridge. This bottleneck lasts from 7:15 am to 10:15 am and again from 2:00 p.m. to 6:45 p.m.

Reliability

Reliability on the I-405 corridor is an issue. In the southbound direction, average travel time and buffer time remain elevated in the AM and Mid-day, culminating in nearly triple free-flow travel time in the PM Peak. In the northbound direction, reliable travel time increases throughout the day, with AM Peak close to free-flow, Mid-day slightly worse, and the PM Peak reliable travel time more than quadruple free-flow travel time. Travelers on I-405 face very unreliable travel time and must plan ahead to make it to their destinations on time.

Calculating Reliable Travel Time on I-405

Distance: 2.9 miles
Free-flow Travel Time: 3.1 minutes

Worst Case: I-405 NB during 2019 PM Peak

	Average Travel Time	**8 minutes**
+	**Buffer Travel Time**	**5 minutes**
=	**Reliable Travel Time**	**13 minutes**

Safety

Crashes by time of day are concentrated during the PM peak period, which is the most unreliable travel period. Crashes by day of the week and direction occur more regularly in the NB direction and near the end of the work week. The majority of the total crashes on I-405 are rear-end (68 percent) and side-swipe (overtaking) (26 percent), which are typical of congested conditions.

I-405 Corridor Dashboard

Daily Vehicle Miles Traveled (DVMT)

I-405 DVMT is low due to the extremely short length of the corridor (2.9 mile study area, excluding interchange ramps), but in reality is just as heavily traveled as the other corridors.

I-405 NB	163,000
I-405 SB	174,000

Daily Vehicle Hours Delay (DVHD)

I-405 has a DVHD comparable to other corridors given the free-flow travel time of the short corridor. The DVHD demonstrates severe congestion in the corridor.

I-405 NB	970
I-405 SB	930

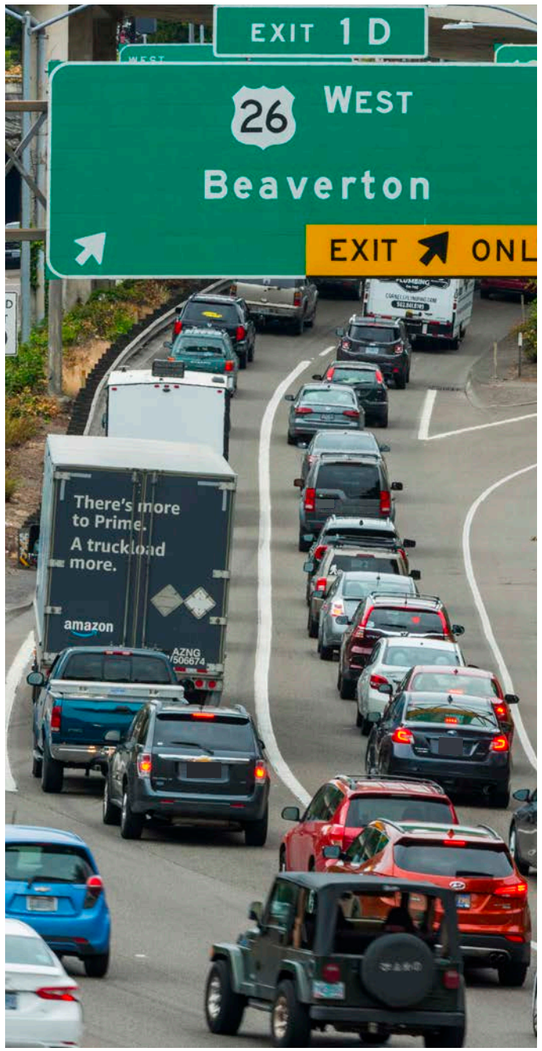
Hours of Congestion (HOC)

I-405 HOC are higher in the SB direction due to degraded travel time throughout the day. In the PM peak, the HOC are worse in the NB direction.

I-405 NB	5.50
I-405 SB	7.75

Peak Period Speed

I-405 has the slowest speeds across the PM Peak period in the region. Speeds in the NB direction worsen throughout the day. In the SB direction speeds are consistently slow throughout AM and mid-day peak periods, with the PM Peak severely congested.



Speed *(in mph)*

	Year	Free-flow	AM peak	Mid-day	PM peak
I-405 NB	2019	55.7	51.6	46.2	21.1
I-405 SB	2019		41.2	45.1	24.3

Reliability

Peak Period Travel Times and Buffer Time

AM
AM travel time and buffer time indicate congestion on I-405 in the SB direction, with nearly double the free-flow travel time required for on-time arrival.

Mid-day
Mid-day travel time is similar for both the NB and SB directions, with a slightly elevated average travel time and buffer time of about one and a half minutes. This creates a reliable travel time of more than two minutes above free-flow travel time.

PM
PM travel time and buffer time show severe congestion in both directions. In the NB direction, a high average travel time and buffer time results in a planning travel time that is more than quadruple the free-flow travel time. Average travel time is slightly better in the SB direction but still results in a planning time more than triple the free-flow travel time.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
I-405 NB	2019	3.1	3.4	0.3	3.7	3.8	1.4	5.2	8.2	5.1	13.4
I-405 SB	2019		4.2	1.4	5.6	3.9	1.6	5.4	7.2	3.5	10.7

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

I-405 Corridor Dashboard

2019 average speed (mph)

AM weekday
7:00 a.m. to 9:00 a.m.
Source: INRIX data

PM weekday
4:00 p.m. to 6:00 p.m.
Source: INRIX data

AM WEEKDAY

SB direction slows from US 26 (exit to Ross Island) to the Fremont Bridge.

NB direction slows from US 26 to the Marquam Bridge and at the Fremont Bridge.

PM WEEKDAY

SB direction slows from I-5 to the Fremont Bridge.

NB direction slows from the Fremont Bridge to I-5.

I-405 bottlenecks

The I-405 corridor is consistantly congested due to the system interchanges at I-5 and US 26. In fact, I-405 is congested on the average weekday from 3:15PM-6:15PM for motorists traveling on most segments of the corridor in either direction.

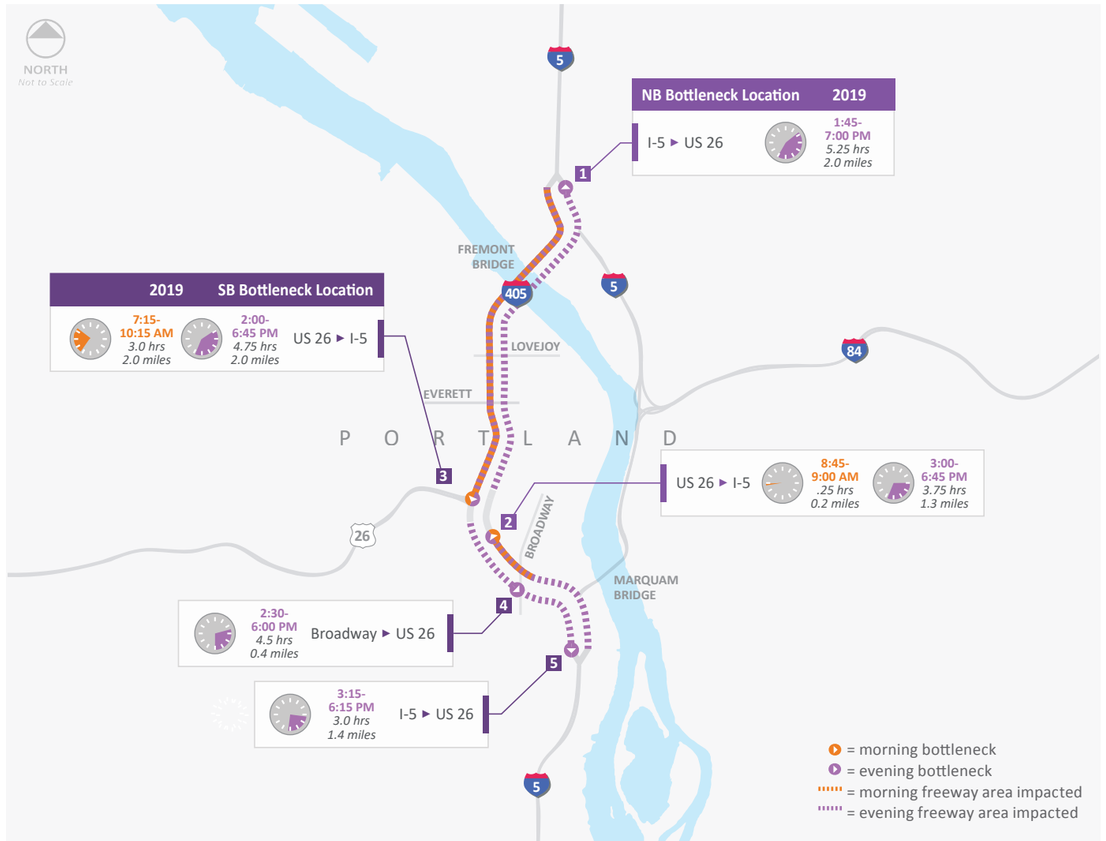
Northbound bottlenecks exist primarily in the PM, with the area from the US 26 merge to the I-5 diverge congested throughout the mid-day and into the PM peak period. A bottleneck recurs at various times during the day from the I-5 merge to the US 26 diverge.

I-405 SB bottlenecks also exist primarily in the PM, with merge points to US 26, the Ross Island Bridge, I-84, and I-5 consistantly creating bottlenecks. The area between the I-5 diverge and US 26 merge is also a bottleneck in the AM as traffic moves through and to Downtown Portland.

How to Read a Bottleneck Map

Bottlenecks are labeled first by their "head," or location where the congestion begins to clear, and then by their "tail," or the distance congestion extends behind the "head".
Bottlenecks may have different queue lengths for peak periods and often overlap with each other during peak periods.

Duration of bottlenecks
2019
Source: INRIX data

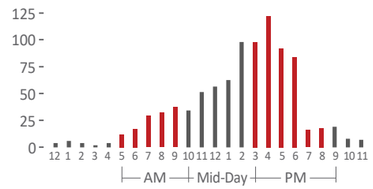


I-405 Corridor Dashboard

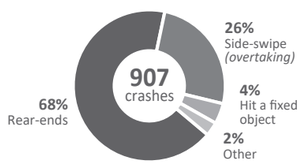
I-405 safety

I-405 had a total of 907 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe (overtaking) crashes, which mainly occur in the PM peak commute period. These types of crashes are typically the result of congestion. SPIS sites were identified based on crash frequency, crash rate and crash severity. There were four top 10 percent 2018 SPIS sites along the corridor.

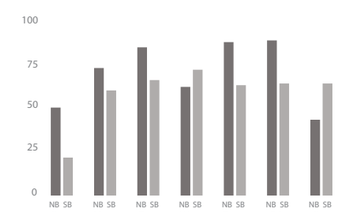
Total crashes by time of day
2015-2019
Source: ODOT



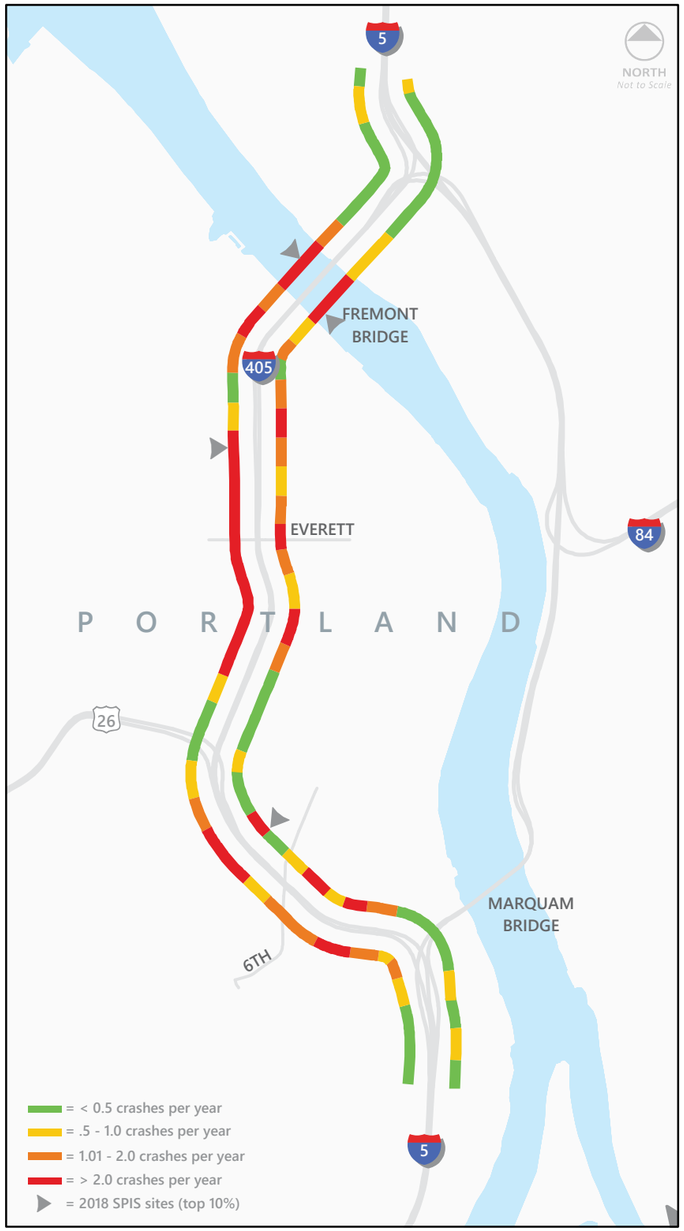
Type of crash
2015-2019
Source: ODOT



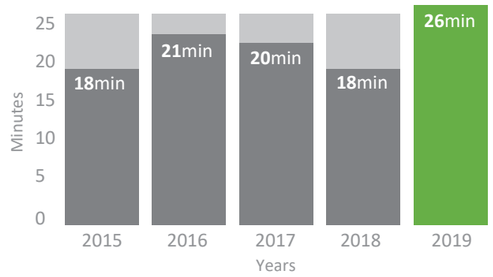
Total crashes by day of the week
2015-2019
Source: ODOT



