Agenda

Metro
600 NE Grand Ave.
Portland, OR 97232-2736

Meeting: Metro Technical Advisory Committee
Date: Wednesday, November 15, 2017
Time: 10:00 a.m. to noon
Place: Council Chamber

Time	Agenda Item	Action Requested	Presenter(s)	Materials
10:00	**CALL TO ORDER** **Updates from the Acting Chair**		Acting Chair Megan Gibb, Metro	
	· **Citizen Communications to MTAC** · **Updates from Committee Members**		All	
10:15 30 min.	**2018 RTP Investment Strategy Update** *Purpose: Provide MTAC with an update on the progress of development and evaluation of the RTP Investment Strategy*	Informational	Kim Ellis, Metro	*
10:45 40 min.	**Overview of Technical Review Draft of Safety Strategy (key issues identified for discussion)** *Purpose: Provide MTAC with an overview of the technical review draft of the 2018 Regional Transportation Safety Strategy*	Informational	Lake McTighe, Metro	*
11:15 30 min.	**Designing Livable Streets and Trails Guide** *Purpose: Provide MTAC with an update on the progress of Designing Livable Streets and Trail Guide*	Informational	Lake McTighe, Metro	*
Noon	**Adjourn**			

* Material will be emailed with meeting notice
** Material will be emailed at a later date after notice
# Material will be distributed at the meeting.

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បើលោកអ្នកត្រូវការអ្នកបកប្រែភាសានៅពេលអង្គបរបង្ហុសាធារណៈ: សូមទូរស័ព្ទមកលេខ 503-797-1890 (ម៉ោង 8 រពឹកដល់ម៉ោង 5 ល្ងាច ថ្ងៃធ្វើការ) ប្រាំពីរថ្ងៃ ថ្ងៃធ្វើការ មុនថ្ងៃរដុំដេម៊ីអោចឲ្យគេសម្រួលតាមសំណើរបស់លោកអ្នក

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Metro

2017 MTAC Tentative Agendas

January 4 – Cancelled	**January 18 – Cancelled**
February 1 • 2018 RTP: Vision Zero and Safety Plan Update (McTighe) • Urban Growth Readiness Task Force Recommended Code Updates Update	**February 15** • Powell-Division Update • RTP Evaluation Framework (Mermin) o System Measures o Transportation equity analysis
March 1 – Cancelled	**March 15** • Regional Transit Strategy • Regional Freight Plan • Building the RTP Investment Strategy* (Ellis)
April 5 • 2018 Urban Growth Management Decision Work Program Overview • Expectations for cities proposing residential UGB expansions	**April 19** • Building the RTP Investment Strategy* and Project Evaluation Process • Powell-Division Transit and locally preferred alternative resolution and related RTP ordinance • 2040 Grants
May 3 • Building the RTP Investment Strategy* (Recommendation to MPAC) (Ellis)	**May 17 – Cancelled**
June 7 – Cancelled	**June 21 – Cancelled**
July 5 – Cancelled	**July 19 – Cancelled**
August 2 • Proposed code for mid-cycle UGB amendment process (Reid) • Designing Livable Streets (McTighe)	**August 16 – Cancelled**
September 6 • Economic Value Atlas update (Raker) • Southwest Corridor Equitable Development Strategy update (Harper) • Expectations for cities proposing residential UGB expansions (Reid)	**September 20**
October 4 • Regional Transportation Technology Strategy (RTx) (Rose) • Proposed methodology for the urban reserve Goal 14 alternatives analysis (O'Brien)	**October 18 – Cancelled**

November 1 – Cancelled	**November 15** • RTP Investment Strategy update (Ellis) • Overview of technical review draft of safety strategy *(key issues identified for discussion)* (McTighe) • Designing Livable Streets and Trails Guide update (McTighe)
December 6 • Draft RTP Investment Strategy Findings (Ellis) • Draft Transportation Equity Analysis Findings (Cho) • RTP 2018 Engagement Activities and Regional Leadership Forum #4 (Higgins) • Overview of technical review drafts of freight strategy *(key issues identified for discussion)* (Collins)	**December 20**

**RTP Revenue Forecast, Priorities, Evaluation Framework and Call for Projects*

Upcoming Events:

- December 4, 2017 TPAC/MTAC workshop on RTP Evaluation Results (System evaluation and pilot project evaluation) 2 – 5 p.m. at Metro (Council Chamber)
- March 2, 2018: RTP Regional Leadership Forum #4 (Finalizing our Shared Plan for the Region)

Parking Lot – Future Agenda Items

- Update on technical activities related to land use modeling/growth management (Frkonja); November or December, and January 2018
- Transportation resiliency
- Regional Transit Strategy and System Expansion Policy (Snook) January 2018
- Draft RTX policies and strategies (Rose) January 2018
- Draft RTP Policy Chapter Review (Ellis) January 2018

Memo

Metro
600 NE Grand Ave.
Portland, OR 97232-2736

Date: November 8, 2017
To: Metro Technical Advisory Committee (MTAC) and interested parties
From: Kim Ellis, RTP Project Manager
Subject: 2018 RTP Investment Strategy Development and Evaluation

PURPOSE

The purpose of this memorandum is to update the Metro Technical Advisory Committee (MTAC) on 2018 RTP update related work that is planned or underway, and the timing of upcoming discussions. Planned upcoming discussions for the remainder of 2017 and the first half of 2018 are provided in **Attachment 1**.

ACTION REQUESTED

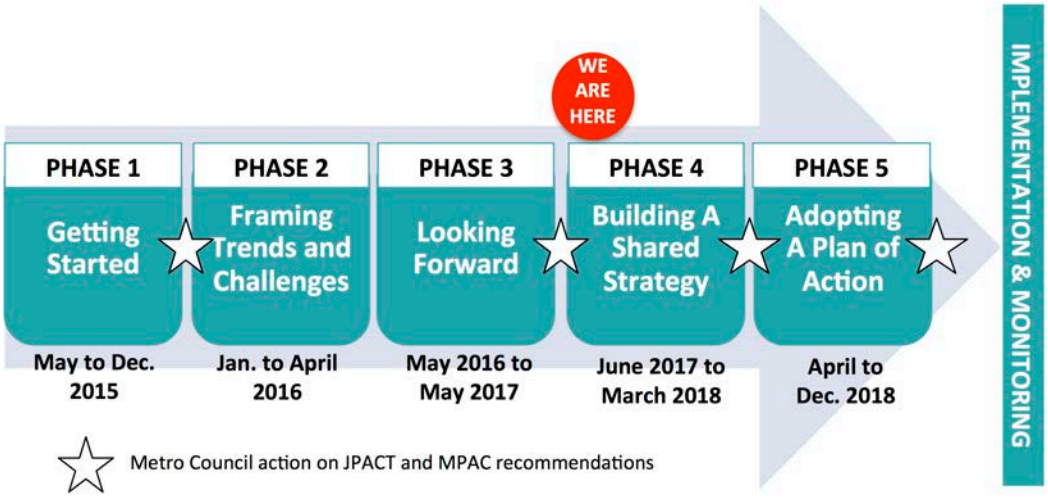
No formal action is requested. This is an opportunity for MTAC to ask questions about the work underway and initial evaluation results, and to provide feedback on the sequence and timing of future discussions.

BACKGROUND

The Portland metropolitan region's economic prosperity and quality of life depend on a transportation system that provides every person and business in the region with equitable access to safe, efficient, reliable, affordable and healthy travel options. Through the 2018 RTP update, the Metro Council is working with leaders and communities throughout the region to plan the transportation system of the future by updating the region's shared transportation vision and investment strategy for the next 25 years.

Shown in **Figure 1**, the plan update is in Phase 4 and on schedule.

Figure 1. Timeline for 2018 Regional Transportation Plan Update



In December 2016 and February 2017, the Council reaffirmed their direction to staff to use development of the 2018 RTP to clearly and realistically communicate our transportation funding outlook and align the financially constrained project list with updated financial assumptions. This direction included developing a pipeline of priority projects for the regional transportation system for Metro and other partners to work together to fund and build. The Council also directed the RTP project list and RTP modal and topical strategies be developed in a transparent way that advances

adopted regional goals, supports regional coalition building efforts, and emphasizes equity, safety and climate change. On May 30, the Council further directed staff to move forward with the 2018 RTP Call for Projects as recommended by the Metro Policy Advisory Committee (MPAC) and the Joint Policy Advisory Committee on Transportation (JPACT).

Since May 30, staff continued to implement the adopted work plan and public engagement plan, consistent with previous Council policy direction. A summary of accomplishments and activities that are underway follows.

Project list development and performance evaluation

- **Call for Projects completed in August.** Staff completed the initial RTP Call for Projects, working with the counties and cities, TriMet, ODOT and other agencies to update the region's project priorities based on direction provided by the Metro Council and JPACT. An interactive map of the projects submitted for evaluation and public review is now available at:

  http://drcmetro.maps.arcgis.com/apps/webappviewer/index.html?id=bd3660b8b7b347f4929edc85d758305f

  In addition, a summary and lists of the projects submitted can be downloaded from the project website at: www.oregonmetro.gov/2018projects

Updated RTP Evaluation Framework advances how we measure outcomes to inform priorities

- **System level and transportation equity performance evaluation continues.** Metro staff is completing the technical evaluation, using the updated evaluation framework agreed upon by JPACT and the Metro Council in May.

  Through the end of the year, staff will review the results with the technical work groups, TPAC and MTAC, and develop findings for public review and discussion by JPACT, MPAC and the Metro Council in early 2018. The RTP work groups, TPAC and MTAC will discuss preliminary findings and recommendations from the performance evaluation at the November and December meetings. In addition, a joint MTAC/TPAC/RTP Work Groups workshop is planned for December 4 to discuss the results in more detail.

- **Assessment of the pilot project evaluation continues.** Metro staff is summarizing comments received from partner agency on the pilot evaluation for initial discussion at the Dec. 4 joint MTAC/TPAC/RTP Work Groups workshop. Through the end of the year, staff will review the assessment and agency comments with the Performance Measure work group, TPAC, and MTAC, and develop recommendations for refinements. Proposed refinements to the project evaluation criteria will be brought forward for discussion by policymakers in early 2018 in advance of the second call for projects and final evaluation. As recommended last May, the updated project evaluation criteria will be applied to larger-scale capital projects that are anticipated to seek regional, state or federal funding, unless otherwise exempt in the updated criteria.

Policy and technical updates

- **Goals, objectives, performance targets and policies review underway.** Recognizing this RTP update has an increased focus on addressing safety, equity and climate change, the adopted work plan calls for the policy framework to be reviewed and updated to more fully address these and other issues of concern identified through the process (e.g., congestion, maintenance,

emerging technologies and funding). In May, JPACT and the Metro Council directed staff to review and refine the RTP policy chapter, including:

- **Review of RTP goals and objectives**, particularly goals related to safety, equity, climate change, accountability, transparency, congestion, maintenance, emerging technologies and funding. The review will seek to:
  - clarify the distinction between the vision, goals, objectives, performance targets and policies and their role in performance-based planning and decision-making;
  - reduce redundancy between the goals and objectives;
  - reflect priority outcomes identified through the process; and
  - better align the objectives with existing or desired data, including updated system evaluation and transportation equity measures and updates to the RTP performance targets to meet regional goals and federal and state requirements.
- **Review of performance targets** to meet regional policy goals and federal and state requirements. The review will seek to:
  - clarify and update definitions and terms related to performance-based planning and measurement;
  - identify gaps in existing performance targets and opportunities to reduce redundancy;
  - update performance targets;
  - streamline how the 2018 RTP addresses state and federally-required target-setting and on-going performance monitoring, and reporting; and
  - define an action plan for system monitoring, including an approach to data collection, maintenance, sharing, and methods development.
- **Review of modal policies and maps**, particularly the throughways/arterials, transit, and freight policies and system maps for each network. This review will seek to:
  - compile recommended changes to RTP system maps;
  - add a new freight safety policy;
  - expand policies for transit to reflect desired ridership, accessibility, convenience, frequency, reliability, and affordability performance outcomes;
  - expand policies for throughways and arterials to reflect desired access/connectivity, reliability and safety performance outcomes;
  - update relevant design policies;
  - draft new policy sections related to address safety, equity, climate change, and emerging technologies; and
  - clarify the distinction between the modal policies in the RTP and modal strategies in the Regional Transit Strategy, Regional Freight Strategy and Regional Safety Strategy that are being developed concurrent with updating the RTP.

  The regional bike and pedestrian network policies will not be subject to this review because they were extensively reviewed and updated as part of the 2014 Regional Active Transportation Plan. The system maps may be updated to reflect additions or updated functional classification designations stemming from local transportation plan updates and the RTP Call for Projects.

From Sept. to Dec. 2017, staff will review the existing policy framework to identify and recommend potential refinements to the 2014 RTP policy chapter for consideration by JPACT, MPAC and the Metro Council. TPAC and MTAC will discuss initial findings and recommendations from this review at their January meetings. Discussions are expected to continue in early 2018.

- **Financially constrained funding assumptions updates to reflect House Bill 2017 underway.** Metro staff will participate in an ODOT-led working group tasked with updating the state transportation revenue forecast. An updated forecast is anticipated in Spring 2018. TPAC will discuss the updated forecast when available.

- **Update to RTP implementation chapter to begin in 2018.** Metro staff will begin work to update the implementation chapter in early 2018. This chapter outlines future studies and other work needed to advance implementation of the RTP or resolve issues that could not be fully addressed during the update. This will include updating sections on needed regional mobility corridor refinement plans, planned project development activities (e.g., Southwest Corridor and Division Transit Project), performance monitoring, and other implementation activities to be undertaken post-RTP adoption. TPAC and MTAC will discuss staff recommendations for updates to this chapter in March 2018.
- **Development of a transportation recovery and disaster preparedness element underway.** Metro staff will partner with Portland State University and the Regional Disaster Preparedness Organization (RPDO) to map previously identified regional emergency transportation routes and prepare recommendations for future work and partnerships needed to more fully address this issue prior to the next RTP update (due in 2023). TPAC and MTAC will discuss the identified regional emergency transportation routes and recommendations for future work in early 2018.

Modal and topical strategies development

- **Development of the Regional Transit Strategy continues.** Staff continue to work with the Transit Work Group to develop a draft strategy, update the System Expansion Policy and define Enhanced Transit Concept (ETC) pilot corridors to advance to project development funded by the 2019-21 Regional Flexible Funds Allocation (RFFA). TPAC discussed a proposed approach to the ETC pilot work at the October meeting, including working with County Coordinating Committees to identify the potential universe of Enhanced Transit locations to inform upcoming jurisdictional workshops. TPAC and MTAC will discuss a technical review draft transit strategy at their January 2018 meetings and receive periodic updates on the ETC work.
- **Update to the Regional Transportation Safety Strategy continues.** Staff finalized work with the Safety Work Group to develop a draft strategy for technical review. TPAC and MTAC will discuss a technical review draft safety strategy at their November 2017 meetings.
- **Update to the Regional Freight Strategy continues.** Staff continue to work with the Freight Work Group to develop a draft strategy. TPAC and MTAC will discuss a technical review draft freight strategy at their December 2017 meetings.
- **Development of a policy framework and strategy for emerging transportation technologies (RTX) continues.** TPAC and MTAC discussed a proposed approach to this work at their September meetings, and will discuss draft policies and strategies at their February 2018 meetings, and a draft strategy in May 2018.
- **Update to Designing Livable Streets and Trails Guide continues.** Staff continue to work with the Design Work Group to update existing design practices. TPAC and MTAC will receive updates at their November meetings.

Engagement and outreach

- **Planning for 2018 public engagement and outreach activities underway.** In Jan. 2018, the draft investment priorities submitted by agencies along with findings from the evaluation will be shared with the general public for input during a planned 30-day comment opportunity. The fourth (and final) Regional Leadership Forum is planned for Friday, March 2, 2018. The forum will be an opportunity for the Metro Council, JPACT and MPAC to discuss public input, updated funding information and the results of the technical evaluation. Policy makers will be asked to provide additional policy direction to staff on refining the RTP project priorities and policies. More information about planned 2018 engagement and outreach activities will be provided at the December TPAC and MTAC meetings.

2018 RTP UPDATE | Council and Regional Advisory Committees Briefings *(dates are subject to change)*

Metro
www.oregonmetro.gov/rtp

2017	June-August	September	October	November	December
Council		**Sept. 26** • Project update	**Oct. 10** *(requested)* • Regional Transportation Technology Strategy (RTX)	**Nov. 7** *(requested)* • Project update	**Dec. 12** *(requested)* • Draft RTP Investment Strategy • RTP policy chapter review findings • 2018 RTP engagement activities and RLF #4
JPACT			**Oct. 19** • Regional Transportation Technology Strategy (RTX)		**Dec. 21** • Project update
MPAC	**July 12** • Regional Transit Strategy		**Oct. 25** • Regional Transportation Technology Strategy (RTX)		**Dec. 13** • Project update
TPAC	**June 30** • Regional Transit Strategy **July 28** • Call for Projects update • Designing Livable Streets **Aug. 25** • RTP work plan next steps	**Sept. 29** • Regional Transportation Technology Strategy (RTX)	**Oct. 27** • RTP Investment Strategy update	**Nov. 17** • Draft RTP Investment Strategy findings • Designing Livable Streets • Overview of technical review draft of safety strategy *(key issues identified for discussion)*	**Dec. 15** • Draft RTP Investment Strategy & Transportation Equity Analysis Findings • RTP Pilot Project Evaluation findings and refinements • 2018 RTP engagement activities and RLF #4 • Technical review draft of freight strategy *(key issues identified for discussion)*
MTAC	**Aug. 2** • Designing Livable Streets		**Oct. 4** • Regional Transportation Technology Strategy (RTX)	**Nov. 15** • RTP Investment Strategy findings • Designing Livable Streets • Overview of technical review draft of safety strategy *(key issues identified for discussion)*	**Dec. 6** • Draft RTP Investment Strategy & Transportation Equity Analysis Findings • 2018 RTP engagement activities and RLF #4 • Technical review draft of freight strategy *(key issues identified for discussion)*

Updated 10/31/17

2018 RTP UPDATE | Council and Regional Advisory Committees Briefings *(dates are subject to change)*

Metro

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2018	January	February	March	April	May
Council		**February 6** • Draft RTP Policy Chapter • Draft Freight Strategy • Draft Safety Strategy **February 13** • Draft Transit Strategy • Draft RTX policies and strategies	**March 27** • Direction on finalizing draft 2018 RTP for public review		**May 1** • Draft RTX *(key issues identified for discussion)*
JPACT	**January 18** • 2018 RTP engagement activities and RLF #4 • RTP Investment Strategy & Transportation Equity Analysis Findings	**February 15** • Draft RTP Policy Chapter • Draft RTX policies and strategies	**March 15** • Draft Transit Strategy • Draft Freight Strategy • Draft Safety Strategy • Direction on finalizing draft 2018 RTP for public review	**April 19**	**May 17** • Draft RTX *(key issues identified for discussion)*
MPAC	**January 24** • 2018 RTP engagement activities and RLF #4 • RTP Investment Strategy & Transportation Equity Analysis Findings	**February 28** • Draft RTP Policy Chapter • Draft RTX policies and strategies	**March 14** • Draft Transit Strategy • Draft Freight Strategy • Draft Safety Strategy • Direction on finalizing draft 2018 RTP for public review	**April 25**	**May 23** • Draft RTX *(key issues identified for discussion)*
TPAC	**January 26** • Draft RTP Policy Chapter • Technical review draft of transit strategy and system expansion policy *(key issues identified for discussion)* • Draft RTX policies and strategies	**February 23** • Draft RTP Policy Chapter • Resiliency and Emergency Transportation Routes	**March 30** • Draft RTP Implementation Chapter *(key issues identified for discussion)*	**April 27** • Draft RTX *(key issues identified for discussion)*	**May 25** • Livable streets and design classification map update
MTAC	**January 17** • Draft RTP Policy Chapter • Technical review draft of transit strategy and system expansion policy *(key issues identified for discussion)* • Draft RTX policies and strategies	**February 21** • Draft RTP Policy Chapter • Resiliency and Emergency Transportation Routes	**March 21** • Draft RTP Implementation Chapter *(key issues identified for discussion)*	**April 18** • Draft RTX *(key issues identified for discussion)*	**May 16** • Livable streets and design classification map update

30-day comment opportunity on draft project list and evaluation findings planned for Jan. 8 to Feb. 9, 2018
45-day public comment period on draft 2018 RTP and modal/topical strategies planned for June 29 to Aug. 13, 2018

Updated 11/7/17

June 2017

2018 Regional Transportation Plan

Getting there with a connected region

How we get around shapes our communities and our everyday lives. Through the fall of 2018, Metro will work with local, regional and state partners and the public to update our region's shared transportation vision and investment strategy for the next 25 years.

Building a connected region

Planning for the region's transportation system means more than deciding where to build roads, transit, sidewalks and bikeways. It's also about:

- taking care of what we have and building great communities
- ensuring that no matter where you're going, you can have safe, reliable, healthy and affordable options to get there.
- creating vibrant and connected communities, nurturing a strong economy, advancing social equity and protecting the quality of life we all value.

Now is the time to act

A half-million new residents are expected to live in the Portland area by 2040. Our communities are becoming more culturally diverse, bringing rich cultural activity to neighborhoods. A new generation will grow to adulthood as others move toward retirement.

To keep people connected and commerce moving, we need to work across interests and communities to bring innovative solutions to the challenges facing our changing region.

The Regional Transportation Plan

The Regional Transportation Plan provides a shared vision and investment strategy that guides investments for all forms of travel to keep people connected and commerce moving throughout the greater Portland region. The plan is updated every four years to stay ahead of future growth and address trends and challenges facing the people of the region.

Why is the 2018 update important?

Our region's economic prosperity and quality of life depend on a transportation system that provides every person and business with access to safe, reliable, healthy and affordable ways to get around.

The 2018 Regional Transportation Plan will help the region respond to the changing transportation needs of our communities and businesses. The new plan will establish priorities for state, federal and regional funding and help set the stage for the new options for people and products to get where they need to go.

This update is an opportunity to define how we will create a safe, reliable, healthy and affordable transportation system that is environmentally responsible, efficiently moves products to market and ensures all people can connect to the education and work opportunities they need to experience and contribute our region's economic prosperity and quality of life.

Throughout the summer, Metro and its regional partners will begin updating the region's transportation investment priorities. In early 2018, residents will be asked to provide feedback on the draft project list and key findings from the technical evaluation.

In spring 2018, regional decision-makers will discuss the findings, new funding information, and public input to provide direction for additional refinements.

New challenges call for new solutions

A history of leadership and collaboration has kept our system of roads, bridges, bikeways, sidewalks and transit ahead of the national curve. In general it serves us well, but there is more to be done. The system is aging and not keeping up with growth and changing needs. People and businesses are concerned about traffic congestion, safety, affordability, climate change and community health. Many residents – especially those of low income and communities of color – are underserved and have difficulty getting to jobs, training and other services.

Funding is tight, and we have multiple transportation priorities. But if not addressed, these challenges will compromise our region's economic prosperity and quality of life.

Join in and be heard

Updating the RTP requires bold leadership, new partnerships, new voices and thoughtful deliberation. It calls for a regional conversation on the future of our transportation system and the role that investment can and should play in building healthy, equitable communities and a strong economy.

Choose how you stay informed and join the conversation now through 2018:

- speaker events and discussion groups
- online quick polls and surveys
- Metro Council and advisory committee meetings.

Find out how to be involved – and more – at oregonmetro.gov/rtp.

Voices from around the region

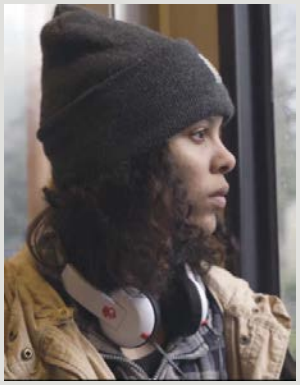
There are many stories from the nearly 2 million residents across our region. Three residents share their perspectives and challenges in getting around.

"I know that we had the snow recently, so that made driving very difficult in some areas because there were a lot of potholes. And besides that, I think traffic in general [is a problem], depending on the area. My commute can be anywhere from 40 minutes to an hour and a half."

– Adam, Cornelius resident

"I use a mobility scooter if there's a long distance in between places I'm traveling… I do have to drive on the streets sometimes, because the sidewalks are bad. I mean, there are places where there are no sidewalks and it leaves the necessity to ride in the road with a mobility scooter, or even with a walker."

– Annadiana, Forest Grove resident



"My ideal transportation experience would be one where I didn't necessarily have to transfer from route to route so often, because that's where I tend to miss more buses and have to wait for longer periods of time."

– Tana, Northeast Portland resident

Regional Snapshot: greater Portland on the move

Find more stories and stats from around a changing region: **oregonmetro.gov/snapshot.**

Metro

October 2017

2018 Regional Transportation Plan

Call for Projects

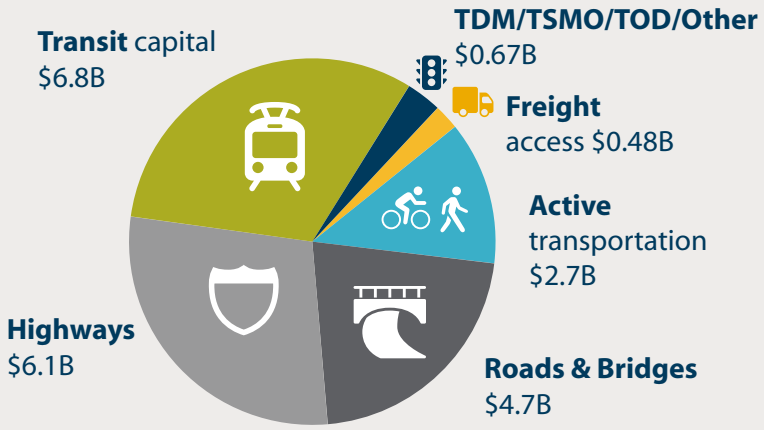
The call for projects is a step in determining the region's priority projects to achieve our vision and goals for the regional transportation system by 2040. The 1057 projects submitted by Metro and its regional partners will undergo evaluation through the end of 2017.

Cost by investment category

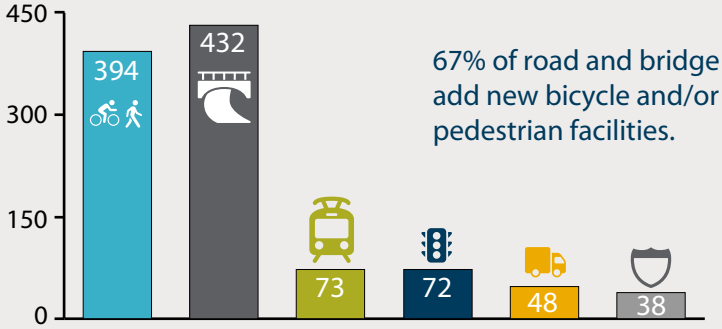
in rounded billions, 2016 dollars

Summary of all capital projects submitted for evaluation and public review. *Road and transit operations and maintenance costs to be added.*

Total: $21.4 billion



Projects by investment category

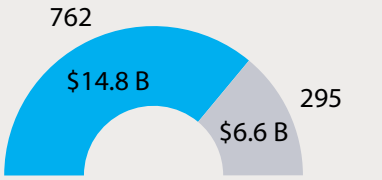


67% of road and bridge projects add new bicycle and/or pedestrian facilities.

53 projects are safety projects

88 projects are regional trails

Capital investments



- Draft financially constrained list
- Draft strategic list

Project status

All projects come from plans or studies adopted through a public process.

Category	Numbe r	% of Total
Carried forward from 2014 RTP	785	74
New to RTP in 2018	272	26
Total	1057	100

Of the 1256 projects listed in the 2014 RTP, 132 have been built or will be completed by 2019 for a total of $3.15 Billion invested in the greater Portland region.

For more information, visit http://www.oregonmetro.gov/2018projects

10/17/17

More than $3 billion invested in Regional Transportation Plan projects from 2014 - 2019

These projects were funded through a combination of private development, and local, state and federal funds.

For more information visit oregonmetro.gov/rtp

Click here to view interactive online map of projects.

Metro

City of Portland Highlights

I-5/Delta Park Interchange	2015
Killingsworth Street Improvements	2015
Portland Bike Share	2016

Washington County Highlights

OR 217 Intelligent Transportation System	2014
Westside to Waterhouse Trail connection	2016
US 26/Shute Road Interchange	2016

Multnomah County Highlights

I-84/Troutdale Interchange	2015
Sellwood Bridge Replacement	2017
Wood Village Boulevard Extension	2014

Clackamas County Highlights

MAX Orange Line Extension to Milwaukie	2015
Sunrise Expressway	2016
Sunrise Multi-use Path	2016

Completed 2014 RTP Projects

Estimated cost (2016 dollars)

less than $10 million	100 projects
$10,000,001 - $25,000,000	17 projects
$25,000,001 - $50,000,000	11 proejcts
$50,000,001 - $100,000,000	1 project
$100,000,001 - $1,000,000,000	2 projects
greater than $1 billion	1 project
Total projects	**132**

September 28, 2017

0 2 4 Miles

Click here to view interactive on-line map of projects.

Completed 2014 RTP Projects

Projects are listed alphabetically by nominating agency.
The projects were funded through a combination of private development and local, state and federal funds.

Metro

2014 RTP ID	Nominating Agency	Project Name	Start Location	End Location	Description	RTP Investment Category	Estimated Cost (2016 dollars)	Year completed
10617	Beaverton	Farmington Road Improvements	Murray Boulevard	Hocken Avenue	Construct turn lanes and intersection improvement, add traffic signals where warranted and complete bike lane and sidewalk gaps.	Active Transportation	$11,374,100	2017
10644	Beaverton	110th Avenue Sidewalks	Beaverton Hillsdale Highway	Canyon Road	Construct sidewalks.	Active Transportation	$1,488,200	2005
10630	Beaverton	Hall Boulevard Multimodal Extension	Hocken Avenue	Cedar Hills Boulevard	Extend Hall Boulevard from Cedar Hills to Hocken Avenue to fill a gap; add turn lanes at intersections, sidewalks and bikeway.	Roads and Bridges	$5,900,000	2016
10616	Beaverton	Rose Biggi Avenue Multimodal Street Extension	Crescent Street	Hall Boulevard	Extend 2-lane Rose Biggi Avenue to Hall Boulevard. (via Westgate Drive) to fill a gap; includes boulevard design, sidewalks and bikeways.	Roads and Bridges	$3,720,500	2015
10629	Beaverton	Hocken Avenue Multimodal Improvements	Tualatin Valley Highway	Farmington Road	Widen existing street from 3 to 5 lanes, add bike lanes and sidewalks.	Roads and Bridges	$1,700,800	2017
11347	Clackamas County	Sunrise Multi-use Path (Sunrise JTA)	I-205	122nd Avenue	Construct new multi-use path paralleling the Sunrise expressway.	Active Transportation	$6,378,000	2016
10017	Clackamas County	Clackamas Regional Center Bike/Pedestrian Corridors	Clackamas regional center	N/A	Construct pedestrian and bike improvements as described in the Clackamas Regional Center Pedestrian and Bicycle Plan.	Active Transportation	$6,138,825	2019
11132	Clackamas County	Clackamas Industrial Area Multi-modal Improvements	Clackamas industrial area	N/A	Complete bike and pedestrian connections within the Clackamas Industrial area.	Active Transportation	$5,315,000	2015
11515	Clackamas County	Sunnyside Road Improvements	OR 213	97th Avenue	Retrofit street with boulevard treatments including lane redesign, medians, beautification, curb extensions, reconstructed sidewalks, landscaping, and south side bikeway. Add flashing yellow arrow for left-turns at signalized intersections.	Active Transportation	$3,189,000	2018
11496	Clackamas County	Park Avenue Pedestrian Connections	River Road	McLoughlin Boulevard	Add pedestrian connections.	Active Transportation	$1,860,250	2015
10042	Clackamas County	Lawnfield realignment (Sunrise JTA)	Lawnfield Road	Sunnybrook Boulevard	Realign the existing Lawnfield Road from 98th to 97th avenues, reduce the grade from 18 percent to 8 percent.	Freight access to industry and ports	$27,265,950	2015
10157	Clackamas County	Carver (Springwater Road) Bridge	Hattan Road	OR 224	Reconstruct Carver bridge at 2 lanes with bike lanes and sidewalks.	Roads and Bridges	$25,086,800	2017
10052	Clackamas County	Tolbert Road (Sunrise JTA)	SE 82nd Drive	Industrial Way	Extend Mather Road across railroad to SE 82nd Drive.	Roads and Bridges	$18,602,500	2017
10004	Clackamas County	Otty Road Improvements	82nd Avenue	92nd Avenue	Improve to minor arterial standard consistent with Fuller Road Station Plan; improve curb radius; add turn lanes, on-street parking, central median, landscaping, bikeway and pedestrian facilities.	Roads and Bridges	$7,802,420	2015
10005	Clackamas County	West Monterey Extension	82nd Avenue	Fuller Road	Construct new two-lane street extension.	Roads and Bridges	$6,590,600	2015
10013	Clackamas County	Boyer Drive Extension	82nd Avenue (OR 213)	Fuller Road	Extend new 2-lane road with turn lanes at OR 213 and Fuller Rd, bikeways and pedestrian facilities; install flashing yellow arrow for left turns on northbound and southbound approaches at OR 213 intersection.	Roads and Bridges	$3,933,100	2017
11492	Clackamas County	Sunnyside Road Intersection Improvements	Sunnyside Road / Stevens Road intersection	N/A	Intersection improvements, such as additional turn lanes, turn lane extensions, and/or signal timing modifications.	Roads and Bridges	$2,126,000	2018
11493	Clackamas County	Otty Street Realignment and Turn Lanes	Otty St / OR 213 / Otty Road Intersection	N/A	Realign Otty Street with Otty Road at OR 213; install dual westbound left-turn lanes; install flashing yellow arrow for left-turns on northbound and southbound approaches.	Roads and Bridges	$1,700,800	2017
11498	Clackamas County	Harmony Road / Sunnyside Road Median and Turn Lanes	Harmony Road / Sunnyside Road / OR 213 intersection	N/A	Extend queue storage on westbound approach and rebuild median; extend queue storage on eastbound approach and install median; convert to right-in-right-out accesses on frontage road.	Roads and Bridges	$1,328,750	2015

Go to www.oregonmetro.gov/rtp to see where projects are located.

