Portland Region

2018

Traffic Performance Report

Oregon Department of Transportation: Region 1
December 2018
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Overview

Purpose of this report

This 2018 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 have led to the need to develop benchmarks for on-going performance monitoring.

ODOT manages the freeway system for safety and efficient and reliable operations. ODOT focuses on improvements at specific key locations to address bottlenecks 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 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:

- **Increased congestion in the mid-day period**
- **Increased congestion, delay & crashes**
- **Degraded travel time reliability**

Improved data


A few changes that were made from the 2016 Traffic Performance Report are:

- Improved data processing and quality control procedures for the Portal/ATR traffic volume data
- New data source for the empirical freeway travel-time and speeds. The 2016 report utilized FHWA NPMRDS data while the 2018 report uses commercial HERE data. More details on changes in the 2018 Traffic Performance Report can be found in the glossary.
- New datasets describing freight commodity flows, non-crash incidents and incident response.

**TIME PERIODS REPORTED**

**TRAVEL TIME, SPEED AND RELIABILITY**

Indicators are reported for the AM peak, Mid-day, and PM peak periods.

- **AM peak**
  - 5 am to 10 am
  - 5 hours

- **Mid-day**
  - 10 am to 3 pm
  - 3 hours

- **PM peak**
  - 3 pm to 9 pm
  - 6 hours

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

ODOT has been implementing cost-effective improvements that reduce crashes and delay, and relieve congestion at recurring bottlenecks on the freeway system.

- ODOT Corridor Bottleneck Operations Study (CBOS) projects are low-cost 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, 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 congestion and bottlenecks in the metro area grew along with the population

The Portland region grew by 30,000 people from July 2016 to July 2017, according to the US Census Bureau, ranking the region 22nd on the list of US metro areas with the greatest number of new residents. Jobs and the economy also grew, although at a slower rate than the past five years. In 2017, Portland outpaced the national average for metro areas in job growth at 2.1%. Little expansion of the region’s infrastructure has occurred over the past 30 years resulting in rapid expansion of congestion as capacity has now been reached on all the region’s freeway corridors. The region’s infrastructure is now tasked with accommodating additional traffic as more residents travel for work and daily activities and more businesses need to move goods and services on the highway system.

Regional impacts

A strengthened local economy 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. The average number of hours of congestion in the regional corridors is 127.3 hours in 2017, an increase of 13.4% since 2015.

This traffic congestion directly affects freight in the region. The increasing congestion is expanding into the mid-day hours. In the past, freight relied on the congestion-free off-peak hours to move goods and services in the region. As the mid-day becomes more unreliable, freight is having more problems meeting delivery schedules, resulting in increased shipping costs.

Overall, the number of crashes for the region’s six freeway corridors has continued to increase in parallel with growing congestion. However, analysis of individual corridors shows the crash trend has declined or stabilized after construction of targeted operations and safety improvement projects.

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 commonly occurs with lane reduction (Rose Quarter from 3 to 2 lanes), older roadway design (I-5 at Interstate Bridge and Terwilliger curves) or significant on-ramp demand (I-5 at Lower Boones/Tualatin-Sherwood Road and I-205 at Airport Way). Congested conditions can range from slowing (40-50 mph) to congested (30-40 mph) to severely congested (less than 30 mph).
Helping to manage congestion and improve safety - traffic 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 and 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. ODOT’s Incident Response team operates special equipped vehicles to perform the functions of incident prevention, motorist assistance and incident management. Incident Response 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 IN 2017

In early September 2017 a wildfire in the Columbia River Gorge, dubbed the Eagle Creek fire, led to the shutdown of more than 30 miles of I-84 from Troutdale to Hood River.4 Highway closures lasted until mid-September, but the fire burned more than 50,000 acres before it was contained three months later.5 Extra restrictions were in effect for freight vehicles along the highway.

This closure impacted local residents’ ability to travel along this key east-west corridor, which connects the east and west parts of Oregon. The fire also had an impact on freight routes, re-routing trucks both on I-84 on the Oregon side and SR 14 on the Washington side. Vehicles were re-routed using OR 26, OR 35, US 97 and US 197.

The solar eclipse of August 21, 2017 was a major traffic event for several days as people traveled south of Portland to Corvallis in the I-5 corridor to view totality. Much of the congestion from this event occurred outside of the Portland region, south of Wilsonville and the Willamette River crossing. Most of the region’s freeways were free flowing on the day of the eclipse. Following the eclipse significant demand to Portland International Airport and points north of Portland (toward Seattle) occurred.
Regional Bottlenecks

Traffic data indicates the region’s travel speeds and travel time reliability are systematically getting worse. The following are the performance indicators for the 2015-2017 time period.

Region's top recurring bottlenecks

These are the most severe recurring bottlenecks for each corridor

<table>
<thead>
<tr>
<th>Bottleneck location</th>
<th>2015</th>
<th>2017</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5 NB</td>
<td>7:30-7:45 AM</td>
<td>7:30-7:45 AM</td>
<td></td>
</tr>
<tr>
<td>I-205 NB</td>
<td>12:30 PM-1:00 PM</td>
<td>12:30-1:00 PM</td>
<td></td>
</tr>
<tr>
<td>I-5 SB</td>
<td>7:30-8:45 AM</td>
<td>7:30-8:45 AM</td>
<td></td>
</tr>
<tr>
<td>US 26 EB</td>
<td>7:30-8:30 AM</td>
<td>7:30-8:30 AM</td>
<td></td>
</tr>
<tr>
<td>OR 217 SB</td>
<td>7:30-8:30 AM</td>
<td>7:30-8:30 AM</td>
<td></td>
</tr>
</tbody>
</table>

Motorists in these corridors experience the slowest driving speeds, the majority of which are in the PM peak period. This is the calculated average speed across all lanes for the analysis period for the entire corridor segment. The right lane in a bottleneck location will experience much lower speeds.

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

<table>
<thead>
<tr>
<th>Corridor Location</th>
<th>Posted Speed</th>
<th>AM</th>
<th>Mid-day</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5 NB</td>
<td>50-65</td>
<td>41.8</td>
<td>46.3</td>
<td>36.4</td>
</tr>
<tr>
<td>I-5 SB</td>
<td>50-65</td>
<td>47.5</td>
<td>45.4</td>
<td>27.7</td>
</tr>
<tr>
<td>I-205 NB</td>
<td>55-65</td>
<td>50.5</td>
<td>50.5</td>
<td>28.7</td>
</tr>
<tr>
<td>I-405 NB</td>
<td>50</td>
<td>45.3</td>
<td>43.3</td>
<td>22.8</td>
</tr>
<tr>
<td>I-405 SB</td>
<td>50</td>
<td>40.6</td>
<td>41.6</td>
<td>23.8</td>
</tr>
<tr>
<td>US 26 EB</td>
<td>50-55</td>
<td>35.4</td>
<td>46.5</td>
<td>37.6</td>
</tr>
<tr>
<td>OR 217 SB</td>
<td>50-55</td>
<td>35.2</td>
<td>42.7</td>
<td>34.1</td>
</tr>
</tbody>
</table>

Motorists in these corridors experience the slowest driving speeds, the majority of which are in the PM peak period. This is the calculated average speed across all lanes for the analysis period for the entire corridor segment. The right lane in a bottleneck location will experience much lower speeds.

Region's corridors with highest drop in weekday speed (mph)

<table>
<thead>
<tr>
<th>Corridor Location</th>
<th>Time of Day</th>
<th>2015</th>
<th>2017</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5 NB</td>
<td>Mid-day</td>
<td>54.2</td>
<td>50.5</td>
<td>-3.7</td>
</tr>
<tr>
<td>I-205 NB</td>
<td>Mid-day</td>
<td>53.7</td>
<td>49.9</td>
<td>-3.8</td>
</tr>
<tr>
<td>I-405 NB</td>
<td>Mid-day</td>
<td>45.3</td>
<td>41.6</td>
<td>-3.7</td>
</tr>
<tr>
<td>US 26 EB</td>
<td>PM</td>
<td>41.9</td>
<td>37.6</td>
<td>-4.2</td>
</tr>
<tr>
<td>US 26 WB</td>
<td>PM</td>
<td>50.1</td>
<td>45.5</td>
<td>-4.7</td>
</tr>
</tbody>
</table>

Motorists in these corridors experience the highest drop in driving speed, mostly during the Mid-day and PM peak periods. This is an indication of growing congestion and longer travel time in these corridors.

Weekday system speed by time of day

2015 vs. 2017

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: HERE data

<table>
<thead>
<tr>
<th>Corridor location</th>
<th>AM</th>
<th>Mid-day</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5 NB</td>
<td>15.3</td>
<td>16.1</td>
<td>29.2</td>
</tr>
<tr>
<td>I-5 SB</td>
<td>9.1</td>
<td>15.9</td>
<td>44.4</td>
</tr>
<tr>
<td>I-84 WB</td>
<td>15.0</td>
<td>7.2</td>
<td>15.1</td>
</tr>
<tr>
<td>I-205 NB</td>
<td>8.9</td>
<td>10.3</td>
<td>27.5</td>
</tr>
<tr>
<td>I-205 SB</td>
<td>11.2</td>
<td>13.7</td>
<td>23.8</td>
</tr>
<tr>
<td>I-405 NB</td>
<td>1.2</td>
<td>2.5</td>
<td>3.5</td>
</tr>
<tr>
<td>US 26 EB</td>
<td>16.4</td>
<td>7.9</td>
<td>15.2</td>
</tr>
</tbody>
</table>

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

**Corridors with highest planning travel time***
Source: HERE data

<table>
<thead>
<tr>
<th>Corridor location</th>
<th>AM</th>
<th>Mid-day</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5 NB</td>
<td>52.1</td>
<td>50.5</td>
<td>88.9</td>
</tr>
<tr>
<td>I-5 SB</td>
<td>44.3</td>
<td>49.7</td>
<td>100.6</td>
</tr>
<tr>
<td>I-205 NB</td>
<td>39.6</td>
<td>40.2</td>
<td>80.8</td>
</tr>
<tr>
<td>I-205 SB</td>
<td>44.1</td>
<td>43.3</td>
<td>64.0</td>
</tr>
<tr>
<td>I-405 NB</td>
<td>6.8</td>
<td>8.4</td>
<td>16.5</td>
</tr>
<tr>
<td>I-405 SB</td>
<td>8.0</td>
<td>8.4</td>
<td>13.4</td>
</tr>
</tbody>
</table>

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

**Corridors with planning travel time higher during mid-day than AM peak period**
Source: HERE data

<table>
<thead>
<tr>
<th>Corridor location</th>
<th>AM</th>
<th>Mid-day</th>
<th>PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5 SB</td>
<td>44.3</td>
<td>49.7</td>
<td>100.6</td>
</tr>
<tr>
<td>I-84 EB</td>
<td>20.1</td>
<td>22.5</td>
<td>30.8</td>
</tr>
<tr>
<td>I-205 NB</td>
<td>39.6</td>
<td>40.2</td>
<td>80.8</td>
</tr>
<tr>
<td>I-405 NB</td>
<td>6.8</td>
<td>8.4</td>
<td>16.5</td>
</tr>
<tr>
<td>I-405 SB</td>
<td>8.0</td>
<td>8.4</td>
<td>13.4</td>
</tr>
</tbody>
</table>

Planning a trip in these corridors will require a longer travel time during the mid-day than during the AM peak period.
Cost of Congestion

In the United States, traffic congestion is getting worse every year, resulting in increased economic damages. Congestion is characterized by slower speeds, longer trip times and increased vehicle queueing on the available transportation network. The additional traffic burden affects a region’s economy, resulting in significant impact to employment. Truck deliveries connecting businesses throughout the state to the global marketplace are reduced because of congestion. It is critical to continue to invest in the transportation network in order to protect and enhance 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 have experienced 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 used. The daily cost of freeway congestion in the Portland metro region in 2015 was $1.7 million and increased to $2.0 million in 2017. These numbers reflect the cost of trucks and cars delayed on the roadway and do not reflect the environmental 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.