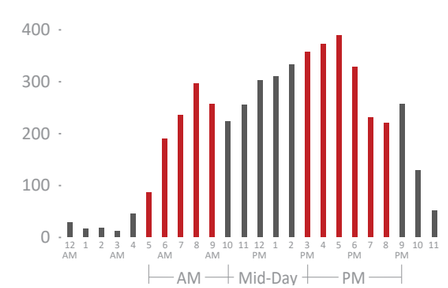
Crash frequency per 10th of a mile
2015-2019
Source: ODOT



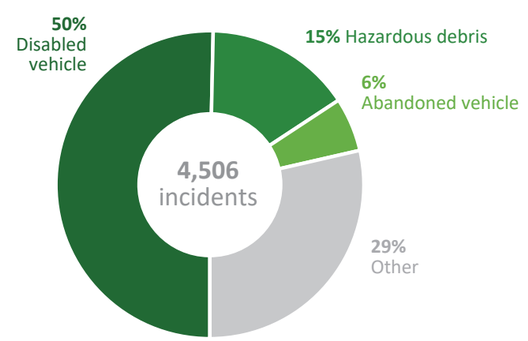
Incidents (non-crash) clearance times
2015-2019
Source: ODOT



Incident (non-crash) frequency by time of day
2015-2019, total incidents by time of day
Source: ODOT



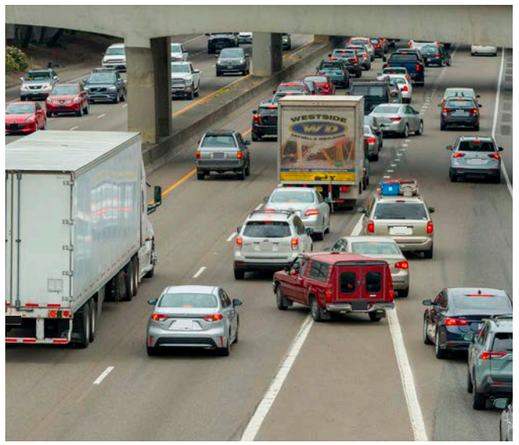
Incidents (non-crash) by type
2015-2019
Source: ODOT



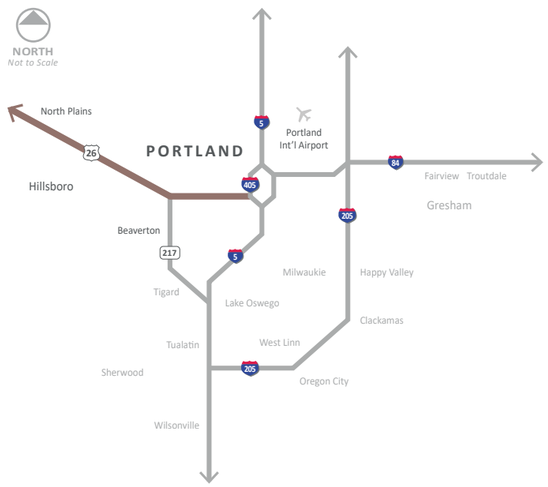
The average time to clear an incident on I-405 is approximately 26 minutes. The top-left graph shows clearance times in minutes from 2015 through 2019. The response time for an incident depends on the nature of the incident. The major non-crash incident area on I-405 is on the west end of the Fremont Bridge near the US 30 interchange.

More cars on the road correlates to more incidents. There is a higher number of incidents happening in the PM peak period, exacerbating congestion in the corridor.

Disabled vehicle incidents account for 50 percent of non-crash incidents on I-405, while hazardous debris accounts for 15 percent and abandoned vehicles account for 6 percent of such incidents in the corridor.



US 26 Corridor Dashboard



Recent/Current Improvements

Widening

- US 26 EB and WB: 185th Avenue to Cornelius Pass widened to six lanes (completed 2018)

Active Traffic Management

- US 26 EB and WB: OR 217 to I-405 (completed 2018)

Road Treatments

- US 26 WB: High Friction Surface Treatment to address road departure crashes on the OR 217 NB to US 26 WB Connection (2021)

Introduction

US 26 provides the only major east-west route from the Willamette River and downtown Portland to Beaverton, Hillsboro and the Oregon Coast. The corridor is approximately 18.8 miles from I-405 to the Dersham Road interchange.

US 26 is severely congested near the I-405 interchange and Vista Ridge Tunnel. The Vista Ridge Tunnel is the busiest tunnel in Oregon. The tunnel is closed to hazardous materials, forcing trucks hauling these materials to other routes. This tunnel is a major bottleneck for the west side of the Portland Metropolitan area, a major economic engine of the region.

The Silicon Forest is the nickname for the concentration of high-tech companies located in Hillsboro and Beaverton. In 2017, Washington County had the highest share of jobs directly supported by exports, representing 11 percent of the workforce which equates to more than 41,000 employees.[11] Additionally, there has been 5.1 percent population growth[12] in the last five years and 11 percent employment growth,[13] resulting in increasing pressure on US 26 and the surrounding transportation system. The Blue and Red light rail lines run adjacent to US 26 from downtown Portland to the Sunset Transit Station.

ODOT and Metro are co-managing the Westside Multimodal Improvements Study to identify opportunities to improve connections between Hillsboro's Silicon Forest, Northern Washington County's agricultural areas and the Portland Central City, I-5 and I-84, Port of Portland marine terminals, rail facilities, and Portland International Airport.

FREIGHT MOBILITY

US 26 is the primary east-west connector to I-405 and I-5 from the west side. Trucks account for approximately 4% to 8% of the total daily traffic volume on US 26, averaging 3,300 to 7,200 trucks per day. The top value commodities transported on US 26 are electronic and other electrical equipment and components, and office equipment, machinery, and chemical products and preparations. The top tonnage commodities transported include gravel and crushed stone and wood products.

US 26 corridor highlights

Traffic

US 26 is severely congested due to the Vista Ridge Tunnel on the eastern end of the corridor. On an average weekday in 2019, the daily vehicle miles traveled in the eastbound direction was 1,035,000 and in the westbound direction was 1,118,000.

In the eastbound direction, the weekday daily average for hours of congestion was 14.3 hours and the daily weekday vehicle hours of delay was 5,500. In the westbound direction, the weekday daily average for hours of congestion was 9.8 hours and the daily weekday vehicle hours of delay was 800.

Congestion and bottlenecks

Free-flow speed is calculated to be 62.5 mph with a free-flow travel time of 18 minutes for both EB and WB.

The most congested conditions in 2019 occurred in the EB direction in the PM peak. In the EB direction, the average travel time for the corridor is 28 minutes, which is ten minutes above free-flow travel time. In the WB direction, the average PM peak travel time for the corridor is reasonable, at 21.5 minutes or just about three minutes above free-flow travel time.

In the EB direction, the most severe recurring bottleneck is from the Vista Ridge Tunnel to OR 217. This bottleneck occurs in AM, mid-day and PM peak periods from 6:00 a.m. to 8:15 p.m. for a 14.25-hour period. In the WB direction, there is a bottleneck that extends from Canyon Rd back to the Vista Ridge Tunnel. This bottleneck occurs during the AM, mid-day, and PM peak periods but is not continuous throughout the day, totaling almost 10 hours over three time periods.

Reliability

Reliability on US 26 is an issue, particularly in the EB direction. For both directions of US 26 in the AM peak, mid-day, and PM peak, the average travel time is above free-flow travel time. Average travel time in the AM and PM peak in the EB direction is an average of 10 minutes longer than free-flow travel time and buffer times at or above 10 minutes. This means trips in the AM and PM peak are taking longer. The WB direction is much more reliable, with reliable travel time never exceeding 6 minutes longer than free-flow travel time.

Calculating Reliable Travel Time on US 26

Distance: 18.8 miles
Free-flow Travel Time: 18 minutes

Worst Case: US 26 EB during 2019 PM Peak

	Average Travel Time	**28 minutes**
+	**Buffer Travel Time**	**13 minutes**
=	**Reliable Travel Time**	**41 minutes**

Safety

Crashes by time of day are concentrated in the PM peak, which is the most unreliable travel period. Crashes by day of the week and direction demonstrate that the majority of crashes occur in the EB direction, and crashes are consistently high all days of the week except Sunday and Monday. The majority of the total crashes on US 26 are rear-end (77 percent) and side-swipe/overtaking (13 percent), which are typical of congested conditions. The number of non-crash incidents on US 26 remains very high and most involve disabled vehicles (60 percent).

US 26 Corridor Dashboard

Daily Vehicle Miles Traveled (DVMT)

US 26 has a high DVMT, with almost ten percent more miles traveled in the WB direction than the EB direction. The substantial difference is likely due to traffic rerouting to the local system to avoid bottlenecks on US 26 EB.

US 26 EB	1,035,000
US 26 WB	1,118,000

Daily Vehicle Hours Delay (DVHD)

US 26 has drastically different DVHD depending on direction. In the EB direction, DVHD is high due to the recurring bottleneck leading to the Vista Ridge Tunnel. US 26 WB has the lowest DVHD in the region.

US 26 EB	5,460
US 26 WB	790

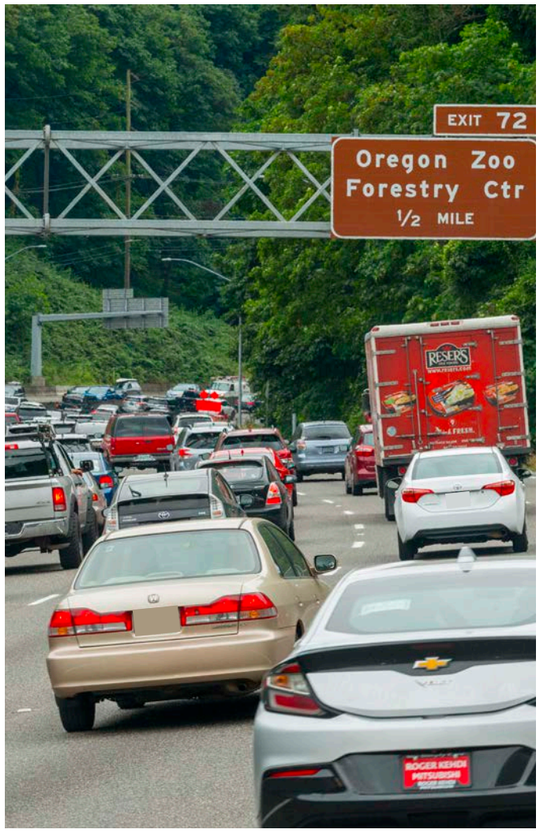
Hours of Congestion (HOC)

US 26 HOC demonstrate the severe congestion experienced on the corridor, particularly in the EB corridor.

US 26 EB	14.25
US 26 WB	9.75

Peak Period Speed

US 26 in the EB direction has one of the slowest average speeds across all three peak periods, never exceeding 50mph. In the WB direction, speeds remain relatively high throughout the day, with the slowest speed during the PM Peak.



Speed *(in mph)*

	Year	Free-flow	AM peak	Mid-day	PM peak
US 26 EB	2019	62.5	40.6	49.8	40.2
US 26 WB	2019		57.6	59.1	52.5

Reliability

Peak Period Travel Times and Buffer Time

AM
AM travel time and buffer time indicate a high level of congestion in the EB direction, with an average travel time about ten minutes longer than free-flow travel time and a reliable travel time double that of free-flow. In the WB direction, a slightly high travel time and buffer time result in a reliable travel time approximately four minutes longer than free-flow.

Mid-day
Mid-day travel time improved from the AM Peak in both directions, with the largest decrease being in the EB direction. Despite improvement compared to the AM Peak, reliable travel time in both directions is still longer than free-flow.