Completed 2014 RTP Projects

Projects are listed alphabetically by nominating agency.
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2014 RTP ID	Nominating Agency	Project Name	Start Location	End Location	Description	RTP Investment Category	Estimated Cost (2016 dollars)	Year completed
10066	Clackamas County	92nd Avenue Turn Lanes	92nd and Johnson Creek Boulevard and Idleman Road	N/A	Add turn lanes on 92nd (northbound left at JCB, and northbound right at Idleman Road).	Roads and Bridges	$1,063,000	2014
11510	Clackamas County	Sunnybrook Boulevard Turn Lanes	82nd Avenue intersection	N/A	Add dual southbound left-turn lanes, extend queue storage for southbound left turns and westbound left turns.	Roads and Bridges	$308,270	2015
10788	Cornelius	10th Avenue Improvements	Holladay Street	Alpine Street	Improve to urban standard w/in City (sidewalks & bike lanes); widen rural road with shoulder bike lane, increase turning radii at Adair Street.	Roads and Bridges	$8,000,000	2018
10772	Forest Grove	David Hill Road Extension	OR 47	Brook Street	Extend easterly from east terminus (just east of Brook) to Sunset Drive (OR 47) as an arterial street with left-turn lanes at major intersections, traffic signals and turn lanes.	Roads and Bridges	$14,467,430	2017
11663	Forest Grove	OR 47/ Purdin Road Intersection Improvements	OR 47	Purdin Road	Construct roundabout.	Roads and Bridges	$3,529,160	2017
10423	Gresham	Cleveland: Powell to Burnside Reconstruction	Powell Boulevard	Burnside Street	Reconstruct street.	Roads and Bridges	$1,169,300	2017
11152	Hillsboro	Cedar Street Bike and Pedestrian Improvements	32nd Avenue	Brookwood Avenue	Construct sidewalks.	Active Transportation	$1,063,000	2018
11142	Hillsboro	37th Avenue Bike and Pedestrian Improvements	Main Street	Brogden Avenue	Widen to provide sidewalks and add bikeway network wayfinding signage to improve access to MAX station and Fairgrounds.	Active Transportation	$1,063,000	2014
11167	Hillsboro	Garibaldi Street Bike and Pedestrian Improvements	Ebberts Avenue	1st Avenue	Widen street to provide sidewalks and add bike boulevard wayfinding signage.	Active Transportation	$531,500	2014
11168	Hillsboro	Connell Avenue Bike and Pedestrian Improvements	Garibaldi Street	Darnielle	Widen street to provide sidewalks and add bike boulevard wayfinding signage.	Active Transportation	$531,500	2014
10844	Hillsboro	Cornelius Pass Road Extension, Phase 1	Tualatin Valley Highway	Blanton Street	Extend as a five-lane facility with buffered bike lanes and sidewalks.	Roads and Bridges	$19,718,650	2018
11367	Hillsboro	Cornelius Pass Road	Cornell Road	US 26	Widen street from five lanes to seven lanes with buffered bike lanes and sidewalks. Dual EB and WB left-turns at Cornell Rd. Dual NB and SB lefts at Evergreen Road.	Roads and Bridges	$13,819,000	2017
11365	Hillsboro	Brookwood Parkway	Evergreen Road/Shute Road	US 26	Widen street from five lanes to seven lanes with buffered bike lanes and sidewalks.	Roads and Bridges	$11,693,000	2017
11395	Hillsboro	Baseline Road Improvements	231st Avenue	Brookwood Avenue	Widen street to five lanes with bike/ped facilities, storm drainage, and street lighting.	Roads and Bridges	$9,567,000	2017
11391	Hillsboro	Tualatin Valley Highway Intersection Improvements	Cornelius Pass Road	N/A	Add EB and WB right-turn lanes, dual left-turn lanes on all approaches; modify signal; construct new rail crossing.	Roads and Bridges	$7,653,600	2018
10834	Hillsboro	28th Avenue	Main Street	Light Rail	Widen street to three lanes with bike lanes and sidewalks.	Roads and Bridges	$3,986,250	2016
11665	Hillsboro	28th Avenue	Light Rail	25th Avenue	Widen street to five lanes with bike lanes and sidewalks.	Roads and Bridges	$3,189,000	2016
11366	Hillsboro	Butler Drive	229th Avenue	Cornell Road	Widen street to five lanes with bike lanes and sidewalks.	Roads and Bridges	$2,126,000	2014
11359	Hillsboro	Cornelius Pass Road Turn Lane	Cornelius Pass Road at Imbrie	Cornelius Pass Road at US 26 Eastbound	Widen northbound Cornelius Pass Road to provide a second right turn lane to US 26 eastbound.	Roads and Bridges	$1,594,500	2017
11368	Hillsboro	US 26 Westbound Off Ramp	US 26 Westbound	Cornelius Pass Road Southbound	Add second lane on westbound loop off ramp and third southbound approach lane.	Throughways	$5,315,000	2018
10088	Lake Oswego	Lower Boones Ferry Road	Madrona Street	Lanewood Street	Widen to include bike lanes, sidewalks, and turn lanes.	Roads and Bridges	$28,701,000	2019
10109	Milwaukie	Kellogg Creek Bike/Pedestrian Bridge	Lake Road	Kronberg Park	Construct bike/pedestrian overpass over Kellogg Creek in conjunction with light rail bridge.	Active Transportation	$2,700,000	2015

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Completed 2014 RTP Projects

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10405	Multnomah County	Multnomah County Pedestrian Improvements	Multnomah County	N/A	Install pedestrian improvements, including marked crossings, lighting, and sidewalks.	Active Transportation	$2,062,220	2014-16
11360	Multnomah County	Sellwood Bridge Replacement	SE Tacoma St.	OR 43	Replace Sellwood Bridge and Improve connection at the west end (OR 43) of the Sellwood Bridge.	Roads and Bridges	$373,963,400	2017
10411	Multnomah County	Burnside Bridge Rehabilitation - Phase 1	Burnside Bridge	N/A	Rehabilitate mechanical system, approach structure, corrosion control, phase 1 seismic retrofit.	Roads and Bridges	$26,575,000	2019
10410	Multnomah County	Broadway Bridge Rehabilitation 1	Broadway Bridge	N/A	Rehabilitate mechanical system, approach structure, corrosion control, phase 1 seismic retrofit.	Roads and Bridges	$24,130,100	2018
11298	Multnomah County	Cornelius Pass Road Safety Improvements - TSM	US 30	Washington County line	Implement system management improvements recommended in FHWA Safety Audit; including targeted shoulder widening, new/additional guard rails.	Roads and Bridges	$6,378,000	2019
10387	Multnomah County	Arata Road Active Transportation and Reconstruction	223rd Avenue	238th Avenue	Construct to 3 lane collector standards with center turn lane/median, sidewalks, and bicycle lanes.	Roads and Bridges	$4,783,500	2018
10404	Multnomah County	Beaver Creek Culvert Replacement	Troutdale Road	Cochran Road	Replace culverts with fish friendly structures allowing for passage to federally desginated endangered species.	Roads and Bridges	$2,657,500	2017
10398	Multnomah County	Wood Village Boulevard Extension	Arata Road	Halsey Street	Construct new extension of Wood Village Blvd as a major collector with 2 travel lanes, center turn lane/median, sidewalks and bicycle lanes.	Roads and Bridges	$1,672,099	2014
11349	ODOT	OR 212/224 improvements	82nd Avenue	98th Avenue	Construct 3rd WB lane on OR 212/224.	Roads and Bridges	$21,260,000	2015
11179	ODOT	I-5 to 99W replacement projects	N/A	N/A	Construct improvements consistent with recommendations from I-5/99W connector process.	Roads and Bridges	$10,630,000	2010
10869	ODOT	Sunrise Expressway	I-205	122nd Avenue	Construct new limited-access expressway.	Throughways	$180,710,000	2016
11121	ODOT	I-5 Delta Park Phase 1	Victory Boulevard	Lombard Street	Widen I-5 to 3 lanes and realign ramps.	Throughways	$53,150,000	2008
11178	ODOT	US 26 at Shute Road interchange improvements	US 26 and Shute Road	N/A	Interchange improvements to improve operations and construct a new westbound-southbound loop ramp to serve Shute Road.	Throughways	$47,835,000	2016
10863	ODOT	I-84/Troutdale Interchange (Exit 17) Improvements	Troutdale interchange (Exit 17)	N/A	Improve eastbound off-ramp, widen South Frontage Road, improve intersection at Graham Road. Also includes initial reconstruction of west end of interchange (NW Marine Drive).	Throughways	$34,228,600	2015
10873	ODOT	US 26 Widening	185th Avenue	Cornelius Pass Road	Widen highway to 6 lanes.	Throughways	$26,575,000	2018
11401	ODOT	I-5 Southbound Auxiliary Lane Extension Lower Boones Ferry to I-205	Lower Boones Ferry entrance ramp	I-205 exit ramp	Extend existing auxiliary lane.	Throughways	$18,071,000	2018
11398	ODOT	I-205 Northbound Auxiliary Lane I-84 to Killingsworth	I-84 Entrance Ramp	Killingsworth Street exit ramp	Construct an auxiliary lane.	Throughways	$15,945,000	2018
11123	ODOT	I-5/North Macadam Interchange	I-5/Macadam interchange	N/A	Construct improvements in North Macadam/South Waterfront area to enhance safety and access.	Throughways	$15,945,000	2013
10865	ODOT	I-205/Airport Way interchange	I-205 and Airport Way		Implement recommendations consistent with I-205/Airport Way Study.	Throughways	$11,161,500	2012
10874	ODOT	I-5 Delta Park Phase 2 (99W / Denver)	Victory Boulevard	Argyle Street	Construct shared-use paths, rehabilitate, resurface and restripe Denver Avenue for buffered bike lanes, connect SUP to Columbia Slough levee trail.	Active Transportation	$10,630,000	2015

Completed 2014 RTP Projects

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2014 RTP ID	Nominating Agency	Project Name	Start Location	End Location	Description	RTP Investment Category	Estimated Cost (2016 dollars)	Year completed
10227	Portland	SW Stephenson/SW Boones Ferry Intersection	SW Boones Ferry Road	SW Stephenson Street	Improve and signalize the intersection at SW Stephenson and SW Boones Ferry Road.	Active Transportation	$1,529,223	2014
10200	Portland	NE Killingsworth Pedestrian District	N/A	N/A	Plan and develop improvements to the pedestrian environment including sidewalks, lighting, crossings, bus shelters and benches.	Active Transportation	$1,491,389	2014
10267	Portland	N. Going, Street Bikeway	N Interstate Avenue	N Basin Street	Design & implement multi-use path.	Active Transportation	$816,384	2014
10297	Portland	Spokane & Umatilla, SE (7th - Tacoma Overcrossing): Bikeway	SE 7th Avenue	Tacoma Street Overcrossing	Implement bike boulevard improvements.	Active Transportation	$372,847	2013
11563	Portland	Southwest In Motion Active Transportation Strategy	SW Portland	N/A	Develop 5-year active transportation strategy for all of Southwest Portland. It will incorporate projects in the RTP, Portland Bicycle Plan, Barbur Concept Plan, Southwest Corridor Plan, and community-led Platinum Bicycle Facility Strategy in Southwest Portland.	Active Transportation	$318,830	2018
11413	Portland	East Portland Access to Employment and Education	N/A	N/A	Sidewalk improvements for access to transit and safety, efficiency and comfort improvements for transit.	Active Transportation	$3,720,500	2019
10192	Portland	Division Streetscape and Reconstruction	SE 6th Avenue	SE 39th Avenue	The project will design and build streetscape and transportation improvements and complete base repair and pavement reconstruction.	Roads and Bridges	$6,216,568	2015
10202	Portland	102nd Avenue Gateway Plan District Multi-modal Improvements, Phase II	NE Glisan Street	SE Stark Street	Implement Gateway regional center plan with boulevard design retrofit, new traffic signals, improved pedestrian facilities and crossings, street lighting and new bicycle lanes.	Roads and Bridges	$2,338,600	2014
10245	Portland	Steel Bridge, NE (East Ramps): Seismic Retrofit	Steel Bridge	N/A	Seismic retrofit.	Roads and Bridges	$1,491,389	2009
10239	Portland	11th/12th/Railroad Crossing, SE (West of Division): Intersection Improvements	Railroad Crossing	12th Avenue	Reconstruct intersection to upgrade traffic signalization and establish bike and pedestrian routes.	Roads and Bridges	$596,556	2015
10236	Portland	Water Avenue, SE (Caruthers - Division Pl): Street Extension Phase II	Caruthers Street	Division Place	Provide new roadway connection with sidewalks, bike lanes, landscaping, access to Willamette Greenway, & reconstruction of existing roadway.	Roads and Bridges	$430,638	2015
11558	Portland	Inner Burnside Safety Improvements	E 16th Avenue	E 32nd Avenue	Safety improvements including improved crossings, left turn pockets and improved signal timing.	Roads and Bridges	$132,875	2017
11091	Portland	Columbia Boulevard/I-205 Interchange: SB On-Ramp Improvement	Columbia Boulevard	N/A	Expand the on-ramp to three lanes, including for truck/HOV.	Throughways	$797,250	2014
11192	Portland	Streetcar Planning/ Alternatives Analysis	City of Portland	N/A	This project will perform follow up and alternatives analysis of the Streetcar System Plan (SSP) for up to three of its highest rated corridors.	Transit	$6,643,750	2015
10177	Portland	South Waterfront Portland Streetcar Extension	SE Water Avenue	SW Moody Street	Construct streetcar extension in South Waterfront.	Transit	$5,315,000	2015
10249	Portland	South Waterfront Transit Improvements	South Waterfront	N/A	Implement transit improvements identified in the North Macadam Framework Plan, including central city transit hub and local bus service improvements.	Transit	$2,982,778	2016
11201	Portland	SW Columbia & SW Jefferson Bus Pads	SW Naito Parkway	SW 14th Avenue	Build concrete bus pads on SW Columbia and SW Jefferson.	Transit	$345,475	2015
11206	Portland	I-84 Active Corridor Management Project	I-84	N/A	This project expands real-time traveler information and enables incident management techniques that reduce traveler delay and improve safety on I-84 and parallel facilities, including Powell Boulevard, Glisan Street, and Sandy Boulevard.	TSMO/TDM/TOD	$1,594,500	2017
11134	THPRD	Westside Trail (Regional) Segment 18	Bronson Creek Trail (Kaiser Ridge Park)	Rock Creek Trail (Kaiser Woods Park)	Design and construct a regional trail multi-use segment in a utility corridor (10'-12' wide paved).	Active Transportation	$2,843,525	2017

Completed 2014 RTP Projects

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2014 RTP ID	Nominating Agency	Project Name	Start Location	End Location	Description	RTP Investment Category	Estimated Cost (2016 dollars)	Year completed
11214	THPRD	Westside /Waterhouse Trail Connection	Westside Trail @ Westside MAX tracks	southern terminus of Waterhouse Trail @	Design and construct a multi-use regional trail segment (10'-12' wide paved).	Active Transportation	$1,594,500	2016
11228	Tigard	Tigard Street Heritage Trail	Tiedeman Avenue	Main Street	Construct trail along portion of abandoned rail line.	Active Transportation	$1,300,000	2018
10759	Tigard	Dartmouth Street Improvements	72nd Avenue	68th Avenue	Widen to 4 lanes with turn lanes and sidewalks.	Roads and Bridges	$2,657,500	2014
11412	TriMet	Barbur-99W Corridor Safety and Access to Transit	Portland	Sherwood	Improving bus stops, constructing sidewalks, enhancing crossings, installing signal priority and transit operations improvements on and connecting to Barbur-99W between Portland and Sherwood.	Active Transportation	$3,832,115	Obligated 2016 *(Transferred to ODOT)*
11414	TriMet	Powell-Division Corridor Safety and Access to Transit	Portland	Gresham	Priority improvements for safety, access to transit and transit operations in the Powell and Division corridors, with current TriMet Frequent Service lines and a designated regional High Capacity Transit development corridor.	Active Transportation	$2,976,400	Obligated 2016 *(Transferred to ODOT)*
11415	TriMet	OR 8 Corridor Safety and Access to Transit	110th Avenue (Beaverton)	209th Avenue (Hillsboro)	Improve bus stops, construct sidewalks, enhance crossings, and install signal priority on and connecting to OR 8.	Active Transportation	$1,715,682	Obligated 2016 *(Transferred to ODOT)*
10901	TriMet	Orange line MAX light rail extension	Portland	Milwaukie	Extend MAX light rail from Portland to Milwaukie.	Transit	$1,589,185,000	2015
11591	TriMet	TriMet Electronic Fare System	Region-wide	Region-wide	Development of protocol specifications for and installation of eFare system.	Transit	$31,890,000	2017
11410	TriMet	Positive Train Control	Region-wide	Region-wide	Installation of PTC system.	Transit	$8,716,600	2018
10899	TriMet	WES Washington County Commuter Rail Railcar Purchases	Washington County	N/A	Purchase 2 WES railcars to increase service capacity.	Transit	$8,504,000	2017
10916	TriMet	Bus Improvements: SE McLoughlin to Oregon City and Clackamas Community College	McLoughlin Boulevard	N/A	Bus improvements along McLoughlin Blvd in Milwaukie, Gladstone, Oregon City, and Clackmas Community College to improve access in corridor and connect to Orange line MAX extension.	Transit	$6,378,000	2015
10926	TriMet	Transit dispatch center upgrade	Region-wide	N/A	Upgrade transit dispatch center to accommodate increasing operating complexities.	Transit	$4,252,000	2015
11037	TriMet	Merlo bus operating base expansion	Washington County	N/A	Pave graveled property for bus parking expansion.	Transit	$1,063,958	2011
11032	TriMet	Ruby Junction light rail operating base expansion	Gresham	N/A	LRV maintenance and storage facility, including expansion on west side of Eleven-Mile Avenue. Capital cost is included in Orange line MAX extension project (#10901).	Transit	*included in other project costs*	2015
11038	TriMet	Center Street bus operating base expansion	Multnomah County	Clackamas County	Includes upgrades to bus facilities and responses to some changes needed to accommodate Orange line MAX extension. Capital cost is included in Orange line MAX extension project (#10901).	Transit	*included in other project costs*	2015
10729	Tualatin	Loop Road	Martinazzi	Boones Ferry	Construct street from Tualatin-Sherwood to Boones Ferry Rd to Martinazzi, including improved intersection at Nyberg near Fred Meyer entrance.	Roads and Bridges	$2,618,169	2015
10728	Tualatin	Boones Ferry Road ITS Improvements	Tualatin-Sherwood Road	Ibach Street	Interconnect six traffic signals.	TSMO/TDM/TOD	$82,914	2014
11467	Washington County	Fischer Road Interim Bike and Pedestrian Improvements	131st Ave	OR 99W	Add sidewalks, bike lanes, lighting, and turn lanes at major intersections.	Active Transportation	$4,868,540	2017
11240	Washington County	Murray Boulevard Bikelane & sidewalk	Farmington Road	Tualatin Valley Highway	Construct a six-foot wide bike lane on west side of Murray Boulevard, replace existing asphalt path with six-foot wide concrete sidewalk & five-foot wide planting strip, and move railroad equipment.	Active Transportation	$3,082,700	2018
11445	Washington County	P15 (Oats) Street Connection	Brugger Road	Springville Road	Build new 2-lane road with sidewalks, bikeway and street lighting.	Active Transportation	$2,444,900	2017

Go to www.oregonmetro.gov/rtp to see where projects are located.

Memo

Metro
600 NE Grand Ave.
Portland, OR 97232-2736

Date: November 9, 2017
To: Metro Technical Advisory Alternatives Committee (MTAC) and interested parties
From: Lake McTighe, Senior Transportation Planner
Subject: Overview of technical review draft 2018 Regional Transportation Safety Strategy

Purpose
The purpose of this memorandum and associated materials and presentation is to provide MTAC with an overview of the technical review draft of the 2018 Regional Transportation Safety Strategy developed by the Technical Work Group (refer to **Attachment 1** and **Attachment 2)**. Chapter 2 and Chapter 4 are sections of the strategy that will be highlighted for discussion in the presentation.

Action Requested
No formal action is requested. This is an opportunity for MTAC to ask questions and provide input on the technical review draft of the 2018 Regional Transportation Safety Strategy and the crash analysis in the Draft 2017 State of Safety Report, and understand next steps moving forward.

Background
Metro is updating the 2012 Regional Transportation Safety Plan as part of the update of the 2018 Regional Transportation Plan. Metro has been working with a Technical Work Group on the update since May 2016. The final meeting of the Technical Work Group was October 19, 2017. At that meeting the work group provided guidance on the technical review draft 2018 Regional Transportation Safety Strategy.

MTAC last provided input on the 2018 Regional Transportation Safety Strategy at the February 1, 2017 meeting. At that meeting, MTAC provided support for moving forward with the Vision Zero safety target and framework, the safety system evaluation measures, and using the Regional High Injury Corridors as a tool to help inform prioritizing regional transportation investments.

In February and April 2017, the Metro Council (February 28), the Metro Policy Advisory Committee (MPAC) (April 12) and the Joint Policy Advisory Committee on Transportation (JPACT) (April 20) expressed support for moving forward with the Vision Zero safety target and framework, the safety system evaluation measures, and using the Regional High Injury Corridors as a tool to help inform prioritizing regional transportation investments.

With this policy direction, Metro staff and the Technical Work Group prepared the technical review draft 2018 Regional Transportation Safety Strategy presented to TPAC at the November 17 meeting.

Overview – Technical review draft 2018 Regional Transportation Safety Strategy
The technical review draft 2018 Regional Transportation Safety Strategy includes the following elements (either updating the 2012 plan or new):

- Updated policy context (Chapter 1)
- New regional safety targets and policies (Chapter 2)
- Updated key findings from 2011-15 crash data analysis (Chapter 3)
- Updated strategies and actions (Chapter 4)

- New chapter on implementation (Chapter 5)
- New annual performance targets and system evaluation measures (Chapter 6)

The 2018 Regional Transportation Safety Strategy updates the 2012 Regional Transportation Safety Plan with a public health and social equity perspective and using a Vision Zero framework which emphasizes a safe systems approach where:

- The focus is on preventing traffic deaths and severe injuries,
- Traffic deaths and severe injuries are assumed to be preventable, and no loss of life is acceptable.
- Human failing is integrated into the approach, so that even when mistakes are made the transportation system is forgiving and do not result in death or life changing injuries.
- Saving lives is not considered expensive, and in fact saves money.

Next Steps

The Technical Safety Work Group has concluded meeting. Refinement and finalization of the 2018 Regional Transportation Safety Strategy will be guided by the Metro Council, Metro's technical and policy advisory committees TPAC, MTAC, JPACT and MPAC, and public comment. The Metro Council will consider adoption of the final strategy in December 2018. Schedule of upcoming discussions and actions:

- **December 12 – Metro Council**: 2018 RTP policy chapter review findings (including safety policies) and 2018 RTP Draft Investment Strategy
- **December 6 & 15 – MTAC and TPAC**: 2018 RTP policy chapter review findings (including safety policies) and 2018 RTP Investment Strategy and Transportation Equity Analysis Findings (including safety projects/ performance measures)

2018

- **January 18 & 25 – JPACT and MPAC**: 2018 RTP Investment Strategy and Transportation Equity Analysis Findings (including safety projects/ performance measures)
- **January 17 & 26 – MTAC and TPAC**: Draft 2018 RTP policies (including safety policies)
- **February 6 – Metro Council**: Discussion draft of 2018 Regional Transportation Safety Strategy and Draft 2018 RTP policies (including safety policies)
- **February 15 & 28 – JPACT and MPAC**: Draft 2018 RTP policies (including safety policies)
- **March 14 & 15 – MPAC and JPACT**: Discussion draft of 2018 Regional Transportation Safety Strategy
- **June 29 – August 13 – Public comment period**: Public review draft of 2018 Regional Transportation Safety Strategy
- **September - MTAC and TPAC**: Adoption draft 2018 Regional Transportation Safety Strategy – recommendation to MPAC and JPACT
- **October – MPAC and JPACT**: -Adoption draft 2018 Regional Transportation Safety Strategy – recommendation to Council
- **December – Metro Council**: Adoption draft 2018 Regional Transportation Safety Strategy – final action (by Metro Resolution)

Attachments

1. List of Safety Technical Work Group members
2. Technical review draft – 2018 Regional Transportation Safety Strategy
3. Draft 2017 Metro State of Safety Report

Attachment 1

Metro

www.oregon**metro.gov/rtp**

10/18/17

2018 REGIONAL TRANSPORTATION PLAN

Roster for Safety Technical Work Group

Metro is working with local, regional and state partners and the public to update the region's shared vision and strategy for investing in the regional transportation system for the next 25 years.

To support development of the 2018 Regional Transportation Plan, Metro staff are convening seven technical work groups to provide input to the project team on implementing policy direction from the Metro Council and regional policy advisory committees. In this role, the work group members review and provide feedback to Metro staff on draft materials and analysis, keep their respective elected officials and agency/organization's leadership informed to identify issues and concerns early on, and integrate input from partners and the public. The work groups also help identify areas for further discussion by the Metro Council and regional technical and policy advisory committees.

Work group members include topical experts and representatives from the Metro Technical Advisory Committee (MTAC) and the Transportation Policy Alternatives Committee (TPAC) or their designees, and other community, business, city and county partners. Meetings of the technical work groups are posted on Metro's calendar at www.oregonmetro.gov/calendar and www.oregonmetro.gov/rtp.

Safety Work Group | *as of 10/18/17*

	Name	Affiliation
1.	Lake McTighe	Metro lead
2.	Anthony Buczek	Metro
3.	Chris Strong Jay Higgins (alternate)	City of Gresham
4.	Clay Veka Zef Wagner/Dana Dickman (alternate)	City of Portland
5.	Jeff Owen	TriMet
6.	Dyami Valentine Stacy Shetler (alternate)	Washington County
7.	Mike Ward	City of Wilsonville
8.	Kari Schlosshauer	National Safe Routes to School partnership
9.	Joe Marek	Clackamas County
10.	Eileen Cunningham	Multnomah County – Planning and Engineering
11.	Becky Bodonyi Brendon Haggerty (alternate)	Multnomah County – Public Health
12.	Katherine Burns Lidwien Rahman	Oregon Department of Transportation – Region 1
13.	Tegan Enloe	City of Hillsboro
14.	Luke Pelz Stacy Revay (alternate)	City of Beaverton
15.	Amanda Owings	City of Lake Oswego
16.	Noel Mickelberry	Oregon Walks
17.	Nick Fortey	Federal Highway Administration
18.	Stephanie Noll	The Street Trust

2018 Regional Transportation Safety Strategy

Table of Contents

Foreword

The 2018 Regional Transportation Safety Strategy (RTSS) updates the region's first Regional Transportation Safety Plan (RTSP), completed in 2012. Safety was one of eight policy focus areas for the 2018 Regional Transportation Plan (RTP). Throughout the update of the 2018 RTP, safety has continued to remain a critical concern with elected and community leaders and the public. The 2018 RTSS updates the safety goals, objectives, policies, targets and performance measures of the 2018 RTP.

With the federal surface transportation legislation TEA-21 in 1998, safety and security appeared as planning factors for metropolitan planning organizations (MPOs) to address in transportation planning. SAFETEA-LU, adopted in 2005, placed a greater emphasis on addressing safety and established the Highway Safety Improvement Program (HSIP) as a core Federal- aid program. Signed into law 2012, MAP-21 required states and MPOs to adopt safety performance measures and targets. This requirement was maintained in the most recent federal surface transportation legislation the Fast-Act, signed into law in 2015.

Since early 2016, Metro has been working with a regional transportation safety work group and the regional transportation technical and policy advisory committees the Joint Policy Advisory Committee on Transportation (JPACT), Metro Policy Advisory Committee (MPAC), Transportation Policy Alternatives Committee (TPAC) and Metro Technical Advisory Committee (MTAC), to update the 2012 RTSP. Development of the RTSS benefitted from the development of recent state, county and city transportation safety action plans.

Transportation safety is influenced by multiple factors, from laws and regulations, to safety education and training, to cultural and societal norms and behaviors, to roadway design. Tackling all of these issues comprehensively in a single plan is impossible. Rather, the purpose of the 2018 RTSS is to provide a specifically urban-focused overarching data-driven framework for increasing traffic safety in the Portland metropolitan region. The plan focuses on a few strategies and actions drawn from best-practices and proven to reduce traffic related deaths and serious injuries.

The 2018 RTSS does not mandate adoption or implementation of the safety strategies and actions described in the plan; transportation elements required to be included in local transportation system plans by cities and counties are described the Regional Transportation Functional Plan.

23 U.S. Code 409 states that crash and safety data, including reports, surveys, schedules, and lists, compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings or for the purpose of developing any highway safety construction improvement project which may be implemented utilizing federal-aid highway funds, shall not be subject to discovery or admitted into evidence in a federal or state court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

Executive Summary

Traffic related deaths and serious injuries is a critical and preventable public health and equity issue in the Portland metro region. Nationwide, crashes kill an average of 33,700 people each year. [1] Traffic crashes are the leading cause of accidental deaths in the United States, the leading cause of deaths of all kinds for ages 5-24, and the second leading cause of death for people ages 25-44.[2]

In Oregon, between 2009 and 2013, there were more than 230,000 crashes, resulting in 1,675 deaths and 7,191 people severely injured. An average of 335 people die annually and1,438 are severely injured in traffic crashes in Oregon.[3]

The Portland metro region, with a population of about 1.5 million, comprises almost 40 percent of the state's population. Between 2011 and 2015, there were more than116,398 traffic crashes resulting in 311 deaths and 2,102 people severely injured. On average, 62 people die each year on the region's roadways and 420 people experience a life changing injury. This represents 43% of the state's crashes, 14% of its fatalities, and 36% of its serious injury crashes. The annual economic cost to the region of these crashes is estimated at $1 billion.[4]

Today, our elected and community leaders acknowledge that the high number of tragedies on our roadways is largely predictable and preventable. And they are stepping up to declare that "enough is enough" and to devise plans and policies for a safe future on our roadways. Just as we expect the right to safe water to drink and clean air to breathe, so too should we expect the right to move about safely.

The region is employing a Vision Zero framework and safe system approach with an adopted goal to eliminate deaths and serious injuries for all users of the transportation system by 2035.

To achieve this ambitious goal the region has adopted annual targets to monitor progress and developed an overall strategy based on a safe system approach, recognizing that people will always make mistakes and may have road crashes—but the system should be forgiving and those crashes should not result in death or serious injury. The strategy identifies a series of actions, grouped into six strategies, and involving data collection and monitoring, community engagement and education, designing streets for safety, and ongoing coordination among all partners.

1. Reduce Speeds and Speeding
2. Protect Vulnerable Users

[1] Centers for Disease Control and Prevention, Key Injury and Violence Data, 2014.
[2] Centers for Disease Control and Prevention, Ten Leading Causes of Death and Injury, 2015 https://www.cdc.gov/injury/wisqars/LeadingCauses.html
[3] Oregon Transportation Safety Action Plan, 2009-2013(this data does not reflect the uptick in serious crashes seen nationally and regionally in 2015 and 2016)
[4] xxx

3. Design Roadways for Safety
4. Address Dangerous Behaviors
5. Address Impairment
6. Ongoing Engagement and Coordination

Strategies and actions are data-driven and were identified in response to key findings from analysis of 2011-2015 crash data.

- People walking and bicycling experience higher crash rates.
- A majority of high injury corridors and pedestrian fatalities are in areas with higher concentrations of people of color, people with low incomes and limited-English proficiency.
- Speeding and aggressive driving are the leading contributing factors toward fatal and serious crashes.
- Arterial roadways have the highest serious crash rate for all modes - 60% of all serious crashes occur on only 6% of the region's roadways.
- Roadeways with more traffic lanes have particularly high serious pedestrian crash rates per mile and per vehicle miles traveled.
- Alcohol and drugs are primary contributing factor to fatal crashes.
- Pedestrian fatality rates are increasing and are higher than any other group.

ADD summary of Vision Zero framework

[Executive Summary will be a 2-4 page document with graphics for data.]

Community Stories – We Remember

Your stories inspire us to take serious action.
This Safety Strategy is dedicated to the victims of traffic violence in the Portland region—the daughters, sons, mothers, fathers, wives, husbands, siblings, and friends who have been killed or severely injured on our streets.

ADD traffic crash victim story(ies).

ADD community member, business and elected leader perspectives on the importance of taking serious action.

Chapter 1: Introduction

The 2018 Regional Transportation Safety Strategy (RTSS) sets regional transportation safety policy and provides a framework for working towards zero traffic related deaths and severe injury crashes in the region. This Introduction provides context for the RTSS, including the role of regional government in transportation safety planning, existing federal, state, regional and local policies related to transportation safety, a description of the Vision Zero framework and the organization of the RTSS.

1.1 Safe System Approach to Achieve Vision Zero

The overall strategy of the 2018 RTSS is to use a safe system approach to safety planning and implementation in the region to achieve a Vision Zero target. The safe system approach involves a holistic view of the transportation system and the interactions among travel speeds, vehicles and road users. It is an inclusive approach that prioritizes safety for all user groups of the transportation system - drivers, motorcyclists, passengers, pedestrians, bicyclists, and commercial and heavy vehicle drivers. Consistent with the region's long-term safety vision, it recognizes that people will always make mistakes and may have road crashes—but the system should be forgiving and those crashes should not result in death or serious injury.

Safe system diagram from the National Road Safety Strategy

Key inputs to the Safe System approach are:

- using data, research and evaluation to understand crashes and risks
- developing road rules and enforcement strategies to encourage compliance and manage non-compliance with the road rules
- managing access to the road through licensing drivers and riders and registering vehicles
- providing education and information
- being open to and seeking innovation
- developing standards for safe vehicles, roads and equipment
- good management and coordination

1.2 Metro's Role

As the region's metropolitan planning organization (MPO), Metro has a variety of roles and requirements in transportation safety planning, including:

- Developing the Regional Transportation Plan (RTP) and the Metropolitan Transportation Improvement Plan (MTIP), including projects consistent with regional plans and policies.
- Allocating federal transportation funding through project selection process informed by regional policies.
- Reviewing local comprehensive and transportation plans for consistency with the RTP.
- Reporting on annual safety targets and performance measures.
- Convening jurisdictions and agencies to achieve better coordination.
- Collecting, maintaining and disseminating data;
- Encouraging best practices in transportation safety and roadway design with funding and programmatic support.
- Supporting and introducing transportation safety legislation.
- Leading and collaborating on efforts to highlight safety in materials, messaging and campaigns.
- Supporting local and state efforts to implement and update plans, policies and projects.

The 2018 RTSS provides the transportation safety plan for the Portland metro region, defined as the area within the Metropolitan Planning Area (MPA). The MPA is slightly larger than the region's Urban Growth Boundary.

1.3 Relationship to Other Strategies and Plans

Transportation safety is an essential element of the region's desired outcomes, to ensure people have safe and reliable transportation choices. Transportation safety is an element of all state, regional and local land use and transportation plans and is achieved through the implementation and update of these plans.

The 2018 RTSS is a topical plan of the **2018 Regional Transportation Plan** (RTP) and updates the transportation safety elements. The RTP lays out the region's transportation concepts and policies to support a complete and interconnected transportation system that supports all modes of travel and implementation of the **2040 Growth Concept**. Chapter 2 describes transportation safety goals, objectives, policies and targets for the 2018 RTP.

Local **transportation system plans**, or TSPs, developed by cities and counties in the region must be consistent with the RTP. The **Regional Transportation Functional Plan (RTFP)** is the implementing plan of the RTP and specifies what local TSPs are required to include. For safety, the RTFP specifies that[5]:

- New street construction and re-construction must be designed to improve safety (3.08.110 A);

[5] Chapter 3.08 Regional Transportation Functional Plan, Effective 09/12/2012

- Cities and counties must consider safety improvements (along with TSMO strategies and operational and access management improvements) before other strategies to meet transportation needs and performance targets and standards (3.08.220);
- Each city and county shall include performance measures for safety (3.08.230 D);

The 2018 RTSS includes Action 6.12 to require TSPs to include a transportation safety plan, with data analysis that addresses all modes and is based on a safety inventory based on both an analysis of crash rates and an analysis of crash risks; to require that TSPs identify safety as a need; and to require that transportation projects do not make a known safety problem worse, and to be consistent with the 2018 RTSS.

Transportation safety is a component in all of the **RTP's topical and modal plans**, including the Climate Smart Strategy, Regional Freight Plan, Regional Transit Plan, Regional Travel Options Plan, Transportation System Management and Options Plan, and the Regional Active Transportation Plan. Implementing these plans helps achieve Vision Zero. Additionally, Metro's regional street and trail design guidelines emphasize engineering and design treatments to achieve Vision Zero streets.

Oregon adopted an updated **State Transportation Safety Action Plan** (TSAP) in 2016 with a Vision Zero target. The TSAP identifies Emphasis Areas for near term focus, goals, policies and strategies. The state must update the TSAP every five years. The TSAP shapes regional and local safety plans, and is in turn shaped by and responsive to the needs identified in local, county, regional and Tribal safety plans.

Several cities and counties in the region have adopted or are in the process of developing **local transportation safety action plans**. Clackamas County was the first county in the state to adopt a TSAP in 2012. The plan uses the Toward Zero Deaths framework. Portland adopted the first Vision Zero Plan in the region, Hillsboro adopted a TSAP in 2017 with a Vision Zero target, and Washington County completed a TSAP in 2017. Coordinating implementation of these plans is an important element of achieving Vision Zero. Action 6.9 of the 2018 RTSS recommends updating the Transportation Planning Rule to require Transportation System Plans to include a transportation safety plan, to identify safety as a need and to clarify that making a known safety problem worse constitutes a "significant effect."