### Cost of Daily Congestion (thousands of dollars)

<table>
<thead>
<tr>
<th>Corridor Location</th>
<th>2015</th>
<th>2017</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5</td>
<td>$623</td>
<td>$734</td>
<td>+17.8%</td>
</tr>
<tr>
<td>I-84</td>
<td>$219</td>
<td>$264</td>
<td>+20.5%</td>
</tr>
<tr>
<td>I-205</td>
<td>$401</td>
<td>$498</td>
<td>+24.2%</td>
</tr>
<tr>
<td>I-405</td>
<td>$114</td>
<td>$130</td>
<td>+14.0%</td>
</tr>
<tr>
<td>US 26</td>
<td>$218</td>
<td>$291</td>
<td>+33.5%</td>
</tr>
<tr>
<td>OR 217</td>
<td>$132</td>
<td>$133</td>
<td>+1.0%</td>
</tr>
</tbody>
</table>

THE DAILY COST OF CONGESTION IN THE PORTLAND METRO REGION HAS INCREASED

$1.7M IN 2015

$2.0M IN 2017
Keep Oregon Moving

House Bill 2017 (HB 2017)

Revenues from HB 2017 are expected to reach $5.3 billion over 10 years and generate $500 million for the State Highway Fund annually. Most of ODOT’s funding will be used for maintenance and repair to keep Oregon’s roads and bridges operational. In order to support a balanced multi-modal transportation system, the funding will also be applied to safety improvements and help relieve congestion and heavy bottlenecks. HB 2017 will also fund auxiliary lanes on I-5 in the Rose Quarter area, which will save drivers 2.5 million hours in congestion annually. Improvements on OR 217 and I-205 will also be made to enhance safety and help relieve bottlenecks.

Evaluating new tools to manage congestion

HB 2017 also directed ODOT to study value pricing as a viable solution to the congestion problem in Portland. Value pricing is a type of tolling that charges a higher fee when congestion is greatest. Orange areas on the map below indicate the potential extent of proposed value pricing projects on I-5 and I-205.

The tolling program would include all lanes in both directions:
- I-5 from about Alberta St to Multnomah Blvd
- I-205 on or near the Abernethy Bridge

Oregonians will pay for this investment through gas taxes, vehicle registration and title fees. The gas tax will increase 10 cents in four steps (graph 1). In 2018, an additional 4 cents will be added to the gas tax with an additional 2 cents added every 2 years starting in 2020 and ending in 2024.
Upcoming projects to address bottlenecks and safety hotspots

RealTime and auxiliary lane projects are planned to improve reliability and safety at bottleneck locations. These projects will not eliminate congestion on an entire corridor, but are expected to improve performance of the targeted segment. Year of expected completion is in parenthesis for each project listed below.

**Auxiliary lanes**

- **A** I-205 NB from I-84 to Killingsworth St (2019)
- **B** I-205 SB from I-84 to Washington/Stark St (2019)
- **C** I-205 NB from Powell Blvd to I-84 (2019)
- **D** I-205 NB from Sunrise to Sunnybrook (2020)
- **E** OR 217 SB from Beaverton-Hillsdale Highway to OR 99W, and collector/distributor road from Allen and Denney interchanges (2022)
- **F** OR 217 NB from OR 99W to Scholls Ferry Rd (2022)

**RealTime Signs and Active Traffic Management (ATM)**

- **G** I-5: Interstate Bridge to Fremont Bridge (2020)
- **H** I-205: Glenn Jackson Bridge to Johnson Creek Blvd (2019)

**Larger-scale projects to improve reliability and safety**

- **I** I-205 from Stafford Road to OR 213*‡
  (including widening of the Abernethy Bridge)
- **J** I-5 at the Rose Quarter*

* These projects are currently in the environmental review and preliminary design phases.
‡ Not yet funded for construction.
Return on Investment

Preliminary data from recently constructed projects have shown major benefits for return on investment. The new auxiliary lane on I-5 southbound from OR 217 to I-205 addresses the bottleneck on this section of freeway and improves traffic flow upstream on I-5 between Capitol Hwy and OR 217 as well as OR 217 southbound between OR 99W to I-5 southbound. The project cost was $28.3 million for construction and will have an estimated delay cost savings of $8.4 million annually to motorists.

NOTE: this preliminary before/after analysis uses 2017 and 2018 data and is completely separate from the delay data analysis of this report, which is full-year 2015-2017.
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, not indicative of individual corridor performance.

**Overall, congestion IS GETTING WORSE.** As congestion increases in the AM and PM, **PEAK PERIODS ARE SPREADING INTO THE MID-DAY.**

Source: HERE data and ODOT

### 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 drivers’ tolerance for congestion is reached.

<table>
<thead>
<tr>
<th>Regional</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Vehicle Miles Traveled (Weekday Average in Millions)</td>
<td>12.1</td>
<td>12.0</td>
<td>12.0</td>
<td>-0.8%</td>
</tr>
</tbody>
</table>

### Congestion Indicators (Weekday Average)

<table>
<thead>
<tr>
<th>Regional</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours of Congestion (Daily Hours)</td>
<td>112.3</td>
<td>121.0</td>
<td>127.3</td>
<td>+13.4%</td>
</tr>
<tr>
<td>Daily Vehicle Hours of Delay (Combined Hours)</td>
<td>67.2K</td>
<td>76.4K</td>
<td>80.7K</td>
<td>+20.1%</td>
</tr>
<tr>
<td>AM Peak Travel Time (Minutes)</td>
<td>251.5</td>
<td>259.2</td>
<td>265.3</td>
<td>+5.5%</td>
</tr>
<tr>
<td>AM Peak Speed (MPH)</td>
<td>45.9</td>
<td>44.8</td>
<td>44.1</td>
<td>-3.9%</td>
</tr>
<tr>
<td>Mid-day Travel Time (Minutes)</td>
<td>223.4</td>
<td>229.5</td>
<td>236.7</td>
<td>+6.0%</td>
</tr>
<tr>
<td>Mid-day Speed (MPH)</td>
<td>50.4</td>
<td>49.2</td>
<td>47.8</td>
<td>-5.2%</td>
</tr>
<tr>
<td>PM Peak Travel Time (Minutes)</td>
<td>330.3</td>
<td>352.1</td>
<td>356.9</td>
<td>+8.1%</td>
</tr>
<tr>
<td>PM Peak Speed (MPH)</td>
<td>36.7</td>
<td>34.8</td>
<td>34.8</td>
<td>-5.2%</td>
</tr>
</tbody>
</table>

### Hours of Congestion (HOC)

HOC for the regional level is based on the cumulative HOC reported for all corridors in both directions. HOC has grown by 13.4 percent.

### Peak Period Travel Times

Average speeds and travel times are general measures of congestion. Speeds decreasing (travel times increasing) indicate that it is taking longer for people to travel through the corridors. For the region, AM, mid-day and PM congestion has gotten worse. Generally, PM traffic conditions have deteriorated the most, followed by mid-day.

### Reliability Indicators

Regional trip reliability in the PM peak is the worst, exceeding AM and mid-day reliability by about two times. Mid-day reliability degraded the most among all buffer times.

<table>
<thead>
<tr>
<th>Regional</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer Time AM Peak (Minutes)</td>
<td>13.3</td>
<td>15.1</td>
<td>15.4</td>
<td>+15.8%</td>
</tr>
<tr>
<td>Buffer Time Mid-day Peak (Minutes)</td>
<td>11.8</td>
<td>13.4</td>
<td>14.9</td>
<td>+26.3%</td>
</tr>
<tr>
<td>Buffer Time PM Peak (Minutes)</td>
<td>32.0</td>
<td>30.9</td>
<td>29.5</td>
<td>-7.8%</td>
</tr>
</tbody>
</table>

- Declining Conditions
- Improving Conditions

---

**Mid-day**

Mid-day travel times and speeds indicate an increase in congestion within the regional system.
Bottlenecks

2017
Source: HERE data

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

In 2017, recurring bottlenecks impacted all of the region’s freeways throughout the day.

Total bottlenecks
2015 vs. 2017
Source: HERE data

<table>
<thead>
<tr>
<th>Year</th>
<th>Bottlenecks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>36</td>
</tr>
<tr>
<td>2017</td>
<td>38</td>
</tr>
</tbody>
</table>

The number of bottlenecks has INCREASED BY in the last 2 YEARS.

AM AND PM PEAK BOTTLENECKS cause MAJOR DELAYS and INCREASE CRASH RATES.

RECURRING BOTTLENECKS impact ALL of the REGION’S FREEWAYS.
Freight

Interstate Freight Routes

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

I-5 carries the highest freight volume, ranging from 10,000 to 19,000 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 6,300 to 13,500 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 7,800 to 14,000 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 7,700 to 9,400 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 2,200 to 6,200 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 about 4,000 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 its national and international competitiveness.\(^9\) As buffer times have increased significantly in recent years, reliability of freight delivery to and through the Portland region has degraded. 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.\(^{10}\)

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, and machinery, while the top commodities by weight are wood products, gravel and crushed stone, and prepared foodstuffs.

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

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.\(^{11}\)
Safety

Crashes 2013-2017
Source: ODOT

ODOT crash trends are looked at over a 5-year period

Freeway high-crash hotspots 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.
Crashes by type
2013-2017
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.

Crashes increase during rush hour
2013-2017, 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.

NOTE: Although crash data is complete, crash rate data is pulled from a statewide report and 2017 report is not yet available.

Crashes by type
2013-2017
Source: ODOT

16,833 crashes

73% Rear-end

17% Side-swipe (overtaking)

7% Hit a fixed object

3% Other

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

Incidents (Non-Crash)
2013-2017
Source: ODOT

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.

Incidents have increased slightly each year, except for a slight decrease in 2015. The rate 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.
Corridors with higher levels of congestion and volumes have increased incident rates. The majority of the incident rates are remaining stable or slightly increasing.

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

Incidents by time of day
2013-2017, 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 by type
2013-2017
Source: ODOT

Over 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 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 25 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 Portland region and statewide businesses who rely on the corridor to fulfill daily business needs.