PM
PM travel time and buffer time show congestion in both directions of the corridor. In the EB direction, a buffer time of over thirteen minutes results in a reliable travel time more than double free-flow travel time. In the WB direction, reliable travel time is more than six minutes longer than free-flow.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
US 26 EB	2019	18	27.8	9.3	37.1	22.7	6.6	29.3	28.1	13.1	41.2
US 26 WB	2019		19.6	2.2	21.8	19.1	1.1	20.2	21.5	3.1	24.6

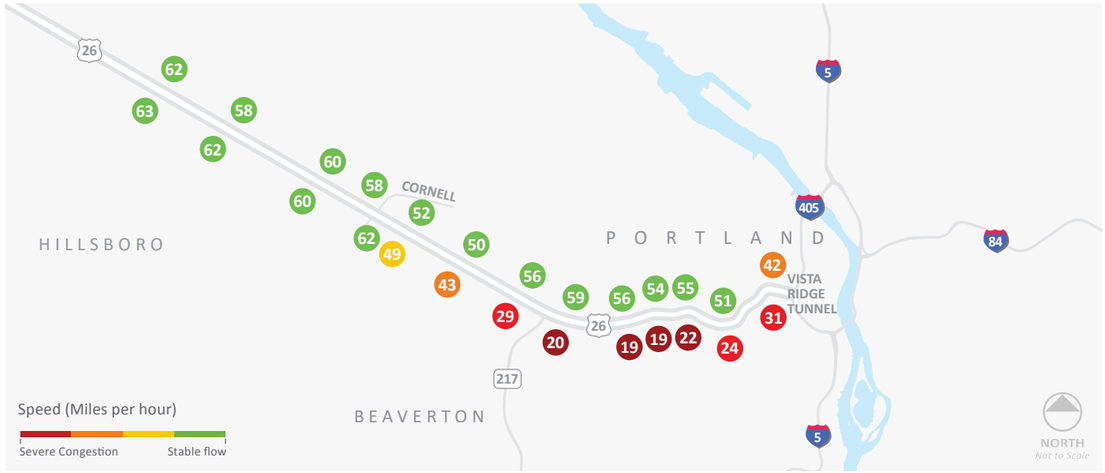
A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

US 26 Corridor Dashboard

2019 average speed (mph)

AM weekday
7:00 a.m. to 9:00 a.m.
Source: INRIX data

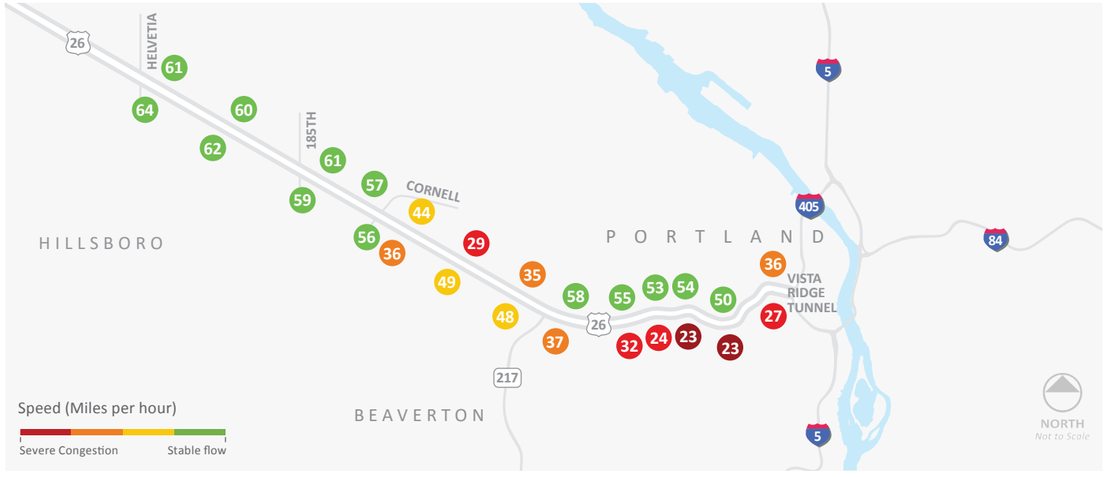


AM WEEKDAY

EB direction slows from I-405 to Cornell Road.

WB direction slows at the Vista Ridge Tunnel.

PM weekday
4:00 p.m. to 6:00 p.m.
Source: INRIX data



PM WEEKDAY

EB direction slows from I-405 to Cornell Road.

WB direction slows at the Vista Ridge Tunnel and from Cornell Road to OR 217.

US 26 bottlenecks

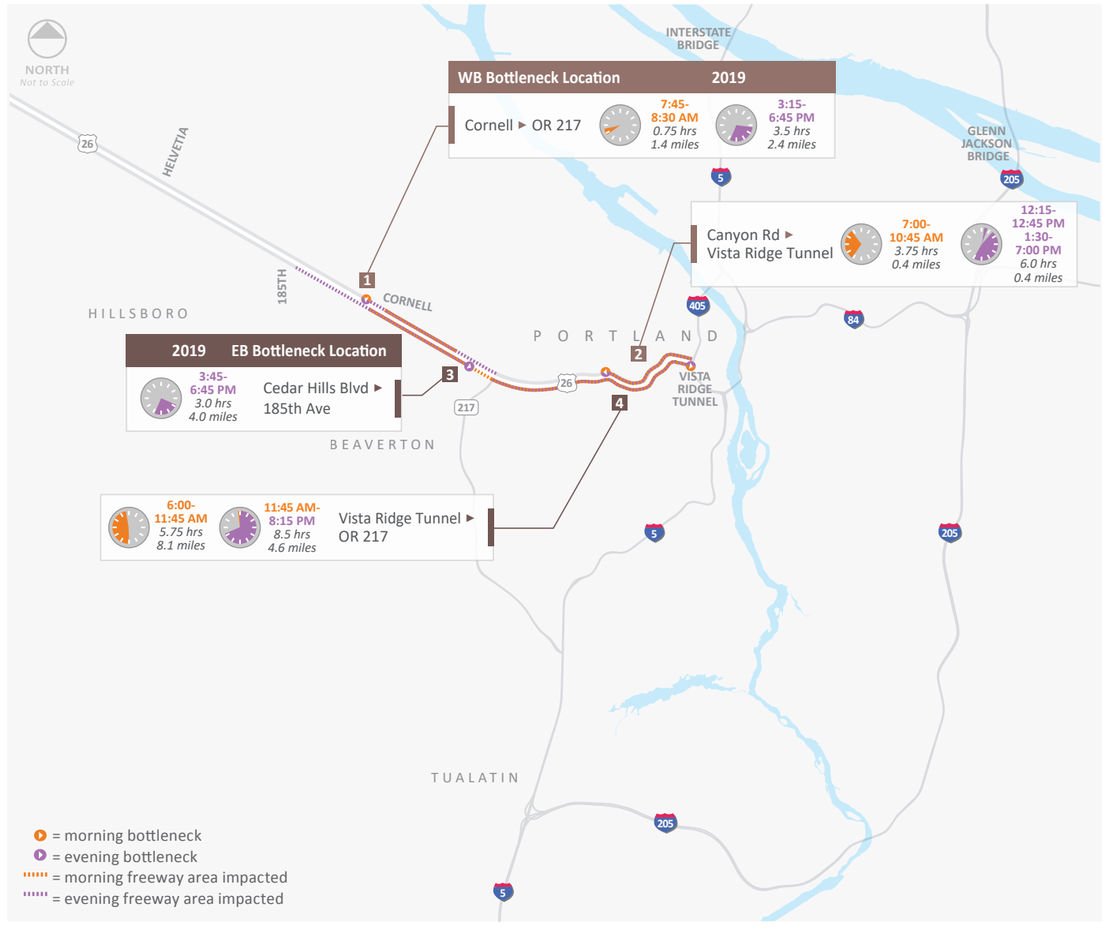
Bottlenecks on US 26 exist in both directions and during all peak periods east of Hillsboro as motorists come from and go to Downtown Portland.

The primary bottleneck on US 26 is EB at the Vista Ridge tunnel/I-405 junction. This is backed up for more than 16 hours a day and to as far west as Cornell in the AM. An overlapping bottleneck occurs in the PM from 185th to Cedar Hills, with a brief break in congestion between Cedar Hills and OR 217.

The primary WB bottleneck is from Canyon Rd to the Vista Ridge Tunnel/I-405 merge as motorists climb the Sylvan hill and occurs in the AM, mid-day, and PM peak periods.

How to Read a Bottleneck Map
Bottlenecks are labeled first by their "head," or location where the congestion begins to clear, and then by their "tail," or the distance congestion extends behind the "head".
Bottlenecks may have different queue lengths for peak periods and often overlap with each other during peak periods.

Duration of bottlenecks
2019
Source: INRIX data

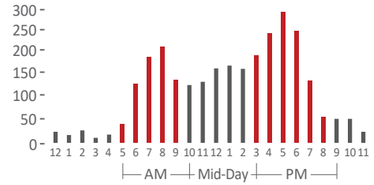


US 26 Corridor Dashboard

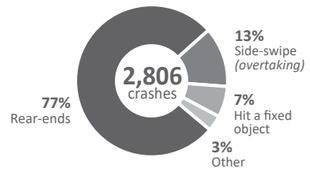
US 26 safety

US 26 had approximately 2,800 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe (overtaking) crashes, which mainly occur in the PM peak period. These types of crashes are typically the result of congestion, which is clearly reflected in the higher crash frequency in the EB direction. SPIS sites were identified based on crash frequency, crash rate and crash severity. There were eight top 10 percent 2018 SPIS sites along the corridor.

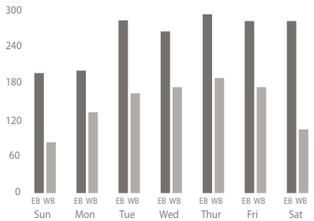
Total crashes by time of day
2015-2019
Source: ODOT



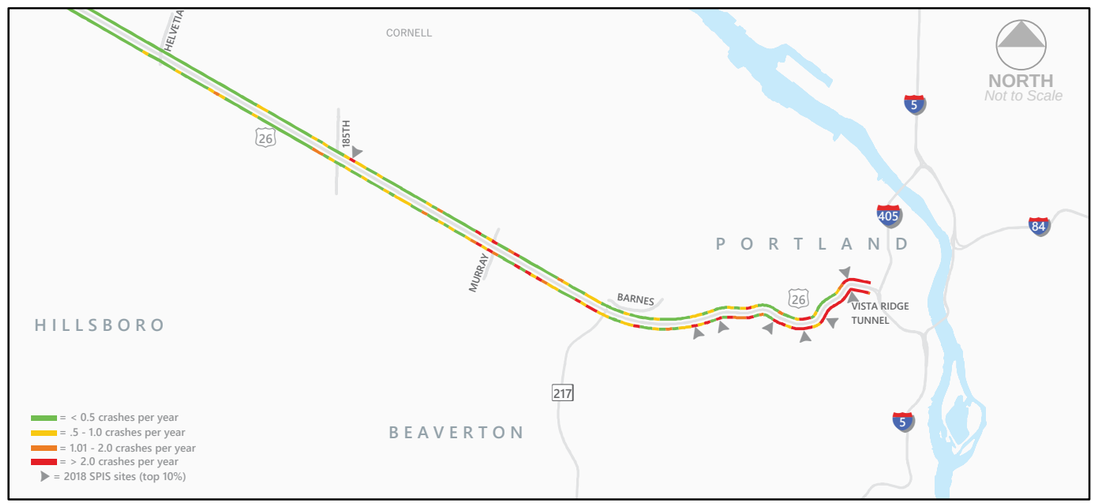
Type of crashes
2015-2019
Source: ODOT



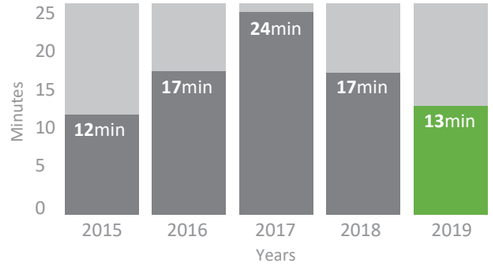
Total crashes by day of the week
2015-2019
Source: ODOT



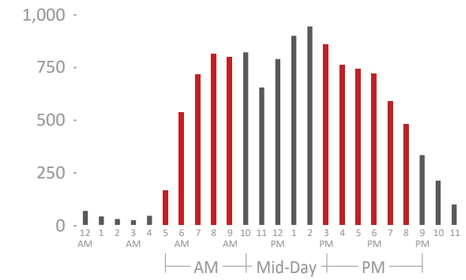
Crash frequency per 10th of a mile
2015-2019
Source: ODOT



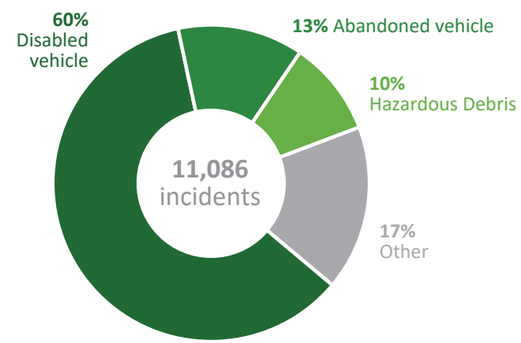
Incidents (non-crash) clearance times
2015-2019
Source: ODOT



Incident (non-crash) frequency by time of day
2015-2019, total incidents by time of day
Source: ODOT



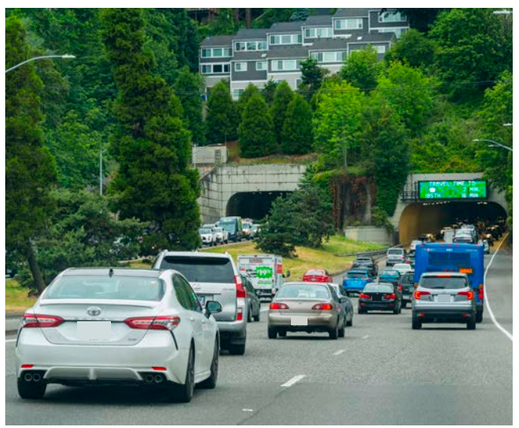
Incidents (non-crash) by type
2015-2019
Source: ODOT



The average time to clear an incident on US 26 is approximately 13 minutes. The top-left graph shows clearance times in minutes from 2015 through 2019. The response time for an incident depends on the nature of the incident. The major non-crash incident areas on US 26 are the Zoo interchange, Sylvan interchange and the Vista Ridge Tunnel.