1.4 Policy Context

Existing policies at all level of government form the context in which the 2018 RTSS was developed. A review of current federal, state, regional and local policies related to transportation safety reveal a continuing and growing emphasis on transportation safety for all modes.[6] In particular, several themes emerged from the policy review:

1. Setting **ambitious transportation safety goals** for zero deaths and serious injuries.
2. Growing use of the Towards Zero Deaths and **Vision Zero frameworks** and targets to achieve better safety results.
3. Use of data, performance measurement, and evaluation to develop **data-driven** safety plans, strategies and actions and monitor progress towards goals.

[6] Refer to the July 2016 Regional Transportation Safety Plan Policy Framework Report in Appendix X

4. Recognition of **vulnerable users** and the need to take additional actions to protect them.
5. Integration of **equity and public health** perspectives into safety plans Public health and equity are also being tied more explicitly to transportation safety policies.

Setting Ambitious Goals

Setting ambitious transportation safety goals is increasingly used as a policy tool because of the severity of the safety issues and because ambitious goals are resulting in better outcomes.

The federal government has continued to elevate safety and recently announced a goal to end traffic fatalities in the next 30 year. ADD detail

Oregon has been successful compared to many other states and the overall rate of fatal and severe crashes has been declining. Building on that success, ODOT updated its transportation safety action plan and adopted a Vision Zero target for 2035.

In the region, Clackamas County has been a leader in setting aggressive safety targets. The county was the first in the state to develop a safety action plan. It uses the Toward Zero Deaths framework.

Over 40 cities in the U.S. have adopted Vision Zero plans and have identified themselves as Vision Zero cities, including the City of Portland. And, in 2016 the City of Hillsboro adopted a safety action plan with a target of zero by 2035. Washington County has completed a plan with a vision of moving towards zero deaths.

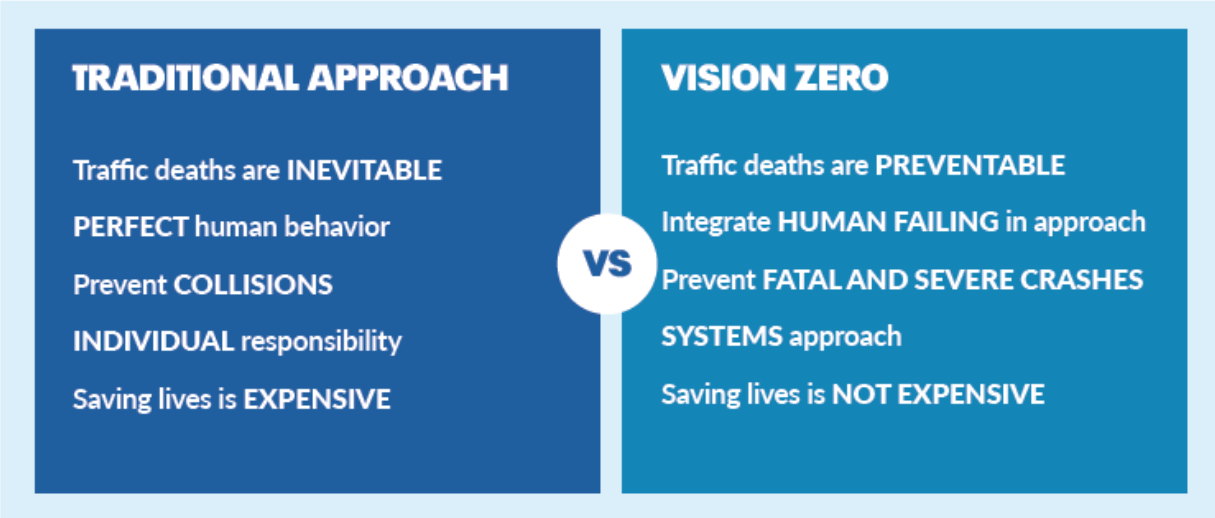
Vision Zero Framework

Different frameworks Vision Zero, Toward Zero Deaths, Road to Zero Describe and efforts to merge

WHO Global Plan for the Decade of Action for Road Safety 2011-2020[7]

Vision Zero originated in Sweden and is a multi-national road traffic safety project with the goal to achieve a transportation system with no fatalities or serious injuries involving motor vehicle traffic.[8] Vision Zero requires a shift in the way we think about transportation safety, and therefore a shift in the policies and programs – it employs what is known as the safe system approach.

[7] http://www.who.int/roadsafety/decade_of_action/plan/plan_english.pdf?ua=1
[8] Learn more about Vision Zero at the Vision Zero Network http://visionzeronetwork.org/



A Vision Zero framework is being adopted at all levels of government in the U.S. In 2016, the U.S. Department of Transportation and the National Safety Council launched the Road to Zero Coalition, which has the goal of ending fatalities on the nation's roads within the next thirty years.[9] More than 40 U.S. states have incorporated a Toward Zero Deaths approach into their safety work and are increasingly supporting local Vision Zero efforts.

- First and foremost Vision Zero states that **traffic deaths and severe injuries are preventable.**
- Second, **human life and health are prioritized within all aspects of the transportation system.**
- Vision Zero recognizes **that people make mistakes and can make bad decisions, and the transportation system should be forgiving.** Impairment, speeding, distracted driving, aggressive behavior – these are behaviors to be discouraged through policies, education and programs and enforcement. But, we must also design roadways that enable and encourage safe behaviors. Roadways should discourage dangerous behaviors by design.
- Strategies and actions should **focus on systems level-changes above influencing individual behavior.**
- **Saving lives is not expensive.** The annual cost of crashes to the region is $1 billion. Investing in and implementing safety plans is cost effective and humane.

Governments are increasingly using the Vision Zero framework as a policy starting point because it is proving to be effective in the countries where it has been in place for decades.

Data Driven

Policies at all levels of government emphasize collecting and tracking data on fatal and severe injury crashes, crash risks, and countermeasures to crashes to inform plans and investments.

[9] "U.S. DOT, National Safety Council Launch Road to Zero Coalition to End Roadway Fatalities" https://www.transportation.gov/briefing-room/us-dot-national-safety-council-launch-road-zero-coalition-end-roadway-fatalities

Understanding why fatal and severe injury crashes occur and who is most vulnerable is used to direct limited investments and to develop policies and actions to reduce fatal and severe crashes.

Strategies to improve data collection and availability (timelines, accuracy, etc), types of data available (post-hospital data, demographics, etc) must be pursued to support data driven plans and policies. Also needing greater attention is how crash risk is defined and addressed. Crash risk must be carefully defined based on data.

ADD description of data sources used in the RTSS, what further data is needed. ADD discussion of Federal performance measures, Highway Safety Improvement Program, ODOT programs and policies (ARTS); state of safety report,

Equity and Public Health

A review of current policies shows that equity and public health are being more explicitly linked to and integrated in transportation safety plans because of the direct relationship of crashes to health, and the growing recognition that some populations, including people of color, with low incomes and older adults, can be disproportionately impacted by crashes. EXPAND

Vulnerable Users

Vulnerable users are groups of people that are more vulnerable to being killed or seriously injured in crashes. Vulnerable users are pedestrians, bicyclists, motorcycle operators, children, older adults, construction workers, people of color and people living in lower income areas.

To be completed

Federal – bike and ped safety initiative

State

- Emphasis area, bicycle and pedestrian plan

Region

- Complete streets policy

Local plans

1.5 Process and Public Engagement

[To be completed]

1.6 Document Organization

The 2018 RTSS is organized into six chapters, with a foreword, executive summary, and back matter such as a glossary and list of acronyms. Supporting documents are provided as stand-alone appendices. This section provides an overview of the different parts of the document.

Foreword
Introduces the genesis, purpose, limitations, and scope of the plan.

Executive Summary
Provides a short summary and key elements of the plan.

Community Stories – We Remember
Shares stories of traffic crash victims which inspires the region to take serious action to end traffic violence. Community, business and elected leaders voices on why Vision Zero is needed.

Chapter 1: Introduction
Provides and introduction to and context for understanding the plan.

Chapter 2: Regional Transportation Safety Policy
Describes adopted regional safety goals, objectives, targets and policies.

Chapter 3: Key Findings from Crash Data
Provides key findings from analysis of the crash data used to identify the strategies and actions.

Chapter 4: Strategies and Actions
Describes data-driven strategies and actions to help achieve Vision Zero.

Chapter 5: Implementation
Outlines how the 2018 RTSS will be implemented.

Chapter 6: Measuring Progress
Describes performance measures to monitor progress towards achieving Vision Zero.

List of Partners
Agencies, organizations, non-profits, private entities, industry and the public who will play a role in implementing the 2018 RTSS.

Acronyms
Defines acronyms used in the document.

Glossary
Defines terms used in the document.

Appendices
Appendices are stand-alone documents that provide additional technical information for the 2018 Regional Transportation Safety Strategy.

- **2017 Metro State of Safety Report**
  Describes the data used in the analysis, the attributes of the data, and any data limitations. Describes the process Metro used to analyze the data. The 2017 State of Safety report presents the findings, identifying trends and relationships of serious crashes with environmental factors including roadway and land use characteristics and serves as the foundation for the 2018 RTSS.

- **Regional High Injury Corridors and Intersections Report**

Provides information and link to the Metro Crash Map and High Injury Corridors online map.

- **Transportation Safety Policy Framework Report**
  Developed prior to the 2018 RTSS, provides an overview of pertinent polices that guided the development of the 2018 RTSS. Includes profiles of local agency plans, actions and programs for transportation safety.

- **Safety Performance Measures Report**
  Developed prior to the 2018 RTSS, outlines the transportation safety related performance measures and targets for the update of the 2018 Regional Transportation Plan.

Chapter 2: Regional Transportation Safety Policy

This chapter describes adopted regional policies related to transportation safety, including vision, goals, objectives, targets and performance measures. Chapters 4 and 5 describe the strategies and actions to take to achieve regional goals and targets.

The information in this chapter is included in Safety Policy section of the policy chapter of the 2018 Regional Transportation Plan.

2.1 RTP Transportation Vision

The 2018 Regional Transportation Plan (RTP) provides a vision for the transportation system. Transportation safety is a crucial element of the vision.

In 2040, everyone in the Portland metropolitan region will share in a prosperous, equitable economy and exceptional quality of life sustained by a safe, reliable, healthy, and affordable transportation system with travel options.

2.2 Safety Goal and Objective

The 2018 RTP has ten goals for the regional transportation system. Goal 5 is the transportation safety and security goal.

Goal 5: Increase Safety and Security
Multimodal transportation infrastructure and services are safe and secure for the public and goods movement.

Objective 5.1 Transportation Safety
Eliminate fatal and severe injury traffic crashes for all modes of travel.

2.3 2035 Vision Zero Target

The 2018 RTSS updates the regional transportation safety target in the 2018 RTP with a Vision Zero target.

By 2035 eliminate transportation related fatalities and serious injuries for all users of the region's transportation system, with a 16% reduction by 2020 (as compared to the 2015 five year rolling average), and a 50% reduction by 2025.

The target year of 2035 will not change in subsequent RTP updates and progress towards meeting the target will be monitored each year. Refer to Chapter 6 for a description of how progress towards meeting the 2035 target, and the 2020 and 2025 interim targets, will be tracked.

The RTP Vision Zero target is consistent with 2016 Oregon Transportation Safety Action Plan target of "no deaths or life changing injuries on Oregon's transportation system by 2035."

2.4 RTP Safety Policies

Chapter 2 of the 2018 RTP includes policies for each of the regional transportation network components. [Note: Metro is considering adding new sections to Chapter 2 on safety, equity and

emerging technologies. Each of the new sections could include a set of policies consistent with the existing policies for the network components, e.g. freight, transit. Proposed safety policies would be vetted through TPAC and MTAC.]

2.5 Regional High Injury Corridors

Using 2010-2014 crash data, the 2018 RTSS identifies regional roadways and intersections where majority of fatal and severe injury crashes for all modes are occurring. Sixty percent of fatal and severe injury crashes for motor-vehicle occupants, pedestrians and bicyclists occur on just six percent of the roadway miles in the region. A majority of high injury corridors are in communities with higher concentrations of people of color, people with low incomes and people with low-English proficiency.

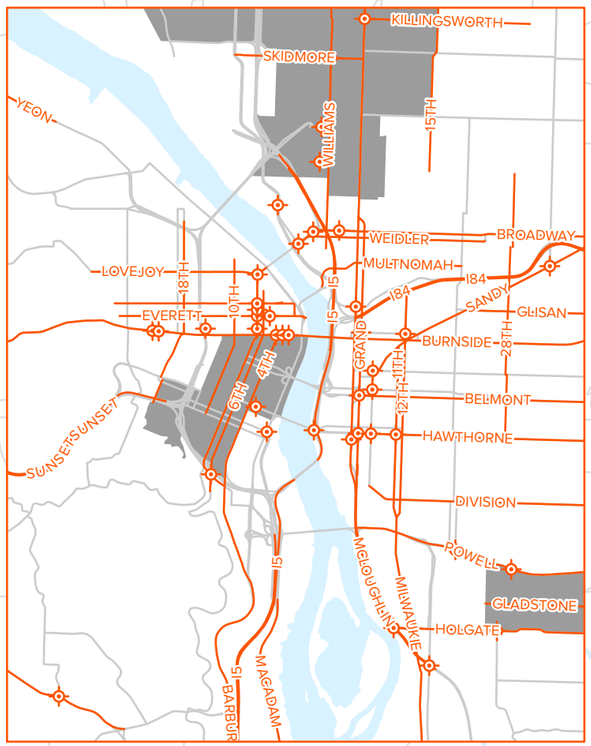
The following map illustrates the High Injury Corridors and Intersections in the Portland metro region. Safety policies, strategies and actions in the 2018 RTSS target these locations.

High Injury Corridors and Intersections in Greater Portland

DRAFT

Areas where the highest concentrations of severe crashes involving people in cars, biking and walking occur on the Regional Transportation Network. Corridors and intersections are analyzed to determine aggregate crash scores based on the frequency and severity of crashes.

- High injury intersections
  *Intersections with weighted crash scores**
- High injury corridors - combined modes
  *Corridors with weighted crash scores**
- Historically marginalized communities
  Concentrations of people with lower incomes, of color and/or limited English proficiency
- Metropolitan Planning Area



Date: 4/19/2017

These High Injury Corridors and Intersections represent 60% of all fatal and serious crashes involving people in cars, biking and walking. Intersections with crash scores higher than 80 and corridors with crash scores higher than 39 are featured on this map. Crashes on this map are weighted by severity, corridors are normalized by length and subject to refinement.

Data: 2010-2014 ODOT Crash data, RLIS, RTP Networks

Metro

Chapter 3: Key Findings from Crash Data

This chapter summarizes key findings from the analysis of five years of crash data, 2011-2015. [10] Refer to the **2017 Metro State of Safety Report.** Data and findings from other national and state data sources and studies are also referenced.

Clarify that this section reflects key findings – it is not comprehensive summary of all data findings. Refer to the 2017 State of Safety report for the comprehensive summary.

Using data to identify trends and understand the underlying contributing factors in fatal and serious injury crashes is the first step in identifying the data-driven strategies and actions described in the next chapter.

ADD brief overview of what is working well, and what is not.

ADD more intraregional (county, city) findings from the 2017 State of Safety report

3.1 Overview

Data from the National Highway Traffic Safety Administration (NHTSA) were compiled and analyzed along with population data from the U.S. Census to identify trends in national, state, regional, and city crashes described in section 3.1. Five years of data between 2005 and 2009 were considered for this analysis.

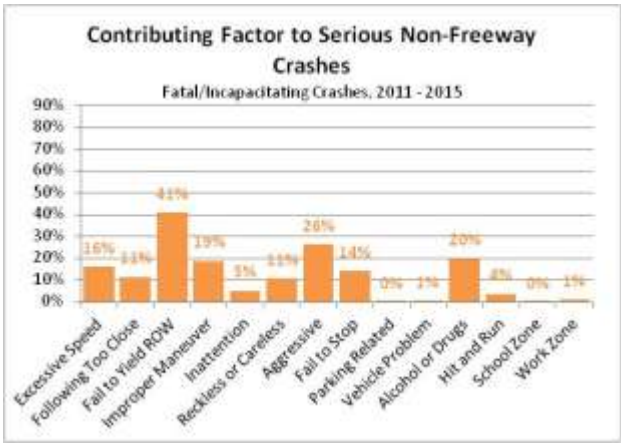
Roadway fatalities have been increasing since 2010.

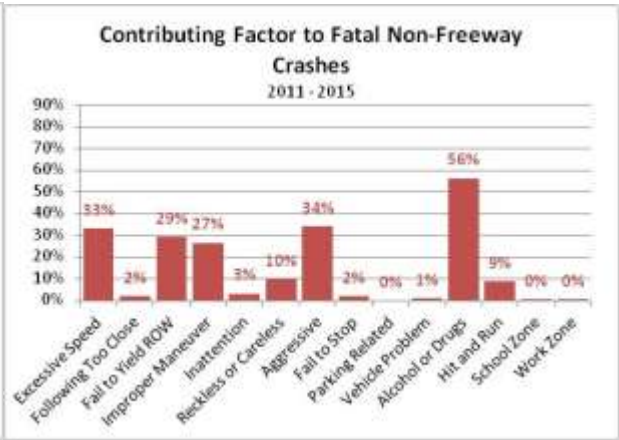
- Travel patterns in the US have changed in the last decade due to a variety of external factors. While the population has continued to increase, VMT per capita and absolute VMT have declined. Roadway fatality rates declined after 2005. However, since 2010 there has been a significant increase in roadway fatalities nationally, in Oregon and in the Portland metro region.
- Nationally, the number of people dying in a crash increased 7.2% in 2015, the largest increase in nearly 50 years.[11]
- Between 2011 and 2015, there were 304 fatal crashes in the Portland metro region, killing 311 people, and an additional 2,102 crashes resulting in incapacitating injury.

Alcohol or drugs, fail to yield ROW, aggressive driving, and excessive speed are the most common factors in serious non-freeway crashes.

- For freeway crashes, alcohol and drugs, aggressive driving and excessive speed are the most common factors.

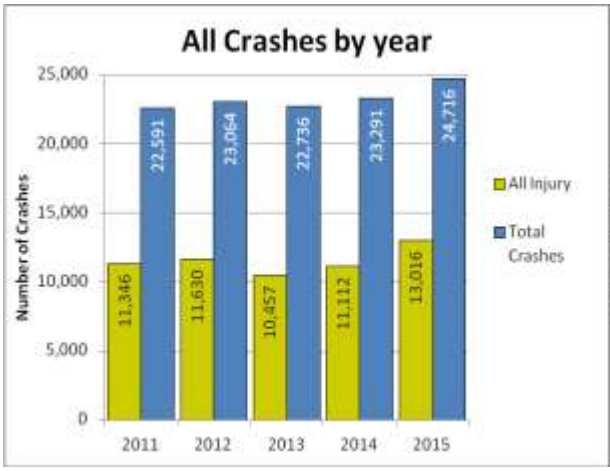
[10] Data is from the Oregon Department of Transportation, 2011-2015. Refer to 2017 Metro State of Safety Report and 2017 Metro High Injury Corridors and Intersections Report for regional crash analysis.
[11] Traffic Safety Facts, 2015 Motor Vehicle Crashes: Overview, National Highway Traffic Safety Administration

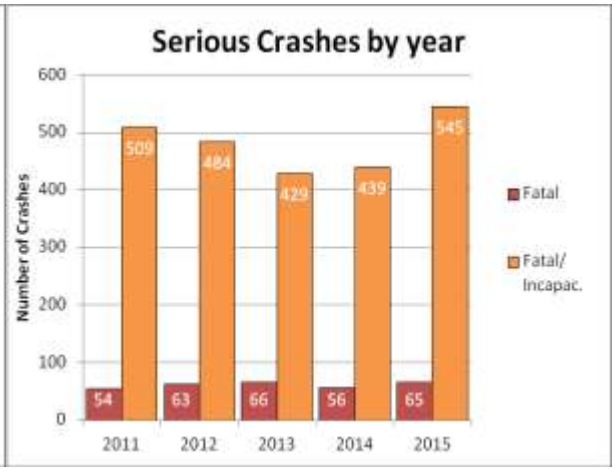




All injury crash rates in the region are rising, but fatal and severe injury crash rates have declined.

- Total reported crashes and injury crashes increased over the 5-year period 2011-2015. Fatal and serious crashes fluctuated over the 5-year period.
- All injury crash rates in the region are higher per million residents and per 100 million vehicle miles traveled (VMT) for 2011-2015, compared to 2007-2009. There were 5,106 all injury crashes per million residents and 81.2 all injury crashes per 100 million VMT for 2007-2009, and 7,181 all injury crashes per million residents and 110.3 all injury crashes per 100 million VMT for 2011-2015.
- Fatal and severe injury crash rates have declined. There were 300 fatal/incapacitating crashes per million residents and 4.6 per 100 million VMT in 2011-2015 compared to 359 and 5.7 in 2007-2009.





2011-2015	Population (2015)	Annual VMT (2015)	Annual injury crashes		Annual serious crashes	
			per million residents	per 100M VMT	per million residents	per 100M VMT
Metro	1,603,229	10,437,000,000	7,181	110.3	300	4.6

Fatality rates are lower in the Portland metro region, compared to other regions and Oregon.

- Roadway fatalities per capita in the Portland metro region are nearly a third the U.S. average and more than half Oregon's average.
- Out of forty-seven MPOs with populations over 1 million, in the U.S., Portland ranked third to last for annual fatalities per million people. The Portland region had 39 fatalities per million people, 2010 to 2014. Boston was the lowest with 36 fatalities and Jacksonville, Florida was the highest with 133 per million people.
- The worst regions in the nation for overall fatality rates are concentrated in Florida and the Sun Belt, where driving is the completely dominant mode of travel. The safest regions in the nation for overall fatality rates are Boston, Minneapolis-St. Paul, Portland, New York, and Chicago. In general, the safest urban regions are those that exhibit dense urban environments and higher usage of non-auto travel modes.
- Seat belt use in the region as reported exceeds 99%.

However, compared to European countries fatality rates are higher in the U.S.

- Of the 28 EU countries, 22 of them exhibit lower rates of roadway fatality per capita than the US average. On a per-VMT basis, 19 of them exhibit lower fatality rates than the US average.

There is a strong correlation between fatality rates and annual per capita VMT.

- States with higher VMT typically also have higher per capita fatality rates, as the typical exposure to risk is increased.
- The District of Columbia has the lowest per capita VMT at 5,610, and exhibits one of the lowest annual fatality rates of 65 per million residents – less than one-third of the national average. Wyoming, with the highest per capita VMT of 17,900, also has the highest annual fatality rate at 310 per million residents – 235% of the national average.
- The national average is 9,500 VMT per capita and 109 fatalities per million residents.
- Oregon statistics are 8,650 VMT per capita (91% of the national average) and 85 fatalities per million residents (81% of the national average).

With the highest population and VMT, Portland has the largest share of the region's serious crashes

- Portland has the highest rate of serious crashes per capita, while Multnomah (excludes Portland) has the highest rate of serious crashes per VMT. Washington County has the lowest rate of serious crashes per capita while Clackamas County has the lower rate of serious crashes per VMT.

Sub-Region	Population (2015)	Annual VMT (2015)	Annual injury crashes		Annual serious crashes	
			per 1M residents	per 100M VMT	per 1M residents	per 100M VMT
Clackamas	290,630	2,101,852,699	6,234	86	226	3.1
Portland	620,540	4,303,322,834	8,867	128	387	5.6
Multnomah (excl. Portland)	152,611	744,473,489	6,623	136	296	6.1
Washington	539,448	3,287,341,693	4,030	75.4	210	3.9
METRO	1,603,229	10,436,990,715	7,181	110	300	4.6

However, fatality rates per capita in cities are generally less than the national average for all areas.

- The city of Portland's average annual fatality rate of 49 fatalities per million residents is much less than the national average of 105 and the Oregon statewide average of 85.
- Twelve of the 64 cities included in the analysis exhibited crash fatality rates above the overall national average, with 52 exhibiting crash fatality rates below the national average. This is likely due to a number of factors including fewer miles driven per capita due to the proximity of services, and the lower speeds of urban streets compared to rural highways, resulting in lower crash severity.

ADD Cities and counties in the region

City	2011-2015 Annual Crashes						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Beaverton	1,987	3.0	35	179	729	943	38.0
Cornelius	101	0.0	4	11	37	52	4.2
Durham	13	0.0	0	1	6	7	0.0
Fairview	88	0.2	1	13	35	48	1.4
Forest Grove	137	0.6	5	19	45	68	5.2
Gladstone	136	0.4	2	16	51	69	2.4
Gresham	1,356	3.4	27	170	546	743	30.4
Happy Valley	221	1.0	3	28	91	122	3.6
Hillsboro	1,413	3.6	26	177	545	748	29.2
Johnson City	0	0.0	0	0	0	0	0.0
King City	9	0.0	0	1	1	2	0.2
Lake Oswego	282	0.0	4	29	96	130	4.0
Maywood Park	27	0.0	1	2	12	15	1.0
Milwaukie	210	0.4	5	28	77	109	5.0
Oregon City	588	1.8	8	62	232	302	9.8
Portland	11,479	31.2	209	1,216	4,079	5505	240.4
Rivergrove	1	0.0	0	0	0	0	0.0
Sherwood	160	0.2	2	18	58	78	2.6
Tigard	935	1.6	12	91	353	455	13.4
Troutdale	167	0.8	4	22	63	88	5.0
Tualatin	486	0.4	7	50	199	256	7.2
West Linn	213	0.6	2	23	78	104	2.8
Wilsonville	218	0.0	2	23	76	102	2.2
Wood Village	67	0.2	1	7	24	32	1.0
Unincorp Clack	1,651	6.0	30	187	670	887	36.2
Unincorp Mult	155	1.6	4	29	45	79	6.0
Unincorp Wash	1,180	3.8	26	144	397	567	30.0
METRO	23,280	60.8	420	2,547	8,545	11,512	481.2

ADD Fatal and serious crashes by mode, time of day, gender and age

3.2 Vulnerable Users

Vulnerable users have higher fatality rates. Increasing safety for vulnerable users increases safety for all transportation users.

Vulnerable users are groups of people that are more vulnerable to being killed or seriously injured in crashes. Vulnerable users are pedestrians, bicyclists, motorcycle operators, children, older adults, construction workers, people of color and people living in lower income areas.

Traffic crashes are the leading cause of unintentional deaths in the U.S., and the leading cause of deaths of all kinds for ages 5-24, and the second leading cause of death for people ages 25-44.[12]

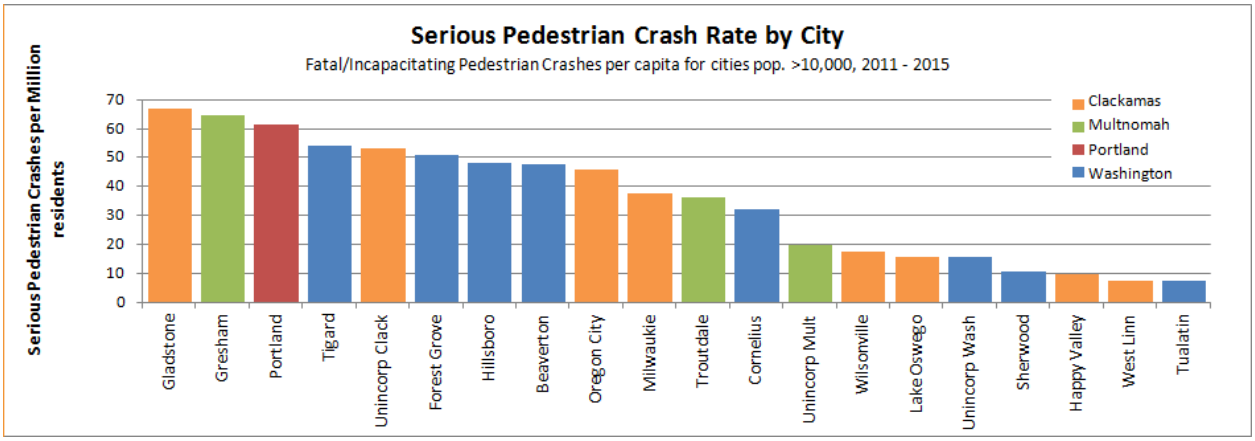
Nationally, traffic related deaths are a more common leading cause of death for American Indians, Alaska Natives, Hispanics or Latinos, Black or African Americans and Asians and Pacific Islanders than Whites.[13] There is evidence suggesting that race and ethnicity play important roles in shaping the prevalence of health-related disparities such as those associated with impaired driving. Yet it is important to note that there are large variations in culture, norms, and behaviors within each racial/ethnic group that are larger than the differences between groups.[14]

ADD additional equity and safety information

[12] Centers for Disease Control and Prevention, Ten Leading Causes of Death and Injury, 2015 https://www.cdc.gov/injury/wisqars/LeadingCauses.html
[13] NHSTA 2006
[14] National Highway Traffic Safety Administration, "Alcohol and Highway Safety: A Speical Report on Race/Ethnicity and Impaired Driving," November 2010

Pedestrian crashes are the most common type of fatal crash.

- 36% of all fatal crashes involve a pedestrian, and 16% of all severe injury crashes involve a pedestrian; for context, 10% of all trips are pedestrian trips.



Crashes involving people on motorcycles, people walking and people riding bicycles tend to be more serious compared to auto-only crashes.

- 91% of all crashes are auto-only, and 1.45% of auto-only crashes are serious.
- 1.7% of all crashes involve motorcycles, and 18% of crashes involving motorcycles are serious.
- 2% of all crashes involve pedestrians, and16% of crashes involving pedestrians are serious.
- 2.2% of all crashes involve bicycles, and 7% of crashes involving bicycles are serious.

The proportion of fatal and severe injury crashes for older drivers is double the regional average.

- For male drivers age 70-79 and female drivers age 80-84 the serious crash rate is double the regional average.
- In Oregon, 15% of the population is over 65, and account for 20% of pedestrian deaths.

A majority of fatal and severe injury pedestrian crashes occur in areas with above average concentrations of people of color, people with low incomes and people with limited English proficiency.

- 61% of pedestrian deaths and 66% of severe injury pedestrian crashes occur in these areas, while only 39% of the region's population lives in these areas. Data is not available on the race and ethnicity of the people killed or severely injured.

A majority of high injury corridors are in communities with higher concentrations of people of color, people with low incomes and people with low-English proficiency.

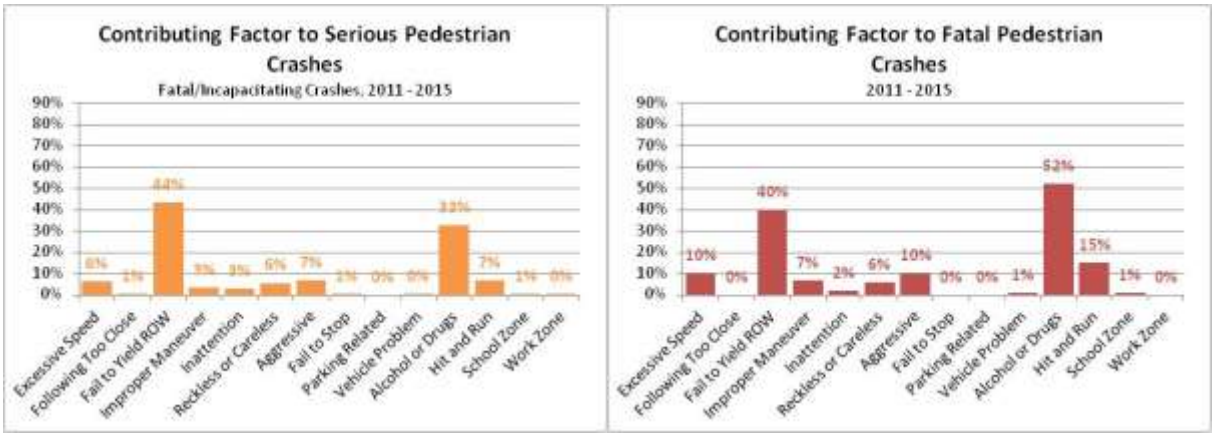
- 56% of the high injury corridors are in areas with higher concentrations of people of color, people with low incomes and people with low English proficiency.
- For context, in Oregon, American Indians/Alaska Natives have the highest average rate of vehicle related deaths (5.9 per 100,000) 1.8 times the rate among whites (3.3 per 100,000) (2008-2014 crashes), and American Indians/Alaska Natives and Black or

African American had the highest hospitalization rate -52.2 and 46.2 per 100,000, compared to 45.5 for whites and 20.8 Asian Pacific Islander (2012-2014) – for traffic related injuries.

Fatality rates for pedestrians are more than three times as high in neighborhoods where more than a quarter of the population lived in poverty.

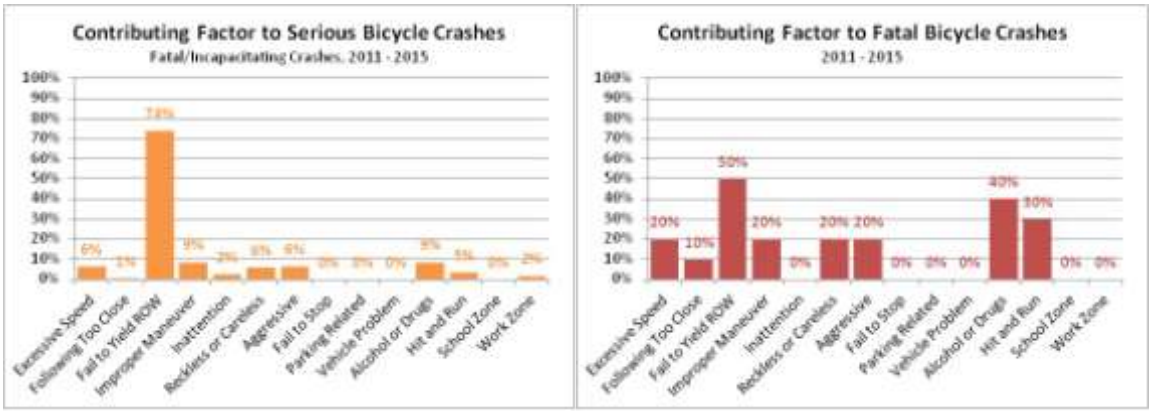
- There were 12.8 pedestrian deaths per 100,000 residents, compared to 3.5 pedestrian deaths per 100,000 residents, in areas with poverty rates below the national rate of fifteen percent.[15]

Alcohol or drugs and failure to yield ROW are the most common contributing factors in serious pedestrian crashes.



Failure to yield ROW and alcohol or drugs are the most common contributing factors in serious bicycle crashes.

- The data do not specify whether the driver, the bicyclist, or both were under the influence of alcohol. Other factors, such as Failure to Yield, Excessive Speed, and Aggressive Driving, are for the driver.



[15] America's Poor Neighborhoods Plagued by Pedestrian Deaths, August 2014, Governing States and Localities Research report. Crash data 2008-2012

For young people below the age of 25, motor vehicle crashes are the leading cause of death.

- Statewide, young drivers (age 15-25) are involved in the highest proportion of fatal and serious injury crashes, followed by older drivers (age 65+). [note: fatality rates by age have not been calculated for the region]

3.3 Roadway Characteristics

Arterial roadways have the highest serious crash rate per road mile and per VMT. Prioritizing and standardizing safety in street design for all modes can prevent dangerous behaviors and save lives.

Roadway design influences behavior and can contribute to whether a crash is fatal or not. Characteristics such as number of lanes, level of physical separation between modes, level of access management, intersection and crossing treatments, median treatments, and number of vehicle miles traveled can impact crash rate and severity.

Analysis of the crash data provide information on the type of roadways where most fatal and severe crashes are occurring. The majority of fatal and severe crashes are occurring on roadways with more lanes, high traffic volumes, higher levels on vehicle miles traveled (VMT), higher travel speeds, less access management, less enhanced crossings for people walking and bicycling, and less protection between different modes.