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: bi-state travel time signage (completed 2014)

Upcoming Improvements

Active Traffic Management
- I-5 NB and SB: Wilsonville to Tigard
- I-5 NB and SB: I-405 to Interstate Bridge (2020)

Auxiliary lane
- 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.

FREIGHT MOBILITY

I-5 has the highest truck volumes in the Portland region. Truck volume accounts for 10% to 15% of total traffic with a daily volume of 10,000 to 19,000 trucks. The top value commodities transported on I-5 are motorized/other vehicles (including parts) and machinery, while the top tonnage commodities transported in the corridor include wood products, prepared foodstuffs (including fats and oils), and waste and scrap.
I-5 corridor highlights

**Congestion and bottlenecks**

Free-flow speed is calculated to be 60 mph with a free-flow travel time of 25 minutes for both NB and SB.

The most congested conditions in 2017 occurred during the PM peak. In the NB direction, the average travel time for the corridor increased from 55 minutes in 2015 to 60 minutes in 2017. In the SB direction, the average travel time for the corridor increased from 51 minutes in 2015 to 56 minutes in 2017. This is more than double the average free-flow travel time.

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 7:00 a.m. to 7:30 p.m. In the SB direction, the most significant recurring bottleneck begins in the AM and extends into the mid-day and PM, totaling over nine 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 generally degraded between 2015 and 2017. For both directions of I-5 in the AM peak, mid-day, and PM peak, the average travel time increased. For AM peak and mid-day, the buffer time also increased. I-5 NB and SB during the PM experiences some of the most unreliable travel times in the region. During the mid-day, I-5 NB and I-5 SB experienced some of the largest buffer travel time increases in the region.

**Calculating Reliable Travel Time on I-5**

Source: HERE data

<table>
<thead>
<tr>
<th>Year</th>
<th>Free-flow</th>
<th>AM peak</th>
<th>Mid-day</th>
<th>PM peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Distance: 25.0 miles</td>
<td>Free-flow Time: 25 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-5 NB</td>
<td></td>
<td>Average Buffer A Total B</td>
<td>Average Buffer A Total B</td>
<td>Average Buffer A Total B</td>
</tr>
<tr>
<td>2015</td>
<td>25</td>
<td>34.4  14.1 48.5</td>
<td>32.3  13.9 46.2</td>
<td>55.2  31.6 86.8</td>
</tr>
<tr>
<td>2017</td>
<td>36.8  15.3 52.1</td>
<td>34.4  16.1 50.5</td>
<td>59.7  29.2 88.9</td>
<td></td>
</tr>
<tr>
<td>I-5 SB</td>
<td></td>
<td>33.9  9.0 42.9</td>
<td>32.0  12.8 44.8</td>
<td>50.7  47.1 97.8</td>
</tr>
<tr>
<td>2015</td>
<td>25</td>
<td>35.2  9.1 44.3</td>
<td>33.8  15.9 49.7</td>
<td>56.2  44.4 100.6</td>
</tr>
<tr>
<td>2017</td>
<td>33.9  9.0 42.9</td>
<td>32.0  12.8 44.8</td>
<td>50.7  47.1 97.8</td>
<td></td>
</tr>
</tbody>
</table>

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).

**Safety**

The crash trend is usually directly related to congestion and the reliability of the corridor. Overall, the number of crashes for I-5 has been increasing. Crashes by time of day are concentrated during the mid-day through PM peak periods, which also are the most unreliable travel periods.

The majority of the total crashes on I-5 are rear-end (72 percent) and side-swipe/overtaking (20 percent), which are typical of congested conditions. The number of non-crash incidents has also increased, the majority of such incidents are disabled vehicles (52 percent).
The I-5 corridor dashboard provides insights into traffic performance. Here are some key points:

**Daily Vehicle Miles Traveled (DVMT)**
DVMT has remained steady from 2015 to 2017, while congestion has been getting worse. This indicates that the corridor is experiencing at or over capacity conditions.

**Hours of Congestion (HOC)**
HOC at the corridor level is measured at the worst bottleneck (Rose Quarter). The HOC on I-5 has steadily increased for both NB and SB directions.

**Daily Vehicle Hours Delay (DVHD)**
The DVHD for the I-5 corridor has increased by 18 percent for both NB and SB directions between 2015 and 2017. This indicates that the extent (number of segments where congestion is present) and duration of congestion in the corridor have continued to increase.

### Peak Period Travel Times and Speeds

**AM**
AM travel time and speed indicate increasing congestion on I-5 in both directions, particularly NB. In the NB direction, the slowest speeds were experienced from Terwilliger to the Burnside Bridge. In the SB direction, the Interstate Bridge to Lombard had the slowest speeds.

**Mid-day**
Mid-day travel time and speed indicate increasing congestion on I-5 in both directions. In both directions, the slowest speeds are experienced between the Interstate Bridge and Rose Quarter.

**PM**
PM travel time and speed indicates increasing congestion on I-5 in both directions. In the NB direction, the slowest speeds were experienced from the Rose Quarter through the Interstate Bridge. In the SB direction, the slowest speeds were experienced from Lombard through the Rose Quarter.

### Congestion Indicators (Weekday Average)

<table>
<thead>
<tr>
<th>I-5</th>
<th>Corridor</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Vehicle Miles Traveled (Weekday Average in Thousands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>1,762</td>
<td>1,763</td>
<td>1,753</td>
<td>-0.5%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>1,698</td>
<td>1,689</td>
<td>1,692</td>
<td>-0.4%</td>
<td></td>
</tr>
<tr>
<td>Hours of Congestion (Daily Hours)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>13.5</td>
<td>13.8</td>
<td>14.0</td>
<td>+3.7%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>13.3</td>
<td>13.5</td>
<td>14.0</td>
<td>+5.3%</td>
<td></td>
</tr>
<tr>
<td>Daily Vehicle Hours of Delay (Daily Vehicle Hours)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>12.6K</td>
<td>13.8K</td>
<td>14.8K</td>
<td>+17.5%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>11.8K</td>
<td>13.4K</td>
<td>13.9K</td>
<td>+17.8%</td>
<td></td>
</tr>
<tr>
<td>AM Peak Travel Time (Minutes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>34.4</td>
<td>36.2</td>
<td>36.8</td>
<td>+7.0%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>33.9</td>
<td>34.6</td>
<td>35.2</td>
<td>+3.8%</td>
<td></td>
</tr>
<tr>
<td>AM Peak Speed (MPH)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>44.2</td>
<td>42.6</td>
<td>41.8</td>
<td>-5.4%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>49.1</td>
<td>48.8</td>
<td>47.5</td>
<td>-3.3%</td>
<td></td>
</tr>
<tr>
<td>Mid-day Travel Time (Minutes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>32.3</td>
<td>32.9</td>
<td>34.4</td>
<td>+6.8%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>32.0</td>
<td>33.0</td>
<td>33.8</td>
<td>+5.6%</td>
<td></td>
</tr>
<tr>
<td>Mid-day Speed (MPH)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>48.8</td>
<td>48.0</td>
<td>46.3</td>
<td>-5.1%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>48.1</td>
<td>46.6</td>
<td>45.4</td>
<td>-5.6%</td>
<td></td>
</tr>
<tr>
<td>PM Peak Travel Time (Minutes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>55.2</td>
<td>58.5</td>
<td>59.7</td>
<td>+8.2%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>50.7</td>
<td>55.2</td>
<td>56.2</td>
<td>+10.8%</td>
<td></td>
</tr>
<tr>
<td>PM Peak Speed (MPH)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>37.0</td>
<td>35.5</td>
<td>36.4</td>
<td>-1.6%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>30.0</td>
<td>27.7</td>
<td>27.7</td>
<td>-7.7%</td>
<td></td>
</tr>
</tbody>
</table>

- Declining Conditions
- Minor change (+/- 2% or less)
- Improving Conditions

Source: HERE data and ODOT
### Safety Indicators

<table>
<thead>
<tr>
<th>Safety (non-crash) Incidents</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB</td>
<td>6351</td>
<td>6845</td>
<td>7200</td>
<td>+13.4%</td>
</tr>
<tr>
<td>SB</td>
<td>5164</td>
<td>4795</td>
<td>4795</td>
<td>+11.7%</td>
</tr>
</tbody>
</table>

### Reliability Indicators (Weekday Average)

<table>
<thead>
<tr>
<th>Reliability Indicators (Weekday Average)</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffer Time AM Peak (Minutes)</td>
<td>NB</td>
<td>14.1</td>
<td>14.2</td>
<td>+8.5%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>9.0</td>
<td>10.8</td>
<td>+1.1%</td>
</tr>
<tr>
<td>Buffer Time Mid-day Peak (Minutes)</td>
<td>NB</td>
<td>13.9</td>
<td>13.8</td>
<td>+15.8%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>12.8</td>
<td>15.1</td>
<td>+24.2%</td>
</tr>
<tr>
<td>Buffer Time PM Peak (Minutes)</td>
<td>NB</td>
<td>31.6</td>
<td>29.7</td>
<td>-7.6%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>47.1</td>
<td>45.9</td>
<td>-5.7%</td>
</tr>
</tbody>
</table>

---

**Reliability/Buffer Time**

Trip reliability is the worst in the PM, with 2-3 times the buffer time of the AM and mid-day. The AM and mid-day have similar reliability, but mid-day indicates higher growth in buffer time.

---

**Safety: Crashes**

I-5 SB had more crashes and less reliable travel in the PM than I-5 NB. However, I-5 NB has seen a significant increase in crashes (23 percent) since 2015.

---

**Safety (non-crash) Incidents**

The total number of incidents increased 13 percent from 2015 to 2017. In 2017, I-5 averaged 15 non-crash incidents daily.
2017 average speed (mph)

**AM weekday**
5:00 a.m. to 10:00 a.m.
Source: HERE data

- **SB** direction slows from the Interstate Bridge through the city center.
- **NB** direction slows from OR 99W to the Marquam Bridge and through the Rose Quarter.

**PM weekday**
3:00 p.m. to 9:00 p.m.
Source: HERE data

- **SB** direction slows from Rosa Parks Blvd to Terwilliger and from OR 217 to the Boone Bridge.
- **NB** direction slows from Capitol Highway to the Interstate Bridge, especially around the Marquam Bridge and Rose Quarter.
I-5 bottlenecks

I-5 corridor has the most bottlenecks (12) of any freeway in the Portland region. While the number of bottlenecks did not change from 2015 to 2017 the nature of all but three of them got worse in terms of duration.

The most significant northbound I-5 bottlenecks occur at the Interstate Bridge, Rose Quarter, Marquam Bridge/I-84, Terwilliger Curves and Lower Boones Ferry Road. These bottlenecks are caused by a variety of factors including geometry and lane drops. The first four of these regularly have overlapping queues that last over seven hours (an increase of one hour between 2015 and 2017).

In addition, an emerging and worsening bottleneck occurs on I-5 SB during the PM peak in Wilsonville. By 2017, drivers encountered congestion regularly from OR 217 to Wilsonville.