More cars and congestion on the road correlate to more incidents. The highest number of incidents is in the mid-day, but incidents are elevated throughout the AM and PM peak periods as well, exacerbating congestion in the corridor all day.

Disabled vehicle incidents account for 60 percent of non-crash incidents on US 26. This is followed by abandoned vehicles (13%) and hazardous debris (10%).



OR 217 Corridor Dashboard

Introduction

OR 217 serves as a connection between US 26 (Sunset Highway) and I-5. OR 217 is approximately 7.0 miles in length. It connects the cities of Tualatin, Tigard, Beaverton and Hillsboro.

OR 217 has nine closely spaced interchanges, which contribute to conflicts between entering and exiting traffic, particularly during peak commute times. To address these conflicts, ODOT has planned a series of auxiliary lanes for the corridor to improve safety and operations in merging and weaving areas.

Recent/Current Improvements

Auxiliary lanes

The following project on I-5 helped alleviate congestion and queuing that would spill onto OR 217:

- I-5 SB: Lower Boones Ferry Road to I-205 Exit (completed in 2018, complementing the Carman Drive to Lower Boones Ferry Road auxiliary lane completed in 2012).

Road Treatments

- US 26 WB: High Friction Surface Treatment to address road departure crashes on the OR 217 NB to US 26 WB Connection (2021)

Upcoming Improvements

Auxiliary lanes

- OR 217 SB: auxiliary lane extension from Beaverton-Hillsdale Highway to OR 99W with a collector-distributor road from Allen Boulevard to Denney Road (expected 2022)
- OR 217 NB: auxiliary lane extension from OR 99W to Scholls-Ferry Road (expected 2022)

FREIGHT MOBILITY

Because of the hazardous material restriction on US 26 at the Vista Ridge Tunnel, OR 217 is the west side connector for US 26 to I-5 SB. Trucks account for approximately 4% of the daily traffic volume on OR 217 with an average of about 4,200 to 4,300 trucks per day. The top value commodities transported on OR 217 are prepared foodstuffs, fats and oils, motorized and other vehicles, and electronic and other electrical equipment and components. The top tonnage commodities transported include gravel and crushed stone, wood products, and nonmetallic mineral products.

OR 217 corridor highlights

Traffic

OR 217 is a congested corridor with persistent congestion in the AM and PM peak periods. On an average weekday in 2019, the daily vehicle miles traveled in the northbound direction was 163,000 and in the southbound direction was 174,000.

In the northbound direction, the weekday daily average for hours of congestion was 6.0 hours and the daily weekday vehicle hours of delay was 1,400. In the westbound direction, the weekday daily average for hours of congestion was 9.75 hours and the daily weekday vehicle hours of delay was 1,700.

Congestion and bottlenecks

Free-flow speed is calculated to be 60 mph with a free-flow travel time of seven minutes for both NB and SB.

OR 217 has the lowest PM peak speed when looking at both directions of travel. In the NB and SB directions, the average PM peak travel time is 13 minutes in 2019, almost double free-flow travel time.

Only two bottlenecks occur in the NB direction of OR 217 and both overlap for more than three miles. An AM peak bottleneck forms at Allen and extends to the I-5 merge.

A slightly shorter in queue length bottleneck occurs in the PM peak and forms at Denney Road and also ends at the I-5 merge.

The SB direction has twice as many bottlenecks with most occurring only during peak periods. For example, an AM peak bottleneck from OR 99W to Walker creates congestion on over half the corridor while two PM peak bottlenecks exist near the US 26 interchange and I-5 interchange. A bottleneck between Hall Boulevard and Walker Road persists for over 7 hours in the mid-day and PM peaks.

Reliability

Reliability on OR 217 is an issue in both the AM and PM peak periods. When calculating the reliable travel time (the average travel time combined with the buffer time needed to ensure on-time arrival), the AM peak period reliable travel time is more than double free-flow travel time and the PM peak period reliable travel time is nearly triple free-flow travel time. Reliable travel time is consistently better in the NB direction than in the SB direction, although motorists traveling along any portion of the corridor must allot extra time to esnure they reach their destination on-time.

Calculating Reliable Travel Time on OR 217

Distance: 7.0 miles
Free-flow Travel Time: 7.1 minutes

Worst Case: OR 217 SB during 2019 PM Peak

	Average Travel Time	13 minutes
+	Buffer Travel Time	7 minutes
=	Reliable Travel Time	20 minutes

Safety

More crashes occur on OR 217 SB than NB. Crashes by time of day are concentrated during AM and PM peak periods, when travel is the most unreliable. The majority of the total crashes on OR 217 are rear-end (81 percent) and side-swipe/overtaking (13 percent), which are typical of congested conditions. The most frequent non-crash incidents on OR 217 are disabled vehicles and hazardous debris.

OR 217 Corridor Dashboard

Oregon Department of Transportation

Daily Vehicle Miles Traveled (DVMT)

OR 217 has a low DVMT compared to other corridors partially due to the short length of the corridor. DVMT is similar in both the NB and SB directions.

OR 217 NB	372,000
OR 217 SB	359,000

Daily Vehicle Hours Delay (DVHD)

OR 217 has low DVHD due to the short length of the corridor. As with the Hours of Congestion, DVHD is worse in the SB direction than in the NB direction.

OR 217 NB	1,350
OR 217 SB	1,690

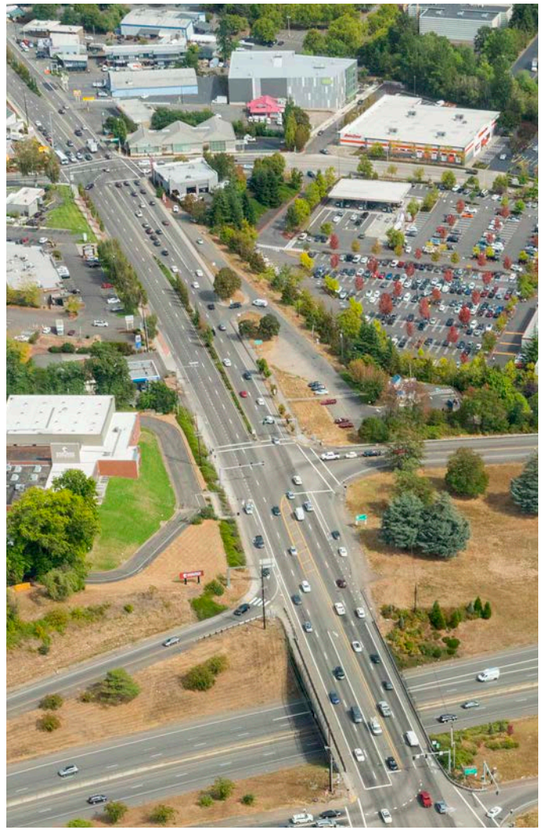
Hours of Congestion (HOC)

OR 217 has high HOC, particularly in the SB direction, due to multiple lengthy bottlenecks.

OR 217 NB	6.00
OR 217 SB	9.75

Peak Period Speed

OR 217 has one of the slowest average AM Peak speeds in the region. On average, the SB direction is slower than the NB direction, apart from very similar PM Peak speeds. In the PM Peak, speeds are nearly half of free-flow speed, indicating severe congestion in both directions.



Speed *(in mph)*					
	Year	Free-flow	AM peak	Mid-day	PM peak
OR 217 NB	2019	59.5	41.2	53.4	31.3
OR 217 SB	2019		37.4	44.8	31.9

Reliability

Peak Period Travel Times and Buffer Time

AM
AM travel time and buffer time indicate a high level of congestion in both directions of OR 217, with a reliable travel time more than double free-flow travel time. The SB direction has a slightly longer travel time and buffer time than in the NB direction.

Mid-day
Mid-day travel time improved from the AM Peak in both directions. A long buffer time in the SB direction and slightly elevated average travel time result in a reliable travel time nearly double free-flow travel time.

PM
PM travel time and buffer time indicate congestion in both directions of the corridor. An average travel time nearly double free-flow travel time and buffer times similar to free-flow travel time result in reliable travel time in both directions approaching triple free-flow travel time.

Travel time *(in minutes)*											
	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
OR 217 NB	2019	7.1	10.2	4.9	15.1	7.9	1.5	9.4	13.4	6.1	19.5
OR 217 SB	2019		11.2	6.0	17.3	9.4	4.6	13.9	13.2	7.1	20.2

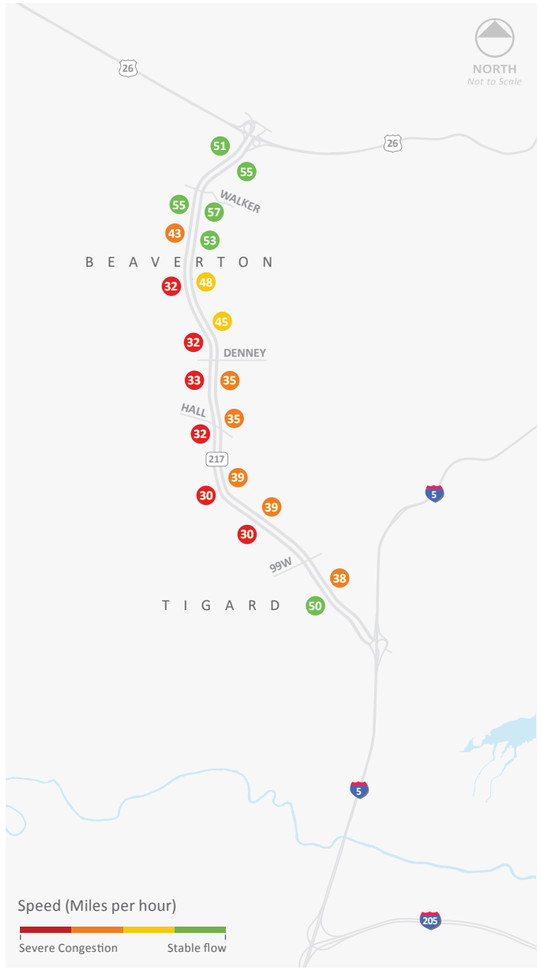
A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

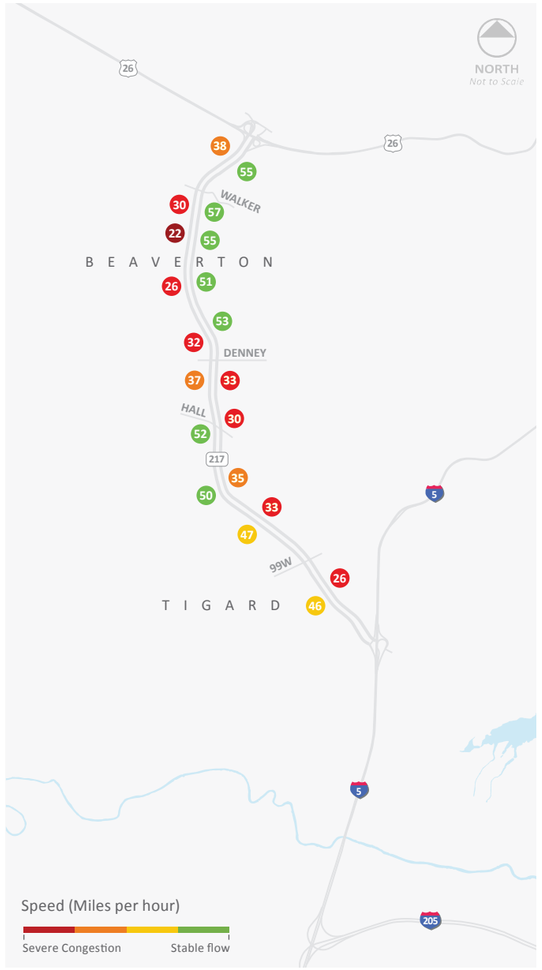
OR 217 Corridor Dashboard

2019 average speed (mph)

AM weekday
7:00 a.m. to 9:00 a.m.
Source: INRIX data



PM weekday
4:00 p.m. to 6:00 p.m.
Source: INRIX data



AM WEEKDAY

SB direction slows from OR 99W to Beaverton-Hillsdale Highway.