Arterial roadways have the highest percentage of serious crashes.

- **73%** of the region's non-freeway serious crashes, **66%** of all serious crashes (including freeways), **77%** of the serious pedestrian crashes, and **65%** of the serious bike crashes

occur on arterial roadways (arterial roadways comprise 12% of the non-freeway roadway network).

Arterial roadways have the highest injury crash rate per VMT; collectors have the highest serious crash rate per VMT.

- The higher serious crash rate per VMT for collectors is new information and deserves further analysis.

Roadway Classification	Annual VMT (2015)	Crashes per VMT	
		All injury	Serious
Freeway	4,454,992,641	40.4	1.1
Arterial	4,281,001,727	174.9	7.4
Collector	1,081,114,496	156.6	8.2
Local	619,881,851*	86.2	4.3

A majority of fatal and severe injury crashes occur on a small fraction of the region's roadways.

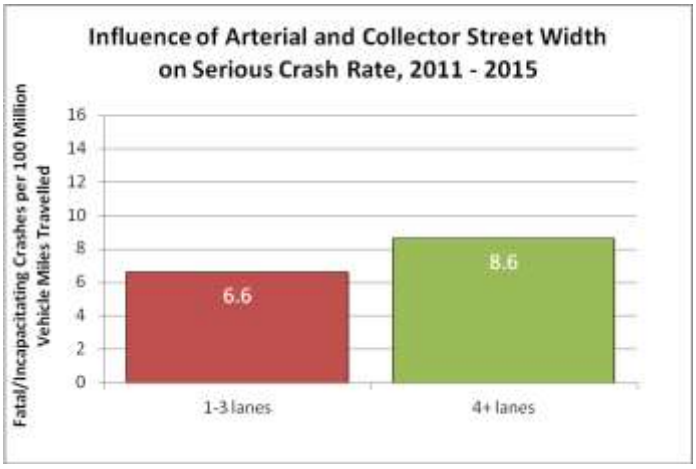
- 60% of all fatal and severe injury crashes occur on just 6% of the region's roadways. These roadways are identified as regional high injury corridors and intersections. Many of these roadways also have the characteristics of high risk corridors, and a majority of these roadways are frequent transit corridors.

A majority of high injury corridors are in communities with higher concentrations of people of color, people with low incomes and people with low-English proficiency.

- 56% of the high injury corridors are in areas with higher concentrations of people of color, people with low incomes and people with low English proficiency.

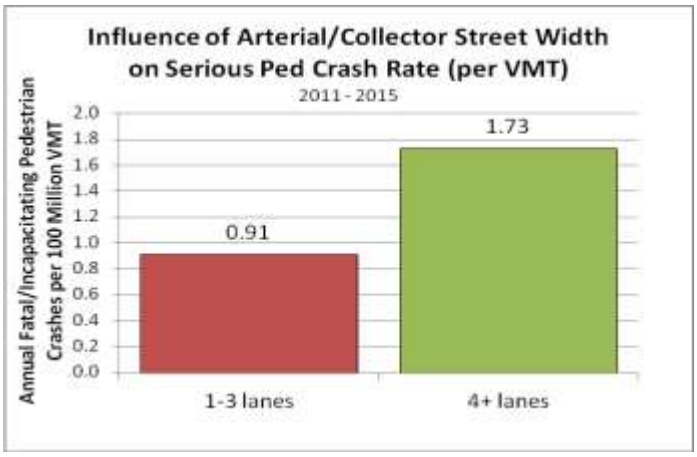
Higher levels of VMT correlate with more fatal and severe injury crashes.

- Wider roadways are the location of a disproportionate number of serious crashes in relation to both their share of the overall system and the vehicle-miles travelled they serve.



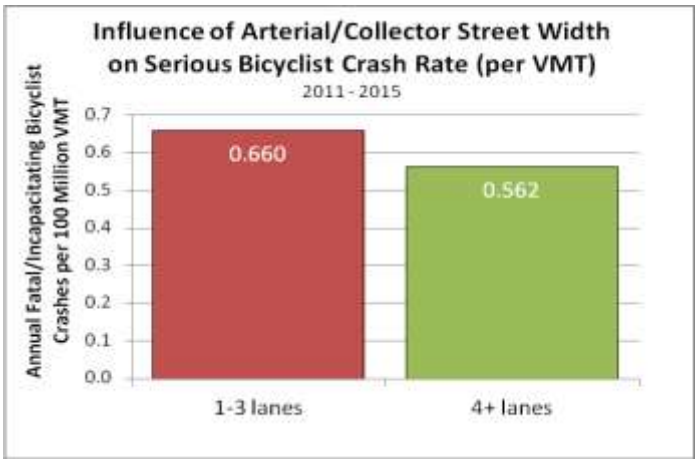
Streets with more traffic lanes have higher fatal and severe injury crash rates per mile.

- 54% of fatal and severe crashes occur on roadways with 4 or more traffic lanes. Roadways with 4 or more traffic lanes comprise 19% of the regional roadway network.



Roadways with more traffic lanes have higher fatal and severe injury pedestrian crash rates per mile and per VMT.

- Wider roadways are particularly hazardous to pedestrians. The serious pedestrian crash rate increases dramatically for roadways with 4 or more lanes. Even when normalized by motor vehicle traffic volume, the serious pedestrian crash rate on wider roadways is still substantially higher than on narrower roads.
- This follows trends documented in AASHTO's Highway Safety Manual. Roads with more lanes have an especially high serious crash rate for pedestrians, producing higher crash rates per mile and per VMT as compared to other modes.



Roadways with more traffic lanes have higher fatal and severe injury bicycle crash rates per mile, but not per VMT.

- The serious bicycle crash rate per road mile increases dramatically for roadways with 4 or more lanes. This is a concern, given that in many parts of the region designated bicycling routes often follow arterial roadways with 4 or more lanes.

- When normalized by motor vehicle traffic volume, the serious bike crash rate on narrower roads is higher than on wider roads. While the reason for this is not clear from the data, it may be related to a higher use of narrower roads by cyclists relative to traffic volume as compared to multi-lane roadways.

A majority of fatal and severe injury bicycle crashes occur at an intersection.

- 73% of serious bicycle crashes occurred at an intersection, compared to 49% for all serious crashes.

The most common serious crash types on surface streets were rear end and turning. For fatal crashes, the most common types were pedestrian and fixed object.

- 35% of all fatal crashes are pedestrian, and 16% are fixed object.
- 26% of fatal and severe injury crashes are turning, and 17% are rear-end (16% are pedestrian).

Serious pedestrian crashes are disproportionately represented after dark.

- While 39% of all serious crashes happen at night, 64% of serious pedestrian crashes happen at night.

3.4 Speeds and Speeding

Speed is a fundamental contributing factor in crash severity. Reducing speeds and preventing speeding saves lives.

Crashes involving higher speeds will tend to increase the severity of the crash and likelihood of death. On average, 1,000 Americans are killed every month in speed-related crashes. In Oregon, speeding is the most common behavioral issue associated with fatal and serious injury crashes.[16]

Crash severity increases with the speed of the vehicle at impact. Inversely, the effectiveness of restraint devices like air bags and safety belts, and vehicular construction features such as crumple zones and side member beams decline as impact speed increases. The probability of death, disfigurement, or debilitating injury grows with higher speed at impact.

Pedestrians, bicyclists and motorcyclists are more vulnerable to dying or being seriously injured in a speed related crash. Nine out of ten pedestrians will survive being hit by a vehicle traveling 20 mph, whereas only one out of ten pedestrians will survive being hit by a vehicle traveling 40 mph.

Excessive speed is defined as speed too fast for conditions; driving in excess of posted speed; speed racing; failed to decrease speed for slower moving vehicle. Fatal and severe crashes occurring at higher speeds, but not fitting these definitions, are not counted as speed-related crashes.

Alone or in combination with other factors, excessive speed is a major factor in fatal and severe injury crashes.

- While 7.5% of all crashes involve speed as a factor, speed is a major factor in 34% of fatal and severe crashes.
- 97% of serious speed related crashes involved aggressive behavior, and 38% involved alcohol.
- 41% of fatal freeway crashes involve excessive speed.
- 35% of fatal crashes involved aggressive behavior, defined as either excessive speed or following too close.

A majority of excessive speed related serious crashes occur on arterial roadways.

- 55% of serious excessive speed related crashes occurred on an arterial roadway, and 71% occurred at a non-intersection.

3.5 Aggressive and Distracted Driving

Dangerous behaviors include those that arise from aggressive or distracted driving and can lead in an instant to injury or death. Systems and policies can reduce and minimize the impact of dangerous behaviors.

[16] 2016 Oregon TSAP

Dangerous behaviors arising from aggressive and distracted driving include failing to yield the right of way, following too close, and excessive speed.

Distracted driving is any activity that diverts attention from driving, including talking or texting on the phone, eating and drinking, talking to people in the vehicle, fiddling with the stereo, entertainment or navigation system—anything that takes attention away from the task of safe driving. Texting is the most alarming distraction. Sending or reading a text takes your eyes off the road for 5 seconds. At 55 mph, that's like driving the length of an entire football field with your eyes closed.

Cell phone use while driving is a growing concern in transportation safety. Drivers use their cell phones 88 out of 100 trips (analysis of 570 million trips in US).[17] On average, more than 8 people are killed and 1,161 more are injured in crashes involving a distracted driver each day in the U.S. [18] In 2015, the number rose to 10 people every day.

Based on limited data, Oregon appears to have the lowest rate of driving and cell phone use in the country; states with hands free cell phone laws have lower rates of cell phone use while driving and it can be assumed lower distracted driving related crashes.[19] However, it is still a

[17] ZenDrive analysis
[18] U.S. Department of Health and Human Services' Centers for Disease Control and Prevention
[19] ZenDrive Analysis

According to a survey conducted by ODOT and Oregon State University, 75% of drivers drive distracted when alone, and 44% when driving with passengers.[20] On average, a crash involving a distracted driver occurs every 2.5 hours in Oregon.[21]

ADD general information on aggressive driving stats

Dangerous behaviors are a major contributing factor in fatal and severe injury crashes.

- Aggressive driving is a factor in 36% of fatal crashes.
- 40% of serious crashes are fail to yield right of way involved.

Aggressive behavior is a major contributing factor in auto only crashes, compared to other modes.

- 41% of auto-only serious crashes involved aggressive behavior, compared to 9% of pedestrian involved crashes and 8% of bicycle involved crashes.
- 64% of serious freeway crashes involved aggressive behavior.

Aggressive behavior is a major contributing factor in rear end crashes, the second most common type of serious crashes.

- Rear end crashes account for 21% of serious crashes, and 73% of those crashes involved aggressive behavior.

Failure to yield by a driver is a contributing factor in 82% of fatal and severe injury bicycle crashes.

- Alcohol or drugs and aggressive driving are also common contributing factors. The data do not specify whether the driver, the bicyclist, or both were under the influence of alcohol.

3.5 Alcohol and Drugs

Crashes involving alcohol and drugs have a much higher likelihood of being fatal than other crashes. Preventing drunk and intoxicated driving saves lives.

ADD intro paragraph, general trends on alcohol and drugs.

Nationally, the percentage of fatally injured drivers who were drinking was highest for Native Americans (57%) and Hispanics or Latinos (47%).[22]

[20] Add source
[21] ODOT crash data, 2011 through 2015.
[22] NHSTA, 2006

Crashes involving alcohol and drugs have a much higher likelihood of being fatal than other crashes.

- 57% of fatal crashes involved alcohol or drugs

The majority of serious alcohol and drug involved crashes are auto only crashes.

- 56% of serious alcohol involved, and 57% of serious drug involved crashes are auto-only crashes

Pedestrian crashes have a high likelihood of involving alcohol or drugs

- 38% of serious pedestrian crashes are alcohol and/or drug involved
- 27% of serious alcohol involved, and 29% of serious drug involved crashes are pedestrian involved

The majority of serious alcohol and drug involved crashes occur at night

- 77% of serious alcohol involved, and 56% of serious drug involved crashes occurred at night

Excessive speed and serious drug and alcohol related crashes are correlated.

- 36% of serious alcohol and drug involved crashes also involve excessive speed.

Chapter 4: Strategies and Actions

Data-driven transportation safety strategies and plans identify strategies and actions to address the most common causes of fatal and serious injury crashes identified through analysis of crash data. The strategies are of equal importance and represent a multi-pronged approach to reducing fatal and severe crashes in the region.

Strategies and actions for the 2018 RTSS were developed with the recognition of existing city, county and state transportation safety and other plans as the foundation for reaching regional safety targets, goals and objectives. The 2018 RTSS strategies and actions are not mandated and implementation is contingent on the availability of funding and political will.

Strategies are broad areas of action designed to achieve an overall aim. The strategies identified respond to the most common causes of fatal and severe crashes in the region.

Actions are specific steps that a variety of partners can take to address specific safety problems. Actions in the 2018 RTSS were identified from multiple sources, including state and local transportation safety action plans, research of current best practices to address the primary factors in fatal and serious crashes.

Timing of Actions

Many of the actions presented in the table Section 4.8 are being implemented to varying degrees by some agencies and jurisdictions. Expanding the number of jurisdictions utilizing proven tools to reduce fatal and severe injury crashes is an overall strategy of the 2018 RTSS. While some of the actions, such as enacting safety legislation or updating plans are short term, many of the actions require ongoing implementation and resources, such as convening safety work groups and education programs, to be successful. Early and aggressive implementation of the strategies and actions will result in more lives saved. As the RTSS is reviewed each time the RTP is updated the timing and number of actions should be refreshed.

4.1 Vision Zero Framework and Safe Systems Approach

The overall strategy of the 2018 RTSS is to change the way transportation safety is perceived and implemented, using the Vision Zero framework and safe systems approach. The individual strategies and actions were identified to support this strategic approach.

In addition to being data-driven, the strategies and actions are identified by their consistency with the Vision Zero framework and Safety Systems approach, outlined in Chapter1. The Vision Zero framework emphasizes an upstream "safe systems" approach, focused on policies and street designs that most affect people's behavioral choices, versus an approach aimed at influencing individual behavior.

Protect Vulnerable Users

Consistent with the policy context outlined in Chapter1, the strategies and actions focus on vulnerable users, with the understanding that increasing safety for vulnerable users increases safety for all users. Expand

Equity and Public Health
Equity and public health considerations form umbrella under which the strategies and actions fall. Each strategy and action must be viewed with an understanding of the racial and other forms of equity and public health impacts (positive or negative). People of color and people living in low-income areas can be disproportionally impacted by traffic crashes and by actions to address safety. EXPAND to address impacts from enforcement and Vision Zero framework perspective on equity and public health

Partners
Transportation safety and achieving zero deaths and serious injuries is everybody's business. Government alone cannot achieve the broader changes needed to reach Vision Zero. In addition to national, state, regional and local agencies, multiple organizations, private entities and the public play a role in achieving Vision Zero. Engineers, emergency medical service providers, law enforcement, educators, public health professionals, the media, industry and business, research and academic institutions, and users of the transportation system all have a role.[23]

Key partners who are likely to play a critical role in advancing each of the actions are identified in the strategies and actions table. Many of the types of partners described above will play some role.

4.2 Protect Vulnerable Users

Vulnerable users have higher fatality rates. Increasing safety for vulnerable users increases safety for all transportation users.

This strategy is focused on protecting users of the transportation system who are more vulnerable to dying or being seriously injured. These groups have higher fatality rates.

Vulnerable users are groups of people that are more vulnerable to being killed or seriously injured in crashes. Vulnerable users are pedestrians, bicyclists, motorcycle operators, children, older adults, construction workers, people of color and people with lower incomes.

Research and practice has shown that increasing the safety of vulnerable users makes the system safe for all users. EXPAND with data points.

Actions for this strategy are focused on proven and recommended programs and education and data collection and monitoring that result in roadways that are safe for the youngest, oldest and most vulnerable users of the transportation system. These actions compliment the other strategies, especially the reduce speeds and speeding and designing roadways for safety strategies.

[23] Refer to Appendix X for a list of organizations and entities with a possible role in directly or indirectly implementing the 2018 RTSS.

4.3 Design Roadways for Safety

Arterial roadways have the highest serious crash rate per road mile and per VMT. Prioritizing and standardizing safety in street design for all modes can prevent dangerous behaviors and save lives.

This strategy is focused on designing the transportation system, especially arterial roadways, to enable and encourage safe behaviors and reduce the severity of crashes when they do occur, primarily through greater separation and slower speeds. Designing roadways to be safe for children, older adults and people walking and bicycling makes the system safe for all users.

Arterial roadways have the highest serious crash rate for all modes, and should be the primary focus of regional safety efforts. Safety interventions that match solutions to the crash pattern and street and neighborhood context are needed. Many of the region's high injury corridors meet or largely meet adopted design standards so simply bringing roadways up to adopted standards does not fully address the needed safety improvements, especially for people walking and bicycling.

The safest arterial roadways slow down traffic, provide separation between modes, and provide intuitive visual cues that make it clear that people using different modes share the space. These roadways keep all people safer – even when they make mistakes.

Actions for this strategy focus on designing for safe auto speeds on arterial roadways and providing greater separation and protection between people walking, bicycling and driving. The illustration below is an example of a Vision Zero street design.

Example of a Vision Zero Street[24] *(1)ADA Accessibility, (2)Public Amenities, (3) Protected Bike Lanes, (4) Narrow Vehicle Lanes, (5) Pedestrian Islands, (6) Wide Sidewalks, (7) Dedicated Mass Transit Facilities, (8) Signal Protected Pedestrian Crossings, (9) Dedicated Unloading Zone, (10) Signal Retiming*

[24]Vision Zero Streets, The Vision Zero Street Design Standard https://www.visionzerostreets.org/

4.4 Reduce Speeds and Speeding

Speed is a fundamental contributing factor in crash severity. Reducing speeds and preventing speeding saves lives.

This strategy is focused on reducing the prevalence of speeding as well as reducing motor-vehicle speeds on arterial roadways to survivable speeds. A comprehensive approach to reducing speeds and speeding is necessary and typically involves multiple countermeasures. For example, NHTSA states that "no single strategy will be appropriate for all locations, and combinations of treatments may be needed to obtain speed limit compliance and achieve crash reduction goals."

ADD summary of National Transportation Safety Board recommendations on speed

ADD Vision Zero Network focus on speed and reference Portland's Vision Zero Plan speed focus

Actions to reduce speeding (exceeding the posted speed limit or driving to fast for conditions) are focused on proven countermeasures such as designing arterial roadways that result in slower speeds, lowering posted speeds, and increasing the use of automated speed enforcement. The focus is on the arterial roadways and high injury corridors.

4.5 Address Dangerous Behaviors

Dangerous behaviors include those that arise from aggressive or distracted driving and can lean in an instant to injury or death. Systems and policies can reduce and minimize the impact of bad decisions.

This strategy is focused on reducing and minimizing the impact of dangerous behaviors. ADD additional context and information on what works to address dangerous behaviors and overall societal issues ADD Equity implications of enforcement.

Actions for this strategy focus on changing overall systems, using education and technology, to reduce the prevalence of dangerous behaviors in the first place. Targeted high-visibility enforcement is included with an emphasis on taking actions to reduce the disproportionate impacts on people of color and people with low incomes.

4.6 Address Impairment

Crashes involving alcohol and drugs have a much higher likelihood of being fatal than other crashes. Preventing drunk and intoxicated driving saves lives.

This strategy is focused on upstream solutions to reduce the prevalence of people using the roadways while intoxicated. ADD additional context and information on what works to address impairment and overall societal issues ADD Equity implications of enforcement.

Actions for this strategy focus on changing overall systems, using education and technology, to prevent impaired driving from occuring. Targeted high-visibility enforcement is included with an

emphasis on taking actions to reduce the disproportionate impacts on people of color and people with low incomes.

4.7 Ongoing Engagement and Coordination

Many partners will implement Vision Zero. Ongoing engagement and coordination among all partners is essential.

This strategy focuses on the need to increase and maintain coordination and engagement among partners. As the region's Metropolitan Planning Organization (MPO), Metro plays an important role in convening and facilitating regional discussions and efforts to ensure partnerships are successful in achieving the regional vision.

Actions in this strategy focus on convening, planning, messaging and campaigns, data collection and maintenance and community engagement. ADD additional description of actions especially specific to Metro

4.8 Strategies and Actions Table

Actions for each of the strategies outlined above are listed in the following table. Key implementing partners and action leads are also identified. A full list of partners is provided at the end of the document.

Actions were developed with the recognition of existing city, county and state transportation safety and other plans as the foundation for reaching regional safety targets, goals and objectives. The 2018 RTSS strategies and actions are not mandated and implementation is contingent on the availability of funding and political will. Many of the actions require multiple partners and/or could be implemented in various ways depending upon the lead agency or agencies.

Actions where Metro is identified a lead agency indicates that Metro has committed taking steps to implement that action.

The effectiveness of each action to reduce fatal and severe injury crashes, based on research and studies, is noted.

- Effectiveness: Proven = proven to be effective based on several evaluations with consistent results
- Recommended = generally accepted to be effective based on evaluations or other sources
- Unknown = limited evaluation or evidence; experimental; outcomes inconsistent or inconclusive among studies

❶ Protect Vulnerable Users

Vulnerable users have higher fatality rates. Increasing safety for vulnerable users increases safety for all transportation users.

#	Action	Lead	Partners	Effectiveness*
1.1	Implement Safe Routes to School programs and infrastructure projects, prioritizing schools in areas with higher concentration populations of people with lower incomes, people of color, and low English proficiency.	ODOT, Metro, cities and counties	Schools, public health, advocates	Recommended
1.2	Provide culturally and age appropriate on-going education of traffic laws and street designs.	ODOT, Metro, cities and counties, Senior advocates, public health	Advocates	Recommended
1.3	Increase opportunities to provide education and products to increase visibility of people walking and bicycling (e.g. lights, reflective materials).	ODOT, cities and counties, schools	Public health, advocates	Recommended
1.4	Continue to improve data collection and reporting of vulnerable users, including: • Collecting and making crash data on race and ethnicity of victims available; • Supporting and developing programs to coordinate and collect bicycle and pedestrian count data. • Evaluate motorcycle, pedestrian and bicycle crash locations and risk factors though analysis of existing data and development of new data sources.	ODOT, Metro cities, counties, police, research institutions	Public health, advocates	Recommended
1.5	Explore opportunities to increase large vehicle industry awareness and implement safety benefits including, but not limited to, rear wheel and side guards, sensors, front and side mirrors, and high visibility cabs. Explore opportunities to collaborate with the US DOT, ODOT, Port of Portland, City of Portland and other agencies to increase use of such safety features.	Metro, cities, counties, ODOT, Port of Portland, US DOT	Advocates, large vehicle industry	Proven
1.6	Evaluate pedestrian and bicycle crash locations and risk factors in TSPs though analysis of existing data and development of new data sources.	Cities, counties, ODOT	Metro, research institutions	Recommended

1.7	Complete the regional active transportation network, filling sidewalk gaps and bicycle gaps on the designated regional pedestrian and bicycle network including arterial roadways, by 2040.	Metro, cities and counties, ODOT, TriMet, SMART	Senior advocates, advocates, public health	Recommended

❷ Design roadways for safety

Arterial roadways have the highest serious crash rate per road mile and per VMT. Prioritizing and standardizing safety in street design for all modes can prevent dangerous behaviors and save lives.

#	Actions	Lead	Partners	Effectiveness*
2.1	Implement/prioritize context sensitive and universal design and engineering solutions such as the Federal Highway Administration proven safety countermeasures, the Highway Safety Manual and other resources that have been shown to support safe speeds, protect vulnerable users and reduce fatal and severe crashes, focusing on arterial roadways and high injury corridors and intersections. Countermeasures with proven safety benefits include: • medians and pedestrian crossing islands – for pedestrian safety and to address head-on crashes • protected left turn signals • separation of travel modes on streets with higher traffic speeds, volumes, and truck volumes with protected bikeways and walkways • bicycle boxes • lead pedestrian intervals • pedestrian hybrid beacons • roundabouts • road diets • access management • driveway consolidation • backplates with retroreflective borders • freight aprons Pedestrian design should account for the needs of all potential users, including those with physical or mental limitations. Design and engineering solutions should account for designated truck routes to safely move freight and agricultural equipment amid other modes.	Cities, counties, ODOT, Metro	TriMet, SMART, public health, advocates	Proven and/or recommended

2.2	Develop and adopt Complete Streets policies and Complete Streets checklists.	ODOT, Metro, cities and counties	Public health, advocates	Unknown
2.3	Provide context sensitive best practices for Vision Zero street design in the Designing Livable Streets regional street design guidelines and tools.	Metro	ODOT, cities and counties, public health, advocates	Unknown
2.4	Review standards for auto travel lane widths and develop criteria to explore making 10' travel lanes preferred standard for arterial roadways in certain contexts, allowing more right-of-way for wider sidewalks, protected bikeways and other safety features.	Cities, counties, ODOT, TriMet	Metro, public health, advocates	Recommended (*greater separation of modes)*
2.5	Develop criteria and spacing standards and/or policies for enhanced pedestrian crossings in areas with pedestrian activity (such as transit access) and where enhanced crossings are greater than 530 feet apart.	Cities, counties, ODOT	Metro, public health, advocates	Recommended
2.6	Explore policies to make protected bike lanes the preferred design for arterial roadways with posted speeds of 30 mph or higher, and/or average daily traffic above 6,000 autos per day, and/or heavy truck volumes.	Cities, counties, ODOT	Metro, NACTO, public health, advocates	Recommended
2.7	Illuminate the transportation system appropriately by: • Requiring new development and redevelopment in the urban area to install street and sidewalk lighting. • Integrating street and sidewalk lighting into major transportation improvement projects, where appropriate. • Exploring a variety of lighting options and identify the appropriate contexts to use them. Considering street lighting designs and practices that limit impacts on neighborhoods, wildlife and agriculture.	Cities, counties, ODOT	Metro	Recommended
2.8	Investigate and perform engineering reviews for crashes that result in fatalities and severe injuries to determine effective countermeasures for preventing future severe crashes. Conduct routine evaluation of effectiveness of traffic safety interventions.	Police, cities, counties, ODOT, academic institutions	Metro, advocates, public health	Recommended
2.9	Prioritize funding for projects that: • Reduce fatal and severe injury crashes; • Increase safety for vulnerable users, including people walking, bicycling and accessing transit and schools (increasing safety for vulnerable users has been shown to increase safety for all users); and/or • Are on a high risk or injury location, with demonstrated crash history, safety concern	Metro, ODOT, counties and cities	Public health, advocates	Recommended

	or other risk factor; and/or • Increases safety in areas with high concentrations of people of color, people with low-incomes and people with low English proficiency.			
2.10	Standardize Highway Safety Manual crash prediction project analysis to guide project development as part of the traffic analysis procedure.	ODOT, cities and counties	Metro, academic research institutions	Recommended
2.11	Pursue policies and tools to reduce vehicle miles traveled, including congestion pricing, multimodal facilities, transit and Transportation Demand Management programs.	ODOT, Metro, cities and counties	Advocates, public health	Recommended

❸ Reduce speeds and speeding

Speed is a fundamental contributing factor in crash severity. Reducing speeds and speeding saves lives.

#	Action	Lead	Partners	Effectiveness*
3.1	Design arterial roadways to achieve appropriate safe target speeds, generally 35 mph or less, using design elements that have been shown to effectively result in lower speeds. A majority of excessive speed related serious crashes occur on arterial roadways.	Cities, counties, ODOT	Metro, TriMet, SMART, public health, advocates	Proven
3.2	Change state law to increase the number of jurisdictions eligible for fixed speed camera installation, especially at high injury locations. Utilize speed feedback cameras given the low cost and effectiveness and immediate information to drivers.	Cities, counties, ODOT	Metro, public health, advocates	Proven
3.3	Utilize authority provided through HB 2409 to issue speeding tickets through red light cameras. Change state law to increase the number of jurisdictions eligible to use this tool.	Cities, counties, ODOT, Metro	Public, health, advocates	Proven
3.4	Seek authority to lower speed limits on arterial roadways to appropriate safe speeds, generally 35 mph or less.	Cities, counties	ODOT, Metro, public health, advocates	Proven
3.5	Fund and install intelligent speed adaptation technologies that alert the vehicle traveling over the speed limit, prioritizing high risk and high injury corridors.	ODOT, cities, counties	Metro, public health, advocates	Proven
3.6	Utilize flexibility in setting speeds so that design speeds can be set at a target speed below the posted speed to increase safe operating speeds.	ODOT, cities, counties	Public health, advocates, police, fire	

❹ Address Dangerous Behaviors

Dangerous behaviors include those that arise from aggressive or distracted driving and can lean in an instant to injury or death. Systems and policies can reduce and minimize the impact of bad decisions.

#	Actions	Lead	Partners	Effectiveness*
4.1	Focus high visibility enforcements on dangerous behaviors (speeding, failing to yield to pedestrians, signal violations, improper turns/illegal turns, texting while driving) and high injury corridors, taking actions to reduce the disproportionate impacts on people of color and people with low incomes, including fully implementing Oregon's anti-racial profiling bill (House Bill 2355). Research shows that high-visibility enforcement can reduce drunk driving fatalities by as much as 20%.	Police, cities, counties	Metro, ODOT, advocacy groups, public health	Recommended
4.2	Increase penalties for dangerous behaviors, identifying actions to reduce the disproportionate impacts from fines on people of color and people with low incomes, such as diversion classes and other non-monetary penalty options.	State, cities, counties, police	Metro, ODOT, advocacy groups, public health	Recommended
4.3	Support implementation of recommendations identified in Reducing Distracted Driving in Oregon report and HB 2597 "Distracted Driving Law"	ODOT, police, cities and counties, Metro	Public health, advocates, auto industry	Unknown
4.4	Support auto insurance companies to provide lower auto insurance costs to drivers that install technologies to turn off phone while driving.	ODOT, Metro, cities, counties, advocates	Public health, advocates	Unknown
4.5	Compile a comprehensive list and contacts of private sector companies that operate large numbers of vehicles in the region, and identify a process that supports state and local partners to engage in outreach regarding safe driving behaviors to members, workforces and customers – companies such as ride hailing services and trucking companies	Metro, ODOT, cities and counties	ODOT, cities and counties, commercial vehicle companies	Unknown
4.6	Support legislation to increase frequency of driver education, testing, inclusion of urban transportation safety in test materials, and driver's license renewal.	Metro, ODOT, cities and counties	Advocates, public health	Recommended

❺ Address impairment

Crashes involving alcohol and drugs have a much higher likelihood of being fatal than other crashes. Providing options to people using the roadways while drunk or intoxicated saves lives.

#	Actions	Lead	Partners	Effectiveness*
5.1	Identify funding to send law enforcement to Drug Recognition Experts (DRE) training, and training to prevent profiling.	Police, cities, counties	State, public health, advocates	Recommended
5.2	Adopt National Transportation Safety Board recommendation to reduce Blood Alcohol Concentration limit to 0.05	State	Advocates, public health, Metro, cities and counties	Proven
5. 3	Implement pre-paid morning parking programs in areas where appropriate (prevents towing/ticket for drivers who choose other way home).	Cities, counties	Public health, advocates	Recommended
5.4	Promote use of apps such as SaferRide developed by NHSTA, which provide people easy ways to find a safe ride home.	Cities, counties, ODOT, Metro	Public health, advocates	Recommended
5.5	Explore opportunities to support the U.S. DOT to work with industry groups and vehicle manufacturers to further the use of technology to reduce impaired driving.	ODOT, Metro, cities and counties	Public health, advocates	Recommended
5.6	Support culturally appropriate safety programs and educational messages, paired with outreach and investments, to curb the risk of impaired driving, using resources such as NHSTA's Impaired Driving Segmentation research (2017). Messaging is more effective when there is an in-depth understanding of what messages work for different groups, and when paired with other investments.	ODOT, Metro, cities and counties, advocates, public health	Public health, advocates	Recommended

❻ Ongoing Engagement and Coordination to Implement Vision Zero

Many partners will implement Vision Zero. Ongoing engagement and coordination among all partners is essential.

#	Actions	Lead	Partners	Effectiveness*
6.1	Develop Metro work program to implement actions where Metro is a lead or one of several leads. Include work program elements to support implementing actions where Metro is not the lead.	Metro		Recommended
6.2	Convene, as needed, transportation safety meetings with local and state partners to implement 2018 RTSS. Determine frequency of meetings in work program developed in Action 6.1.	Metro	Cities, counties, ODOT, FHWA, public health, advocates, police,	Recommended

			fire, TriMet, SMART	
6.3	Provide an annual Vision Zero report back to JPACT and Metro Council, reporting on safety targets and regional safety plan implementation.	Metro	Cities and counties, ODOT, TriMet, SMART, public health, advocates	Recommended
6.4	Review the strategies and actions of the RTSS prior to each update of the RTP and update as needed.	Metro	Cities and counties, ODOT, TriMet, SMART, public health, advocates	
6.5	Maintain and update Metro crash data. • Update Metro webpage annually with MAP-21 transportation safety performance measure data; include data on race and ethnicity as available. • Update and maintain regional crash map tool and crash map. • Develop a regional crash prediction modeling tool that utilizes and links social and environmental factors with injury data.	Metro	FHWA, ODOT, public health, academic inst.	Recommended/ Proven
6.6	Identify opportunities to engage and partner with community based organizations and advocates, especially to increase opportunities for proactive monitoring and feedback gathering from the community on their safety issues and concerns. Conduct targeted outreach/education to communities near high injury arterials and intersections, focusing on historically marginalized communities.	Metro, ODOT, cities and counties	Public health, advocates	Recommended
6.7	Support development of city and county Transportation Safety Action Plans and Vision Zero targets; include a transportation safety plan, with data analysis that addresses all modes and is based on a safety inventory based on both an analysis of crash rates and an analysis of crash risks in the updates of Transportation System Plans; participate in local, regional and state safety task forces, and develop and participate in state, regional and city safety summits.	Metro, ODOT, DLCD, cities and counties	Public health, advocates, TriMet, SMART	Recommended
6.8	Identify opportunities to develop safety workshops for state, regional, county and city staff on Vision Zero framework and priorities, including racial equity and public health.	Metro, ODOT, TriMet, cities and counties	FHWA	Recommended
6.9	Convene regular local safety meetings made up of state and local transportation and public health professionals, equity representatives, police and fire, and community and advocacy organizations, to review progress on implementing safety plans and collaborate on specific topics, such as impairment, distracted driving, street design, and enforcement.	Local agencies	ODOT, Metro, public health, advocates, police, fire, TriMet, SMART	Recommended

	Integrate Vision Zero/Toward Zero Deaths framework and priorities, including racial equity and public health.			
6.10	Identify funding for and develop at least one annual coordinated culturally appropriate and targeted mass media safety campaign in the region, utilizing campaign materials developed by NHSTA, Drive Toward Zero, Vision Zero, Toward Zero Deaths and other sources as appropriate. Strong, targeted advertising with high-visibility enforcement and publicity about that enforcement have proven to be most effective.	Metro, cities, counties, ODOT	Advocates, public health	Proven
6.11	Support safety legislation, regulations and funding at the state and federal level that implement Vision Zero and do not increase racial disparities.	Metro, ODOT, cities, counties, advocates	Advocates, public health	Recommended
6.12	Monitor federal and state autonomous vehicle (AV) policies and ensure that they do not place the burden of safety on vulnerable users (e.g., requiring them to carry a sensor/install an app to be picked up by an AV), and require rigorous safety testing of all AVs prior to public deployment.	Metro, ODOT, cities and counties	Advocates, public health, AV industry	Unknown
6.13	Update Regional Transportation Functional Plan to require TSPs to include a transportation safety plan, with data analysis that addresses all modes and is based on a safety inventory based on both an analysis of crash rates and an analysis of crash risks, to require that TSPs identify safety as a need, and to require that transportation projects do not make a known safety problem worse, and to be consistent with the 2018 RTSS.	Metro	Cities, counties, ODOT, TriMet, advocates, public health	Unknown
6.14	Update the following sections of OAR 660-012-0000, the Oregon Transportation Planning Rule: • Section 0020 (2), requiring Transportation System Plans to include a transportation safety plan, with data analysis that addresses all modes and is based on a safety inventory based on both an analysis of crash rates and an analysis of crash risks. • Section 0030 (1) and (2) identifying safety as a need. • Section 0060 (1)(c) clarifying that making a known safety problem worse constitutes a "significant effect".	DLCD, Metro, ODOT	Cities and counties, advocates	Recommended
6.15	Best practices recommend that police periodically review, update and conduct trainings to reflect new traffic safety priorities.	Police, state, cities, counties,	Advocates, public health	Recommended

Chapter 5: Implementation

Implementation of the Vision, Goals, Objectives, Policies, and Actions of the 2018 RTSS is contingent on the availability of funding and the political will to take steps which may be politically challenging.