Total bottlenecks

<table>
<thead>
<tr>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 bottlenecks</td>
<td>12 bottlenecks</td>
</tr>
</tbody>
</table>

Source: HERE data

### Duration of bottlenecks

2015 vs. 2017

Source: HERE data
I-5 had a total of 5,000 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 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 23 top 10 SPIS sites along the corridor, most of which were located in the northern section from the Marquam Bridge to the Interstate Bridge where congestion is highest. The I-5 corridor crash rate was 0.94 crashes per million vehicle miles traveled, which is higher than the 2016 statewide average crash rate of 0.87 on interstate freeways in urban cities.
The average time to clear an incident on I-5 is approximately 18 minutes. The table shows clearance times in minutes from 2013 through 2017. 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; Interstate Bridge; and OR 99W to Taylor’s Ferry Road.

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 52 percent of non-crash incidents on I-5. This is followed by hazardous debris (19%) and abandoned vehicles (7%).
OREGON DEPARTMENT OF TRANSPORTATION

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 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.

Upcoming Improvements

Auxiliary lane

Three auxiliary lane projects on I-205 at the I-84 interchange would alleviate congestion and queuing that currently spill onto I-84:

- I-205 NB: I-84 EB entrance to the Killingsworth Street exit (under construction, expected 2019)
- I-205 SB: I-84 EB entrance to the Washington Street/Stark Street exit (under construction, expected 2019)
- I-205 NB: Powell Boulevard entrance to the I-84 WB entrance (expected 2019)

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 20% of total traffic, with a daily volume of 6,300 to 13,500 trucks. The top value commodities transported on I-84 are electronics and other electrical equipment, machinery, and motorized and other vehicles (including parts). The top tonnage commodities transported in the corridor include wood products, gravel and crushed stone, and agricultural products.
I-84 corridor highlights

Congestion and bottlenecks

Free-flow speed is calculated to be 61 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. The most congested conditions in 2017 occurred on I-84 EB from 11:45 a.m. to 7:45 p.m. (8 hours).

In the PM peak, the average travel time for the corridor was 25 minutes for both directions. There is a bottleneck on I-84 WB from I-5 that extends to I-205 between 6:00 a.m. and 10:30 a.m. and a second bottleneck on I-84 at the I-205 split that lasts from 3:00 p.m. to 5:00 p.m. Congestion on I-84 impacts freight access to key industrial areas and affects travel to and from Portland International Airport and east Portland.

Reliability

Reliability on the I-84 corridor has degraded between 2015 and 2017 for the AM and mid-day peak periods. For both directions of I-84 in the AM peak, mid-day, and PM peak, the average travel time increased. For AM peak and mid-day, the buffer time also increased. This means trips in the AM peak and mid-day are taking longer. In particular, the AM peak on I-84 WB experiences some of the least reliable travel times in the corridor. As reliability degrades throughout the day, it affects drivers’ ability to reach their destinations on time.

Calculating Reliable Travel Time on I-84

Distance: 17.6 miles
Free-flow Travel Time: 17 minutes

**Worst Case: I-84 WB during 2017 AM Peak**

<table>
<thead>
<tr>
<th></th>
<th>Average Travel Time</th>
<th>Buffer Travel Time</th>
<th>Reliable Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>30 minutes</td>
<td>15 minutes</td>
<td>45 minutes</td>
</tr>
</tbody>
</table>

The crash trend is usually directly related to congestion and the reliability of the corridor. The number of crashes for I-84 EB has been increasing, but WB crashes decreased. Crashes by time of day are concentrated during the AM and PM peak periods, which also are the most unreliable travel periods. The majority of crashes on I-84 are rear-end (72 percent) and side-swipe/overtaking (16 percent), which are typical of congested conditions. The number of non-crash incidents has also increased, the majority of such incidents on I-84 are disabled vehicles (60 percent).
Daily Vehicle Miles Traveled (DVMT)

DVMT has remained steady from 2015 to 2017, while congestion has worsened. This indicates I-84 is experiencing at or over capacity conditions. 2017 DVMT may have been impacted by the Eagle Creek Fire.

Hours of Congestion (HOC)

HOC at the corridor level is measured at the worst bottleneck (I-205 interchange). I-84 WB has a longer HOC than EB. I-84 EB has a higher growth in HOC than WB.

Daily Vehicle Hours Delay (DVHD)

The DVHD for the I-84 corridor has increased in both directions, especially from 2016 to 2017. This indicates that the extent and duration of congestion in the corridor have continued to increase. WB delay is significantly greater than EB delay due to little to no EB delays in the AM.

Peak Period Travel Times and Speeds

AM
AM travel time and speed indicate increasing congestion on I-84 primarily in the WB direction. The EB direction experiences little congestion during the AM, while the WB experiences significantly slower speeds and increased travel times compared to free-flow conditions.

Mid-day
Mid-day travel time and speed indicate a slight increase in congestion on I-84 in both directions.

PM
PM travel time and speed indicates increasing congestion on I-84 in both directions. In the EB direction, the slowest speeds were experienced from the I-5 merge to the I-205 interchange. In the WB direction, the slowest speeds are experienced around the I-5 merge and I-205 split.
### Safety Indicators

#### Annual Crashes

<table>
<thead>
<tr>
<th>Direction</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB</td>
<td>153</td>
<td>156</td>
<td>178</td>
<td>+16.3%</td>
</tr>
<tr>
<td>WB</td>
<td>299</td>
<td>293</td>
<td>296</td>
<td>-1.0%</td>
</tr>
</tbody>
</table>

#### Annual Incidents

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2237</td>
<td>2386</td>
<td>2407</td>
<td>+7.6%</td>
</tr>
</tbody>
</table>

### Reliability Indicators (Weekday Average)

#### Buffer Time AM Peak

<table>
<thead>
<tr>
<th>Direction</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB</td>
<td>1.2</td>
<td>1.2</td>
<td>1.7</td>
<td>+41.7%</td>
</tr>
<tr>
<td>WB</td>
<td>12.7</td>
<td>13.9</td>
<td>15.0</td>
<td>+18.1%</td>
</tr>
</tbody>
</table>

#### Buffer Time Mid-day Peak

<table>
<thead>
<tr>
<th>Direction</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB</td>
<td>2.3</td>
<td>2.2</td>
<td>2.7</td>
<td>+17.4%</td>
</tr>
<tr>
<td>WB</td>
<td>6.9</td>
<td>7.1</td>
<td>7.2</td>
<td>+4.3%</td>
</tr>
</tbody>
</table>

#### Buffer Time PM Peak

<table>
<thead>
<tr>
<th>Direction</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB</td>
<td>7.0</td>
<td>5.3</td>
<td>6.3</td>
<td>-10.0%</td>
</tr>
<tr>
<td>WB</td>
<td>17.3</td>
<td>16.3</td>
<td>15.1</td>
<td>-12.7%</td>
</tr>
</tbody>
</table>

### Reliability / Buffer Time

Trip reliability is the worst for the WB direction during the AM and PM. The EB direction has good reliability in the AM and mid-day. The slight decrease in PM travel time is offset by the increase in PM travel time in both directions.

### Safety: Crashes

The number of crashes in the EB direction increased by 16 percent from 2015 to 2017. I-84 WB had 60 percent more crashes than I-84 EB, as well as less reliable travel than the EB direction.

### Safety (non-crash) Incidents

The total number of incidents increased from 2015 to 2017. In 2017, there were on average approximately 7 non-crash incidents per day on I-84.
2017 average speed (mph)

**AM weekday**
5:00 a.m. to 10:00 a.m.
Source: HERE data

**PM weekday**
3:00 p.m. to 9:00 p.m.
Source: HERE data

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

**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 has few bottlenecks that are not caused by junctions with or queue extensions from other facilities (I-5 and I-205). At I-5, bottlenecks exist WB at the split to I-5 and EB at the confluence of on-ramps from I-5 with the NE Grand Avenue on-ramp. At I-205, queues extend back onto I-84 due to merge/weave capacity issues for I-84 EB to I-205 NB and I-84 WB to I-205 NB. The I-5 WB split is a bottleneck that occurs for about four and a half hours of the day, mostly in the morning peak and extends back to I-205. I-84 EB has one primary bottleneck. The junction of I-5 ramps with NE Grand Avenue is congested back toward I-5 for about eight hours in the mid-day and evening peak.

**Duration of bottlenecks**

2015 vs. 2017

Source: HERE data

<table>
<thead>
<tr>
<th>Location</th>
<th>2015 Duration</th>
<th>2017 Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-5 I-205 Merge</td>
<td>6:30-10:00 AM</td>
<td>6:00-10:30 AM</td>
</tr>
<tr>
<td>I-5 Lloyd Blvd.</td>
<td>1:00-2:00 PM</td>
<td>11:00 AM-2:00 PM</td>
</tr>
<tr>
<td>I-205 122nd</td>
<td>3:45-5:00 PM</td>
<td>3:00-5:30 PM</td>
</tr>
</tbody>
</table>

**Total bottlenecks**

2015 vs. 2017

Source: HERE data

<table>
<thead>
<tr>
<th>Year</th>
<th>Bottlenecks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>4</td>
</tr>
<tr>
<td>2017</td>
<td>4</td>
</tr>
</tbody>
</table>
I-84 safety

I-84 had a total of 2,234 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 eight top 10 SPIS sites along the corridor, most of which were located in the section between I-5 and I-205 where congestion is highest. The I-84 corridor’s crash rate was 0.75 crashes per million vehicle miles traveled, which is lower than the 2016 statewide average crash rate of 0.87 on interstate freeways in urban cities.
The average time to clear an incident on I-84 is approximately 23 minutes. The table shows clearance times in minutes from 2013 through 2017. 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 during the mid-day shoulder to PM peak period.

Disabled vehicle incidents account for 60 percent of non-crash incidents on I-84. This is followed by hazardous debris (11%) and abandoned vehicles (11%).
**Introduction**

I-205 is one of the longest corridors in the region, at 25 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 state of Oregon.

I-205 from the Willamette River near Oregon City to I-5 was constructed as a four-lane interstate. 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.

**Recent/Current Improvements**

**Active Traffic Management**
- I-205 NB and SB: Bi-state travel time signage (completed 2014)

**Upcoming Improvements**

**Auxiliary lane**
- I-205 NB: I-84 EB entrance to the Killingsworth Street exit (under construction, expected 2019)
- I-205 SB: I-84 EB entrance to the Washington Street/Stark Street exit (under construction, expected 2019)
- I-205 NB: Powell Boulevard entrance to the I-84 WB entrance (expected 2019)
- I-205 NB: Sunrise to Sunnybrook (expected 2020)

**Active Traffic Management**
- I-205 NB and SB: Glenn Jackson Bridge to Johnson Creek Boulevard (expected 2019)
- I-205 NB and SB: I-5 to OR 213 (expected 2020)

**Widening**
- I-205 NB and SB: Stafford Road to OR 213, including widening the Abernethy Bridge (future project, environmental process 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 7,800 to 14,000 trucks. This accounts for 6% to 9% of total traffic on I-205. The top value commodities transported are machinery, motorized and other vehicles, electronics and textiles. The top tonnage commodities transported are wood products, gravel and crushed stone, logs and nonmetallic mineral products.
I-205 corridor highlights

**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 in 2017 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 increased from 48 minutes in 2015 to 53 minutes in 2017. In the SB direction, the average travel time for the corridor increased from 37 minutes in 2015 to 40 minutes in 2017.