NB direction slows from Denney Road to I-5.

PM WEEKDAY

SB direction slows in two general areas: Hall Boulevard to US 26 and I-5 to 72nd Avenue.

NB direction slows from Denney Road to I-5.

OR 217 bottlenecks

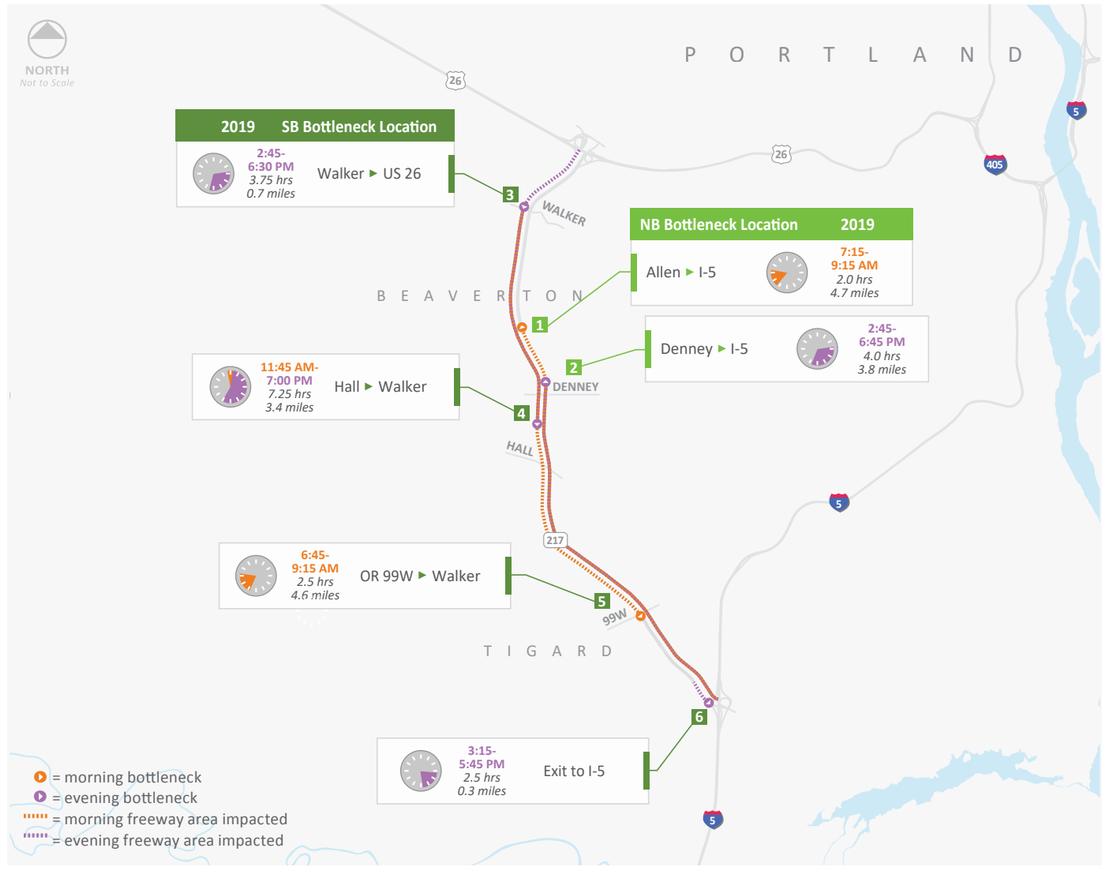
OR 217 connects US 26 and I-5 as well as serves the cities of Beaverton and Tigard. OR 217 is congested in most locations at some point during the day, with many bottlenecks feeding into one another.

The NB corridor between Denney Road and I-5 is backed up in both the AM and PM peak as motorists travel to and through Beaverton. The bottleneck extends to Allen during the AM.

In the SB direction, the worst bottleneck is between Walker Road and Hall Boulevard due to weaving and high traffic near the Beaverton-Hillsdale Highway on- and off-ramp. Additional PM bottlenecks occur after the US 26 merge and before the I-5 merge. An AM bottleneck occurs between OR 99W and Walker.

How to Read a Bottleneck Map
Bottlenecks are labeled first by their "head," or location where the congestion begins to clear, and then by their "tail," or the distance congestion extends behind the "head".
Bottlenecks may have different queue lengths for peak periods and often overlap with each other during peak periods.

Duration of bottlenecks
2019
Source: INRIX data

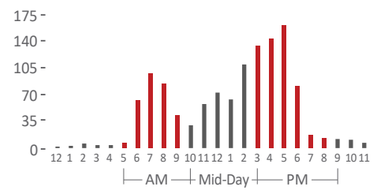


OR 217 Corridor Dashboard

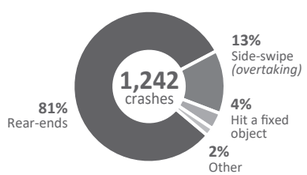
OR 217 safety

OR 217 had approximately 1,200 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe (overtaking) crashes, which mainly occur in the PM peak period. These types of crashes are typically the result of congestion. SPIS sites were identified based on crash frequency, crash rate and crash severity. There were three top 10 percent 2018 SPIS sites along the corridor.

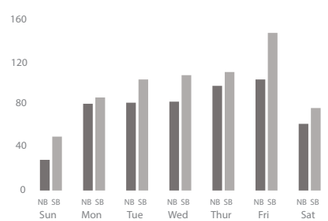
Total crashes by time of day
2015-2019
Source: ODOT



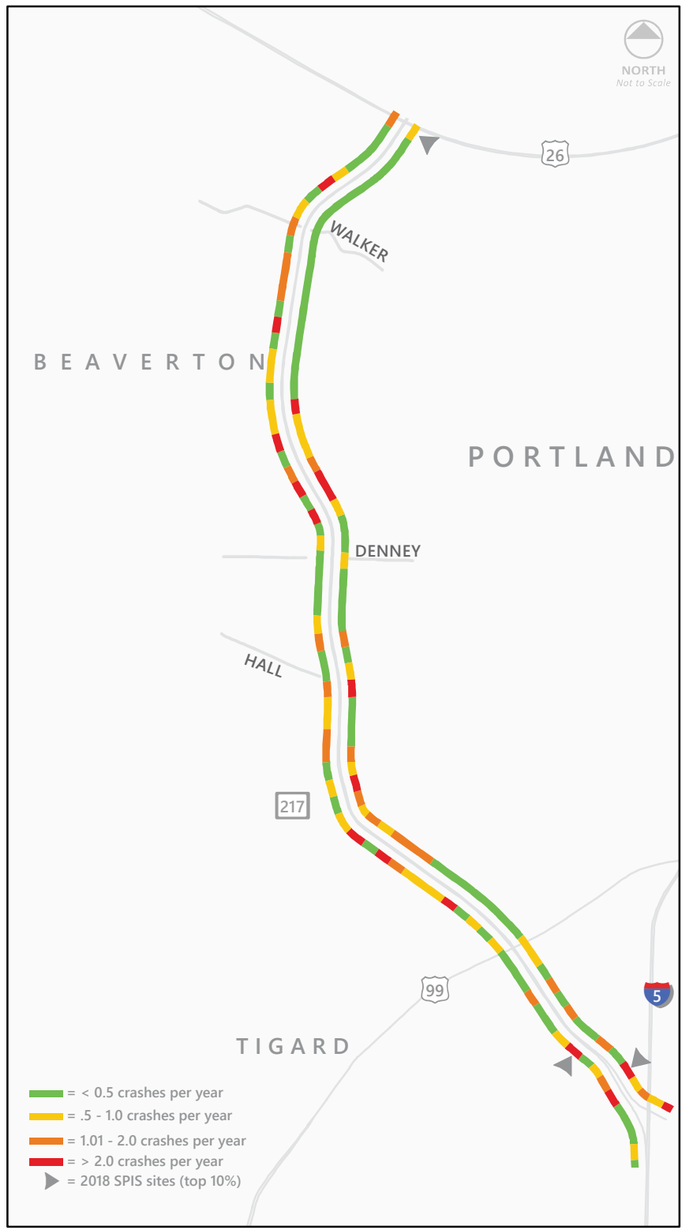
Type of crashes
2015-2019
Source: ODOT



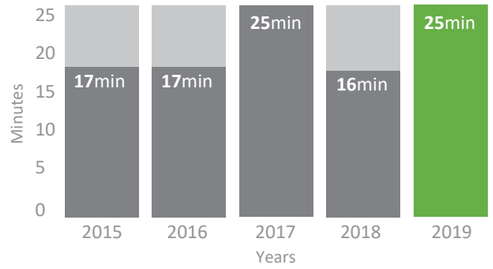
Total crashes by day of the week
2015-2019
Source: ODOT



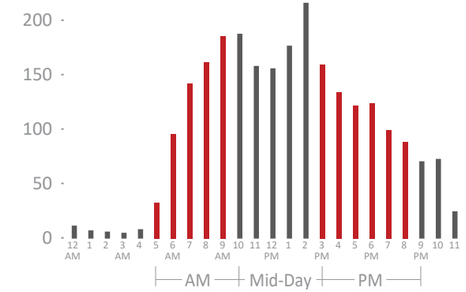
Crash frequency per 10th of a mile
2015-2019
Source: ODOT



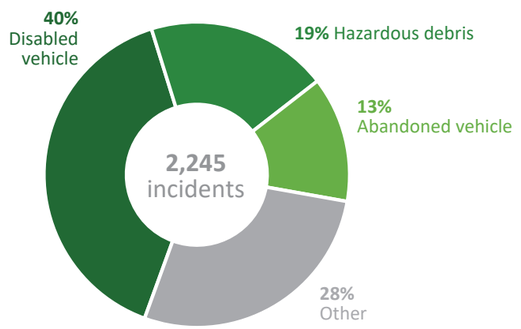
Incidents (non-crash) clearance times
2015-2019
Source: ODOT



Incident (non-crash) frequency by time of day
2015-2019, total incidents by time of day
Source: ODOT



Incidents (non-crash) by type
2015-2019
Source: ODOT



The average time to clear an incident on OR 217 is approximately 25 minutes. The top-left graph shows clearance times in minutes from 2015 through 2019. The response time for an incident depends on the nature of the incident. Non-crash incident hot-spots include the OR 217/ I-5 interchange and the interchange with US 26.

More cars on the road correlate to more incidents. There is a higher number of incidents happening in the AM and mid-day peak period, exacerbating congestion in the corridor.

Disabled vehicle incidents account for 40 percent of non-crash incidents on OR 217, followed by hazardous debris (19%) and abandoned vehicles (13%).

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Glossary

Change in Data Sources

The data set used to calculate travel time and traffic volume in the 2020 Portland Region Traffic Performance Report differs from the data set used for the 2018 edition of the report. These differences are explained below:

Probe Data

For the emprical freeway travel time and speeds, ODOT used a commercial INRIX XD data source for this 2020 report in contrast to the 2018 report which used a commercial HERE data source**.** The INRIX XD segment data includes estimates of segment travel times and segment speed (in mph) by 15-minute periods for each day. It is recognized that with each report update, data sources may change and/or more advanced data may become available. Trend lines will be similar with each data source, but replicating exact results from one report to another will be unlikely.

For this report, the commercial INRIX XD data is reflected in the following performance measures: travel time, speed, buffer time, daily vehicle miles traveled, daily vehicle hours of delay, hours of congestion, bottleneck duration and bottleneck length. New refined data sources were used to more accurately capture freeway corridors within Region 1, slightly changing corridor lengths compared to the 2018 report.

System Performance Analysis

For this report, system performance analysis considered the regional and corridor operations primarily for 2019 as well as a five-year time frame for safety.

Regional
The regional traffic performance overview provides a region-wide cumulative performance evaluation of all six freeway corridors.

Corridor
The corridor traffic performance overview provides details on individual freeway corridor performance.

System Performance Measures

System performance measures are derived using basic data components such as time of day, travel time and speed. These terms are explained below:

Time of Day

For this report, the time of day has been divided into four traffic analysis time periods. The AM, mid-day and PM time periods include adequate time to capture the current peak periods, in terms of traffic volume and congestion.

AM Peak Period
5:00 a.m. to 10:00 a.m. – duration of five hours in the morning.

Mid-day Peak Period
10:00 a.m. to 3:00 p.m. – duration of five hours from late morning to mid-afternoon.

PM Peak Period
3:00 p.m. to 9:00 p.m. – duration of six hours in the afternoon and evening.

Off-Peak Period
12:00 a.m. (midnight) to 5:00 a.m. – duration of five hours with low traffic volume for free-flow calculation.

Travel Time and Speed

The travel times and speeds for each of the selected time periods were derived using five-minute interval data for the 24-hour workday (non-holiday weekday).

Average Travel Time
The average travel time on a route is determined during a specific time interval. For example, the travel time to work refers to the total number of minutes that it usually took a person to get from home to work each day.

Average Speed
Speed is the inverse of travel time. The average weekday speed is calculated by using the segment length and dividing by the average travel time, reported in miles per hour (mph).