ADD discussion of what is working well in the region and what needs more work. Do more of what is working well: land use plans, shorter trips, less VMT per capita, taking safety seriously, strong regional coordination. Arterial roadways, high crash corridors need to focus on them even more. ARTS program supportive. Challenges: increasing pedestrian crashes, more vehicle trips, emerging technologies, etc

Add discussion on timing of implementation – Actions should be implemented right away. Some will take time to implement. Implement and begin implementing actions in 2018. Assess progress and update actions as needed in the next update of the RTP

5.1 Metro Work Program

To support implementation of the 2018 RTSS Metro will develop a work program (Action 6.1) describing tasks and timeline to take direct action or support partners in implementing the actions in Section 4.8.

5.2 Ongoing Engagement and Coordination to Implement Vision Zero

Many partners are implementing Vision Zero. Ongoing engagement and coordination among all partners is essential.

The previous chapter identified near-term actions for reducing fatalities and life-changing injuries in the Portland metro region. Example long-term and near-term coordination, implementation or outreach roles or activities for agencies and stakeholders in the region are summarized below and are based on the 2016 Oregon TSAP.

5.3 Implementing and Updating Plans

[to be added to]
Transportation safety is an essential element of the region's desired outcomes, to ensure people have safe and reliable transportation choices, and it is achieved through the implementation of state, regional and local land use and transportation plans, in addition to safety strategies and plans.

Implementing land use and transportation system plans, including the 2040 Growth Concept, will help achieve Vision Zero. Building walkable and bikewable communities, reducing travel distances, locating jobs and housing near each other, making transit more accessible all contribute to safer communities.

ADD summary of local plans

Update – Actions 6.13 and 6.14 RTFP
RTP

RTSSS
TSPs Updating project lists and programs, safety plans

5.4 RTP Safety Projects and Programs

To be added – will summarize the safety related investment in the 2018 RTP and regional programs, such as RTO.

5.5 Funding Sources

[to be added?]

Chapter 6: Measuring Progress

Progress towards Vision Zero will be measured by the number of fatal and severe injury crashes reduced annually.

6.1 Annual Performance Targets

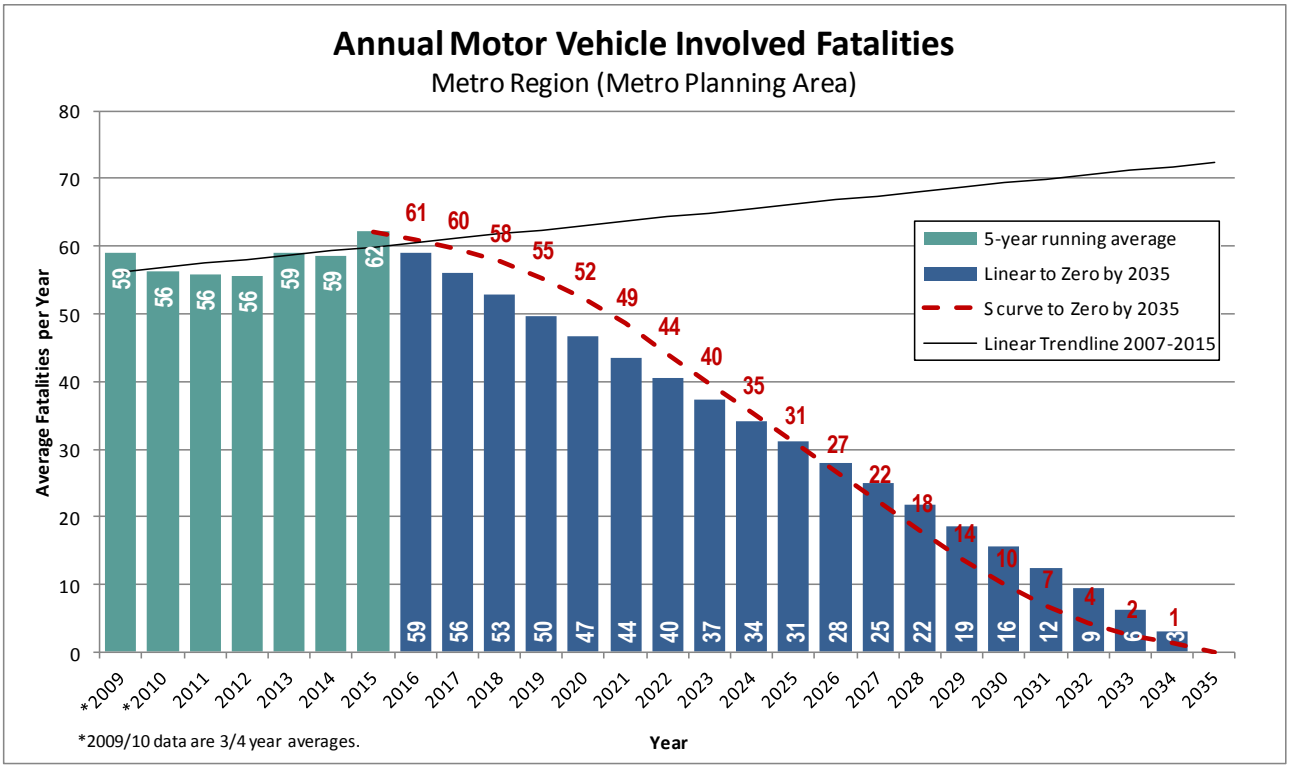
State DOTs and MPOs must now report on the federally required safety performance measure identified in MAP-21 and the FAST Act. Metro will report on these measures in each update of the RTP, and in the Metropolitan Service District report of performance measures that Metro is required to submit in accordance with ORS 197.301 to the Department of Land Conservation and Development (DLCD) every two years. Additionally, Metro will report out annually to JPACT and the Metro Council.

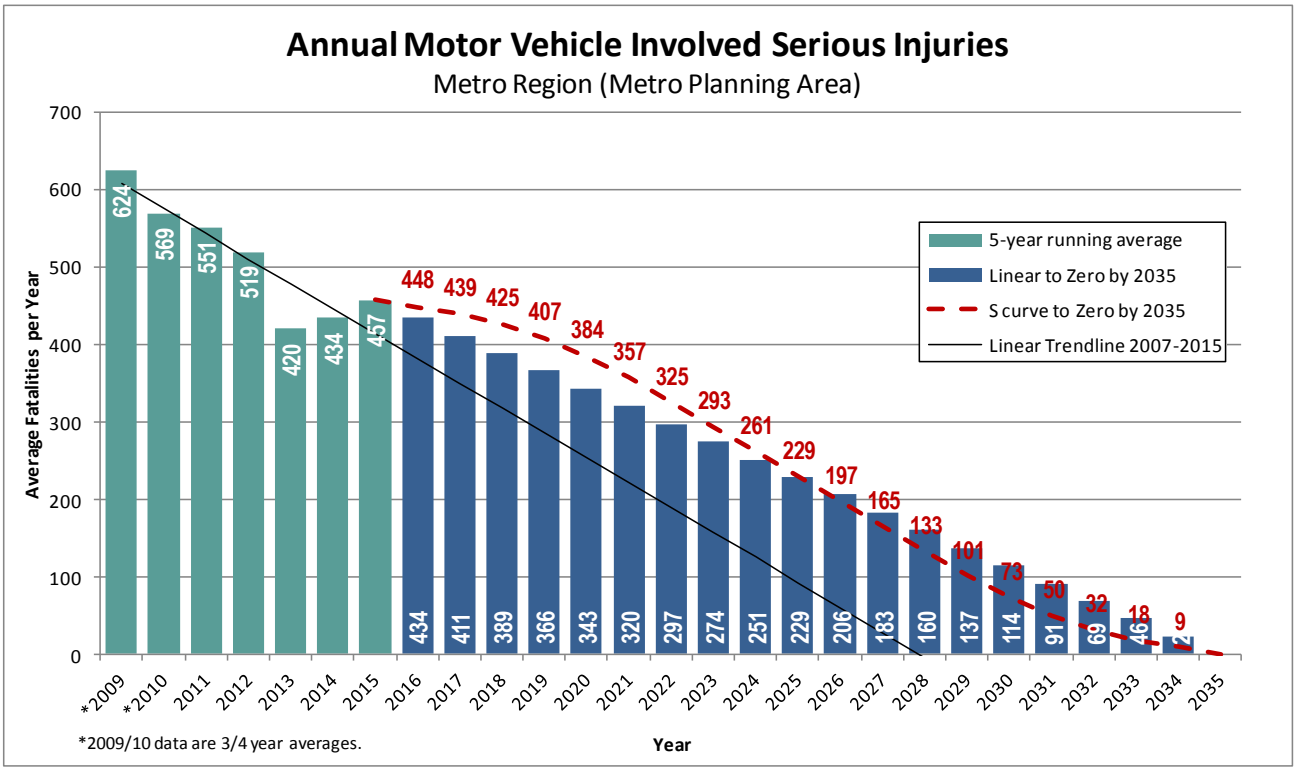
To satisfy federal requirements, Metro will report on the five year rolling average of the number of people killed and seriously injured in traffic crashes in the region, per 100 million miles traveled (per VMT) and the number of non-motorized fatalities and serious injuries.

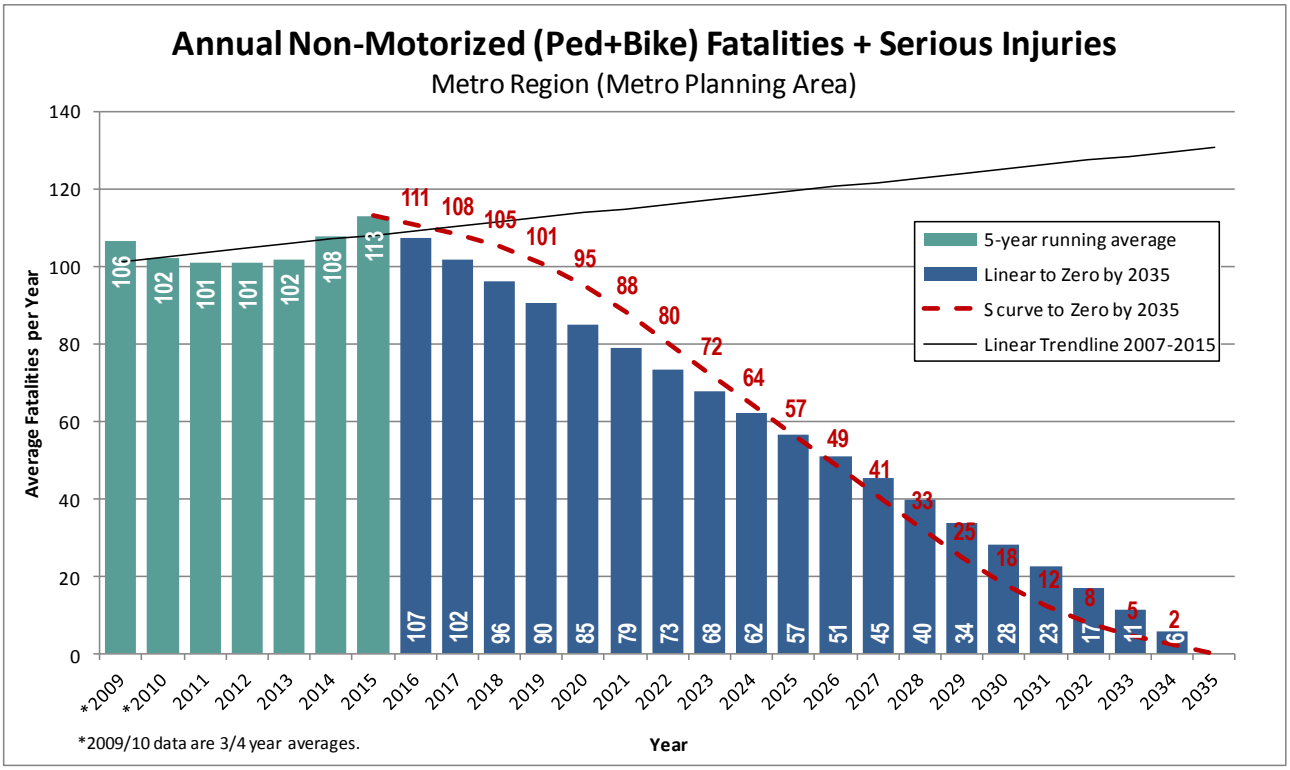
Additionally, Metro will also report on the number of fatalities and serious injuries for each mode separately, as well as per VMT and per captia for each mode.

The tables and charts below show the annual performance targets necessary to reach zero fatalities and severe injuries by 2035. The black trend line in the charts shows the expected trend of crashes for each mode. Pedestrian fatalities are rising.

	FHWA Performance Measures						
		Fatality Rate			Serious Injury Rate		
Reporting Year (based on a 5-year rolling average)	Fatalities (People)	Per VMT (People/ 100 MVMT)	Per capita (People/ 100k pop)	Serious Injuries (People)	Per VMT (People/ 100 MVMT)	Per capita (People/ 100k pop)	Non-Motorized Fatalities and Serious Injuries (People)
2011 - 2015 (Base)	62	0.9	4.0	457	6.4	29.4	113
2014 - 2018	58	0.8	3.6	425	5.8	26.5	105
2015 - 2019	55	0.7	3.4	407	5.5	25.1	101
2016 - 2020	52	0.7	3.2	384	5.1	23.4	95
2017 - 2021	49	0.6	2.9	357	4.7	21.5	88
Note: Due to rounding, addition of numbers across modes may result in minor variation from totals.							

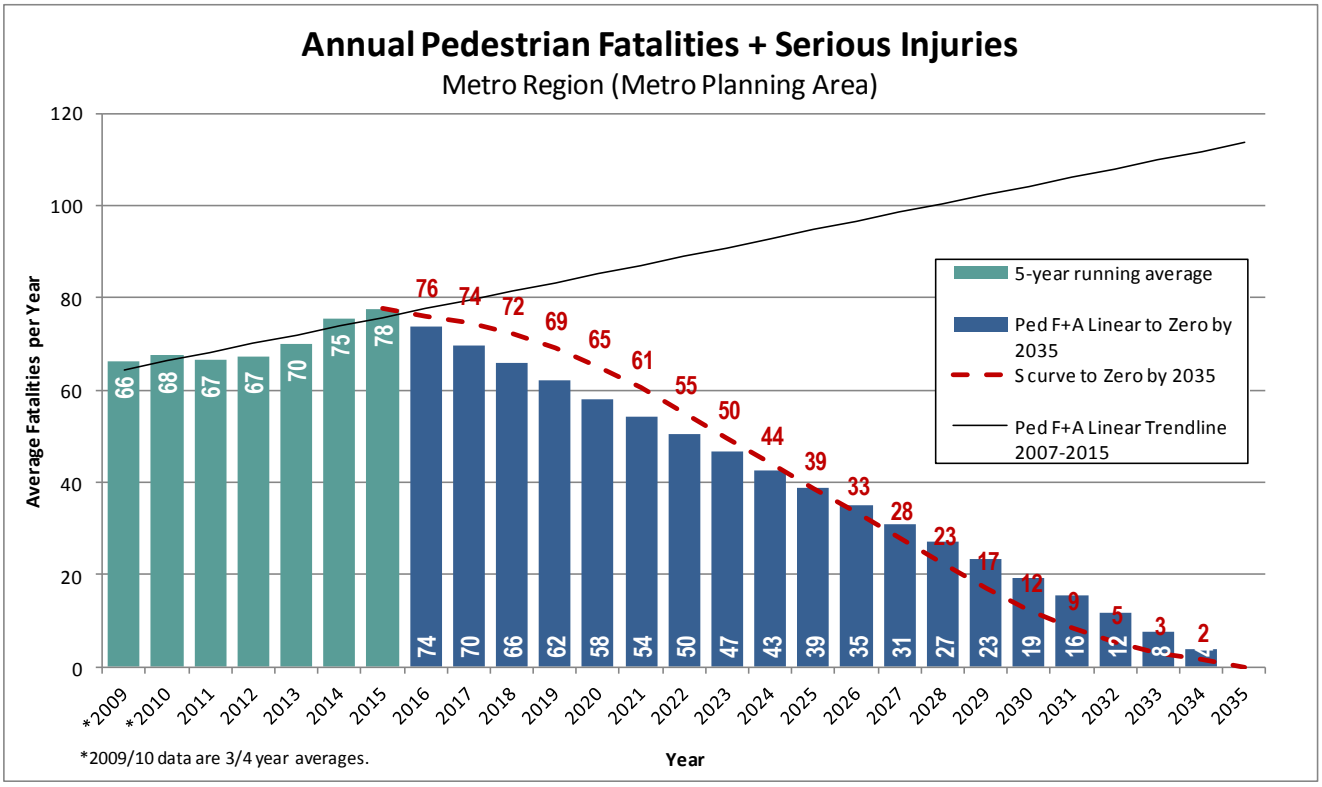

Annual Motor Vehicle Involved Fatalities
Metro Region (Metro Planning Area)
Average Fatalities per Year
Year
*2009/10 data are 3/4 year averages.
5-year running average
Linear to Zero by 2035
S curve to Zero by 2035
Linear Trendline 2007-2015


Annual Motor Vehicle Involved Serious Injuries
Metro Region (Metro Planning Area)
Average Fatalities per Year
Year
*2009/10 data are 3/4 year averages.
5-year running average
Linear to Zero by 2035
S curve to Zero by 2035
Linear Trendline 2007-2015



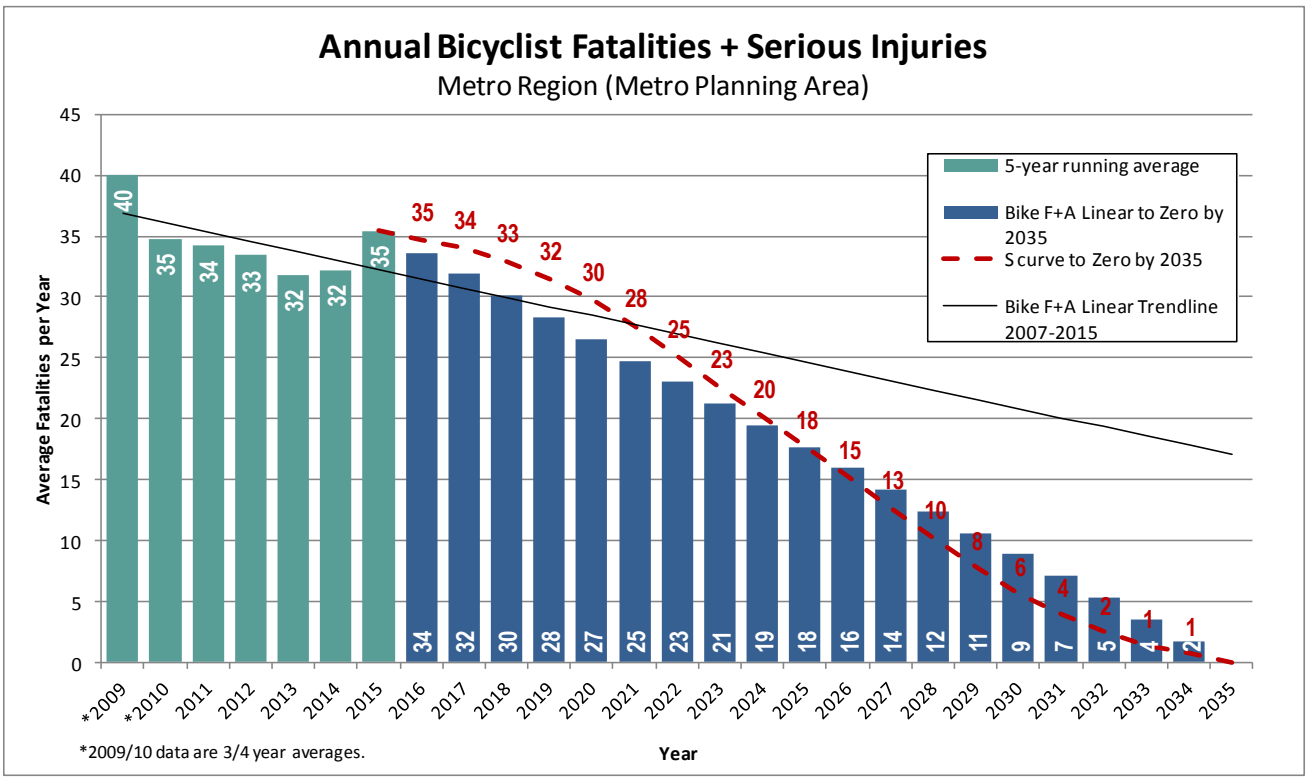
Reporting Year (based on a 5-year rolling average)	Motor Vehicle Only					
	Fatalities (People)	Fatality Rate		Serious Injuries (People)	Serious Injury Rate	
		Per VMT (People/ 100 MVMT)	Per capita (People/ 100k pop)		Per VMT (People/ 100 MVMT)	Per capita (People/ 100k pop)
2011 - 2015 (Base)	38	0.5	2.4	368	5.2	23.7
2014 - 2018	35	0.5	2.2	343	4.7	21.3
2015 - 2019	34	0.5	2.1	328	4.4	20.2
2016 - 2020	32	0.4	1.9	309	4.1	18.8
2017 - 2021	30	0.4	1.8	287	3.8	17.3

Note: Due to rounding, addition of numbers across modes may result in minor variation from totals.



Reporting Year (based on a 5-year rolling average)	Pedestrians					
	Fatalities (People)	Fatality Rate		Serious Injuries (People)	Serious Injury Rate	
		Per VMT (People/ 100 MVMT)	Per capita (People/ 100k pop)		Per VMT (People/ 100 MVMT)	Per capita (People/ 100k pop)
2011 - 2015 (Base)	22	0.3	1.4	56	0.8	3.6
2014 - 2018	20	0.3	1.3	52	0.7	3.2
2015 - 2019	20	0.3	1.2	49	0.7	3.0
2016 - 2020	18	0.2	1.1	47	0.6	2.8
2017 - 2021	17	0.2	1.0	43	0.6	2.6

Note: Due to rounding, addition of numbers across modes may result in minor variation from totals.



	Bicyclists					
		Fatality Rate			Serious Injury Rate	
Reporting Year (based on a 5-year rolling average)	Fatalities (People)	Per VMT (People/ 100 MVMT)	Per capita (People/ 100k pop)	Serious Injuries (People)	Per VMT (People/ 100 MVMT)	Per capita (People/ 100k pop)
2011 - 2015 (Base)	2.2	0.03	0.14	33	0.5	2.1
2014 - 2018	2.0	0.03	0.13	31	0.4	1.9
2015 - 2019	2.0	0.03	0.12	30	0.4	1.8
2016 - 2020	1.8	0.02	0.11	28	0.4	1.7
2017 - 2021	1.7	0.02	0.10	26	0.3	1.6
Note: Due to rounding, addition of numbers across modes may result in minor variation from totals.						

6.2 System Evaluation Measures

In addition to tracking the number of serious crashes, the 2018 RTP includes two system evaluation measures to assess *future of traffic safety* by tracking the level of safety investments in the RTP and crash risk through exposure to VMT. These measures will change over time as more comprehensive methods, such as a crash prediction model, are developed accounting for more of the crash factors. Both of these measures also assess equity impacts.

RTP System Evaluation Measures compare the base year conditions of the transportation system with alternative investment packages of projects and programs to document how well each

package of transportation investments performs on an array of measures that are linked to RTP Goals, and in most cases, overlap with the RTP Performance Targets.

Transportation Safety – Infrastructure Investments
This system evaluation measure identifies the number, cost and percent of safety projects in the RTP investment packages region-wide, and the number, cost and percent of safety projects in areas with historically marginalized communities to identify where and at what level of investment the package of future transportation projects addresses transportation safety.This system evaluation measure requires providing a definition of a "safety project" in order to track safety investments.

Refer to Chapter 5 for a summary of this evaluation measure for the 2018 RTP.

Transportation Safety – Exposure to Crash Risk
This system evaluation measure approximates the risk of exposure to crashes by identifying whether the package of future transportation investments increases or decreases the sum of all non-freeway vehicle miles traveled (VMT) in Transportation Area Zones (TAZ) for RTP investment packages region-wide, and in historically marginalized communities.

ADD summary of 2018 RTP results.

Acronyms

AASHTO	American Association of State Highway and Transportation Officials
DLCD	Department of Land Conservation and Development
FAST ACT	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HSM	Highway Safety Manual
HIN	High Injury Network
HSIP	Highway Safety Improvement Plan
JPACT	Joint Policy Advisory Committee on Transportation
MAP-21	Moving Ahead for Progress in the 21st Century Act
MMLOS	Multi Modal Level of Service
MPA	Metro Planning Area
MPAC	Metro Policy Advisory Committee
MTAC	Metro Technical Advisory Committee
NHSTA	National Highway Safety Traffic Administration
RATP	Regional Active Transportation Plan
RTFP	Regional Transportation Functional Plan
RTP	Regional Transportation Plan
RTSS	Regional Transportation Safety Strategy
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
ODOT	Oregon Department of Transportation
OTP	Oregon Transportation Plan
UGMFP	Urban Growth Management Functional Plan
SHSP	State Highway Safety Plan
TPAC	Transportation Policy Alternatives Committee
TSAP	Transportation Safety Action Plan
TSP	Transportation System Plan
VMT	Vehicle Miles Traveled

List of Partners

Government alone cannot achieve the broader changes needed to end traffic fatalities. In addition to national, state, regional and local agencies, multiple organizations, private entities and the public play a role in achieving Vision Zero.

National agencies
U.S. Department of Transportation
Federal Highway Administration
National Highway Traffic Safety Administration
Center for Disease Control

State agencies
Oregon Department of Transportation
Oregon Health Authority
Department of Motor Vehicles
Oregon State Police
Department of Land Conservation and Development
Oregon Liquor Control Commission

Regional Agencies and Districts
Metro
TriMet
SMART
Port of Portland

City and County transportation and land use agencies
Transportation and land use departments/staff for the three counties and twenty-five cities in the region

County public health agencies
Clackamas County Public Health
Multnomah County Public Health
Washington County Public Health

Schools
Public and private, K-college

Elected officials
U.S. Representatives and Senators
State Representatives and Senators
Governor
Metro Council
Metro Joint Policy Advisory Committee on Transportation
City Mayors and Councils
County Commissioners

Appointed committees
Oregon Transportation Commission
Oregon Transportation Safety Committee
Oregon Bicycle and Pedestrian Advisory Committee
Oregon Freight Advisory Committee
Oregon Transit Advisory Committee
Portland pedestrian, bicycle and freight committees
City and county transportation committees

Emergency Service Providers

County and Local Police
Clackamas, Multnomah and Washington County Sheriff's Offices
City Police

County and City Fire & Rescue
Portland Fire and Rescue
Tualatin Valley Fire and Rescue
Clackamas Fire District #1
Multnomah County Fire District #14
Washington County Fires District #2
Gresham Fire
Hillsboro Fire
Cornelius Fire
Forest Grove Fire and Rescue
Gladstone Fire
Lake Oswego Fire

Advocacy and Community Organizations
Oregon Walks
Oregon and SW Washington Families for Safer Streets
Vision Zero Network
Toward Zero Deaths
Safe Routes to School National Partnership
AARP
Street Trust
Community Cycling Center

Commercial Vehicle Companies
Companies located and/or operating in the region

Industry Groups
Auto insurance companies
Auto manufacturers
AAA

Technology Leaders
Volpe Institute

Research and Academic Institutions
Portland State University
ODOT Research
Transportation Research Board (TRB)

Glossary

The glossary defines terms used in this document. These definitions are also included in the2018 Regional Transportation Plan.

AASHTO: The American Association of State Highway and Transportation Officials; it represents all five transportation modes: air, highways, public transportation, rail, and water and has a primary goal of fostering the development, operation, and maintenance of an integrated national transportation system.

Aggressive Driving: An individual commits a combination of moving traffic offenses so as to endanger other persons or property (FHWA). For purposes of this plan those offenses are driving too fast for conditions, following too closely, and/or driving in excess of posted speed.

Aggressive Driving Related Crash: One or more of driving too fast for conditions, following too closely, and/or driving in excess of posted speed was an attribute of the crash. As used in this plan, note that duplicate crashes are not counted more than once.

Arterial Street: A functional classification for surface streets. AASHTO defines arterials from the motor vehicle perspective as providing a high degree of mobility for the longer trip lengths and high volumes of traffic, ideally providing a high operating speed and level of service and avoiding penetrating identifiable neighborhoods.

Autonomous Vehicle (AV): Also known as a driverless car, self-driving car, robotic car is and unpiloted ground vehicle is that is capable of sensing its environment and navigating without human input.

Basic Rule Speed: A speed that is reasonable and prudent considering the conditions at the time. Speeds in excess of the posted speed are evidence of the violation. Basic rule violations can apply on any roadway.

Best Practices: For purposes of this plan, the term "best practices" is used as a general term of preferred practices accepted and supported by experience of the applicable professional discipline. It is not prescriptive to a particular set of standards or a particular discipline.

Collector: A functional classification for surface streets. AASHTO defines collectors as providing both land access and traffic circulation within neighborhoods and commercial and industrial areas. The role of the collector system, from the motor vehicle perspective, is to distribute traffic to and from the arterial system.

Complete Streets: A transportation policy and design approach that requires streets to be planned, designed, operated, and maintained to enable safe, convenient and comfortable travel and access for users of all ages and abilities regardless of their mode of transportation.

Context sensitive design: A model for transportation project development that requires proposed transportation projects to be planned not only for its physical aspects as a facility serving specific transportation objectives, but also for its effects on the aesthetic, social,

economic and environmental values, needs, constraints and opportunities in a larger community setting. Projects designed using this model:

Countermeasure: An activity or initiative to prevent, neutralize, or correct a specific problem.

Crash: A violent collision, typically of one vehicle with another or with an obstacle.

Crash Reduction Factor (CRF): The percentage crash reduction that might be expected after implementing a given countermeasure at a specific site. For example, the installation of centerline rumble strips on a two-lane roadway can expect a 14%reduction in all crashes and a 55% percent reduction in head-on crashes.

Design Speed: Speed for which roadway elements such as curves are designed.

Designated speeds: As opposed to statutory speeds (i.e., 35 mph on city arterial), and must be established by a defined speed zoning process and investigation. Designated speeds typically have to be administered by the Oregon Department of Transportation.

Distracted Driving: Engagement in any activity that could divert a person's attention away from the primary task of driving: the practice of driving a motor vehicle while engaged in another activity. Typical distractions include eating, dealing with passengers or pets, changing settings on vehicle devices, and, increasingly, using a cellular phone or other electronic device.

DMV: Driver and Motor Vehicle Services, Oregon Department of Transportation

Emerging Technologies: Are the technical innovations representing progressive developments within a field aim at providing competitive advantage.

EMS: Emergency Medical Services

Equity: See Social Equity

FARS: Fatal Analysis Reporting System is a nationwide census providing NHTSA, Congress and the American public yearly data regarding fatal injuries suffered in motor vehicle traffic crashes.

FAST: Fixing America's Surface Transportation Act is a funding and authorization bill to govern United States Federal surface transportation spending, signed by President Obama on December 4, 2015. It is subsequent to MAP-21, but does not replace all of the applicable requirements of that earlier law, so both must be referenced.

Fatal Crash: Any motor-vehicle crash that results in one or more deaths within 30 days of the crash.

Fatality Rate: The number of traffic fatalities per number of vehicle miles traveled in a given year. The rate is usually expressed in terms of fatalities per one hundred million miles traveled. Sometimes also expressed as a rate of fatalities per population or licensed drivers

FHWA: The Federal Highway Administration is an agency within the U.S. Department of Transportation that supports State and local governments in the design, construction, and maintenance of the Nation's highway system (Federal Aid Highway Program) and various federally and tribal owned lands (Federal Lands Highway Program).

Fixed speed camera: A camera installed to detect traffic regulation violations.

Freeway: Directional travel lanes usually separated by a physical barrier, and access and egress points are limited to on-and off-ramp locations or a very limited number of at-grade intersections.

Functional classification: The class or group of roads to which the road belongs. There are three main functional classes as defined by the United States Federal Highway Administration: arterial, collector, and local.

High Crash Location: Highway or road segments that are susceptible to an inordinate number of crashes. Identification of high crash locations is part of the problem identification process.

High Injury Corridors (regional): Corridors within a transportation network with higher risk of injury than other corridors within the network.

High Visibility Enforcement (HVE): Law enforcement efforts that are highly visible and well publicized through paid and earned media support. (NHTSA)

Highway Safety Improvement Program: Projects, activities, plans, and reports carried out under 23 USC section 148.

Highway Safety Improvement Project: (23 USC section 148) In general, the term "highway safety improvement project" means strategies, activities, and projects on a public road that are consistent with a state strategic highway safety plan and correct or improve a hazardous road location or feature; or address a highway safety problem.

Historically marginalized communities: Are communities of people that have been historically excluded from critical aspects of social participation including, voting, education, housing and more. Historical marginalization is often a result of systematic exclusion based on devaluation of any individual existing outside of the dominant culture.

HSM: Highway Safety Manual is the recognized source of information and methods for quantitatively evaluating traffic safety performance on existing or proposed roadways.

HSP: Highway Safety Plan, the grant application submitted for Federal section 402 and similar funds. Funds are provided by the National Highway Traffic Safety Administration and the Federal Highway Administration.

Impaired Driving: Driving a vehicle while the driver's reflexes have suffered from alcohol or other drugs to a point that is generally considered unsafe to operate a vehicle. Impairment is usually viewed less severely than intoxication. (NHTSA)

Injury A/ Incapacitating injury/ severe injury: Synonymous terms referring to an injury from a motor-vehicle crash that prevents the injured party from walking, driving, or normally continuing the activities they were capable of performing before the injury occurred. Examples include severed, broken or distorted limbs, skull or chest injuries, abdominal injuries, unconscious at or when taken from the crash scene, unable to leave crash scene without assistance, etc.

Injury B / Moderate injury/ Visible injury: Synonymous terms referring to injuries from a motor-vehicle crash which are evident to observers at the scene of the crash. Examples include a visible lump, abrasions, cuts, bruises, lacerations, etc.

Injury C/ Minor injury/ Complaint of pain: Synonymous terms referring to injuries indicated by the victim. Examples include momentary unconsciousness, complaint of pain, limping, nausea, etc.

Intelligent speed adaption technologies: Are any system that ensures that vehicle speed does not exceed a safe or legally enforced speed. In case of potential speeding, a human driver can be alerted, or the speed reduced automatically.

KABCO Injury Scale: An injury rating scale used to determine the severity of injuries ranging from Severe Injury (A) to Minor Injury (C)

Local Street: A functional classification for surface streets that includes all public surface streets not defined as arterial or collector. Local streets are typically low-speed streets with low traffic volumes in residential areas, but also include similar streets in commercial and industrial areas.

MAP-21: Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), reauthorization of Federal highway funding, signed into law by President Obama on July 6, 2012. Subsequent adoption of the FAST Act does not replace MAP-21 in all areas regulation of transportation safety planning and funding, so both must be referenced.

Metro Planning Area Boundary

Minor Arterial: Provides moderate-length trips and offers connectivity to the higher arterial system, providing intracommunity continuity.

Model Minimum Uniform Crash Criteria Guideline (MMUCC): A minimum, standardized data set for describing motor vehicle crashes and the vehicles, persons and environment involved. The Guideline is designed to generate the information necessary to improve highway safety within each state and nationally.