The most severe recurring bottleneck on I-205 NB was at the Glenn Jackson Bridge, lasting from 2:15 p.m. to 7:00 p.m. The second most severe NB bottleneck was at the Abernethy Bridge, lasting from 2:45 p.m. to 6:15 p.m.

In the SB direction, the most significant recurring bottleneck extended from Division Street to the Glenn Jackson Bridge. This bottleneck occurred from 2:30 p.m. to 6:15 p.m.

**Reliability**

Reliability on the I-205 corridor generally degraded between 2015 and 2017. For both directions of I-205 in the AM peak, mid-day, and PM peak, the average travel time increased. For AM peak and mid-day, the buffer time also increased. I-205 NB and SB during the mid-day had one of the largest increases in buffer travel time.

**Calculating Reliable Travel Time on I-205**

| Distance: 25.0 miles | Free-flow Travel Time: 25 minutes |

**Worst Case: I-205 NB during 2015 PM Peak**

| Average Travel Time | 48 minutes |
| Buffer Travel Time | 33 minutes |
| Reliable Travel Time | 81 minutes |

### Travel time (in minutes)

<table>
<thead>
<tr>
<th>Year</th>
<th>Free-flow</th>
<th>AM peak</th>
<th>Mid-day</th>
<th>PM peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Buffer</td>
<td>Total</td>
<td>Average</td>
</tr>
<tr>
<td>I-205 NB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>25</td>
<td>29.2</td>
<td>7.6</td>
<td>36.8</td>
</tr>
<tr>
<td>2017</td>
<td>30.7</td>
<td>8.9</td>
<td>39.6</td>
<td>29.9</td>
</tr>
<tr>
<td>I-205 SB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>25</td>
<td>31.8</td>
<td>11.0</td>
<td>42.8</td>
</tr>
<tr>
<td>2017</td>
<td>33.0</td>
<td>11.2</td>
<td>44.2</td>
<td>29.6</td>
</tr>
</tbody>
</table>

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).

**Safety**

The total crashes on I-205 are rear-end (70 percent) and side-swipe/overtaking (18 percent), which are typical of congested conditions. Disabled vehicles and hazardous debris account for a majority of non-crash incidents on I-205 (40 percent and 29 percent respectively).
Daily Vehicle Miles Traveled (DVMT)

DVMT has remained steady from 2015 to 2017, while congestion has been getting worse. This indicates that the corridor is experiencing at or over capacity conditions.

Hours of Congestion (HOC)

HOC at the corridor level is measured at the worst bottleneck (Glenn Jackson Bridge). The HOC on I-205 has steadily increased for both NB and SB directions.

Daily Vehicle Hours Delay (DVHD)

The DVHD for the I-205 corridor has increased by 25 percent for both NB and SB directions between 2015 and 2017. This indicates that the extent (number of segments where congestion is present) and duration of congestion in the corridor have continued to increase.

Peak Period Travel Times and Speeds

AM
AM travel time and speed indicate increasing congestion on I-205 in both directions.

Mid-day
Mid-day travel time and speed indicate increasing congestion on I-205 in both directions.

PM
PM travel time and speed has the most growth in congestion throughout the day on I-205 in both directions. The NB direction experiences slower speeds and higher travels times than the SB direction, indicating more congestion in that direction.

Source: HERE data and ODOT

<table>
<thead>
<tr>
<th>I-205</th>
<th>Corridor</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Vehicle Miles Traveled (Weekday Average in Thousands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>1,692</td>
<td>1,671</td>
<td>1,628</td>
<td>-3.8%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>1,732</td>
<td>1,731</td>
<td>1,695</td>
<td>-2.1%</td>
<td></td>
</tr>
<tr>
<td>Congestion Indicators (Weekday Average)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours of Congestion (Daily Hours)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB</td>
<td>6.0</td>
<td>8.3</td>
<td>8.8</td>
<td>+46.7%</td>
<td></td>
</tr>
<tr>
<td>SB</td>
<td>7.3</td>
<td>8.5</td>
<td>9.0</td>
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</tr>
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<td>Daily Vehicle Hours of Delay (Daily Vehicle Hours)</td>
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<td>AM Peak Speed (MPH)</td>
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<td>+7.6%</td>
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<tr>
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<td>+7.2%</td>
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<tr>
<td>PM Peak Travel Time (Minutes)</td>
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<tr>
<td>PM Peak Speed (MPH)</td>
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<td>NB</td>
<td>30.9</td>
<td>28.7</td>
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<td>-7.1%</td>
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<td>SB</td>
<td>40.8</td>
<td>38.3</td>
<td>38.0</td>
<td>-6.9%</td>
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### I-205 Corridor

#### Reliability Indicators (Weekday Average)

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<tr>
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<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
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</thead>
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<tr>
<td><strong>Buffer Time AM Peak (Minutes)</strong></td>
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</tr>
<tr>
<td>NB</td>
<td>7.6</td>
<td>8.7</td>
<td>8.9</td>
<td>+17.1%</td>
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<td>11.0</td>
<td>12.4</td>
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<td>+1.8%</td>
</tr>
<tr>
<td><strong>Buffer Time Mid-day Peak (Minutes)</strong></td>
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<td>NB</td>
<td>7.8</td>
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<td><strong>Buffer Time PM Peak (Minutes)</strong></td>
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<tr>
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#### Safety Indicators

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<tr>
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<th>2015 vs 2017 % Change</th>
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<tr>
<td><strong>Annual Crashes</strong></td>
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<td>523</td>
<td>461</td>
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<tr>
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<td>430</td>
<td>513</td>
<td>444</td>
<td>+3.3%</td>
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<tr>
<td><strong>Annual Incidents</strong></td>
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<td>2,959</td>
<td>3,481</td>
<td>3,491</td>
<td>+18.0%</td>
</tr>
</tbody>
</table>

- **Declining Conditions**
- **Minor change (+/- 2% or less)**
- **Improving Conditions**

---

**Reliability / Buffer Time**

Trip reliability is the worst in the PM, with 2-3 times the buffer time of the AM and mid-day. The AM and mid-day have similar reliability.

**Safety: Crashes**

Although the number of crashes in the NB direction decreased slightly, it still exceeds the number of crashes in the SB direction.

**Safety (non-crash) Incidents**

The total number of incidents increased 18 percent from 2015 to 2017. In 2017, there were on average approximately 10 non-crash incidents per day on I-205.
2017 average speed (mph)

AM weekday
5:00 a.m. to 10:00 a.m.
Source: HERE data

PM weekday
3:00 p.m. to 9:00 p.m.
Source: HERE 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. This number has not changed since 2015. The NB I-205 bottlenecks are at Glenn Jackson Bridge, Division/Powell and OR 43. The Glenn Jackson Bridge is congested for over four hours in the PM peak and reaches back to Johnson Creek Boulevard at times. This queue connects up with the Division/Powell bottleneck, which backs up for two hours during the AM and four hours during the PM, reaching back to Johnson Creek Boulevard. The OR 43 bottleneck lasts three and a half hours in the PM peak reaching back to I-5.

The primary SB bottlenecks occur at OR 43, OR 212, and Powell/Division. The Powell/Division bottleneck has the longest duration and can extend back to the Glenn Jackson Bridge (over 3.5 hours in the PM and slightly into the AM). The OR 43 bottleneck extends over three hours in the morning peak and continues slightly into the evening peak.

### Total bottlenecks

2015 vs. 2017

Source: HERE data

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<thead>
<tr>
<th></th>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottlenecks</td>
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<td>6</td>
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</tbody>
</table>

### Duration of bottlenecks

2015 vs. 2017

Source: HERE data

<table>
<thead>
<tr>
<th>Bottleneck Location</th>
<th>2015 Duration</th>
<th>2017 Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenn Jackson Bridge</td>
<td>4.75 hrs</td>
<td>3.5 hrs</td>
</tr>
<tr>
<td>Division</td>
<td>5.8 Miles</td>
<td>5.8 Miles</td>
</tr>
<tr>
<td>OR 212</td>
<td>Johnson Creek</td>
<td>3.5 Miles</td>
</tr>
<tr>
<td>Abernethy Bridge</td>
<td>3.4 Miles</td>
<td>3.4 Miles</td>
</tr>
<tr>
<td>OR 212</td>
<td>Johnson Creek</td>
<td>1.0 hrs</td>
</tr>
<tr>
<td>Division</td>
<td>Glenn Jackson Bridge</td>
<td>2.0 hrs</td>
</tr>
<tr>
<td>OR 212</td>
<td>Johnson Creek</td>
<td>1.75 hrs</td>
</tr>
<tr>
<td>Abernethy Bridge</td>
<td>I-5</td>
<td>3.0 hrs</td>
</tr>
<tr>
<td>Abernethy Bridge</td>
<td>OR 212</td>
<td>1.75 hrs</td>
</tr>
</tbody>
</table>

= morning bottleneck
= evening bottleneck
= morning freeway area impacted
= evening freeway area impacted

**Note:** The map shows the bottlenecks and their durations with the corresponding times and distances for each location.
I-205 safety

I-205 had a total of 4,301 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 14 top 10 SPIS sites along the corridor. The I-205 corridor crash rate was 0.84 crashes per million vehicle miles traveled, which is slightly lower than the 2016 statewide average crash rate of 0.87 on interstate freeways in urban cities.
The average time to clear an incident on I-205 is approximately 18 minutes. The table shows clearance times in minutes from 2013 through 2017. 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 40 percent of non-crash incidents on I-205. This is followed by hazardous debris (29%) and abandoned vehicles (12%).
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. Most of the freeway was built below-grade, with fifteen 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 crash rate 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)

Upcoming Improvements

None planned

Freight Mobility

I-405 is an urban interstate connector, linking I-5, US 26, and US 30. Truck volume accounts for approximately 7% of total traffic on I-405, with a daily volume of 7,700 to 9,400 trucks. The top value commodities transported on I-405 are motorized and other vehicles (including parts), precision instruments and apparatus, and electronic and other electrical equipment and components. The top tonnage commodities transported are cereal grains and gravel and crushed stone.
I-405 corridor highlights

### Congestion and bottlenecks

Free-flow speed is calculated to be 56 mph with a free-flow travel time of five minutes for both NB and SB.

The most congested conditions in 2017 occurred during the PM peak. In the PM peak, the average travel time for the corridor increased less than one minute for the NB (13 minutes) and SB directions (11 minutes) in 2017. This is more than double 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 23-24 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 2:00 p.m. to 7:15 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 1:30 p.m. to 6:30 p.m.

### Reliability

Reliability on the I-405 corridor degraded between 2015 and 2017. For both directions of I-405 in the AM peak, mid-day, and PM peak, the average travel time increased. For AM peak and mid-day, the buffer time also increased. In the PM peak, the sum of travel time and buffer time remains constant. This means that trips are taking longer for all time periods reported.