Free-flow Speed and Travel Time
The free-flow speed and travel time are used as a benchmark for the uncongested traffic conditions for the corridor. Free-flow speed is used as one of the empirically estimated values when calculating vehicle-hours of delay and hours of congestion. It is based on average speeds during the off-peak period (midnight to 5:00 a.m.) on workdays (non-holiday weekday) and reported for each freeway corridor.

95th Percentile Travel Time
The 95th percentile generally represents a reasonable upper boundary on expected motorist travel time. For commuters it means 19 out of 20 workday trips in a month will take no more than the planned time. The 95th percentile vehicular travel times, in minutes, are estimated for each five-minute interval of the 24-hour workday (non-holiday weekday) tallied for the reported time periods.

Climate Change Indicators

Greenhouse Gas Emissions

Annual greenhouse gas (GHG) emission rates were calculated for each freeway, by direction, in the Portland region using USEPA's Motor Vehicle Emissions Simulator (MOVES) model 2014b, ODOT vehicle counts and volumes and INRIX speed data for 2019. In this analysis, GHG emissions are represented by carbon dioxide equivalent (CO_2e) and includes carbon dioxide, methane and nitrous oxide. MOVES input files include meteorological data, fuel characteristics, vehicle age, speed profile, local vehicle mix and vehicle inspection and maintenance programs for the Metro area. This methodology was developed in consultation with Oregon Department of Environmental Quality and used MOVES modeling input files from Metro, DEQ and Washington State Department of Ecology.

Emission rates reflect three distinct vehicle groups – vehicles predominantly from Multnomah and Washington counties that are subject to an inspection program (77%), vehicles registered in Clark County, Washington (13%), and vehicles traveling in the Metro area that are not subject to an inspection and maintenance program (10%). Default fuel inputs in MOVES were used, with the exception of updating biodiesel to 10% for Oregon vehicles.

Emission rates were calculated for passenger vehicles, medium trucks and heavy trucks by speed bin. The speed bins cover a 5-mile-per-hour (MPH) speed interval and align with the speed bins in the emission model that range from 2.5 to 75 MPH. ODOT traffic count data informed the vehicle type distribution on each freeway segment.

Annual vehicle miles traveled (VMT) was calculated for 252 non-holiday weekdays. VMT by hour was aggregated by speed bin and subdivided into vehicle type. Hourly emissions were averaged by season and averaged over a 24 hour period.

Emission rates by vehicle type and speed bin were multiplied by annual vehicle miles traveled by vehicle type to determine total annual emissions (measured as metric tons of CO_2e per year per million vehicle miles traveled). Emissions represent tailpipe emissions and do not include emissions from the extraction, refinement, or distribution of the fuel.

In addition to the total emissions calculated using 2019 traffic data, a scenario was modeled to estimate the potential emissions savings from eliminating slow speeds on the freeways due to congestion. In this scenario, VMT associated with speed bins below 50 MPH were assigned the emission rate of the 50 MPH speed bin. The resulting total emissions by highway and highway segment for this optimized scenario were compared to the base analysis for 2019 to establish the percentage difference.

Corridor Performance Indicators

Using the measurements from traffic data, key traffic indicators can be defined and used to evaluate freeway system performance. These indicators are grouped into the following categories:

Congestion and Delay Indicators

Congestion and Delay

Congestion is relatively easy to recognize—roads filled with cars, trucks, and buses. Congestion usually relates to an excess of vehicles on a portion of roadway at a particular time resulting in speeds 75 percent (or lower) of the roadway's "free flow" speed. Delay begins at 75% of free flow speed (this is a change from the 2018 report). This generally correlates to speeds at or below 45 miles per hour. Severe congestion refers to speeds below 30 miles per hour.

Costs of Delay

The costs of delay in the TPR are calculated as:

Daily Cost of Delay = (total daily vehicle delay in hours * passenger vehicle % * $26.44 per hour) + (total daily vehicle delay in hours * medium truck % * $31.89 per hour) + (total daily vehicle delay in hours * heavy truck % * $33.24 per hour)

The daily cost of travel time for each vehicle type is based on a published ODOT report on the value of travel time, which can be found here: https://www.oregon.gov/ODOT/Data/Documents/2017-The-Value-of-Travel-Time.pdf

Annual Cost of Delay = Daily Cost of Delay *250 days
250 days represent the average non-holiday weekdays in a year.

Hours of Congestion (HOC)

The duration of traffic congestion is reported as the average number of hours per workday (non-holiday weekday) that the motorist will experience congestion. The HOC for a corridor is the total number of hours that the corridor has at least one congested location. For example, on I-205 SB the HOC is the sum of the durations of the following bottlenecks: 1) AM peak from 10th St to 82nd Ave with 3.5 hours; 2) PM peak from Powell Blvd to Airport Way with 4.0 hours. These two bottlenecks total an HOC of 7.5 on I-205 SB. Region-wide HOC is based on the average HOC reported for all corridors in both directions.

Daily Vehicle Hours of Delay (DVHD)

The total travel delay experienced by motorists on the roadway during an average weekday, reported in vehicle hours. DVHD is estimated for each five-minute interval of the 24-hour workday (non-holiday weekday).

Daily Vehicle Miles Traveled (DVMT)

DVMT is the cumulative number of miles traveled by all motorists on freeways. DVMT can be used as a measure of throughput. Generally, throughput will begin to decline as the system breaks down and the tolerance to congestion is reached. DVMT was estimated for each 5-minute interval of the 24-hour workday (non-holiday weekday).

Bottleneck Indicators

Recurring Bottlenecks

Areas where traffic slows to an average workday (non-holiday weekday) speed below 75 percent of free-flow speed. In these bottleneck areas the traffic demand exceeds the capacity of the roadway.

Bottleneck Duration

The number of hours per day (non-holiday weekday) that average speeds fall below 75 percent of free-flow speed.

Bottleneck Length

The total length in miles of a bottleneck, where the average workday (non-holiday weekday) speeds fall below 75 percent of free-flow speed.

Reliability Indicators

Buffer Travel Time

Buffer travel time is the extra time (time cushion) that travelers should add to their average travel time to ensure on-time arrival in 19 out of 20 workdays (95 percent of the time).

Reliable Travel Time (Planning Travel Time)

The sum of average travel time and buffer travel time. This is the total time travelers should allot for on-time arrival at their destination.

Safety Indicators

ODOT crash and non-crash incident trends are analyzed over a five-year period. Crashes were analyzed for each freeway mainline corridor, excluding those occurring at ramps and interchange locations.

SPIS

The Safety Priority Index System (SPIS) is a method for identifying high-crash locations on state highways based on crash frequency, rate and severity. Top 10 percent locations are typically identified for targeted project improvements.

Annual Crashes

The total crashes that occur on each freeway corridor for each year.

Crash Frequency

The crash frequency is an indicator of how often crashes occur by time of day or by location.

Non-crash Incidents

All roadway incidents identified through ODOT's Traffic Incident Management program, excluding crashes. Common non-crash incidents on the freeway system include disabled vehicles, abandoned vehicles, hazardous debris and roadway maintenance. Several non-crash incident types can contribute to and/or result from congested freeway conditions and may require some form of incident response, motorist assistance or incident management.

Non-crash Incident Median Clearance Duration

This performance measure is reported for each freeway corridor and indicates the median duration in minutes for ODOT incident responders to address a non-crash hazardous incident and leave the scene. While there are many non-crash incident types, only those that are deemed hazardous require ODOT incident response to deploy to the incident location.

Data Sources

INRIX XD

INRIX XD speed data was obtained from the Probe Data Analytics (PDA) Suite of the RITIS platform for the list of final XD segments. The data was downloaded using the Massive Data Downloader tool in the PDA Suite.

PORTAL

Portland Oregon Regional Transportation Archive Listing (PORTAL) is the official Archived Data User Service (ADUS) for the Portland Metropolitan region as specified in the Regional ITS Architecture. PORTAL provides a centralized, electronic database that facilitates the collection, archiving, and sharing of data and information for public agencies within the region. The data stored in PORTAL includes 20-second granularity loop detector data from freeways in the Portland metropolitan region, arterial signal data, travel time data, weather data, incident data, variable message data, truck volumes, transit data and arterial signal data.

Automatic Traffic Recorder (ATR)

ODOT collects traffic data throughout the state, including in the Portland region, via permanent automatic traffic recording stations. ATR data contributes to vehicle counts and classification.

Lane Miles

The reported lane miles were based on published lane miles data from the Oregon Mileage Report, which can be found online at https://www.oregon.gov/odot/Data/Pages/Road-Assets-Mileage.aspx#OMR.

Crashes and Non-crash Incidents

ODOT collects data for each reported crash and non-crash incident on state highways. The crash data can be found online at https://www.oregon.gov/odot/Data/Pages/Crash.aspx. Incidents (both crash incidents and non-crash incidents) are identified through ODOT's Traffic Incident Management program. Incident data can be obtained through RITIS.

Truck Volume

Truck volume and truck percent of annual average daily traffic is available at the highway segment level. ODOT provides this data online at https://gis.odot.state.or.us/transgis/. The latest available truck volume data at the time of analysis for this report was 2019.

Commodity Flows

The freight commodity flow analysis included in this report indicates general commodity types, values and weight transported by truck on freeways in the Portland region. ODOT's Transportation Planning Analysis Unit completed the analysis using the Oregon Statewide Integrated Model (SWIM) version 2.5, which utilized Freight Analysis Framework (FAF) data from FHWA, to produce commodity flow estimates for 2019.

Transportation Project Specific Terms

Active Traffic Management (ATM)

The use of dynamic tools to manage recurring and nonrecurring congestion based on prevailing traffic conditions. ATM focuses on improving safety and trip reliability.

Auxiliary Lane

An auxiliary lane typically provides a direct connection on the freeway from one interchange ramp to the next. The purpose is to allow the mixing of different traffic speeds that are entering and exiting the freeway. The lane separates the slower movements from the freeway mainline, reducing conflicts that cause congestion and improving safety and traffic flow at the freeway interchanges.

Corridor Bottleneck Operations Study (CBOS)

ODOT study that identifies key congestion locations along six Portland metro area corridors (I-5, I-205, I-84, I-405, OR 217 and US 26). The study recommends projects to improve freeway safety and operations.

Portland Region 2020 Traffic Performance Report Appendix

Oregon Department of Transportation
Region 1

BEFORE/AFTER STUDIES

I-5 Southbound: Lower Boones Ferry Road to I-205
Freeway Improvement Performance Evaluation

THE CHALLENGE:

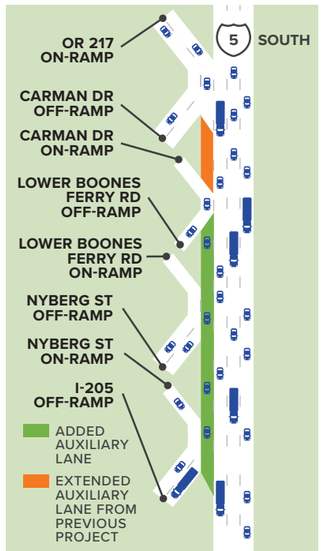
The stretch of southbound I-5 between OR 217 and I-205 was one of the most congested locations in the Portland region, especially during the afternoon hours. This was primarily due to the high volume of traffic merging onto I-5 from OR 217 and weaving with the traffic leaving I-5 at downstream exits. Additionally, the large majority of vehicles exiting at I-205 enter I-5 at one of the four upsteam on-ramps. The afternoon queues extended back on I-5 to the Haines Street exit and on OR 217 past the 72nd Avenue interchange. Afternoon traffic was often under stop-and-go conditions. Without improvements, congestion and related crashes were anticipated to increase in the area due to growing travel demand.

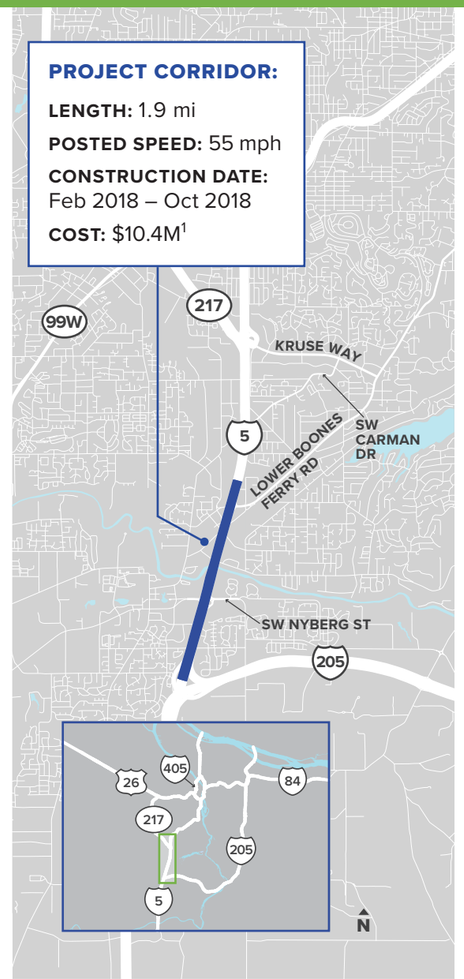
IMPROVEMENTS MADE:

The operational enhancements listed below were selected in part because of ODOT's objective to preserve reliable travel times.