Monitoring: Management and oversight of the day-to-day operations of grant and sub-grant supported activities to assure compliance with applicable Federal and state requirements and that performance goals are being achieved.

Motorcycle: A motor vehicle with motive power having a seat or saddle for the use of the rider and designed to travel on not more than three wheels in contact with the ground. The NHTSA defines "motorcycle" to include mopeds, two or three-wheeled motorcycles, off-road motorcycles, scooters, mini bikes and pocket bikes.

MPO: Metropolitan Planning Organization. MPOs are designated by the governor to coordinate transportation planning in an urbanized area of the state.

MUTCD: Manual on Uniform Traffic Control Devices is a document issued by the Federal Highway Administration (FHWA) of the United States Department of Transportation (USDOT) to specify the standards by which traffic signs, road surface markings, and signals are designed, installed, and used.

NHTSA: The National Highway Traffic Safety Administration is an agency of the Executive Branch of the U.S. government, part of the Department of Transportation. It describes its mission as "Save lives, prevent injuries, reduce vehicle-related crashes."

NTSB: National Transportation Safety Board is an independent U.S. government investigative agency responsible for civil transportation accident investigation. In this role, the NTSB investigates and reports on aviation accidents and incidents, certain types of highway crashes, ship and marine accidents, pipeline incidents, and railroad accidents.

ODOT – Oregon Department of Transportation

Operating Speed: This is the speed at which motor vehicles generally operate on that road.

Per capita: Is used to describe crash rate per population. Except where otherwise noted, crash rates are per million residents.

Per vehicle miles traveled (VMT): Is used to describe crash rate per motorized vehicle miles. Except where otherwise noted, crash rates are per 100-million motorized vehicle miles travelled.

Performance Measure: "A process of assessing progress toward achieving predetermined goals, including information on the efficiency with which resources are transformed into goods and services (outputs), the quality of those outputs (how well they are delivered to clients and the extent to which clients are satisfied) and outcomes (the results of a program activity compared to its intended purpose), and the effectiveness of government operations in terms of their specific contributions to program objectives." (FHWA)

Portland metro region: Is the scope of this plan, and is defined as area within the Metropolitan Planning Area (MPA) boundary.

Posted Speed Violations: In Oregon, posted speeds set the maximum speed that can be traveled, violations can be either speed limit or basic rule.

Posted Speed: The speeds indicated on signs along the roadway.

Protected bike lanes: A bike lane that is physically separated from auto traffic, typically they are created using planters, curbs, parked cars, or posts and are essential for creating a complete network of bike-friendly routes.

Public health: The health of the population as a whole, especially as monitored, regulated, and promoted by the state.

Road Safety Audit: A formal safety performance examination of an existing or future road or intersection by an independent multidisciplinary audit team. (23 CFR § 924.3).

Road users: A motorist, passenger, public transportation operator or user, truck driver, bicyclist, motorcyclist, or pedestrian, including a person with disabilities. (23 USC section 148)

Roadway Departure Crash: Crash where roadway departure is an attribute. As used in this plan, note that the roadway or lane departure definition excludes intersections, pedestrian-related, and bicycle-related crashes.

RTP: Regional Transportation Plan for a Metropolitan Planning Organization

Safe Routes to School: A comprehensive engineering/education program focused on youth school travel that aims to create safe, convenient, and fun opportunities for children to walk and roll (bike, scooter, etc.) to and from schools. City or school district based programs incorporate evaluation, education, encouragement, engineering, enforcement, and equity with the goal of increasing walking and rolling to school.

Safety data: Includes, but is not limited to, crash, roadway, and traffic data on all public roads. For railway- highway grade crossings, safety data also includes the characteristics of highway and train traffic, licensing, and vehicle data. (23 CFR § 924.3)

Serious Injury: An incapacitating injury or any injury, other than a fatal injury, which prevents the injured person from walking, driving, or normally continuing the activities the person was capable of performing before the injury occurred.

Severity: A measurement of the degree of seriousness concerning both vehicle impact (damage) and bodily injuries sustained by vehicle occupant.

SHSP: Strategic Highway Safety Plan, A comprehensive, multi-disciplinary plan, based on safety data developed by a State Department of Transportation in accordance with 23 U.S.C. 148.

Side Guard for Trucks: Vehicle-based safety devices designed to keep pedestrians, bicyclists, and motorcyclists from being run over by a large truck's rear wheels in a side-impact collision.

Social Equity: The idea that all members of a societal organization or community should have access to the benefits associated with civil society – the pursuit of an equitable society requires the recognition that there are a number of attributes that give members of a society more or less privilege and that in order to provide equitable situations the impacts of these privileges (or lack

thereof) must be addressed. For transportation, equity refers to fair treatment or equal access to transportation services and options. In the context of safety, transportation equity relates to improving the travel choices, the safety of travel and not unfairly impacting one group or mode of transportation. More specifically it means improved safety for all transportation options and lessening the risks or hazards associated with different choices of transportation.

Speed Limit: Speed limits are limited to specific roadways such as interstates, roadways within city limits, and school speed zones. In addition, speed limits apply to certain types of vehicles on any roadway – large trucks, school buses and vehicles transporting children or workers.

Speeding: Driving too fast for conditions and/or driving in excess of posted speed

Speed-Related Crashes: Attributes of crash include driving too fast for conditions and/or driving in excess of posted speed (note that duplicate crashes are not counted more than once).

SPIS: The Safety Priority Indexing System is a systemic scoring method that identifies potential safety problems on state high-ways.

Spot Safety Improvement: An improvement or set of improvements that is implemented at a specific location on the basis of location-specific crash experience or other data-driven means.

SSHSP: State Strategic Highway Safety Plan; A comprehensive, multi-disciplinary plan, based on safety data developed by a State Department of Transportation in accordance with 23 U.S.C. 148.

State Highway Safety Improvement Program: The term "State highway safety improvement program" means a program of highway safety improvement projects, activities, plans and reports carried out as part of the Statewide transportation improvement program under section 135(g). (23 USC section 148)

Statutory Speeds: Are posted as defined in statute (i.e., 25 mph on a neighborhood street) and any road authority may post applicable statutory speeds within their jurisdiction.

STIP: Statewide Transportation Improvement Program is the Oregon Department of Transportation's capital improvement program for state and federally-funded projects. The Oregon Transportation Commission and ODOT develop the STIP in coordination with a wide range of stakeholders and the public.

Strategic Highway Safety Plan (SHSP): A comprehensive, multi-disciplinary plan, based on safety data developed by a State Department of Transportation in accordance with 23 U.S.C. 148.

Systemic Safety Improvement: An improvement or set of improvements that is widely implemented based on high-risk roadway features that are correlated with particular severe crash types.

Toward Zero Deaths: A term analogous to Vision Zero

Transportation Demand Management: The application of strategies and policies to reduce travel demand, or to redistribute this demand in space or in time

Transportation Planning Rule (TPR): Oregon's statewide planning goals established state policies in 19 different areas. The TPR implements the Land Conservation and Development Commission's Planning Goal 12 (Transportation) which requires ODOT, MPOs, Counties and Cities, per OAR 660-012-0015 (2) and (3), to prepare a Transportation System Plan (TSP) to identify transportation facilities and services to meet state, regional and local needs, as well as the needs of the transportation disadvantaged and the needs for movement of goods and services to support planned industrial and commercial development, per OAR 660-012-0030(1).
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TSAP: Oregon's Transportation Safety Action Plan

Vision Zero: A system and approach to public policy developed by the Swedish government which stresses safe interaction between road, vehicle and users. Highlighted elements include a moral imperative to preserve life, and that the system conditions and vehicle be adapted to match the capabilities of the people that use them.

VMT: Vehicle miles traveled; a measure used as a means of determining exposure in calculating fatality rates.

Appendices

Appendices are stand-alone documents that provide additional technical information for the 2018 Regional Transportation Safety Strategy.

Appendices can be accessed at_____

2017 Metro State of Safety Report
Describes the data used in the analysis, the attributes of the data, and any data limitations. Describes the process Metro used to analyze the data. The 2017 State of Safety report presents the findings, identifying trends and relationships of serious crashes with environmental factors including roadway and land use characteristics and serves as the foundation for the 2018 RTSS.

Regional High Injury Corridors and Intersections Report
Provides information and link to the Metro Crash Map and High Injury Corridors online map.

Transportation Safety Policy Framework Report
Developed prior to the 2018 RTSS, provides an overview of pertinent polices that guided the development of the 2018 RTSS. Includes profiles of local agency plans, actions and programs for transportation safety.

Safety Performance Measures Report
Developed prior to the 2018 RTSS, outlines the transportation safety related performance measures and targets for the update of the 2018 Regional Transportation Plan.

Metro State of Safety Report

A compilation of information on roadway-related crashes, injuries, and fatalities in the Portland Metro region and beyond, 2011-2015 crash data

DRAFT November 2017

Executive Summary

Between 2011 and 2015, there were 304 fatal crashes in the Portland Metro region, killing 311 people, and an additional 2,102 crashes resulting in incapacitating injury. Nationwide, crashes killed an average of 33,305 people per year between 2011 and 2015, and roadway safety remains one of the most pressing health issues nationwide. The 8% increase in traffic deaths in 2015 is the highest increase in fifty years. For young people between the ages of 5 and 24, motor vehicle crashes are the leading cause of death.

It is the Portland Metro region's adopted goal to progressively reduce the number of people killed or seriously injured on the region's roadways to zero by 2035. The purpose of this report is to document roadway crash data, patterns, and trends in the Portland Metro area and beyond to inform the pursuit of this goal. The Oregon Department of Transportation (ODOT) has assembled and distributed statewide crash data since 2007. This is a rich dataset, including numerous information fields for each geocoded crash, and is complemented by Metro's rich datasets of transportation infrastructure, transportation operations, and spatial data. The combination of these provides the opportunity of detailed analyses of the safety of the region's transportation system and land use patterns. Further, a large amount of US and international data is available to document national and international patterns and trends. This information is important to provide context for local data.

In 2010-2011, Metro staff worked with staff from cities and counties of the Metro region, ODOT, TriMet, and other local safety experts to develop a strategy for analyzing and summarizing this data from 2007 to 2009. The 2012 State of Safety report was the result of this collaboration. This 2017 report updates these findings, using the most recent five years of crash data – through 2015. It identifies trends and relationships of serious crashes with environmental factors including roadway characteristics. This report provides the data for the update of the 2018 Regional Transportation Safety Action Plan.

The findings include:

- Nationally and in Oregon, fatalities have stabilized for automobile occupants and motorcyclists, while fatalities have been increasing for pedestrians and bicyclists. *(Section 1)*
- Higher levels of vehicle miles travelled (VMT) correlate with more fatal and serious crashes due to increased exposure. (*Section 1)*
- The Portland Metro region has less than half the annual fatalities per million residents compared to Oregon's and the national average. (*Section 1)*
- Arterial roadways comprise 73% of the region's serious crashes, 77% of the serious pedestrian crashes, and 65% of the serious bike crashes, while accounting for 12% of road lane miles. (*Sections 2, 5, and 6)*
- Alcohol or drugs were a factor in 57% of fatal crashes. *(Section 2)*
- Excessive speed is a contributing factor in 34% of fatal crashes, and aggressive driving is a factor in 35% of fatal crashes. *(Section 2)*
- Seat belt use in the region as reported exceeds 99%. *(Section 2)*
- The percent of serious crashes for male drivers age 70-79 and female drivers age 80-84 is double the regional average. (*Section 2)*

- Streets with more lanes have higher serious crash rates per road mile and per VMT. This follows trends documented in AASHTO's Highway Safety Manual. *(Section 3)*
- Streets with more lanes have an especially high serious crash rate for pedestrians, producing higher crash rates per mile and per VMT as compared to other modes. *(Section 5)*
- The most common serious crash types were Turning and Rear End. For fatal crashes, the most common types were Pedestrian and Fixed Object. *(Section 3)*
- Serious pedestrian crashes are disproportionately represented after dark. While 39% of all serious crashes happen at night, 64% of serious pedestrian crashes happen at night. (*Section 5)*

Table of Contents

Introduction

It is the Portland Metro region's adopted goal to progressively reduce the number of people killed or seriously injured on the region's roadways to zero by 2035.

The purpose of this report is to document roadway crash data, patterns, and trends in the Portland Metro area and beyond to inform the pursuit of this goal. The Oregon Department of Transportation (ODOT) has assembled and distributed statewide crash data since 2007. This is a rich dataset, including numerous information fields for each geocoded crash, and is complemented by Metro's rich datasets of transportation infrastructure, transportation operations, and spatial data. The combination of these provides the opportunity of detailed analyses of the safety of the region's transportation system and land use patterns.

Further, a large amount of US and international data is available to document national and international patterns and trends. This information is important to provide context for local data.

In this report, crashes are broken down by a number of factors contained in the dataset provided by ODOT.

- Injury Type: Each crash is identified by the worst injury incurred in the crash: Fatal, Injury A (incapacitating), Injury B (moderate), Injury C (minor) or Property Damage Only (PDO). This report largely focuses on Fatal/Incapacitating crashes (the sum of Fatal and Injury A), referred to as 'Serious Crashes' throughout this report. These are the types of crashes that the region is primarily focused on eliminating.
- Location
- Date and Time
- Weather and Pavement Conditions
- Roadway Location: the location on the roadway system allows data from Metro's mapping databases to be attributed to the crash.
- Contributing Factors: These include speeding, alcohol, drugs, school zone, work zone, and hit and run.

Metro's mapping database includes:

- Roadway data, such as speed, geometry, traffic volumes, traffic congestion, transit routes, bicycle routes, and sidewalk inventory
- Spatial data, such as land use, population, density, socioeconomic factors, and walkability

Note that many figures in this document are in color, and while colors are generally selected to be legible when printed in black and white, they are most readable in full color.

Definitions

Terms that are used throughout this report are defined as follows:

"**Portland Metro region**" is the scope of this study, and is defined as the area within the Metropolitan Planning Area (MPA) as of December 31, 2016. The MPA is slightly larger than the Urban Growth Boundary (UGB).

"**Serious Crashes**" in this report refers to the total number of Fatal and Injury A crashes.

"**Injury A**" and "**Incapacitating injury**" are used interchangeably. Incapacitating injuries typically are injuries that the victim is not able to walk away from. They are synonymous with the term "**Severe injury**"

"**Injury B**" and "**Moderate injury**" are used interchangeably.

"**Injury C**" and "**Minor injury**" are used interchangeably.

Per capita is used to describe crash rate per population. Except where otherwise noted, crash rates are per million residents.

Per VMT is used to describe crash rate per vehicle miles. Except where otherwise noted, crash rates are per 100-million vehicle miles travelled.

Arterial is a functional classification for surface streets. AASHTO defines arterials from the motor vehicle perspective as providing a high degree of mobility for the longer trip lengths and high volumes of traffic, ideally providing a high operating speed and level of service and avoiding penetrating identifiable neighborhoods.

Collector is a functional classification for surface streets. AASHTO defines collectors as providing both land access and traffic circulation within neighborhoods and commercial and industrial areas. The role of the collector system, from the motor vehicle perspective, is to distribute traffic to and from the arterial system.

Local is a functional classification for surface streets that includes all public surface streets not defined as arterial or collector. Local streets are typically low-speed streets with low traffic volumes in residential areas, but also include similar streets in commercial and industrial areas.

Section 1 – Regional, State, National, and International Trends

Data from the National Highway Traffic Safety Administration (NHTSA) were compiled and analyzed along with population data from the US Census to identify trends in national, state, regional and city crashes. NHTSA summarizes traffic fatality data by state and by major city, including number of fatalities, fatalities per capita and per vehicle-miles travelled (VMT), and by travel mode. Five years of data between 2005 and 2009 were considered for this analysis.

Travel and Fatality Patterns: US and Oregon

Travel patterns in the US have changed in the last decade due to a variety of external factors. While the population has continued to increase, VMT per capita and absolute VMT have declined. Roadway fatality rates declined after 2005, but have increased significantly since 2010. In Oregon, these trends are consistent with national patterns. Figures 1-1 and 1-2 show the national and state trends of population, VMT, and crash-related fatalities.

Figure 1-1

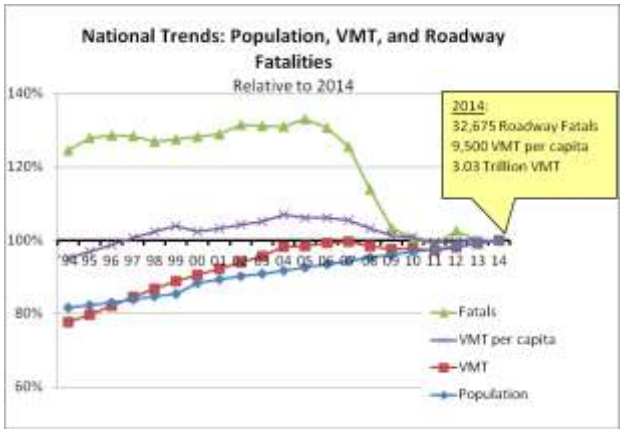
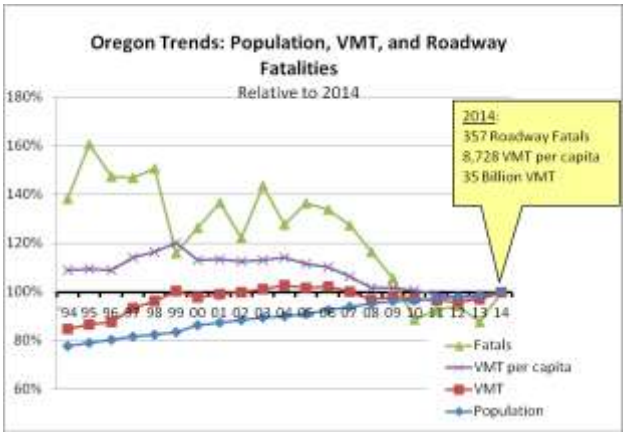


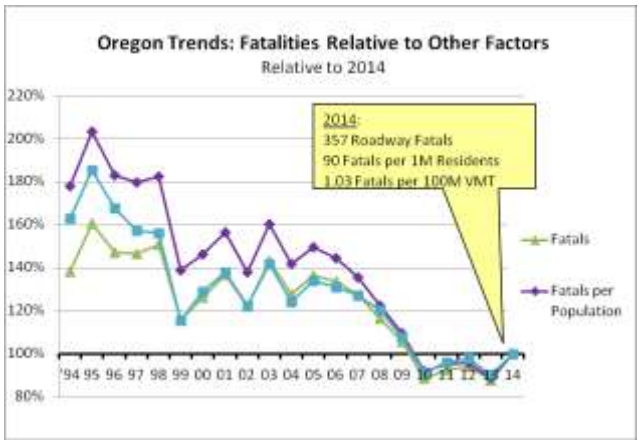
Figure 1-2



It is common practice to normalize roadway fatality rates by both population and traffic volumes. Normalization by population is useful in measuring the overall safety of the roadway system. Normalization by traffic volumes is useful in measuring the safety per distance travelled. Figures 1-3 and 1-4 show national and state trends for fatalities and fatality rates.

Figure 1-3

Figure 1-4



Total fatalities, fatalities per capita, and fatalities per VMT are all generally decreasing over time, although there has been a notable uptick since 2010.

Fatality Patterns by Mode: US and Oregon

The NHTSA data are broken out by mode: automobile occupants, motorcyclists, bicyclists, and pedestrians. Figures 1-5 and 1-6 show the recent national and state trends for each mode.

Figure 1-5

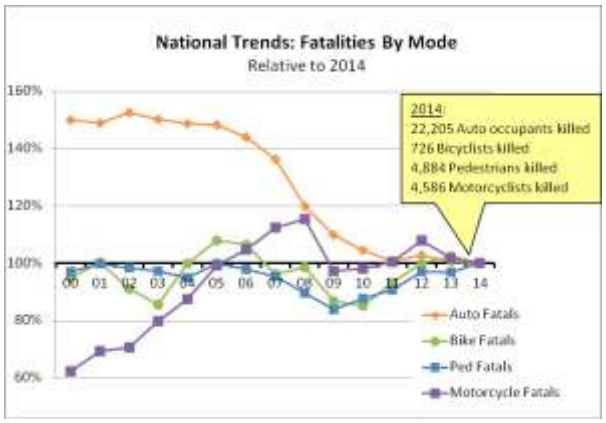
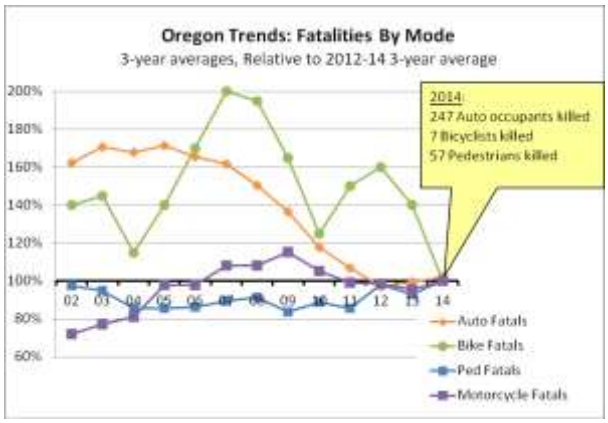


Figure 1-6



Fatalities have recently stabilized for automobile occupants and motorcyclists, while fatalities have been increasing for pedestrians and bicyclists.

Annual Vehicle-Miles Traveled (VMT)

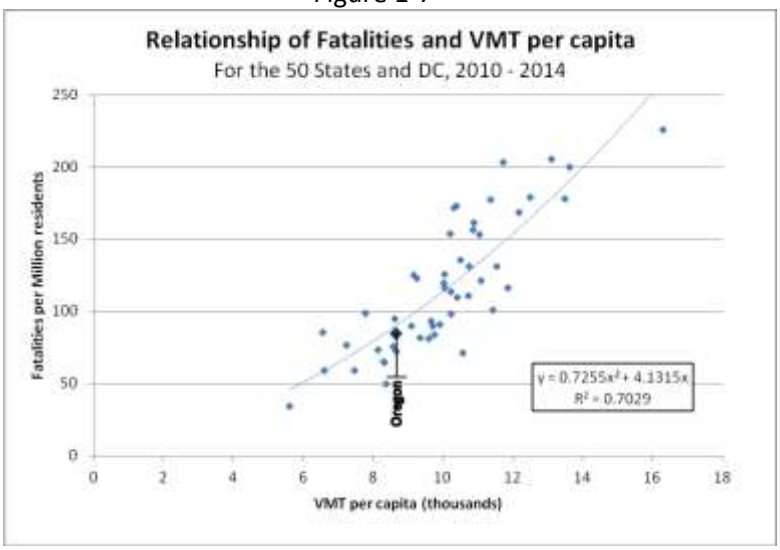
One of the clearest trends in crash data is the correlation between fatality rates and annual per capita VMT. Figure 1-7 shows the relationship by US state for all fatalities, and Figure 1-8 shows the relationship for pedestrian or bicyclist fatalities.

States with higher VMT typically also have higher per capita fatality rates, as the typical exposure to risk is increased. A polynomial equation with a good R-squared value can be fitted to estimate the change in roadway fatalities that would occur by changing per capita VMT, and is shown in Figure 1-7.

All Fatalities

It is apparent from the data that states with more auto travel typically exhibit higher fatality rates. The District of Columbia has the lowest per capita VMT at 5,610, and exhibits one of the lowest annual fatality rates of 65 per million residents – less than one-third of the national average. Wyoming, with the highest per capita VMT of 17,900, also has the highest annual fatality rate at 310 per million residents – 235% of the national average.

Figure 1-7



As with the 2012 State of Safety report, which looked at 2005 – 2009 data, a polynomial equation with a good R-squared value can be generated for the VMT-fatality relationship by setting the intercept to zero. While the equation is likely to vary slightly year-to-year, the relationship appears to be permanent. The relationship for 2010 – 2014 data is shown in Figure 1-7.

The national average is 9,500 VMT per capita and 109 fatalities per million residents.

Oregon statistics are 8,650 VMT per capita (91% of the national average) and 85 fatalities per million residents (81% of the national average).

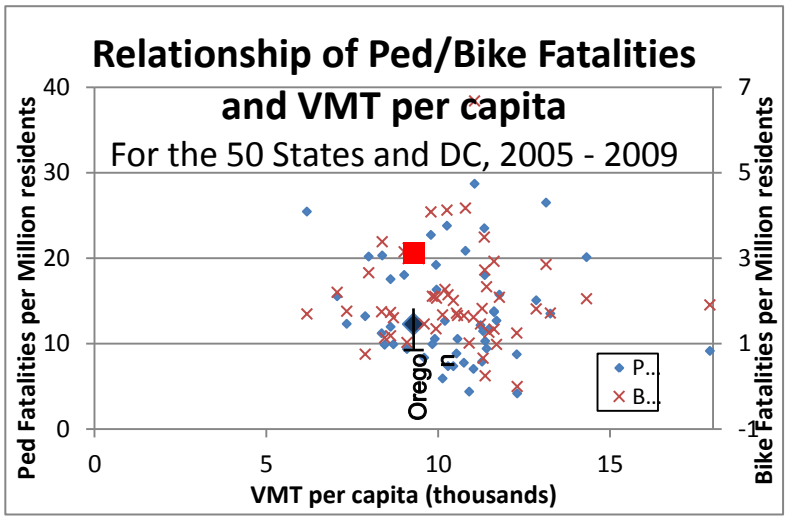
Ped/Bike Fatalities

The relationship between statewide VMT per capita and ped/bike fatalities is unclear. As can be seen in Figure 1-8, the data are scattered, and unlike the overall fatality data, no clear trend exists. This may be due to the complex relationships at play – higher VMTs make ped/bike travel more dangerous, but discourage travel by these modes thereby reducing ped/bike exposure.

The national average (2010 – 2014) is 14.7 pedestrians killed in crashes per million residents and 2.2 cyclists killed in crashes per million residents.

Oregon crash statistics (2010 – 2014) are 13.4 pedestrians killed per million residents (91% of the national average) and 2.2 cyclists killed per million residents (same as the national average).

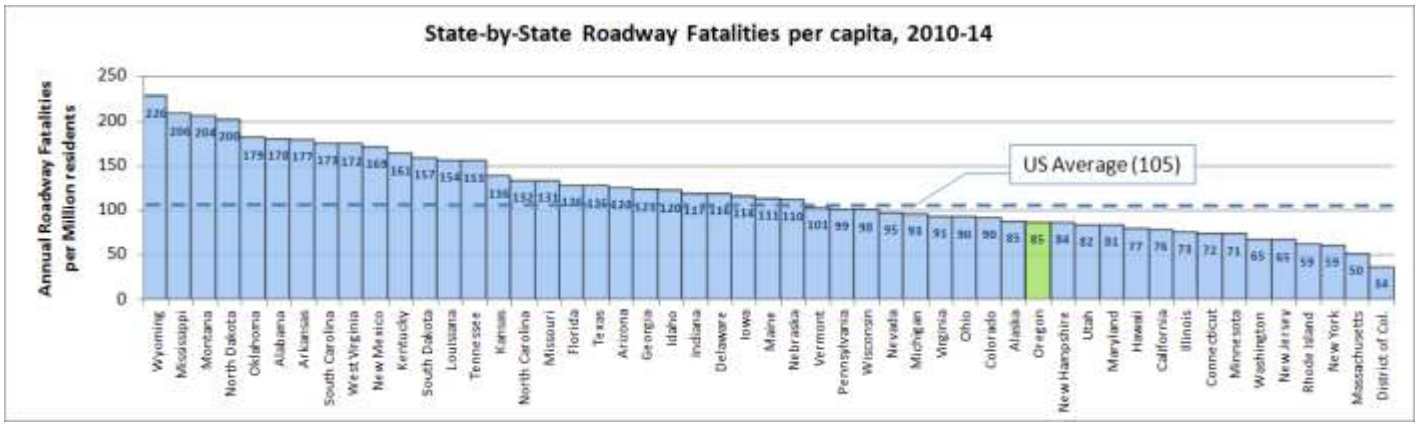
Figure 1-8



State-by-State Fatality Trends

Figure 1-9 shows the per capita fatality rate by state. Oregon is slightly better than the US average.

Figure 1-9



European Data

Data from the EU Road Federation's publication "European Road Statistics" were compiled in order to provide a comparison to US data. European practices are often considered as a best practice as their transportation systems are generally safer and more efficient than US systems.

Figures 1-10 and 1-11 present European roadway fatality rates per capita and per VMT.

Of the 28 EU countries, 22 of them exhibit lower rates of roadway fatality per capita than the US average. On a per-VMT basis, 19 of them exhibit lower fatality rates than the US average.

Figure 1-10

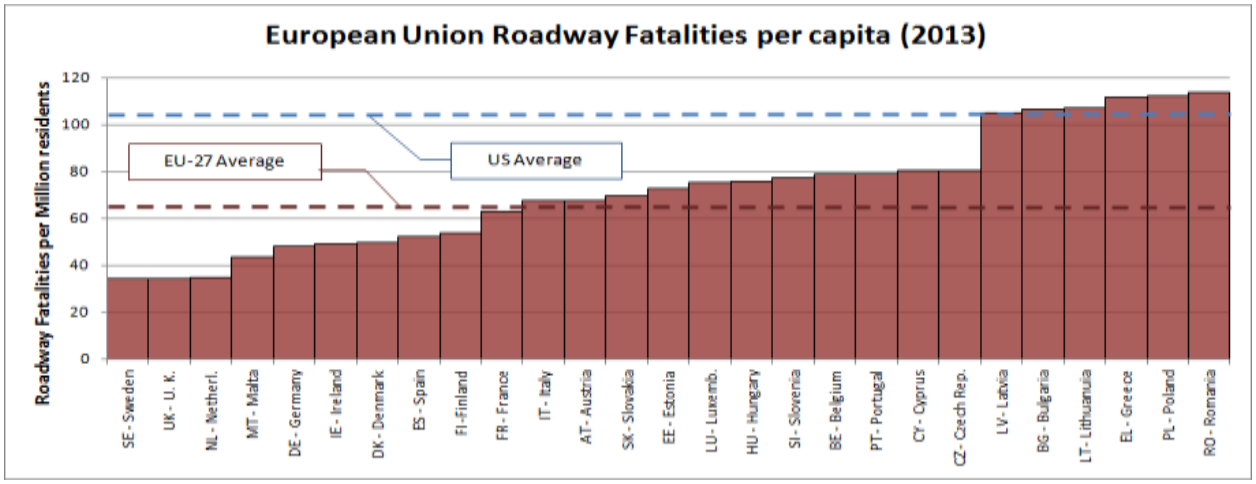
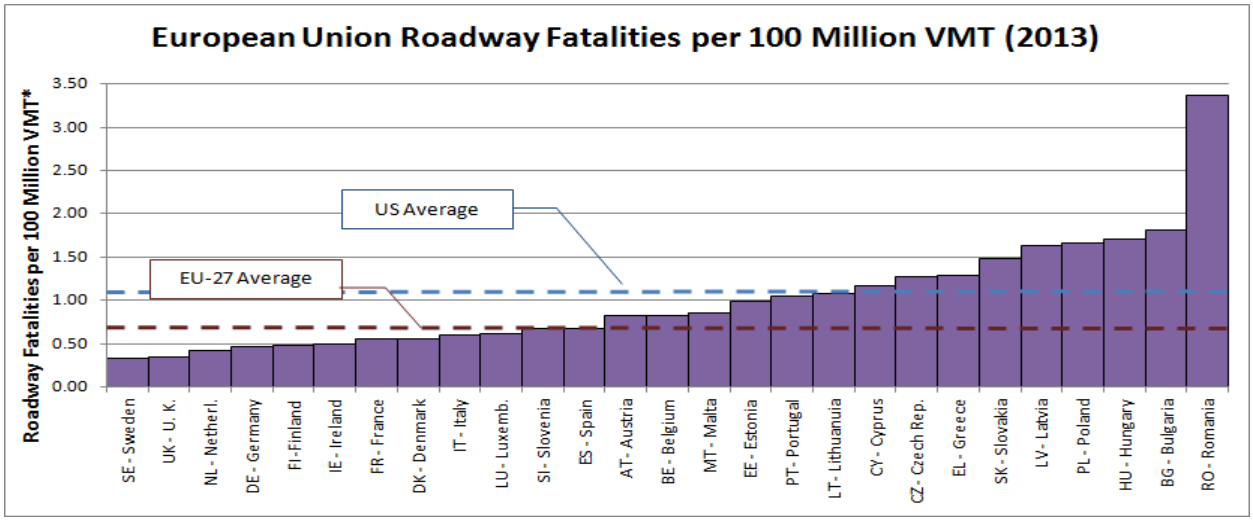


Figure 1-11

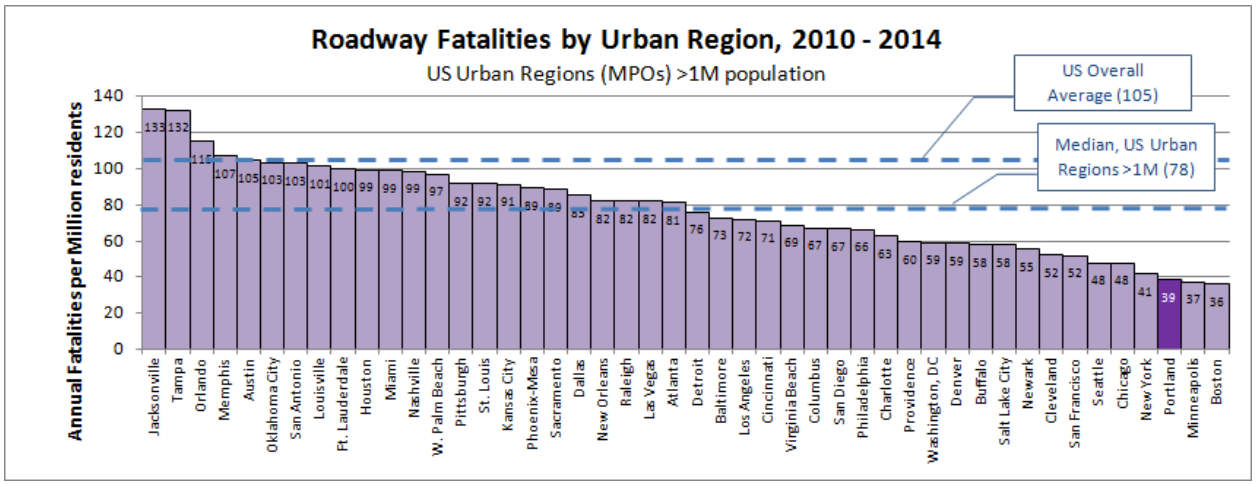


European countries appear to be limiting roadway fatalities both by managing safer roadways and developing transportation systems and development patterns which require less driving.

Urban Region Fatality Trends

Crash and population data was reviewed for the large urban regions in the US, those with populations of over 1 million people. Figure 1-12 shows the per capita fatality rate by urbanized region. Oregon is slightly better than the US average, while roadway fatalities per capita in the Portland Metro region are nearly a third the US average and more than half Oregon's average.

Figure 1-12



Fatality rates

The worst regions in the nation for overall fatality rates are concentrated in Florida and the Sun Belt, where driving is the completely dominant mode of travel. The safest regions in the nation for overall fatality rates are Boston, Minneapolis-St. Paul, Portland, New York, and Chicago. In general, the safest urban regions are those that exhibit dense urban environments and higher usage of non-auto travel modes.

US City Data

NHTSA data include counts of all fatalities and pedestrian fatalities in US cities. This information is of special interest for this report given that the the Portland Metro region is highly urbanized and that the adopted growth concepts call for accomodating growth by increasing urbanization.

The figures below summarize overall fatality rates and pedestrian fatality rates for the best and worst 15 cities with population above 300,000. The figures are five-year averages (2010 – 2014). Brightly colored bars (red or green) indicate that the city was also in the best or worst 15 for the 2012 State of Safety report, which looked at 2005 – 2009 data.