#### Calculating Reliable Travel Time on I-405

Distance: 4.2 miles  
Free-flow Travel Time: 4.6 minutes

**Worst Case: I-405 NB during 2017 PM Peak**

<table>
<thead>
<tr>
<th>Average Travel Time</th>
<th>Buffer Travel Time</th>
<th>Reliable Travel Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 minutes</td>
<td>4 minutes</td>
<td>17 minutes</td>
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#### Travel time (in minutes)

<table>
<thead>
<tr>
<th>Year</th>
<th>Free-flow AM peak Mid-day PM peak</th>
<th>Buffer A Total (^a)</th>
<th>Buffer A Total (^a)</th>
<th>Buffer A Total (^a)</th>
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</thead>
<tbody>
<tr>
<td>2015</td>
<td>I-405 NB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.6</td>
<td>5.5</td>
<td>1.2</td>
<td>6.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.6</td>
<td>2.1</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.3</td>
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<td>2017</td>
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<td>5.6</td>
<td>1.2</td>
<td>6.8</td>
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<td></td>
<td></td>
<td>5.9</td>
<td>2.5</td>
<td>8.4</td>
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<tr>
<td></td>
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<td>13.0</td>
<td>3.5</td>
<td>16.5</td>
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<tr>
<td>2015</td>
<td>I-405 SB</td>
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</tr>
<tr>
<td></td>
<td>4.6</td>
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<td></td>
<td></td>
<td>11.3</td>
<td>2.2</td>
<td>13.5</td>
</tr>
</tbody>
</table>

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).

### Safety

The crash trend is usually directly related to congestion and the reliability of the corridor. Overall, the number of crashes for I-405 has held steady due to capacity constraints by downstream bottlenecks on I-5 and US 26. Crashes by time of day are concentrated during the PM peak period, which is the most unreliable travel period. 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. Notably, I-405 was the only corridor with a reduction in non-crash incidents between 2015 and 2017.
Daily Vehicle Miles Traveled (DVMT)
DVMT has remained steady from 2015 to 2017, while congestion has been getting worse. This indicates that the corridor is experiencing at or over capacity conditions.

Hours of Congestion (HOC)
HOC at the corridor level is measured at the worst bottleneck (north I-5 junction). The HOC on I-405 has significantly increased for both NB and SB directions.

Daily Vehicle Hours Delay (DVHD)
The DVHD for the I-405 corridor has increased by 11-18 percent between 2015 and 2017. This indicates that the extent (number of segments where congestion is present) and duration of congestion in the corridor have continued to increase.

I-405 Corridor Dashboard

<table>
<thead>
<tr>
<th>I-405</th>
<th>Corridor</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
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<td>Daily Vehicle Miles Traveled (Weekday Average in Thousands)</td>
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<td>237</td>
<td>236</td>
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<tr>
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<td>Congestion Indicators (Weekday Average)</td>
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<tr>
<td>SB</td>
<td>25.4</td>
<td>24.4</td>
<td>23.8</td>
<td>-6.3%</td>
<td></td>
</tr>
</tbody>
</table>

Source: HERE data and ODOT

Peak Period Travel Times and Speeds

AM
AM travel time and speed indicate a slight increase in congestion on I-405 in both directions, particularly SB. AM travel time and speeds are similar to the mid-day period.

Mid-day
Mid-day travel time and speed indicate increasing congestion on I-405 in both directions. The SB direction experiences a greater change in travel time and speed.

PM
PM travel time and speed indicates increasing congestion on I-405 in both directions. The travel time is more than double the free-flow travel time. The PM peak period has some of the slowest peak hour speeds in the region.
### I-405 Corridor Safety Indicators

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reliability Indicators (Weekday Average)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffer Time AM Peak (Minutes)</td>
<td>NB</td>
<td>1.2</td>
<td>1.2</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>1.3</td>
<td>1.4</td>
<td>+15.4%</td>
</tr>
<tr>
<td>Buffer Time Mid-day Peak (Minutes)</td>
<td>NB</td>
<td>2.1</td>
<td>2.1</td>
<td>+19.0%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>1.5</td>
<td>1.8</td>
<td>+46.7%</td>
</tr>
<tr>
<td>Buffer Time PM Peak (Minutes)</td>
<td>NB</td>
<td>4.0</td>
<td>4.0</td>
<td>-12.5%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>2.5</td>
<td>2.7</td>
<td>-12.0%</td>
</tr>
<tr>
<td><strong>Safety Indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Crashes</td>
<td>NB</td>
<td>93</td>
<td>124</td>
<td>+35.5%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>82</td>
<td>88</td>
<td>+9.8%</td>
</tr>
<tr>
<td>Annual Incidents</td>
<td>969</td>
<td>959</td>
<td>803</td>
<td>-17.1%</td>
</tr>
</tbody>
</table>

- Declining Conditions
- Minor change (+ / - 2% or less)
- Improving Conditions

#### Reliability / Buffer Time

Trip reliability is the worst in the PM, especially in the NB direction. AM and mid-day buffer time increases slightly. The slight decrease in PM buffer time is offset by the increase in PM travel time in both directions.

#### Safety: Crashes

NB has a larger number of crashes than SB and has seen a significant increase in crashes (36 percent) since 2015.

#### Safety (non-crash) Incidents

The total number of incidents decreased by 17 percent since 2015. In 2017, there were on average approximately 2 non-crash incidents per day on I-405.
2017 average speed (mph)

**AM weekday**
5:00 a.m. to 10:00 a.m.
Source: HERE data

**PM weekday**
3:00 p.m. to 9:00 p.m.
Source: HERE 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 has had the same number of bottlenecks since 2013. There are six primary bottlenecks associated with system interchanges at I-5 and US 26.

The northbound bottlenecks are located at the US 26 WB off-ramp and weave with SW 6th Avenue on-ramp (both AM and PM) and the I-5 on-ramp (in the PM). The longest duration is the I-405 NB on-ramp to I-5 that is congested for over five hours (a 30 percent increase since 2015). The queue regularly extends back to US 26 where it nearly joins the US 26 bottleneck.

I-405 SB bottlenecks exist at the US 26 WB - Everett on-ramp in the morning and evening peaks and at the junction with I-5. The I-5 bottleneck is the largest, lasting five hours (a 25 percent increase in duration since 2015).

Duration of bottlenecks
2015 vs. 2017
Source: HERE data

<table>
<thead>
<tr>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 bottlenecks</td>
<td>6 bottlenecks</td>
</tr>
</tbody>
</table>

Total bottlenecks
2015 vs. 2017
Source: HERE data
I-405 safety

I-405 had a total of 946 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 ten top 10 SPIS sites along the corridor. The I-405 corridor crash rate was 1.21 crash per million vehicle miles traveled, which is much higher than the 2016 statewide average crash rate of 0.87 on interstate freeways in urban cities.

Total crashes by time of day

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>2013-2017 Crashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>107</td>
</tr>
<tr>
<td>Mid-Day</td>
<td>116</td>
</tr>
<tr>
<td>PM</td>
<td>323</td>
</tr>
</tbody>
</table>

Type of crash

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear-ends</td>
<td>68%</td>
</tr>
<tr>
<td>Side-swipe (overtaking)</td>
<td>26%</td>
</tr>
<tr>
<td>Hit a fixed object</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>2%</td>
</tr>
</tbody>
</table>

Total: 946 crashes
The average time to clear an incident on I-405 is approximately 17 minutes. The table shows clearance times in minutes from 2013 through 2017. The response time for an incident depends on the nature of the incident. The major non-crash incident areas on I-405 extend from the Fremont Bridge to the I-5 interchange (north).

More cars and congestion on the road correlate 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 55 percent of non-crash incidents on I-405, while hazardous debris accounts for 14 percent and abandoned vehicles account for 5 percent of such incidents in the corridor.
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 15 miles from I-405 to the Brookwood Parkway 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: 12 percent busier than I-5’s six-lane Interstate Bridge and 2 percent busier than I-205’s Glenn Jackson Bridge. 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, which is the economic engine of the region.

The Silicon Forest is the nickname for the concentration of high-tech companies located in Hillsboro and Beaverton. In 2015, Washington County exported $9.9 billion of goods, with the majority of exports consisting of computer and electronic products. Growth has occurred in Washington County, with 8.4 percent population growth in the last five years and 4.8 percent employment growth, 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.

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)

Upcoming Improvements

None planned

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% of the total daily traffic volume on US 26, averaging 2,200 to 6,200 trucks per day. The top value commodities transported on US 26 are motorized and other vehicles, electronic and other electrical equipment and components, and prepared foodstuffs, fats, oils, meat, fish and seafood. The top tonnage commodities transported include gravel and crushed stone and wood products.
US 26 corridor highlights

**Congestion and bottlenecks**

Free-flow speed is calculated to be 62 mph with a free-flow travel time of 15 minutes for both EB and WB.

The most congested conditions in 2017 occurred in the EB direction during the AM peak. In the EB direction, the average travel time for the corridor increased three minutes to 28 minutes in 2017. In the WB direction, the average PM peak travel time for the corridor increased two minutes to 19 minutes in 2017.

**Reliability**

Reliability on the US 26 corridor degraded between 2015 and 2017. For both directions of US 26 in the AM peak, mid-day, and PM peak, the average travel time increased. For AM peak and mid-day, the buffer time also increased. This means trips in the AM peak and mid-day are taking longer. In the PM peak, the sum of travel time and buffer time on US 26 EB increased while WB stayed constant. Improvements on US 26 seem to have helped in the WB direction, but US 26 EB is among the top corridors with unreliable travel time. The buffer time in the EB direction often exceeds the free-flow travel time for the corridor.

In the EB direction, the most severe recurring bottleneck is from the Vista Ridge Tunnel to OR 217. This bottleneck occurs in both AM and PM periods from 6:15 a.m. to 8:00 p.m. for a 13.75-hour period. In the WB direction, there is a bottleneck that extends from Cornell back to OR 217. This bottleneck has expanded in 2017 with a duration of 1.75 hours in the morning and 2.75 hours in the evening.

**Calculating Reliable Travel Time on US 26**

- **Distance:** 15 miles
- **Free-flow Travel Time:** 15 minutes

**Worst Case: US 26 EB during 2017 AM Peak**

- **Average Travel Time:** 28 minutes
- **Buffer Travel Time:** 16 minutes
- **Reliable Travel Time:** 44 minutes

### Travel time (in minutes)

<table>
<thead>
<tr>
<th>Year</th>
<th>Free-flow</th>
<th>AM peak</th>
<th>Mid-day</th>
<th>PM peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Buffer a</td>
<td>Total b</td>
</tr>
<tr>
<td>US 26 EB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>15</td>
<td>24.5</td>
<td>12.1</td>
<td>36.6</td>
</tr>
<tr>
<td>2017</td>
<td>15</td>
<td>27.5</td>
<td>16.4</td>
<td>43.9</td>
</tr>
<tr>
<td>US 26 WB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>15</td>
<td>16.6</td>
<td>2.9</td>
<td>19.5</td>
</tr>
<tr>
<td>2017</td>
<td>15</td>
<td>17.6</td>
<td>4.5</td>
<td>22.1</td>
</tr>
</tbody>
</table>

**Safe to Drive on US 26**

The crash trend is usually directly related to congestion and the reliability of the corridor. More crashes occur on US 26 EB than WB, but the growth in WB crashes has been greater. Crashes by time of day are concentrated between 6:00 a.m. to 7:00 p.m., which is the most unreliable travel period. The majority of the total crashes on US 26 are rear-end (79 percent) and side-swipe/overtaking (11 percent), which are typical of congested conditions. The number of non-crash incidents on US 26 increased and most involve disabled vehicles (64 percent).
Daily Vehicle Miles Traveled (DVMT)
DVMT has grown slightly from 2015 to 2017 and congestion has been getting worse.