- Added a single southbound auxiliary lane on I-5 from north of Lower Boones Ferry Road to I-205 to relieve congestion and reduce crashes. The auxiliary lane work included on- and off-ramp lane modifications at Lower Boones Ferry Road and Nyberg Street, and the on-ramp to I-205.
- Reduced conflicts from merging movements onto the mainline and allowed for more direct route for people travelling from OR217 to I-205, while improving traffic flow on I-5.
- Repaved I-5 from OR 99W to I-205, approximately 5.5 miles. This extended the service life of the road for another 10 to 15 years. By combining the pavement and southbound auxiliary lane work, the project took advantage of cost savings and reduced construction impacts to travelers.

LANE CONFIGURATION AFTER IMPROVEMENTS:





WHAT IS AN AUXILIARY LANE?

An auxiliary lane typically provides a direct connection on the freeway from one interchange ramp to another. The purpose is to allow the mixing of different traffic speeds that are entering and exiting the freeway. The lane separates the slower movements from the freeway mainline, reducing conflicts that cause congestion and improving safety and traffic flow at the freeway interchanges.

[1] Only includes costs directly associated with the auxiliary lane (i.e., does not include paving outside the extents of the auxiliary lane)

I-5 Southbound: Lower Boones Ferry Road to I-205
Freeway Improvement Performance Evaluation

RESULTS:

This project was primarily intended to reduce congestion on I-5 southbound over a segment of just under two miles in length between Lower Boones Ferry Road and I-205. Travelers also experienced benefits upstream of this project, reaching as far as 3.2 miles up I-5 southbound and 1.3 miles up OR 217 southbound. This project represented the completion of efforts spanning nearly a decade to extend an auxiliary lane from the OR 217 southbound on-ramp to the I-205 off-ramp to lessen the impacts of traffic weaving between entrance and exit points in this area.

RELIABLE TRAVEL TIME (MIN):

ON I-5 SOUTHBOUND:

↓ 37%

RELIABLE TRAVEL TIMES **IMPROVED BY 37 PERCENT** ON I-5 SOUTHBOUND DURING THE WEEKDAY P.M. PEAK PERIOD (3-6 P.M.), **REDUCING BY 14 MINUTES** THE TIME NEEDED TO CONFIDENTLY TRAVEL THROUGH THIS AREA.

ON OR 217 SOUTHBOUND:

↓ 28%

RELIABLE TRAVEL TIMES **IMPROVED BY 28 PERCENT** ON OR 217 SOUTHBOUND FROM OR 99W TO I-5 (1.3 MILES) DURING THE WEEKDAY P.M. PEAK PERIOD (3-6 P.M.), **REDUCING BY TWO MINUTES** THE TIME NEEDED TO CONFIDENTLY TRAVEL THROUGH THIS AREA.

VEHICLE HOURS OF DELAY:

↓ 59%

THE NUMBER OF VEHICLES HOURS OF DELAY EXPERIENCED ON AN AVERAGE WEEKDAY DECREASED BY 2,050 VEHICLE HOURS—**A 59 PERCENT DECREASE**—FROM 3,490 VEHICLE HOURS TO 1,440 VEHICLE HOURS.

VALUE OF TIME SAVED:

$13.8M

AS A RESULT OF THE REDUCED CONGESTION FROM 2017 TO 2019, THE VALUE OF TIME SAVED FOR THE TRAVELING PUBLIC TOTALS $13.8 MILLION—**A 59 PERCENT REDUCTION** IN THE ANNUAL COST OF CONGESTION—FROM $23.6 MILLION TO $9.8 MILLION.

HOURS OF CONGESTION:

↓ 90 MIN

THE DURATION OF THE CONGESTED PERIOD ON I-5 SOUTHBOUND DURING AN AVERAGE WEEKDAY WAS **REDUCED BY 90 MINUTES—A 22 PERCENT DECREASE**—FROM 6.75 HOURS TO 5.25 HOURS.

CONGESTION OF THE BOONE BRIDGE BOTTLENECK DOWNSTREAM OF THIS PROJECT REDUCES BENEFITS SEEN IN THE PROJECT AREA.

SAFETY:

↓ 29%

THE NUMBER OF CRASHES IN A ONE YEAR PERIOD IN THE STUDY AREA DECREASED FROM 318 TO 226—**A 29 PERCENT DECREASE**—INDICATING A REDUCTION OF SAFETY CONCERNS RELATED TO CONFLICT POINTS AND WEAVING CHALLENGES.

I-205 Northbound: I-84 Eastbound to Killingsworth Street
Freeway Improvement Performance Evaluation

THE CHALLENGE:

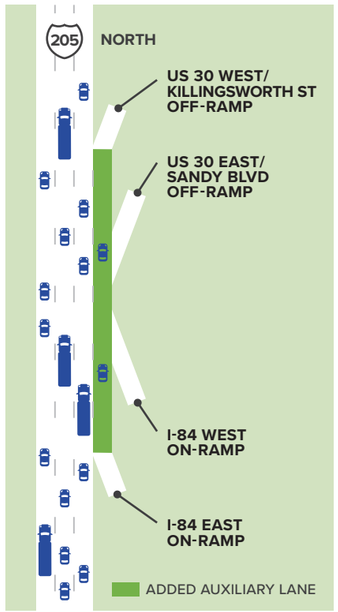
The stretch of northbound I-205 between the I-84 eastbound on-ramp and the US 30 Bypass West/Killingsworth Street off-ramp had reached its vehicle capacity. High traffic volumes and short merging distances caused speeds to drop below five miles per hour during peak travel times. The worst congestion started at the US 30 Bypass/Sandy Boulevard exit and extended more than four miles to south of Powell Boulevard. Without improvements, congestion and related crashes were anticipated to increase in the area.

IMPROVEMENTS MADE:

The selection of the following improvements was guided by ODOT's objective to invest in operational enhancements that preserve reliable travel times.

- Added an auxiliary lane on I-205 northbound connecting the I-84 eastbound on-ramp to the US 30 Bypass West/ Killingsworth Street off-ramp.
- Added ODOT RealTime signs displaying traffic flow and roadway conditions, enabling drivers to make better informed travel decisions. These new signs will assist in reducing crashes, improve travel time reliability, and enhance transit operations throughout the project area.

LANE CONFIGURATION AFTER IMPROVEMENTS:



WHAT IS AN AUXILIARY LANE?

An auxiliary lane typically provides a direct connection on the freeway from one interchange ramp to another. The purpose is to allow the mixing of different traffic speeds that are entering and exiting the freeway. The lane separates the slower movements from the freeway mainline, reducing conflicts that cause congestion and improving safety and traffic flow at the freeway interchanges.

[1] Only includes costs directly associated with the northbound auxiliary lane (i.e., does not include southbound work or paving outside the extents of the auxiliary lane)

I-205 Northbound: I-84 Eastbound to Killingsworth Street
Freeway Improvement Performance Evaluation

RESULTS:

This project included improvements over an approximately one-mile segment along northbound I-205. However, because the congestion caused by this bottleneck extended far to the south, the benefits are summarized over an approximately 11-mile segment on I-205 (approximately Airport Way to OR 224), as well as over the I-84 ramps feeding into I-205, to capture the full impact of improvements. Note that a separate auxiliary lane project from Powell Boulevard to I-84 westbound was still in construction during the "after" time period and is part of the 11-mile segment. This construction activity may have been slowing traffic flow and, therefore, the potential benefits that could be realized from the I-84 eastbound to Killingsworth Street improvements may be greater than measured.

RELIABLE TRAVEL TIME (MIN):

DURING P.M. PEAK PERIOD

↓ 22%

RELIABLE TRAVEL TIMES **IMPROVED BY 22 PERCENT** ON I-205 NORTHBOUND DURING THE WEEKDAY P.M. PEAK PERIOD (3-6 P.M.), **REDUCING BY 11 MINUTES** THE TIME NEEDED TO CONFIDENTLY TRAVEL THROUGH THIS AREA.

DURING A.M. PEAK PERIOD

↓ 12%

RELIABLE TRAVEL TIMES **IMPROVED BY 12 PERCENT** ON I-205 NORTHBOUND DURING THE WEEKDAY A.M. PEAK PERIOD (6-9 A.M.), **REDUCING BY THREE MINUTES** THE TIME NEEDED TO CONFIDENTLY TRAVEL THROUGH THIS AREA.

HOURS OF CONGESTION:

ON THE I-84 EASTBOUND RAMP TO I-205 NORTHBOUND:

↓ 4 HRS 30 MIN

THE DURATION OF THE CONGESTED PERIOD ON THE I-84 EASTBOUND RAMP FEEDING INTO I-205 NORTHBOUND DURING AN AVERAGE WEEKDAY WAS **REDUCED BY FOUR HOURS AND 30 MINUTES–A 43 PERCENT DECREASE–** FROM 10.5 HOURS TO 6 HOURS.

ON THE I-84 WESTBOUND RAMP TO I-205 NORTHBOUND:

↓ 4 HRS 45 MIN

THE DURATION OF THE CONGESTED PERIOD ON THE I-84 WESTBOUND RAMP FEEDING INTO I-205 NORTHBOUND DURING AN AVERAGE WEEKDAY WAS **REDUCED BY FOUR HOURS AND 45 MINUTES–A 43 PERCENT DECREASE–** FROM 11 HOURS TO 6.25 HOURS.

I-205 Northbound: I-84 Eastbound to Killingsworth Street
Freeway Improvement Performance Evaluation

AVERAGE TRAVEL SPEED:

ON I-205 NORTHBOUND:

+7 MPH

DURING THE WEEKDAY A.M. PEAK HOUR (7-8 A.M.), AVERAGE TRAVEL SPEEDS INCREASED BY SEVEN MILES PER HOUR (MPH)–**AN 18 PERCENT INCREASE**–FROM 38 MPH TO 45 MPH.

ON THE I-84 EASTBOUND RAMP TO I-205 NORTHBOUND:

+9 MPH

DURING THE WEEKDAY A.M. PEAK HOUR (7-8 A.M.), AVERAGE TRAVEL SPEEDS INCREASED BY NINE MILES PER HOUR (MPH)–**AN 18 PERCENT INCREASE**–FROM 49 MPH TO 58 MPH.

ON THE I-84 WESTBOUND RAMP TO I-205 NORTHBOUND:

+16 MPH

DURING THE WEEKDAY A.M. PEAK HOUR (7-8 A.M.), AVERAGE TRAVEL SPEEDS INCREASED BY 16 MILES PER HOUR (MPH)–**A 46 PERCENT INCREASE**–FROM 35 MPH TO 51 MPH.

VEHICLE HOURS OF DELAY:

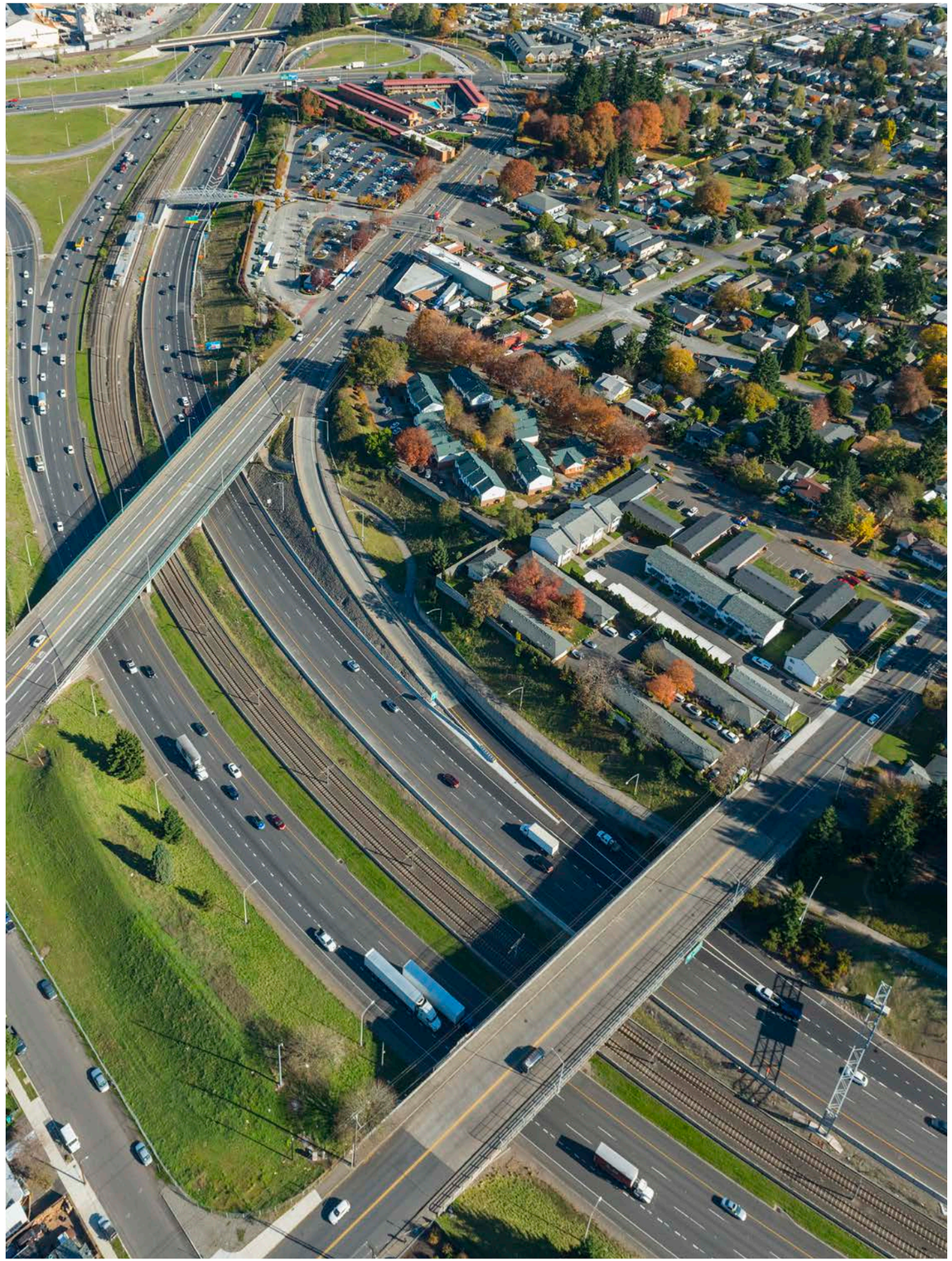
↓15%

THE NUMBER OF VEHICLE HOURS OF DELAY EXPERIENCED ON AN AVERAGE WEEKDAY DECREASED BY 1,010 VEHICLE HOURS–**A 15 PERCENT DECREASE**–FROM 6,960 VEHICLE HOURS TO 5,950 VEHICLE HOURS.