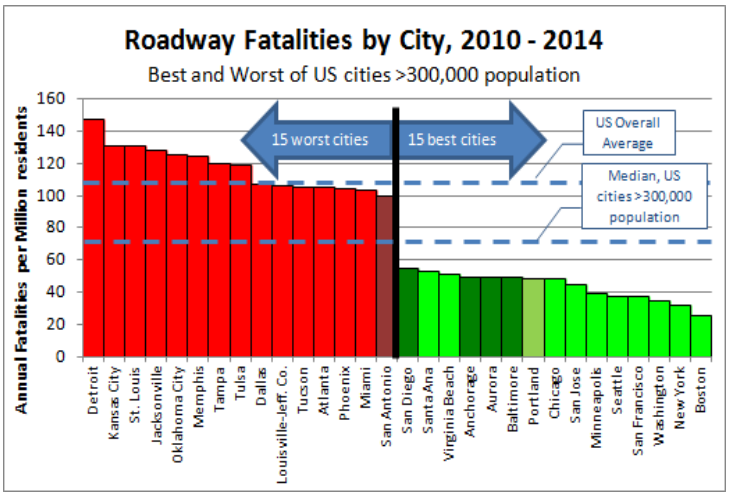
Overall fatality rates

The worst cities in the nation for overall fatality rates are Detroit, Kansas City MO, St. Louis, Jacksonville, and Oklahoma City. In general, the worst cities are in states which have higher levels of VMT per capita, such as Michigan, Missouri, Florida, Texas, Oklahoma, and Arizona.

The safest cities in the nation in terms of roadway fatalities per capita are New York, Boston, Washington DC, San Francisco, and Seattle. In general, the safest cities are those that exhibit dense urban environments and higher usage of non-auto travel modes.

The city of Portland ranks well in this list, at 9th best out of the 64 cities of population 300,000 or more. In the prior State of Safety report, Portland ranked 8th best.

Figure 1-17

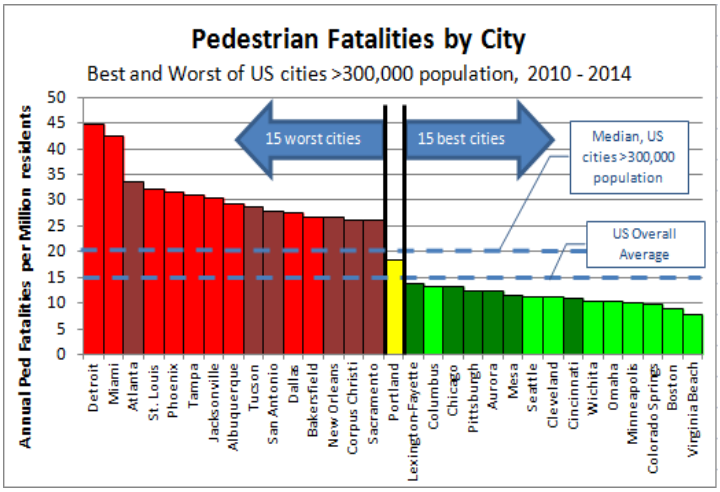


Pedestrian fatality rates

The worst cities in the nation for pedestrian crash fatality rates are Detroit, Miami, Atlanta, St. Louis, and Phoenix. Many of the most dangerous cities for pedestrians are in states which have higher levels of VMT per capita.

The safest cities in the nation for pedestrians per capita in terms of crash fatalities are Virginia Beach, Boston, Colorado Springs, Minneapolis and Omaha. The city of Portland ranks in the middle of the pack, at 39th of the 64 cities of population 300,000 or more.

Figure 1-18



Discussion

In general, overall fatality rates per capita in cities are less than the national average for all areas. For example, the city of Portland's average annual fatality rate of 49 fatalities per million residents is much less than the national average of 105 and the Oregon statewide average of 85. Twelve of the 64 cities exhibited crash fatality rates above the overall national average, with 52 exhibiting crash fatality rates below the national average.

This is likely due to a number of factors including fewer miles driven per capita due to the proximity of services, and the lower speeds of urban streets compared to rural highways, resulting in lower crash severity.

In general, cities which are more urban and which have lower levels of VMT per capita show substantially lower overall crash fatality rates. Those which have invested disproportionately in auto infrastructure, and therefore have higher VMT per capita, exhibit higher crash fatality rates.

Regarding pedestrian fatality rates, the relationships are complex, as cities with better pedestrian infrastructure encourage use by people walking, thereby increasing exposure. So while it may be safer to walk a given distance, the increased walking that results may increase pedestrian exposure and thus pedestrian crashes. Increasing walking may lead to more pedestrian fatalities because of the increased exposure but fewer overall fatalities because of the reduced VMT.

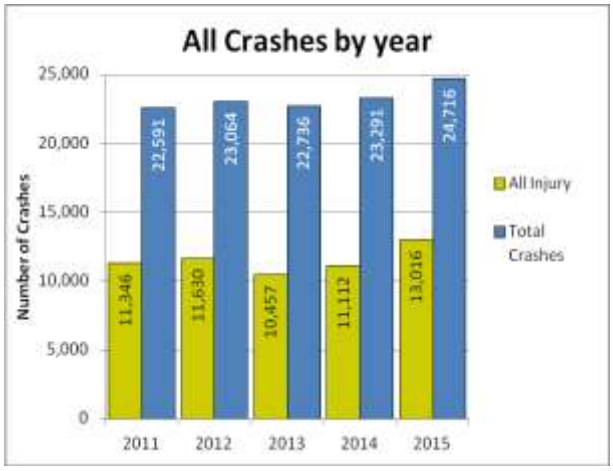
Section 2 – All Crashes

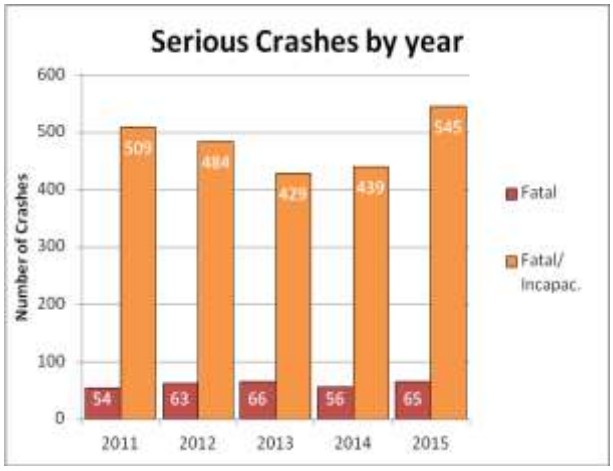
This section summarizes all crashes occurring in the Portland Metro region. The term "serious crashes" refers to all fatal or incapacitating injury (injury A) crashes.

Crashes By Year

Year	Total Crashes	Fatal Crashes (Fatalities)	Injury A Crashes	Injury B Crashes	Injury C Crashes	All Injury Crashes (Injuries)	Serious Crashes
2011	22,591	54 (54)	455	2,487	8,404	11,346	509
2012	23,064	63 (66)	421	2,654	8,555	11,630	484
2013	22,736	66 (68)	363	2,428	7,666	10,457	429
2014	23,291	56 (57)	383	2,512	8,217	11,112	439
2015	24,716	65 (66)	480	2,655	9,881	13,016	545
METRO	116,398	304 (311)	2102	12,736	42,723	57,561 (81,718)	2,406

Figures 2-1 and 2-2





Total reported crashes and injury crashes increased over the 5-year period (Figure 2-1). Fatal and serious crashes fluctuated over the 5-year period (Figure 2-2).

Metro crash rates compared to other places

2011-2015	Population (2015)	Annual VMT (2015)	Annual injury crashes		Annual serious crashes	
			per million residents	per 100M VMT	per million residents	per 100M VMT
Metro	1,603,229	10,437,000,000	7,181	110.3	300	4.6

2011 - 2015	Avg. Annual Fatalities	Estimated Population (2015)	Annual VMT (2015)	Annual Fatality rate per million residents	Fatality rate per 100M VMT
Metro	62.2	1,603,229	10,437,000,000	39	0.60
City of Portland	31.8	620,540	4,303,000,000	51	0.74
Oregon	356.4	4,028,977	36,000,000,000	88	0.99
Median, cities >300,000 pop.	-	-	n/a	72	n/a
US	35,092	321,418,820	3,095,373,000,000	109	1.13
UK*	2,123	64,128,226	520,600,000,000	33	0.41
EU – 28*	32,463	506,592,457	4,322,500,000,000	64	0.75

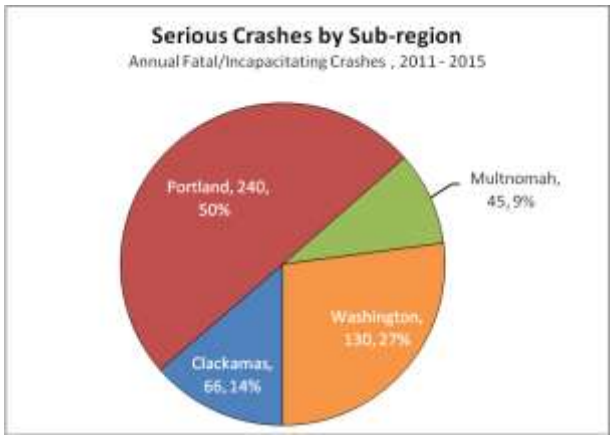
* All data for UK and EU is for year 2013

The City of Portland, the Portland Metro region, and the State of Oregon all have fatality rates below the national average. The United Kingdom and European Union data are included for reference as international best practice.

By Sub-Region

Sub-Region	2011-2015 Annual Crashes						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Clackamas	3,482	10 (10)	55	395	1,362	1,812	66
Portland	11,475	31 (32)	209	1,216	4,078	5,503	240
Multnomah (excl. Portland)	1,870	6 (6)	39	245	727	1,011	45
Washington	6,452	13 (14)	117	692	2,378	3,187	130
METRO	23,280	61 (62)	481	1,907	5,174	7,562	532

Figures 2-3 and 2-4



Sub-Region	Population (2015)	Annual VMT (2015)	Annual injury crashes		Annual serious crashes	
			per 1M residents	per 100M VMT	per 1M residents	per 100M VMT
Clackamas	290,630	2,101,852,699	6,234	86	226	3.1
Portland	620,540	4,303,322,834	8,867	128	387	5.6
Multnomah (excl. Portland)	152,611	744,473,489	6,623	136	296	6.1
Washington	539,448	3,287,341,693	4,030	75.4	210	3.9
METRO	1,603,229	10,436,990,715	7,181	110	300	4.6

With the highest population and VMT, Portland has the largest share of the region's serious crashes (Figure 2-3). Portland has the highest rate of serious crashes per capita, while Multnomah (excludes Portland) has the highest rate of serious crashes per VMT. Washington County has the lowest rate of serious crashes per capita while Clackamas County has the lower rate of serious crashes per VMT.

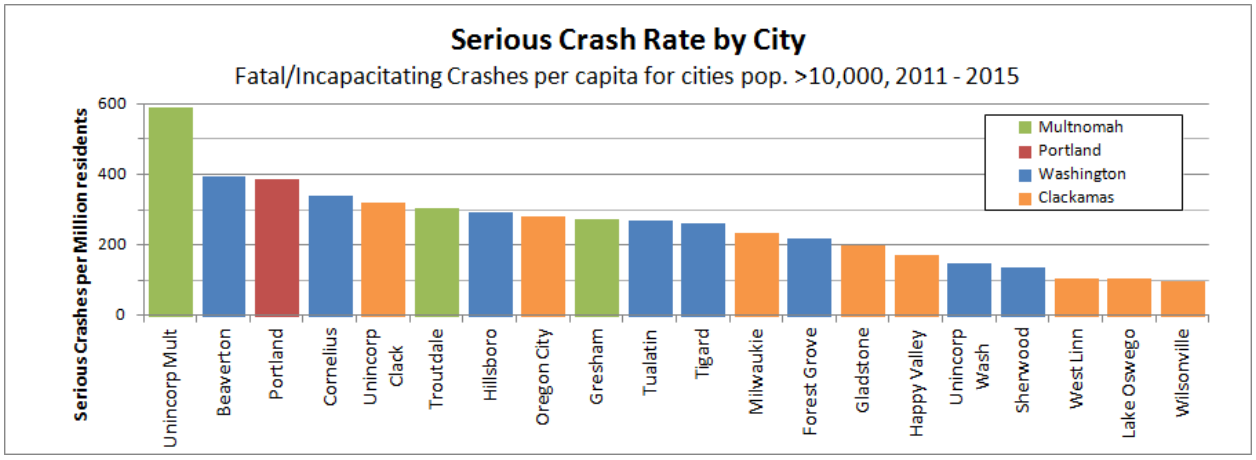
By City

City	2011-2015 Annual Crashes						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Beaverton	1,987	3.0	35	179	729	943	38.0
Cornelius	101	0.0	4	11	37	52	4.2
Durham	13	0.0	0	1	6	7	0.0
Fairview	88	0.2	1	13	35	48	1.4
Forest Grove	137	0.6	5	19	45	68	5.2
Gladstone	136	0.4	2	16	51	69	2.4
Gresham	1,356	3.4	27	170	546	743	30.4
Happy Valley	221	1.0	3	28	91	122	3.6
Hillsboro	1,413	3.6	26	177	545	748	29.2
Johnson City	0	0.0	0	0	0	0	0.0
King City	9	0.0	0	1	1	2	0.2
Lake Oswego	282	0.0	4	29	96	130	4.0
Maywood Park	27	0.0	1	2	12	15	1.0
Milwaukie	210	0.4	5	28	77	109	5.0
Oregon City	588	1.8	8	62	232	302	9.8
Portland	11,479	31.2	209	1,216	4,079	5505	240.4
Rivergrove	1	0.0	0	0	0	0	0.0
Sherwood	160	0.2	2	18	58	78	2.6
Tigard	935	1.6	12	91	353	455	13.4
Troutdale	167	0.8	4	22	63	88	5.0
Tualatin	486	0.4	7	50	199	256	7.2
West Linn	213	0.6	2	23	78	104	2.8
Wilsonville	218	0.0	2	23	76	102	2.2
Wood Village	67	0.2	1	7	24	32	1.0
Unincorp Clack	1,651	6.0	30	187	670	887	36.2
Unincorp Mult	155	1.6	4	29	45	79	6.0
Unincorp Wash	1,180	3.8	26	144	397	567	30.0
METRO	23,280	60.8	420	2,547	8,545	11,512	481.2

These two tables and the accompanying Figure 2-5 summarize crash data within the region by City and for the unincorporated sections of each of the three counties. Crash rates were determined per capita but not per VMT, as the VMT estimates for the smaller cities are not considered reliable enough for such an analysis.

City	Population	2011-2015 Annual crashes	
		All injury per capita	Serious per capita
Beaverton	96,704	9,751	393
Cornelius	12,389	4,230	339
Durham	1,430	4,895	0
Fairview	9,357	5,173	150
Forest Grove	23,630	2,878	220
Gladstone	11,990	5,771	200
Gresham	111,716	6,653	272
Happy Valley	20,835	5,846	173
Hillsboro	100,109	7,470	292
Johnson City	588	0	0
King City	3,817	576	52
Lake Oswego	38,156	3,397	105
Maywood Park	809	19,036	1,236
Milwaukie	21,365	5,102	234
Oregon City	35,004	8,622	280
Portland	620,540	8,871	387
Rivergrove	321	623	0
Sherwood	19,012	4,124	137
Tigard	51,642	8,818	259
Troutdale	16,486	5,362	303
Tualatin	26,617	9,610	271
West Linn	26,267	3,944	107
Wilsonville	22,932	4,448	96
Wood Village	4,056	7,939	247
Unincorp Clack	113,172	7,836	320
Unincorp Mult	10,187	7,775	589
Unincorp Wash	204,098	2,777	147
METRO	1,603,229	7,181	300

Figure 2-5



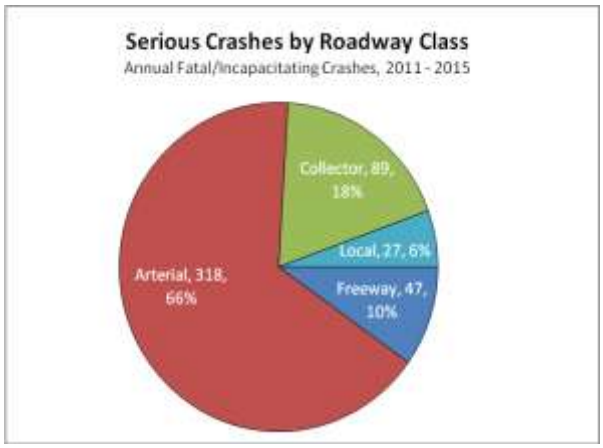
By Roadway Classification

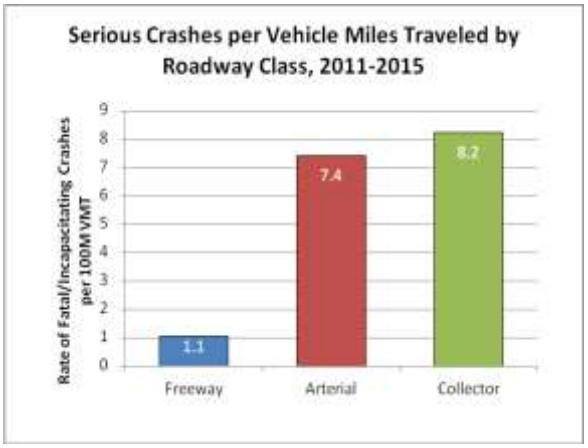
Roadway Classification	2011-2015 Annual Crashes							Percent Serious
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious	
Freeway	2,800	6.3	55	262	854	1,171	61	2.2%
Arterial	9,845	30.7	285	1,038	3,003	4,326	315	3.2%
Collector	3,398	10.0	94	426	870	1,391	104	3.1%
Local	1,346	3.3	35	128	277	440	38	2.8%
Unknown	874	0.0	13	53	170	235	13	1.4%
METRO	18,263	50.3	481	1,907	5,174	7,562	532	2.9%

Roadway Classification	Annual VMT (2015)	Crashes per VMT	
		All injury	Serious
Freeway	4,454,992,641	40.4	1.1
Arterial	4,281,001,727	174.9	7.4
Collector	1,081,114,496	156.6	8.2
Local	619,881,851*	86.2	4.3

* VMT for local streets is a low-confidence estimate

Figures 2-8 and 2-9



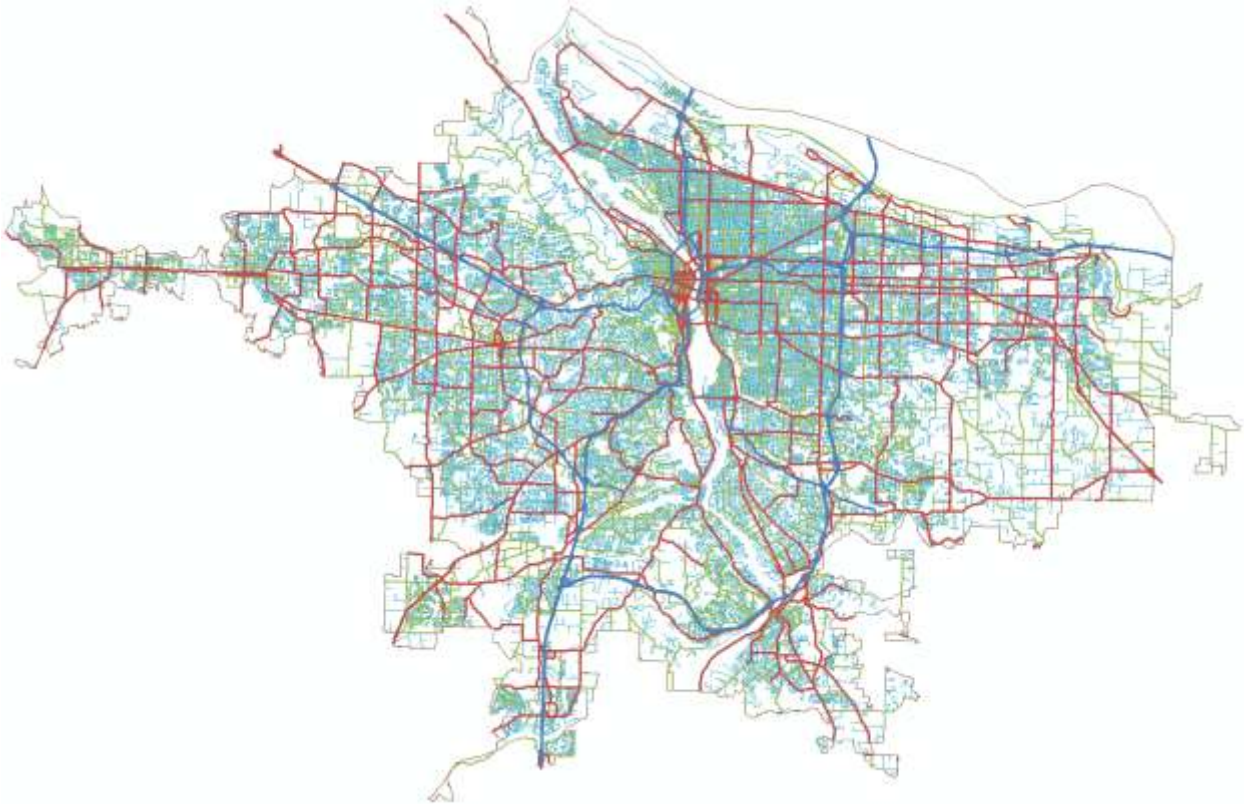


A review of the distribution of the region's serious crashes by roadway classification reveals one of the most conclusive relationships in this study. Arterial roadways are the location of the majority of the serious crashes in the region (Figure 2-8). A similar relationship is evident for pedestrians and cyclists, as detailed in Sections 5 and 6. Freeways and their ramps are relatively safe, per mile travelled, compared to arterial and collector roadways (Figure 2-9).

Figure 2-10 presents the functional classification of the region's roadways.

Figure 2-10

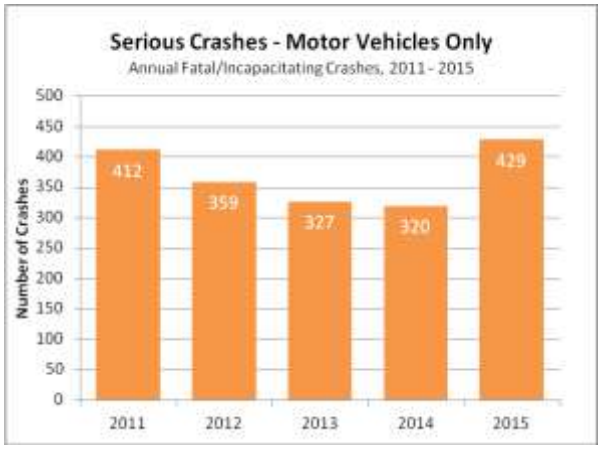
Functional Classifications

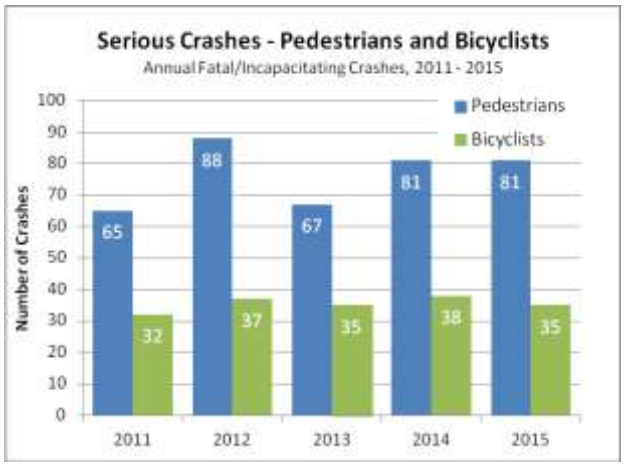


By Mode

Year	Pedestrians		Bicyclists		Autos Only		Motorcycle		Truck Involved	
	All injury	Serious	All injury	Serious	All injury	Serious	All injury	Serious	All injury	Serious
2011	403	65	477	32	10,467	412	301	72	243	20
2012	485	88	558	37	10,588	359	345	63	273	16
2013	408	67	488	35	9,562	327	346	76	235	11
2014	457	81	508	38	10,147	320	289	55	280	22
2015	448	81	476	35	12,092	429	327	86	310	19
TOTAL	2,201	382	2,507	177	52,856	1,847	1,608	352	1,341	88

Figures 2-11 and 2-12





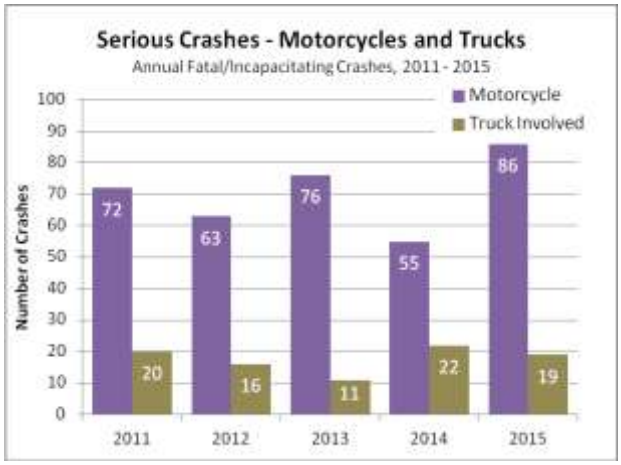


Figure 2-13

Figure 2-11 presents the annual number of serious crashes involving only motor vehicles (no pedestrians or cyclists). Figure 2-12 presents the annual number of serious crashes involving pedestrians and cyclists. Figure 2-13 presents the annual number of serious crashes involving motorcycles and large trucks.

By Month

Month	2011-2015 Annual Crashes		
	All	All injury	Serious
January	1,787	868	39.4
February	1,679	807	35.8
March	1,788	894	35.6
April	1,859	932	33.0
May	1,881	954	37.8
June	1,922	951	43.2
July	1,922	961	43.8
August	1,971	979	46.6
September	1,995	1,012	44.8
October	2,200	1,115	39.4
November	2,102	1,012	40.8
December	2,173	1,025	41.0

Figure 2-14

Figure 2-14 presents the annual average number of serious crashes by month. No clear trend is evident.

By Time of Day

Figure 2-15

Serious Crashes by Day of Week and Hour

Annual Fatal/Incapacitating Crashes, 2011 - 2015

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat		Hour	Avg Wkday	Avg Wkend
12 AM	2.2	1.8	0.8	0.6	1.8	1.8	3.0		12 AM	1.4	2.6
1 AM	2.6	2.0	0.8	1.6	0.6	1.6	2.0		1 AM	1.3	2.3
2 AM	4.8	0.6	1.0	1.8	1.2	2.8	3.6		2 AM	1.5	4.2
3 AM	1.2	0.6	0.4	0.8	0.6	1.2	2.0		3 AM	0.7	1.6
4 AM	1.4	0.2	1.2	0.6	0.2	0.2	0.6		4 AM	0.5	1.0
5 AM	0.6	1.2	1.2	1.0	1.4	1.8	0.8		5 AM	1.3	0.7
6 AM	0.8	1.8	1.4	3.0	1.8	2.8	0.6		6 AM	2.2	0.7
7 AM	2.8	2.6	3.0	4.2	2.8	2.6	1.8		7 AM	3.0	2.3
8 AM	0.6	3.2	2.4	4.2	3.4	3.0	1.0		8 AM	3.2	0.8
9 AM	1.6	1.6	2.8	2.2	2.8	2.4	1.2		9 AM	2.4	1.4
10 AM	2.0	2.0	2.6	2.4	3.2	2.0	3.4		10 AM	2.4	2.7
11 AM	2.2	2.6	2.6	3.0	3.0	5.0	3.0		11 AM	3.2	2.6
12 PM	3.0	2.0	1.8	3.4	4.8	4.8	3.6		12 PM	3.4	3.3
1 PM	3.0	3.2	4.2	3.4	3.0	4.2	4.2		1 PM	3.6	3.6
2 PM	3.6	5.6	4.6	3.0	4.2	3.0	2.8		2 PM	4.1	3.2
3 PM	4.2	4.8	5.6	4.6	4.4	5.4	5.4		3 PM	5.0	4.8
4 PM	2.8	6.2	5.8	6.6	5.8	5.2	2.8		4 PM	5.9	2.8
5 PM	4.6	5.0	7.8	7.4	6.4	6.6	5.0		5 PM	6.6	4.8
6 PM	3.4	4.8	5.0	5.0	5.2	5.8	5.2		6 PM	5.2	4.3
7 PM	3.0	3.2	4.2	3.8	5.0	4.6	4.8		7 PM	4.2	3.9
8 PM	3.4	1.4	2.8	2.0	2.2	2.2	2.6		8 PM	2.1	3.0
9 PM	2.6	3.2	2.4	3.6	3.8	3.6	1.8		9 PM	3.3	2.2
10 PM	1.8	2.0	1.8	2.8	2.6	3.0	3.4		10 PM	2.4	2.6
11 PM	1.4	1.2	1.4	2.0	1.6	2.8	1.8		11 PM	1.8	1.6

	Sun	Mon	Tue	Wed	Thu	Fri	Sat			Avg Wkday	Avg Wkend
All Day	59.6	62.8	67.6	73.0	71.8	78.4	66.4		All Day	70.7	63.0

Figure 2-15 presents the rate of serious crashes by day of the week and hour of the day using a "heat map" format. Dark cells indicate the highest relative crash time periods; light cells indicate the lowest relative crash time periods. The average weekday and weekend day are summarized on the right side of the figure, while each day is summarized and compared at the bottom of the figure.

The weekday evening peak hours produce the highest number of serious crashes, with the 5:00 – 5:59 pm hour as the worst. Late Friday night/early Saturday morning and late Saturday night/early Sunday morning also stand out with high rates of serious crashes.

By Weather

Weather	2011-2015 Annual Crashes		
	All	All injury	Serious
Cloudy/Clear	17,658	8,941	384
Rain/Fog	4,462	2,211	84
Sleet/Snow	189	70	3
Unknown	970	290	10
Total	20,947	11,507	481

The majority (80%) of serious crashes occurred in clear or cloudy conditions (Figure 2-16).

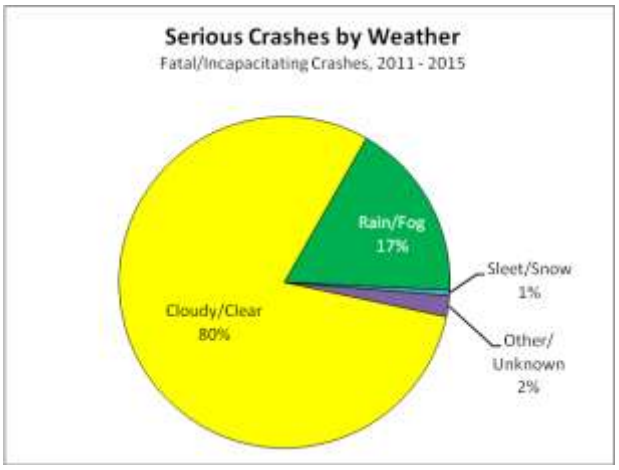


Figure 2-16

By Road Surface Condition

Road Surface	2011-2015 Annual Crashes		
	All	All injury	Serious
Dry	16,378	8,327	349
Ice/Snow	342	126	6
Wet	5,715	2,827	120
Unknown	844	233	6
Total	20,947	11,507	481

The majority (73%) of serious crashes occurred in dry conditions (Figure 2-17).

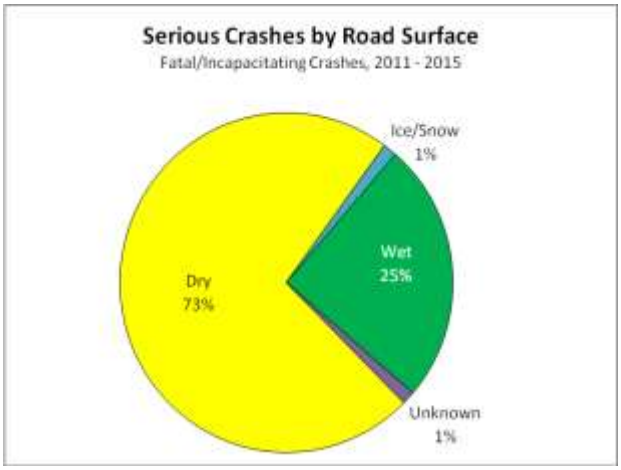


Figure 2-17

By Lighting

Lighting	2011-2015 Annual Crashes		
	All	All injury	Serious
Daylight	16,508	8,162	282
Dawn/Dusk	1,657	828	33
Night - Dark	892	399	40
Night - Lit	4,153	2,101	125
Unknown	70	22	1
Total	20947	11507	481

The majority (59%) of serious crashes occurred in daylight (Figure 2-18).

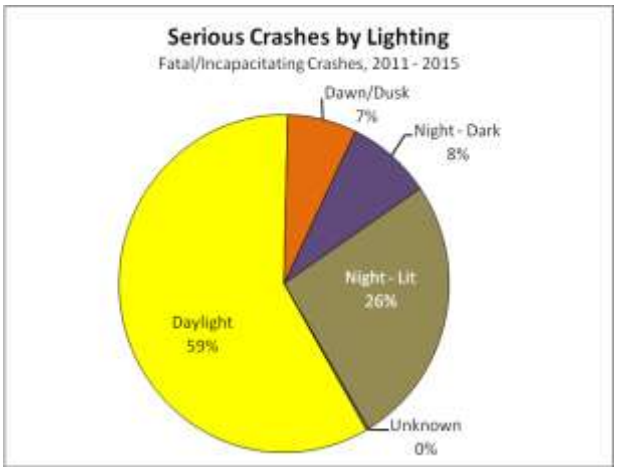
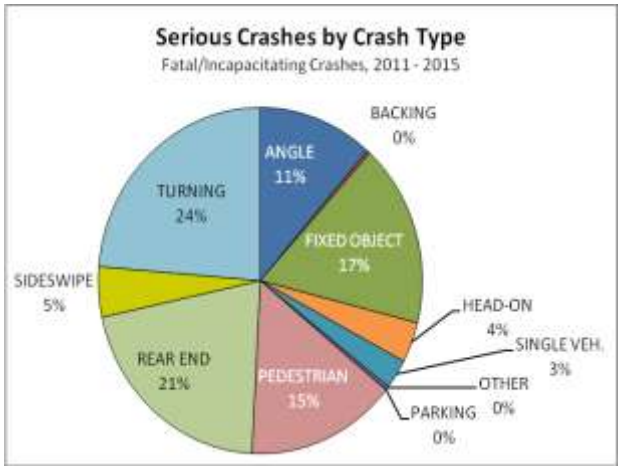


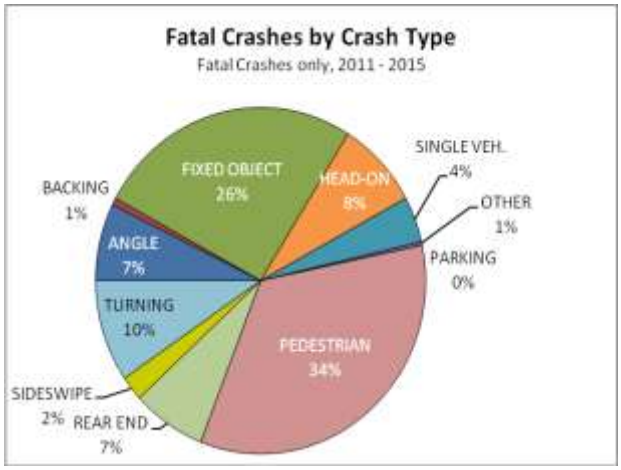
Figure 2-18

By Crash Type

Collision Type	2011-2015 Annual Crashes						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Angle	2,304	4	51	388	803	1,242	55
Backing	336	0	1	6	71	79	2
Fixed Object	1,734	16	67	289	341	696	82
Head-on	151	5	13	34	44	91	18
Single Vehicle	101	3	11	43	23	76	13
Other	78	0	1	10	10	21	2
Parking	201	0	0	8	30	38	0
Pedestrian	450	21	51	214	160	426	72
Rear End	10,573	4	96	661	4,948	5,705	100
Sideswipe	2,198	1	21	136	476	633	23
Turning	5,154	6	108	758	1,638	2,505	114
METRO	23,280	61	420	2,547	8,545	11,512	481

Figures 2-19 and 2-20





Figures 2-19 and 2-20 present serious crash types and fatal crash types. Fatal crashes are specifically broken out here because the distribution is substantially different. For the purpose of establishing crash type, bicycles are considered vehicles, and so there is no separate bicycle crash type.