Hours of Congestion (HOC)
The EB direction has a longer duration of congestion than the WB, but the WB has more growth in HOC.

Daily Vehicle Hours Delay (DVHD)
The DVHD for the US 26 corridor has increased by 31-41 percent for the EB and WB directions between 2015 and 2017. This indicates that the extent (number of segments where congestion is present) and duration of congestion in the corridor have continued to increase.

Source: HERE data and ODOT

<table>
<thead>
<tr>
<th>US 26</th>
<th>Corridor</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily Vehicle Miles Traveled (Weekday Average in Thousands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EB</td>
<td>891</td>
<td>915</td>
<td>929</td>
<td>+4.3%</td>
<td></td>
</tr>
<tr>
<td>WB</td>
<td>931</td>
<td>948</td>
<td>947</td>
<td>+1.7%</td>
<td></td>
</tr>
</tbody>
</table>

Congestion Indicators (Weekday Average)

<table>
<thead>
<tr>
<th>EB</th>
<th>WB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours of Congestion (Daily Hours)</td>
<td>13.5</td>
</tr>
<tr>
<td>Daily Vehicle Hours of Delay (Daily Vehicle Hours)</td>
<td>6,568</td>
</tr>
<tr>
<td>AM Peak Travel Time (Minutes)</td>
<td>24.5</td>
</tr>
<tr>
<td>AM Peak Speed (MPH)</td>
<td>39.1</td>
</tr>
<tr>
<td>Mid-day Travel Time (Minutes)</td>
<td>18.5</td>
</tr>
<tr>
<td>Mid-day Speed (MPH)</td>
<td>49.5</td>
</tr>
<tr>
<td>PM Peak Travel Time (Minutes)</td>
<td>23.1</td>
</tr>
<tr>
<td>PM Peak Speed (MPH)</td>
<td>41.9</td>
</tr>
</tbody>
</table>

Peak Period Travel Times and Speeds

AM
AM travel time and speed indicate increasing congestion on US 26 in both directions, particularly EB. The EB direction has significantly higher travel times and lower speeds than the WB direction.

Mid-day
Mid-day travel time and speed indicate increasing congestion on US 26 in both directions.

PM
PM travel time and speed indicates increasing congestion on US 26 in both directions. In the EB direction, travel times and speeds are much worse than the WB direction, indicating a higher level of congestion in that direction.
### Reliability Indicators (Weekday Average)

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buffer Time AM Peak</strong></td>
<td>EB</td>
<td>12.5</td>
<td>15.9</td>
<td>16.4</td>
</tr>
<tr>
<td></td>
<td>WB</td>
<td>2.9</td>
<td>3.3</td>
<td>4.5</td>
</tr>
<tr>
<td><strong>Buffer Time Mid-day Peak</strong></td>
<td>EB</td>
<td>6.4</td>
<td>7.0</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>WB</td>
<td>1.1</td>
<td>1.4</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Buffer Time PM Peak</strong></td>
<td>EB</td>
<td>17.8</td>
<td>17.5</td>
<td>15.2</td>
</tr>
<tr>
<td></td>
<td>WB</td>
<td>3.5</td>
<td>4.2</td>
<td>5.4</td>
</tr>
</tbody>
</table>

### Safety Indicators

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual Crashes</strong></td>
<td>EB</td>
<td>437</td>
<td>422</td>
<td>390</td>
</tr>
<tr>
<td></td>
<td>WB</td>
<td>214</td>
<td>222</td>
<td>232</td>
</tr>
<tr>
<td><strong>Annual Incidents</strong></td>
<td></td>
<td>2,210</td>
<td>2,480</td>
<td>2,528</td>
</tr>
</tbody>
</table>

- Declining Conditions
- Minor change (+/- 2% or less)
- Improving Conditions

### Reliability / Buffer Time

Trip reliability is the worst in the EB direction, with 3-4 times the buffer time of the WB direction. US 26 EB buffer time increased by 31 percent in the AM. Buffer time increased at least 54 percent in the WB direction at all time periods.

### Safety: Crashes

Significantly more crashes occur in the EB direction than the WB direction. However, from 2015 to 2017, the number of EB crashes decreased by 11 percent.

### Safety (non-crash) Incidents

The total number of incidents in the corridor increased by 14 percent. In 2017, there were on average approximately 7 non-crash incidents per day on US 26.
2017 average speed (mph)

**AM weekday**

5:00 a.m. to 10:00 a.m.

Source: HERE data

**PM weekday**

3:00 p.m. to 9:00 p.m.

Source: HERE data

**AM WEEKDAY**

- EB direction slows from I-405 to OR 217.
- WB direction slows at the Vista Ridge Tunnel.

**PM WEEKDAY**

- EB direction slows from I-405 to OR 217.
- WB direction slows at the Vista Ridge Tunnel and at Cornell Road.
US 26 bottlenecks

Between 2015 and 2017, bottlenecks on US 26 increased from three to five. Duration increased for each of the bottlenecks.

The primary bottleneck on US 26 is EB at the Vista Ridge tunnel/I-405 junction. This is backed up for nearly 14 hours a day to as far as OR 217, a 30 percent increase in duration from 2015. Additional bottlenecks were identified in the PM at NW 185th Avenue and AM at NW Cornell Road.

Total bottlenecks
2015 vs. 2017
Source: HERE data

<table>
<thead>
<tr>
<th>Year</th>
<th>Bottlenecks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>3</td>
</tr>
<tr>
<td>2017</td>
<td>5</td>
</tr>
</tbody>
</table>

Duration of bottlenecks
2015 vs. 2017
Source: HERE data

<table>
<thead>
<tr>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 boîlenecks</td>
<td>5 boîlenecks</td>
</tr>
</tbody>
</table>

### 2017 Bottlenecks
- **Cornell ▶ OR 217**
  - EB: 4:30-6:00 PM, 1.5 hrs
  - WB: 7:00-10:00 AM, 1.5 hrs
- **Cornell ▶ OR 217**
  - EB: 4:30-6:15 PM, 1.75 hrs
  - WB: 7:15-9:00 AM, 1.75 hrs
- **Vista Ridge Tunnel ▶ OR 217**
  - EB: 3:45-6:30 PM, 2.75 hrs
  - WB: 3:45-6:30 PM, 2.75 hrs

**Symbols:**
- 🔺 = morning bottleneck
- 🔻 = evening bottleneck
- 🔵 = morning freeway area impacted
- 🔴 = evening freeway area impacted
US 26 safety

US 26 had a total of 2,895 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 period from 5:00 a.m. to 7:00 p.m. 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 SPIS sites along the corridor. The US 26 corridor crash rate was 1.01 crashes per million vehicle miles traveled, which is lower than the 2016 statewide average crash rate of 1.12 on freeways/expressways in urban cities.
The average time to clear an incident on US 26 is approximately 17 minutes. The table shows clearance times in minutes from 2013 through 2017. 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. There is a higher number of incidents happening in the PM peak period, exacerbating congestion in the corridor.

Disabled vehicle incidents account for 64 percent of non-crash incidents on US 26. This is followed by abandoned vehicles (12%) and hazardous debris (11%).

---

### Incidents (non-crash) clearance times

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>17 min</td>
<td>15 min</td>
<td>17 min</td>
<td>18 min</td>
<td>17 min</td>
</tr>
</tbody>
</table>

### Incident (non-crash) frequency by time of day

- **AM:** 0 AM, 3 AM, 6 AM
- **Mid-Day:** 10 AM, 1 PM
- **PM:** 3 PM, 6 PM, 10 PM, 11 PM

### Incidents (non-crash) by type

- **64%** Disabled vehicle
- **12%** Abandoned vehicle
- **11%** Hazardous Debris
- **13%** Other

**11,741** incidents

---

Source: ODOT
OREGON DEPARTMENT OF TRANSPORTATION

OR 217 Corridor Dashboard

Introduction

OR 217 serves as a connection between US 26 (Sunset Highway) and I-5. OR 217 is approximately 7.5 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 queueing 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).

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 4,000 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 and wood products.
OR 217 corridor highlights

**Congestion and bottlenecks**

Free-flow speed is calculated to be 59 mph with a free-flow travel time of eight minutes for both NB and SB. The most congested conditions in 2017 occurred during the PM peak.

In the SB direction, the average travel time for the corridor stayed constant at 15 minutes in 2017. Congestion did not increase as much on this corridor compared to other highways in the region. This is partially due to travelers using alternate routes to access US 26 and I-5 and skip the queues that form near their junctions with OR 217.

In the NB direction, the average travel time for the corridor increased one minute to 15 minutes in 2017. Between I-5 and Denney Road, there are two recurring bottlenecks (AM and PM). The AM bottleneck lasts from 7:15 a.m. to 9:00 a.m. and the PM bottleneck lasts from 3:00 p.m. to 6:30 p.m. In the SB direction, the most significant recurring bottleneck near Hall Boulevard begins in the AM and extends into the mid-day and PM, totaling seven hours of congestion during the day. These extended hours of congestion in both directions pose significant problems for freight.

**Reliability**

Reliability on the OR 217 corridor generally degraded between 2015 and 2017. For both directions of OR 217 in the AM peak, mid-day, and PM peak, the average travel time increased. For AM peak and mid-day, the buffer time also increased. OR 217 SB during the AM and mid-day periods experiences the most unreliable travel times on the corridor. This means trips in the AM peak and mid-day are taking longer. In the PM peak, the sum of travel time and buffer time remains constant.

<table>
<thead>
<tr>
<th>Year</th>
<th>Free-flow</th>
<th>AM peak</th>
<th>Mid-day</th>
<th>PM peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Buffer</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR 217 NB</td>
<td>7.6</td>
<td>11.3</td>
<td>3.4</td>
<td>14.7</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR 217 SB</td>
<td>7.6</td>
<td>11.7</td>
<td>3.1</td>
<td>14.8</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Calculating Reliable Travel Time on OR 217**

Distance: 7.5 miles

Free-flow Travel Time: 7.6 minutes

**Worst Case: OR 217 SB during 2015 PM Peak**

Average Travel Time  15 minutes

+ Buffer Travel Time  3 minutes

= Reliable Travel Time  18 minutes

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).