VALUE OF TIME SAVED:

$6.7M

AS A RESULT OF THE REDUCED CONGESTION FROM 2017 TO 2019, THE VALUE OF TIME SAVED FOR THE TRAVELING PUBLIC TOTALS $6.7 MILLION—**A 14 PERCENT REDUCTION** IN THE ANNUAL COST OF CONGESTION—FROM $47 MILLION TO $40.3 MILLION.



I-205 Southbound: I-84 Eastbound to Powell Boulevard
Freeway Improvement Performance Evaluation

THE CHALLENGE:

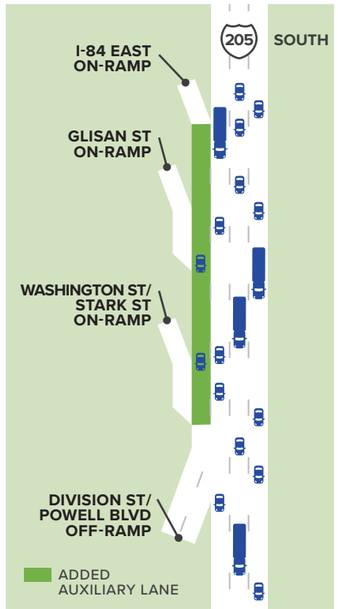
The stretch of southbound I-205 between I-84 eastbound and Powell Boulevard had reached its vehicle capacity. High traffic volumes and short merging distances caused speeds to drop below 10 miles per hour during peak travel times. The worst congestion started at the Powell Boulevard interchange and extended more than five miles north to Airport Way. Without improvements, congestion and related crashes were anticipated to increase in the area.

IMPROVEMENTS MADE:

The selection of the following improvements was guided by ODOT's objective to invest in operational enhancements that preserve reliable travel times.

- Added an auxiliary lane on I-205 southbound connecting the I-84 eastbound on-ramp to the Division Street/ Powell Boulevard off-ramp.
- Installed ODOT RealTime signs displaying traffic flow and roadway conditions, enabling drivers to make better informed travel decisions. These new signs will assist in reducing crashes, improve travel time reliability, and enhance transit operations throughout the project area.

LANE CONFIGURATION AFTER IMPROVEMENTS:



WHAT IS AN AUXILIARY LANE?

An auxiliary lane typically provides a direct connection on the freeway from one interchange ramp to another. The purpose is to allow the mixing of different traffic speeds that are entering and exiting the freeway. The lane separates the slower movements from the freeway mainline, reducing conflicts that cause congestion and improving safety and traffic flow at the freeway interchanges.

[1] Only includes costs directly associated with the southbound auxiliary lane (i.e., does not include northbound work or paving outside the extents of the auxiliary lane)

I-205 Southbound: I-84 Eastbound to Powell Boulevard
Freeway Improvement Performance Evaluation

RESULTS:

This project included improvements to a segment, just under one-mile long, along southbound I-205. However, because the congestion caused by this bottleneck extended far to the north, the benefits are summarized over an approximately six-mile segment on I-205 (approximately Foster Road to the Columbia River), as well as over the I-84 ramps feeding into I-205, to capture the full impact of improvements.

RELIABLE TRAVEL TIME (MIN):

↓ 11%

RELIABLE TRAVEL TIMES **IMPROVED BY 11 PERCENT** ON I-205 SOUTHBOUND DURING THE WEEKDAY A.M. PEAK PERIOD (6-9 A.M.), **REDUCING BY ONE MINUTE** THE TIME NEEDED TO CONFIDENTLY TRAVEL THROUGH THIS AREA.

VEHICLE HOURS OF DELAY:

↓ 24%

THE NUMBER OF VEHICLE HOURS OF DELAY EXPERIENCED ON AN AVERAGE WEEKDAY DECREASED BY 460 VEHICLE HOURS–**A 24 PERCENT DECREASE**–FROM 1,915 VEHICLE HOURS TO 1,455 VEHICLE HOURS.

HOURS OF CONGESTION:

↓ 2 HRS 45 MIN

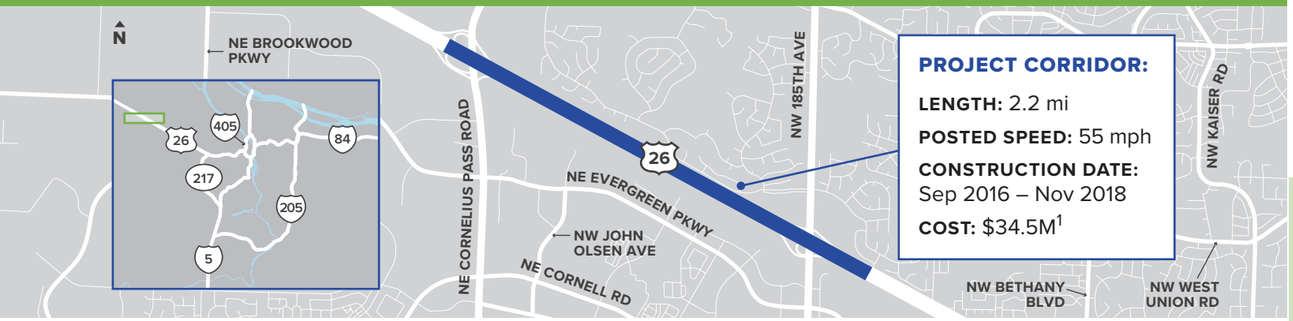
THE DURATION OF THE CONGESTED PERIOD DURING AN AVERAGE WEEKDAY WAS **REDUCED BY TWO HOURS AND 45 MINUTES—A 35 PERCENT DECREASE**—FROM 7.75 HOURS TO 5 HOURS.

VALUE OF TIME SAVED:

$3M

AS A RESULT OF THE REDUCED CONGESTION FROM 2017 TO 2019, THE VALUE OF TIME SAVED FOR THE TRAVELING PUBLIC TOTALS $3 MILLION—**A 24 PERCENT REDUCTION** IN THE ANNUAL COST OF CONGESTION—FROM $12.9 MILLION TO $9.9 MILLION.

US 26: Cornelius Pass Road to 185th Avenue
Freeway Improvement Performance Evaluation



THE CHALLENGE:

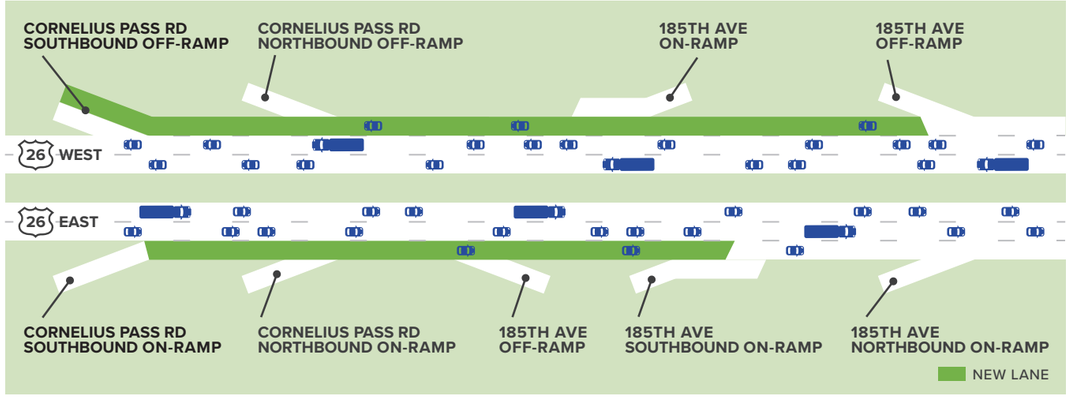
Congestion on the stretch of US 26 between Cornelius Pass Road and 185th Avenue was particularly evident from 3–6 p.m. Population and employment in Washington County continue to grow including high concentration on the western edge, increasing traffic demand on US 26. We recognize we can't build our way of out of congestion, but we can make strategic investments in the system to manage future demand, reduce congestion and improve safety.

IMPROVEMENTS MADE:

The selection of the following improvements was guided by ODOT's objective to invest in operational enhancements that preserve reliability, especially in this part of the region with its employment centers. These improvements were a part of a Jobs and Transportation Act funded project.

- Extended the third lane on US 26 in each direction between Cornelius Pass Road and 185th Avenue. The majority of the widening occurred to the inside of the highway, in the highway center median.
- Replaced the two US 26/Rock Creek bridges with one bridge. This work took place over the Rock Creek Trail.
- Improved the north side of the US 26/Cornelius Pass Road interchange, including adding a second lane to the westbound off-ramp (the loop ramp).
- Built a noise wall on the north side of US 26 in the Rock Creek neighborhood.
- Added ramp meters to preserve capacity

LANE CONFIGURATION AFTER IMPROVEMENTS:



[1] Includes full project cost as all project elements were required in order to add the lane, including the noise wall and bridge work

US 26: Cornelius Pass Road to 185th Avenue
Freeway Improvement Performance Evaluation

EASTBOUND RESULTS:

This project included improvements to both directions of US 26 between Cornelius Pass Road and 185th Avenue. However, the benefits shown below are for eastbound traffic conditions only, because the eastbound improvements resulted in the most significant benefits. Also, most benefits were experienced on weekdays from 3–6 p.m., which is when most congestion occurs.

AVERAGE TRAVEL SPEED:

+6.5 MPH

DURING THE WEEKDAY P.M. PEAK PERIOD (3–6 P.M.), AVERAGE TRAVEL SPEEDS INCREASED BY 6.5 MILES PER HOUR (MPH)—**A 13 PERCENT INCREASE**—FROM 49.5 MPH TO 56 MPH.

RELIABLE TRAVEL TIME (MIN):

↓ 15%

RELIABLE TRAVEL TIMES **IMPROVED BY 15 PERCENT** ON US 26 EASTBOUND FROM 185TH AVENUE TO BROOKWOOD PARKWAY (3.53 MILES) DURING THE WEEKDAY P.M. PEAK PERIOD (3-6 P.M.), **REDUCING BY ONE MINUTE** THE TIME NEEDED TO CONFIDENTLY TRAVEL THROUGH THIS AREA.

VEHICLE HOURS OF DELAY:

↓ 53%

THE NUMBER OF VEHICLE HOURS OF DELAY EXPERIENCED ON AN AVERAGE WEEKDAY DECREASED BY 54 VEHICLE HOURS—**A 53 PERCENT DECREASE**—FROM 102 VEHICLE HOURS TO 48 VEHICLE HOURS.

HOURS OF CONGESTION:

↓ 30 MIN

THE DURATION OF THE CONGESTED PERIOD DURING AN AVERAGE WEEKDAY AFTERNOON WAS **REDUCED BY 30 MINUTES—A 22 PERCENT DECREASE**—FROM 2.25 HOURS TO 1.75 HOURS.

VALUE OF TIME SAVED:

$362K

AS A RESULT OF THE REDUCED CONGESTION FROM 2017 TO 2019, THE VALUE OF TIME SAVED FOR THE TRAVELING PUBLIC TOTALS $362,000—**A 53 PERCENT REDUCTION** IN THE ANNUAL COST OF CONGESTION—FROM $686,000 TO $324,000.

SAFETY:

↓ 30%

THE NUMBER OF CRASHES IN A ONE YEAR PERIOD FOR BOTH DIRECTIONS IN THE STUDY AREA DECREASED FROM 37 TO 26—**A 30 PERCENT DECREASE**—INDICATING A REDUCTION OF SAFETY CONCERNS RESULTING FROM CONGESTED-RELATED CONFLICTS.