**Safety**

The crash trend is usually directly related to the congestion and reliability of the corridor. More crashes occur on OR 217 SB than NB, but the growth in SB crashes has been decreasing. Crashes by time of day are concentrated between 6:00 a.m. and 6:00 p.m., which is the most unreliable travel period. The majority of the total crashes on OR 217 are rear-end (82 percent) and side-swipe/overtaking (13 percent), which are typical of congested conditions. The number of non-crash incidents on OR 217 increased since 2015, 40 percent of which involve disabled vehicles.
OR 217 | Corridor Dashboard

### Daily Vehicle Miles Traveled (DVMT)
DVMT has decreased from 2015 to 2017, while congestion has been getting slightly worse. This indicates that the corridor is experiencing at or over capacity conditions.

### Hours of Congestion (HOC)
HOC at the corridor level is measured at the worst bottleneck (Hall/Denney). The HOC on OR 217 has steadily increased for both NB and SB directions.

### Daily Vehicle Hours Delay (DVHD)
The DVHD for the OR 217 corridor remained steady for both NB and SB directions between 2015 and 2017. Due to the decrease in VMT, less trips are being made and thus less total delay is being experienced on this corridor.

### Peak Period Travel Times and Speeds

**AM**
AM travel time and speed indicate increasing congestion on OR 217 in both directions. The SB direction has slightly higher travel times and lower speeds than the NB direction.

**Mid-day**
Mid-day travel time and speed indicate increasing congestion on OR 217 in both directions, particularly SB.

**PM**
PM travel time and speed indicates increasing congestion on OR 217 in the NB direction. In the SB direction, speed and travel time remains relatively steady, indicating no significant change in congestion levels.
<table>
<thead>
<tr>
<th>OR 217</th>
<th>Corridor</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2015 vs 2017 % Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reliability Indicators (Weekday Average)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buffer Time AM Peak (Minutes)</td>
<td>NB</td>
<td>3.4</td>
<td>3.8</td>
<td>3.5</td>
<td>+2.9%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>3.1</td>
<td>3.7</td>
<td>4.0</td>
<td>+29.0%</td>
</tr>
<tr>
<td>Buffer Time Mid-day Peak (Minutes)</td>
<td>NB</td>
<td>1.6</td>
<td>2.0</td>
<td>2.2</td>
<td>+37.5%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>5.8</td>
<td>6.9</td>
<td>5.8</td>
<td>0.0%</td>
</tr>
<tr>
<td>Buffer Time PM Peak (Minutes)</td>
<td>NB</td>
<td>2.0</td>
<td>1.8</td>
<td>1.8</td>
<td>-10.0%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>3.5</td>
<td>3.5</td>
<td>2.5</td>
<td>-28.6%</td>
</tr>
<tr>
<td><strong>Safety Indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Crashes</td>
<td>NB</td>
<td>125</td>
<td>113</td>
<td>128</td>
<td>+2.4%</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>156</td>
<td>149</td>
<td>174</td>
<td>+11.5%</td>
</tr>
<tr>
<td>Annual Incidents</td>
<td>425</td>
<td>513</td>
<td>488</td>
<td>+14.8%</td>
<td></td>
</tr>
</tbody>
</table>

**Safety (non-crash) Incidents**

The total number of incidents on the corridor increased 15 percent. In 2017, there was on average approximately 1 non-crash incident per day on OR 217.

**Reliability / Buffer Time**

Trip reliability is the worst in the AM and mid-day periods. Trip reliability is generally worse in the SB direction. Buffer time increased the most in the AM peak for the SB direction. The decrease in PM buffer time is offset by the increase in PM travel time.

**Safety: Crashes**

More crashes occur in the SB direction. From 2015 to 2017, the number of NB crashes increased two percent, while then number of SB crashes increased 12 percent.
2017 average speed (mph)

**AM weekday**
5:00 a.m. to 10:00 a.m.
Source: HERE data

**PM weekday**
3:00 p.m. to 9:00 p.m.
Source: HERE 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

The number of bottlenecks on OR 217 has been constant (five) but the duration has increased slightly (about five percent on average).

The NB bottleneck at Denney Road backs up to I-5 in the AM and PM peaks for about five hours of the day due to the poor weaving from Denney to Beaverton-Hillsdale Highway and the added traffic from Scholls Ferry Road.

In the SB direction, the worst bottleneck is caused by similar issues of poor weaving and volumes from Hall Boulevard back to the Beaverton-Hillsdale Highway on-ramp that extend queues to US 26. Other bottlenecks at the OR 99W to I-5 segment and at Walker Road are recurring but less severe.

Duration of bottlenecks
2015 vs. 2017
Source: HERE data

<table>
<thead>
<tr>
<th>Duration</th>
<th>2015</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:15-9:00 AM</td>
<td>1.75 hrs</td>
<td>1.75 hrs</td>
</tr>
<tr>
<td>3:00-6:30 PM</td>
<td>3.5 hrs</td>
<td>3.25 hrs</td>
</tr>
<tr>
<td>6:45-9:00 AM</td>
<td>2.25 hrs</td>
<td>2.0 hrs</td>
</tr>
<tr>
<td>7:00-9:00 AM</td>
<td>2.0 hrs</td>
<td>1.75 hrs</td>
</tr>
</tbody>
</table>

SB Bottleneck Location
- 2015: Walker ➔ US 26 2.7 Miles
- 2017: Hall ➔ US 26 3.5 Miles

SB Bottleneck Location
- 2015: Denney ➔ I-5 3.5 Miles
- 2017: Denney ➔ I-5 3.5 Miles

NB Bottleneck Location
- 2015: Denney ➔ I-5 1.75 hrs
- 2017: Denney ➔ I-5 1.75 hrs

Total bottlenecks
2015 vs. 2017
Source: HERE data

- 2015: 5 bottlenecks
- 2017: 5 bottlenecks
OR 217 safety

OR 217 had a total of 1,457 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 period from 6:00 a.m. to 6:00 p.m. 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 two top 10 SPIS sites along the corridor. The OR 217 corridor crash rate was 0.96 crashes per million vehicle miles traveled, which is lower than the 2016 statewide average crash rate of 1.12 on freeways/expressways in urban cities.

Total crashes by time of day

2013-2017

Source: ODOT

Type of crashes

2013 to 2017

Source: ODOT

- 82% Rear-ends
- 13% Side-swipe (overtaking)
- 4% Hit a fixed object
- 1% Other

1457 crashes

13% Side-swipe (overtaking)

4% Hit a fixed object

1% Other

0 - 100 - 150 - 200 - 250 - 300

AM Mid-Day PM

12 3 1 2 6 4 5 9 7 8 12 10 11 3 1 2 6 4 5 9 7 8 10 11

2010-2014

1457 crashes

13% Side-swipe (overtaking)

4% Hit a fixed object

1% Other

OR 217 had a total of 1,457 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 period from 6:00 a.m. to 6:00 p.m. 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 two top 10 SPIS sites along the corridor. The OR 217 corridor crash rate was 0.96 crashes per million vehicle miles traveled, which is lower than the 2016 statewide average crash rate of 1.12 on freeways/expressways in urban cities.
The average time to clear an incident on OR 217 is approximately 20 minutes. The table shows clearance times in minutes from 2013 through 2017. The response time for an incident depends on the nature of the incident. Non-crash incident areas of note include the area south of the OR 217/US 26 interchange, the stretch between Walker Road and OR 8, and just north of Allen Boulevard to Denney Road.

More cars and congestion 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. This is followed by hazardous debris (19%) and abandoned vehicles (11%).
References


Glossary

Change in Data Sources

The data set used to calculate travel time and traffic volume in the 2018 Portland Region Traffic Performance Report differs from the data set used for the 2016 edition of the report. These differences are explained below:

Travel Time

FHWA acquired the national data set of average travel times on the National Highway System for use in its performance measures and management activities. This data set, also referred to as the National Performance Management Research Data Set (NPMRDS), is available to State Departments of Transportation and Metropolitan Planning Organizations to use for their performance management activities.

For the 2016 Portland Region Traffic Performance Report, FHWA NPMRDS data provided to ODOT was HERE data. HERE is a company that attained probe data (vehicle navigation, mobile phone data, etc.) and processed it to provide travel time for each segment of highway. As ODOT embarked on preparing the 2018 Portland Region Traffic Performance Report, FHWA had switched its contracting of NPMRDS data from HERE to another similar company named INRIX. Knowing that there may be discrepancies in the NPMRDS data from HERE and INRIX, ODOT decided in would use a commercial HERE data source in order to be as consistent as possible with the data used in the last report. The commercial HERE data set is a purchased data set that is essentially the same data source as NPMRDS HERE, except it is a bit more refined. After processing the data, ODOT discovered that the NPMRDS HERE data and the commercial HERE data produced slightly different results. The reason for this is that the commercial HERE data has more error filtering and is a cleaner version than the NPMRDS HERE data set. 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 HERE 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.

System Performance Analysis

For this report, system performance analysis considered the regional and corridor operations over time. ODOT typically uses a three-year time frame for operations and 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 account for future growth into shoulder peak periods to allow for year-to-year tracking of 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.

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
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. This generally correlates to speeds at or below 45 miles per hour.

Costs of Delay
The costs of delay in the TPR are calculated as:

\[
\text{Daily Cost of Delay} = (\text{total daily vehicle delay in hours} \times \text{passenger vehicle \%} \times \$25 \text{ per hour}) + (\text{total daily vehicle delay in hours} \times \text{truck \%} \times \$30 \text{ per hour})
\]

The rounded average values of the daily cost of travel time, $25 per hour for passenger vehicles and $30 per hour for trucks, are based on a published ODOT report on the value of travel time, which can be found here:


\[
\text{Annual Cost of Delay} = \text{Daily Cost of Delay} \times 250 \text{ days}
\]

250 days represent the average non-holiday weekdays in a year.

Hours of Congestion (HOC)
The duration of traffic congestion and reported as the average number of hours per workday (non-holiday weekday) that the motorist will experience congestion. Region wide HOC is based on the cumulative HOC reported for each corridor. For the corridors, the HOC reported is based on the location of the worse congestion or bottleneck of that corridor.

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). Free-flow travel time (FFTT) was used as the congestion threshold for estimating DVHD, that is, any speeds below free-flow were used to indicate delay.

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).

System Speed by Time of Day
Average speed (mph) by time of day for 24-hour workday (non-holiday weekday).

Bottleneck Indicators

Recurring Bottlenecks
Recurring bottlenecks are defined as areas where traffic begins to slow from free-flow to average workday (non-holiday weekday) speeds that drop 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 in which a bottleneck extends, 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 location 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 Rate**

The crash rate is expressed as the number of crashes per million vehicle miles traveled.

\[
\text{Crash Rate} = \frac{(\text{number of crashes} \times 1,000,000)}{(\text{length in miles} \times \text{average daily traffic} \times \text{number of days})}
\]

**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

**HERE (commercial version)**

ODOT acquired a HERE data set of average travel times for use in performance measurement. The HERE data is obtained from a number of sources including mobile phones, vehicles, and portable navigation devices.

**PORTAL**

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.

**Crashes and Non-crash Incidents**

ODOT collects data for each reported crash and non-crash incident on state highways.

**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 2016.

**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 2017.

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 from one interchange ramp to the next. The auxiliary lane separates slower traffic movements from the mainline, which smooths the flow of traffic and provides safer merge and weave opportunities.

**Corridor Bottleneck Operations Study (CBOS)**

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