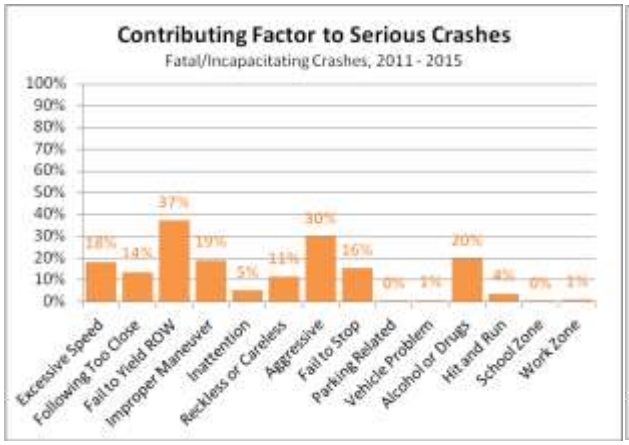
The most common serious crash types were Turning and Rear End.

The most common fatal crash types were Pedestrian and Fixed Object.

By Contributing Factor

Collision Type	2011-2015 Annual Crashes (All Crashes)						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	2,891	20.6	68	369	1,018	1,475	88
Following Too Close	7,778	1.4	64	482	3,649	4,197	66
Fail to Yield ROW	6,802	17.0	162	1,160	2,273	3,612	179
Improper Maneuver	4,514	16.2	76	376	1,091	1,559	92
Inattention	1,173	2.4	23	148	491	664	26
Reckless or Careless	1022.6	6.4	48	220	345	620	55
Aggressive	9,633	21.2	122	766	4,186	5,096	143
Fail to Stop	8,972	1.6	73	511	4,226	4,812	75
Parking Related	115.2	0.0	0	4	18	22	0
Vehicle Problem	1,056	0.8	3	13	31	47	4
Alcohol or Drugs	1,382	34.4	60	215	265	575	94
Hit and Run	1,382	5.0	12	104	452	572	17
School Zone	66	0.2	1	13	26	39	1
Work Zone	177	0.2	5	24.6	69	99	5
METRO	23,280	60.8	420	2,547	8,545	11,573	481

Figures 2-21 and 2-22



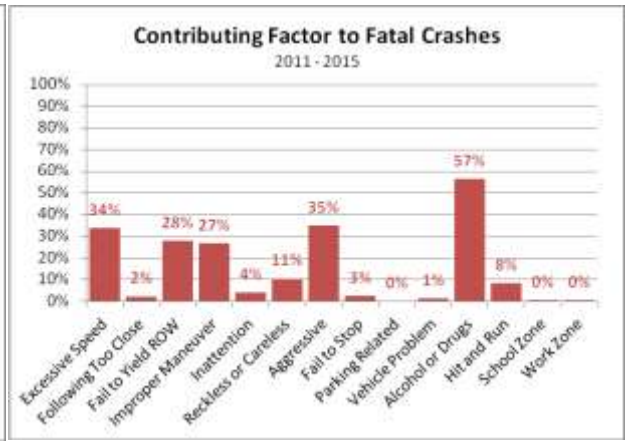


Figure 2-21 presents the the percentage of crashes of serious severity (fatal or injury A) with each contributing factor. Figure 2-22 presents the the percentage of fatal crashes with each contributing factor. Each crash may have several contributing factors.

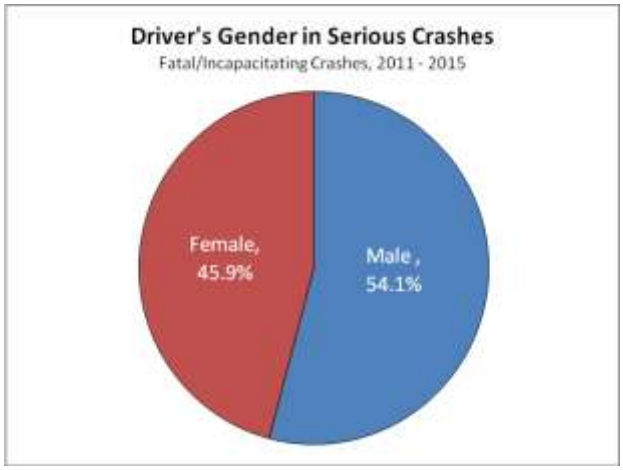
Alcohol and Drugs, Excessive Speed, Fail to Yield ROW, and Aggressive Driving are particularly common factors. Crashes involving Alcohol and Drugs have a much higher likelihood of being fatal than other crashes.

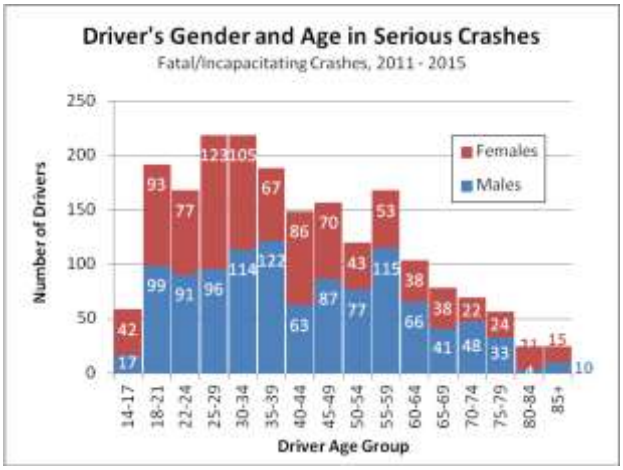
By Driver's Age and Gender

The age and gender of drivers involved in crashes, regardless of fault, are presented in the following table and Figures 2-23 and 2-24.

Age Group	Total Male Drivers (2011 – 2015)			Total Female Drivers (2011 – 2015)		
	All Crashes	Serious	Percent Serious	All Crashes	Serious	Percent Serious
14-17	3,076	17	0.6%	3,579	42	1.2%
18-21	9,572	99	1.0%	9,413	93	1.0%
22-24	7,518	91	1.2%	7,466	77	1.0%
25-29	12,431	96	0.8%	11,968	123	1.0%
30-34	11,897	114	1.0%	10,804	105	1.0%
35-39	10,343	122	1.2%	9,247	67	0.7%
40-44	10,421	63	0.6%	8,898	86	1.0%
45-49	9,218	87	0.9%	8,053	70	0.9%
50-54	9,114	77	0.8%	7,500	43	0.6%
55-59	8,248	115	1.4%	6,810	53	0.8%
60-64	6,734	66	1.0%	5,529	38	0.7%
65-69	4,589	41	0.9%	3,823	38	1.0%
70-74	2,408	48	2.0%	2,180	22	1.0%
75-79	1,428	33	2.3%	1,306	24	1.8%
80-84	820	4	0.5%	813	21	2.6%
85+	747	10	1.3%	777	15	1.9%
Unknown	15,669	16	0.1%	11,098	14	0.1%
METRO	124,233	1,099	0.9%	109,264	931	0.9%

Figures 2-23 and 2-24





Seat Belt Use

The reported use of seat belts is shown in the following tables, for all crashes, for serious crashes only, and for non-serious crashes.

Seat Belt Use (All crashes, 2011-2015)					
	Seat Belt Use	No Seat Belt	Unknown	% Seat Belt Use	% No Seat Belt
Males	81,267	769	47,229	99.1%	0.9%
Females	80,854	445	34,213	99.5%	0.5%
Unknown	245	2	6,261	99.2%	0.8%
Total	162,366	1,216	87,703	99.3%	0.7%

Seat Belt Use (Serious crashes, 2011-2015)					
	Seat Belt Use	No Seat Belt	Unknown	% Seat Belt Use	% No Seat Belt
Males	622	79	164	88.7%	11.3%
Females	768	51	100	93.8%	6.2%
Unknown	0	0	0	-	-
Total	1,390	130	264	91.4%	8.6%

Seat Belt Use (Injury B, C, and PDO crashes, 2011-2015)					
	Seat Belt Use	No Seat Belt	Unknown	% Seat Belt Use	% No Seat Belt
Males	80,645	690	47,065	99.2%	0.8%
Females	80,086	394	34,113	99.5%	0.5%
Unknown	245	2	6,261	99.2%	0.8%
Total	160,976	1,086	87,439	99.3%	0.7%

Seat belt use in the region as reported exceeds 99%.

Males were 71% more likely than females to be reported without a seat belt.

Occupants without seat belts were 12 times as likely to be seriously injured or killed as occupants wearing seat belts.

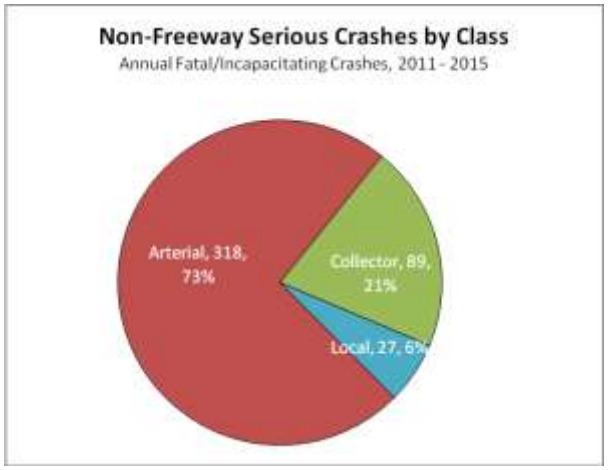
Section 3 – Roadway Characteristics of Non-Freeway Crashes

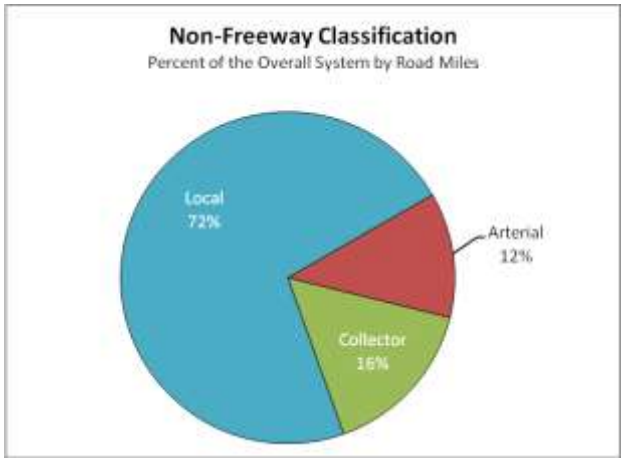
By Roadway Classification

Roadway Classification	Total Length (mi.)	Annual VMT	2011-2015 Annual Crashes		
			All	All Injury	Serious
Arterial	772	4,281,001,727	14,463	7,487	318
Collector	994	1,081,114,496	3,609	1,693	89
Local	4,565	619,881,851*	1,519	534	27
METRO	6,331	5,981,998,074	19,591	9,714	434

* VMT for local streets is a low-confidence estimate

Figures 3-1 and 3-2





Roadway Classification	% crashes resulting in		Annual Crashes per mile		Annual Crashes per VMT	
	All Injury	Serious	All Injury	Serious	All Injury	Serious
Arterial	52%	2.2%	9.70	0.412	174.9	7.4
Collector	47%	2.5%	1.70	0.090	156.6	8.2
Local	35%	1.8%	0.12	0.006	--	--
METRO	50%	2.2%	--	--	--	--

A review of the distribution of non-freeway serious crashes by roadway classification reveals one of the most conclusive relationships in this report. Arterial roadways are the location of the majority of the serious crashes in the region. Despite making up only 12% of the region's non-freeway road miles, they constitute 73% of the serious crashes (Figures 3-1 and 3-2). A similar relationship is evident for pedestrians and cyclists, as detailed in Sections 5 and 6. In general, these roads have high traffic volumes, high travel speeds, and are challenging to pedestrians crossing.

Collector streets have the highest crash rate per traffic volume (Figure 3-3). Figure 3-4 presents the functional classification of the region's roadways.

Figure 3-3

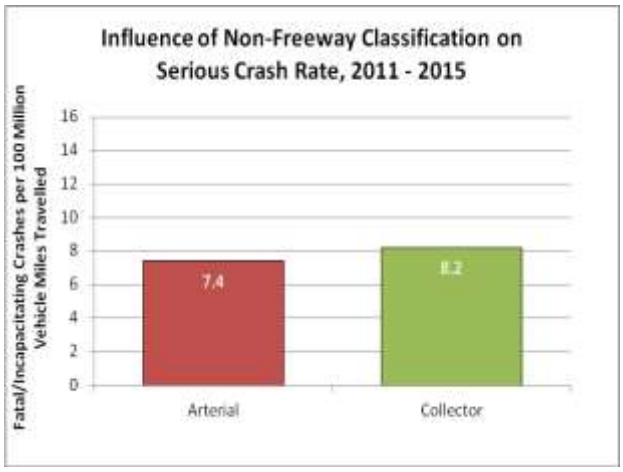


Figure 3-4

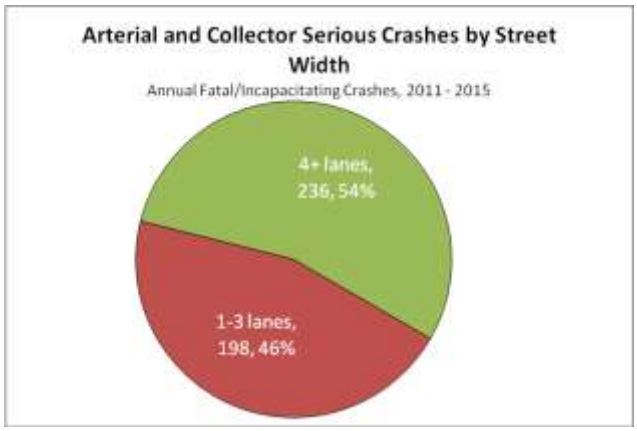
By Number of Lanes

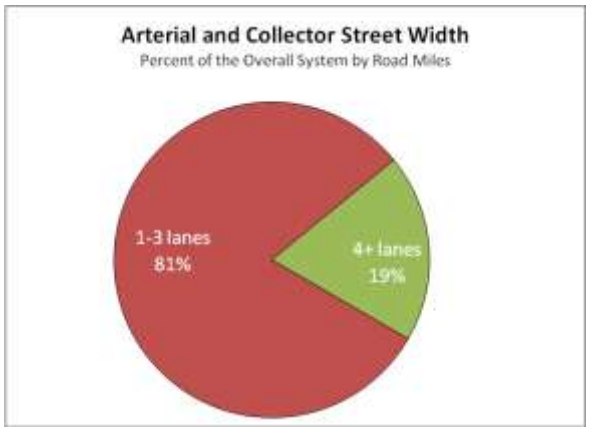
The following tables and Figures 3-5 and 3-6 summarize crashes by number of lanes for arterial and collector roadways.

Number of Lanes*	Total Length	Annual VMT	2011-2015 Annual Crashes		
			All	All injury	Serious
1 – 3 Lanes	1,427	2,971,881,073	8,932	4,191	198
4+ Lanes	340	2,738,469,044	10,597	5,502	236

* Arterial and Collector roadways only

Figures 3-5 and 3-6





Number of lanes*	% crashes resulting in		Annual Crashes per mile		Annual Crashes per VMT	
	All Injury	Serious	All Injury	All Injury	Serious	All Injury
1-3 lanes	47%	2.2%	2.94	0.14	141.0	6.6
4+ lanes	52%	2.2%	16.20	0.69	200.9	8.6

*Arterial and Collector roadways only

Figure 3-7

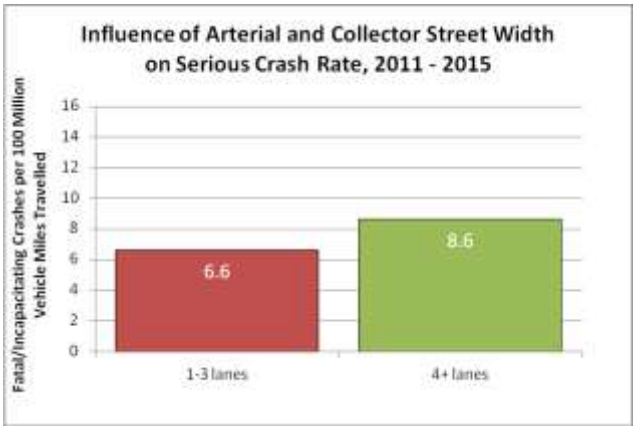
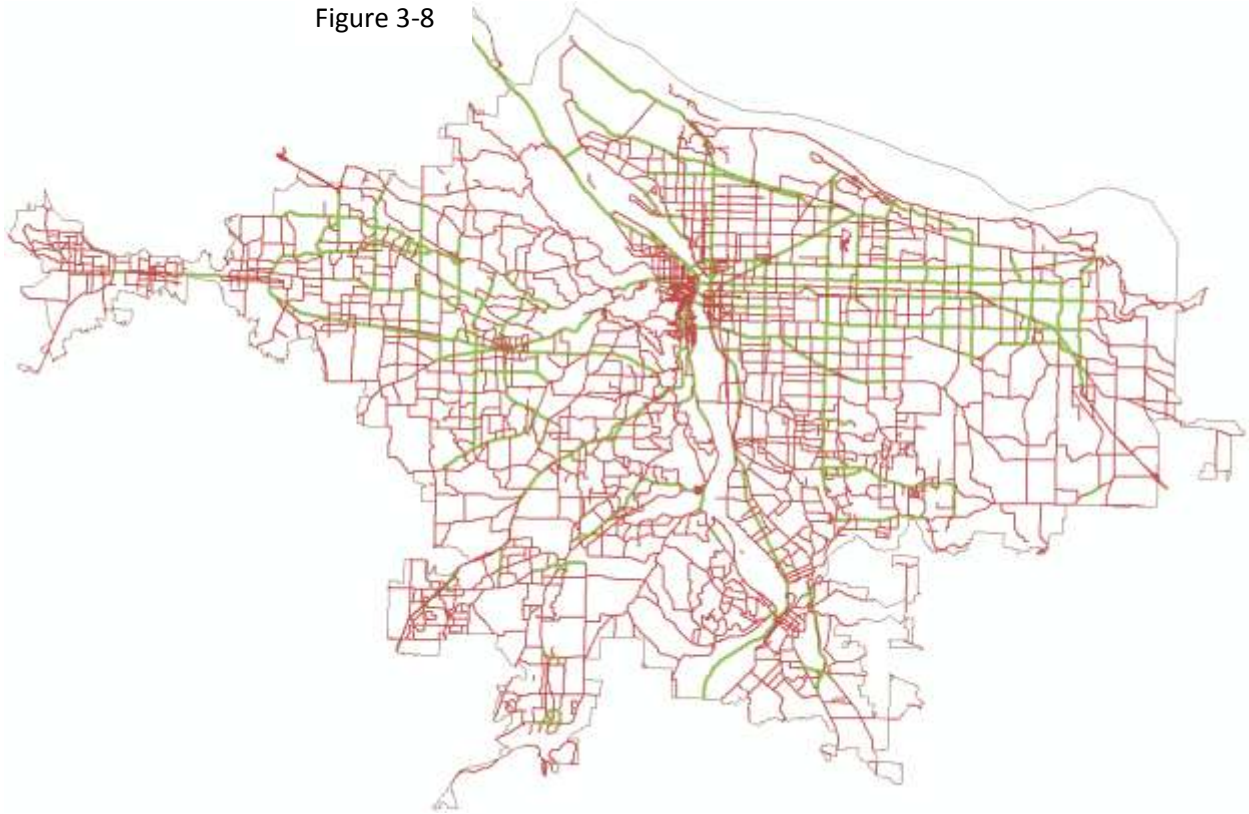


Figure 3-7 presents the crash rate per traffic volume, and Figure 3-8 presents the number of lanes for arterials and collectors in the region.

The influence of street width is consistent with the influence of roadway classification. Wider roadways are the location of a disproportionate number of serious crashes in relation to both their share of the overall system (Figures 3-5 and 3-6) and the vehicle-miles travelled they serve (Figure 3-7).

Similar patterns are documented in AASHTO's Highway Safety Manual (2010), Chapter 12.

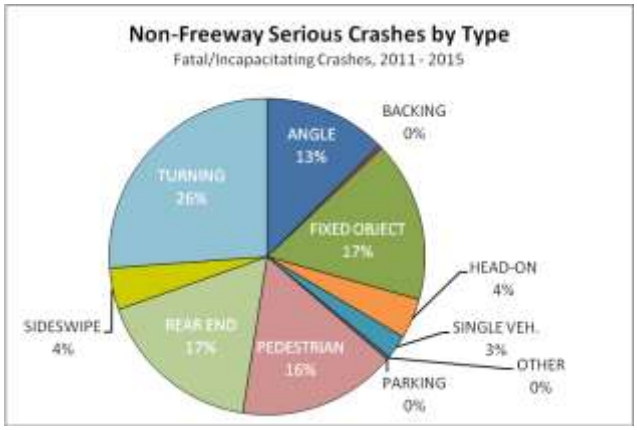
Figure 3-8

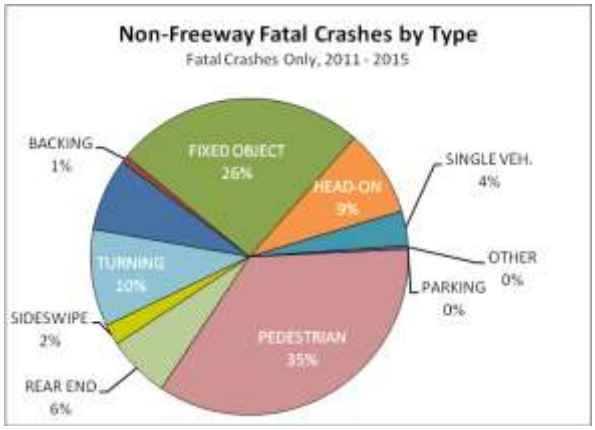


By Crash Type

Collision Type	2011-2015 Annual Crashes						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Angle	2,296	4	50	386	801	1,237	55
Backing	329	0	1	6	70	77	2
Fixed Object	1,416	14	57	241	263	561	71
Head-on	145	5	13	33	41	88	18
Single Vehicle	79	2	9	35	18	62	11
Other	51	0	1	7	7	14	1
Parking	200	0	0	8	30	38	0
Pedestrian	446	20	51	212	160	423	70
Rear End	7,912	4	71	467	3,753	4,290	74
Sideswipe	1,608	1	17	100	324	441	19
Turning	5,108	6	108	754	1,623	2,484	113
METRO	19,591	56	377	2,247	7,090	9,714	434

Figure 3-9 and 3-10





Figures 3-9 and 3-10 present non-freeway serious crash types and non-freeway fatal crash types. Fatal crashes are specifically broken out here because the distribution is substantially different. For the purpose of establishing crash type, bicycles are considered vehicles, and so there is no separate bicycle crash type.

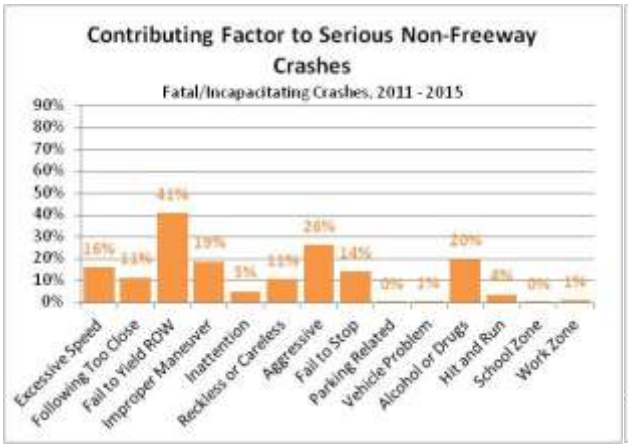
The most common serious crash types were Turning and Rear End.

The most common fatal crash types were Pedestrian and Fixed Object.

By Contributing Factor

Collision Type	2011-2015 Annual Crashes (Non-Freeway)						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	1,977	18.8	52	273	643	987	71
Following Too Close	5,792	1.2	49	335	2,762	3,147	50
Fail to Yield ROW	6,723	16.6	162	1,152	2,249	3,579	178
Improper Maneuver	3,807	15.0	67	319	903	1,304	82
Inattention	981	1.8	20	128	410	560	22
Reckless or Careless	876.8	5.6	40	193	285	525	46
Aggressive	7,181	19.2	95	562	3,131	3,807	114
Fail to Stop	7,040	1.2	60	380	3,352	3,794	61
Parking Related	81	0.0	0	4	17	21	0
Vehicle Problem	958	0.6	2	10	24	37	3
Alcohol or Drugs	1,161	31.8	54	195	235	516	86
Hit and Run	1,161	5.0	11	92	374	482	16
School Zone	66	0.2	1	13	25	39	1
Work Zone	129	0.2	3.2	17	49.6	70	3
METRO	19,591	56.4	377	2,247	7,090	9,771	434

Figures 3-11 and 3-12



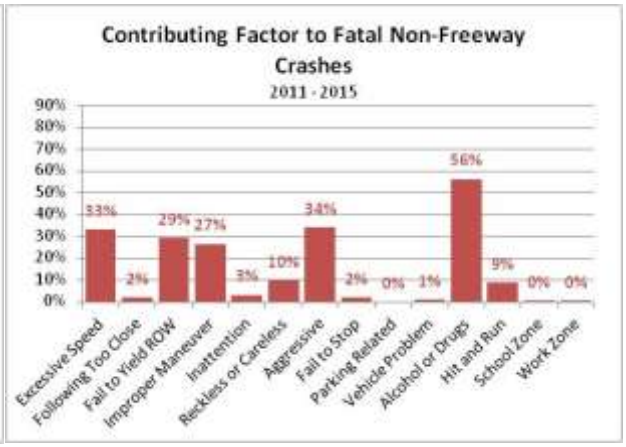


Figure 3-11 and 3-12 present the proportion of non-freeway crashes by contributing factor for serious and fatal crashes, respectively. Alcohol or Drugs, Fail to Yield ROW, Aggressive Driving, and Excessive Speed are the most common factors.

By Volume-to-Capacity Ratio

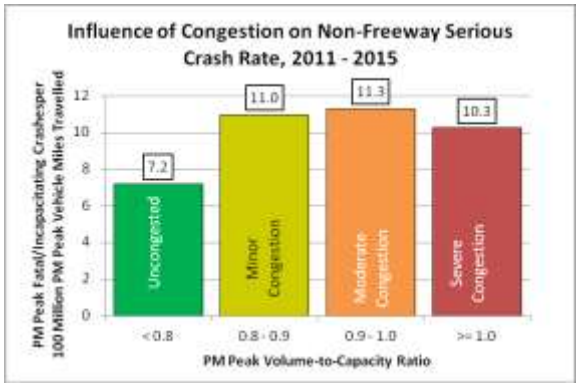
The combination of traffic data available from the region's travel demand model and crash data allowed for a comparison of traffic congestion with safety.

An analysis of serious crash rates compared to congestion levels for non-freeway roadways was performed. The analysis included all roadways in the regional travel demand model, including all arterials and collectors, as well as certain local streets serving a collector function. The intent was to establish the relationship between congestion and safety.

PM peak 3-hour Volume-to-Capacity ratios as determined by the travel demand model were compared to the same 3-hours of weekday crash data. The results are shown in the table and Figures 3-13. Figure 3-14 presents the Volume-to-Capacity ratios for the region's non-freeway roadways.

PM Peak V/C Range	Total Length (miles)	PM Peak			Per Mile		Per VMT	
		VMT	All injury	Serious	All injury	Serious	All injury	Serious
< 0.8	1,357.8	751,634,827	1,703	54	1.25	0.04	226.6	7.2
0.8 - 0.89	83.0	81,960,139	278	9	3.35	0.11	339.7	11.0
0.9 – 0.99	29.9	30,040,618	123	3	4.11	0.11	410.1	11.3
≥ 1.0	25.1	23,392,688	99	2	3.95	0.10	423.2	10.3

Figures 3-13 and 3-14



The serious crash rate per vehicle-mile travelled on arterials and collectors was highest with minor and moderate congestion.

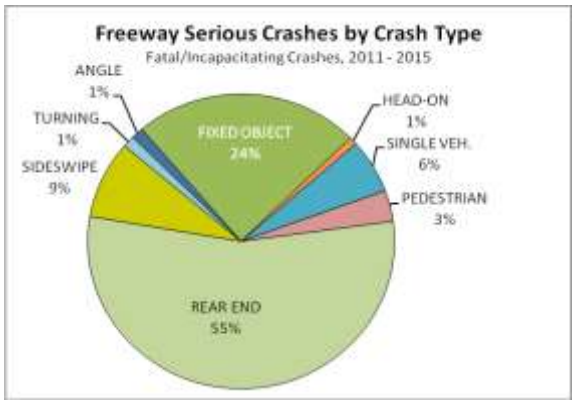
The relationship is quite different from the analysis of 2007 – 2009 data, largely because of significant differences in travel demand model assignment procedures used and resulting Volume-to-Capacity ratio estimate. In order to provide a more conclusive analysis of this relationship, use of a more accurate tool for measuring real-world congestion, such as probe data, would be recommended.

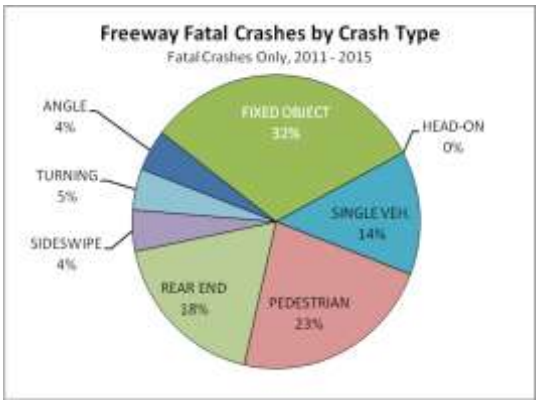
Section 4 – Roadway Characteristics of Freeway Crashes

By Crash Type

Collision Type	2011-2015 Annual Crashes						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Angle	8	0.2	0	2	3	5	1
Backing	7	0	0	0	1	1	0
Fixed Object	318	1.4	10	48	77	135	11
Head-on	6	0	0	1	3	4	0
Single Vehicle	21	0.6	2	8	4	15	3
Parking	1	0	0	0	0	0	0
Pedestrian	4	1.0	1	2	0	3	2
Rear End	2,661	0.8	25	195	1,195	1,415	26
Sideswipe	589	0.2	4	36	152	192	4
Turning	46	0.2	0	5	15	20	1
Other	27	0	0	3	3	7	0
METRO	3,688	4.4	43	301	1,454	1,798	47
Total – Fwy Mainline	3,117	3.8	37	252	1,230	1,519	41
Total – Fwy Ramps	572	0.6	6	48	225	279	7

Figure 4-1 and 4-2





Figures 4-1 and 4-2 present freeway serious crash types and freeway fatal crash types. Fatal crashes are specifically broken out here because the distribution is substantially different.

The most common serious crash type was Rear End crashes.

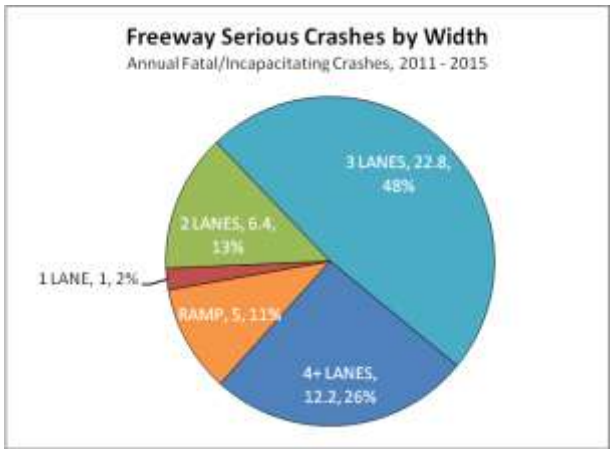
The most common fatal crash type was Fixed Object crashes.

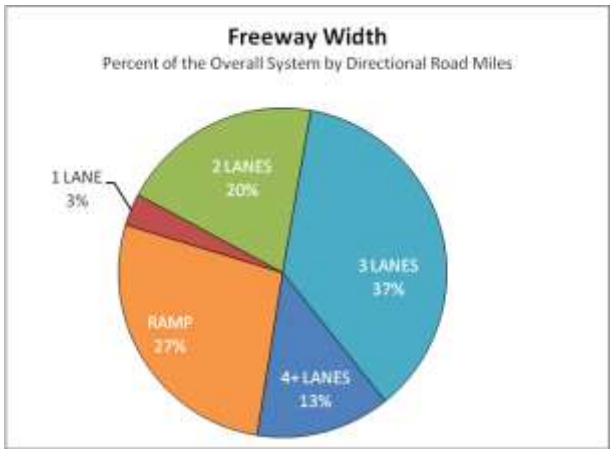
By Number of Lanes

No. lanes (in one direction)	Total Length (miles)	Annual VMT	2011-2015 Annual Crashes		
			All	All injury	Serious
Freeway ramp	83	274,628,607	300.4	150.2	5
1 Lanes	10	47,817,829	67.6	33.2	1
2 Lanes	61	757,614,942	493.4	233.4	6.4
3 Lanes	111	2,385,576,075	1906	921.6	22.8
4+ Lanes	40	979,418,170	908.8	454.6	12.2
ALL FREEWAYS	304	4,445,055,623	3,688	1,798	47

Figures 4-3 and 4-4 present the distribution of freeway crashes by number of lanes. They also present the proportion of freeway crashes that occur on ramps.

Figure 4-3 and 4-4





Number of lanes (in one direction)	% crashes resulting in		Per mile		Per VMT	
	Injury	Fatal/ Incapac.	Injury crashes	Fatal/ Incapac.	Injury crashes	Fatal/ Incapac.
Freeway ramp	50%	1.7%	1.8	0.06	54.7	1.82
1 Lanes	49%	1.5%	3.5	0.10	69.4	2.09
2 Lanes	47%	1.3%	3.9	0.11	30.8	0.84
3 Lanes	48%	1.2%	8.3	0.21	38.6	0.96
4+ Lanes	50%	1.3%	11.3	0.30	46.4	1.25
ALL FREEWAYS	49%	1.3%	5.9	0.16	40.4	1.07

The influence of freeway width is not as pronounced as for non-freeway roadways. Freeways with two directional lanes (including auxiliary lanes) exhibit the lowest crash rates, while the rate increases for freeways with more or fewer lanes (Figure 4-5). Figure 4-6 presents the number of lanes for the region's freeways. Ramps exhibit a higher rate per mile travelled, while still representing a relatively small proportion (11%) of all serious freeway crashes (Figure 4-3).

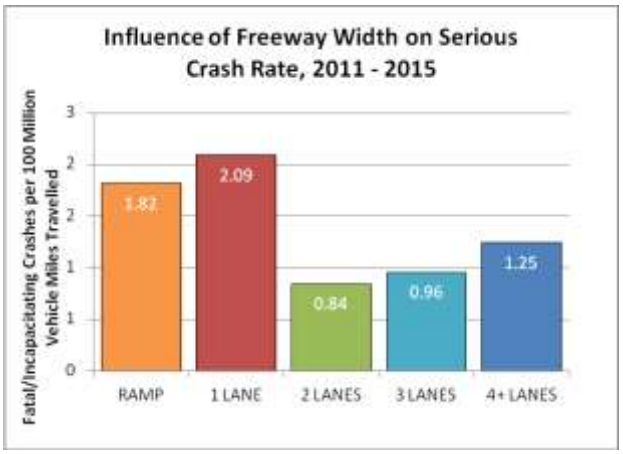
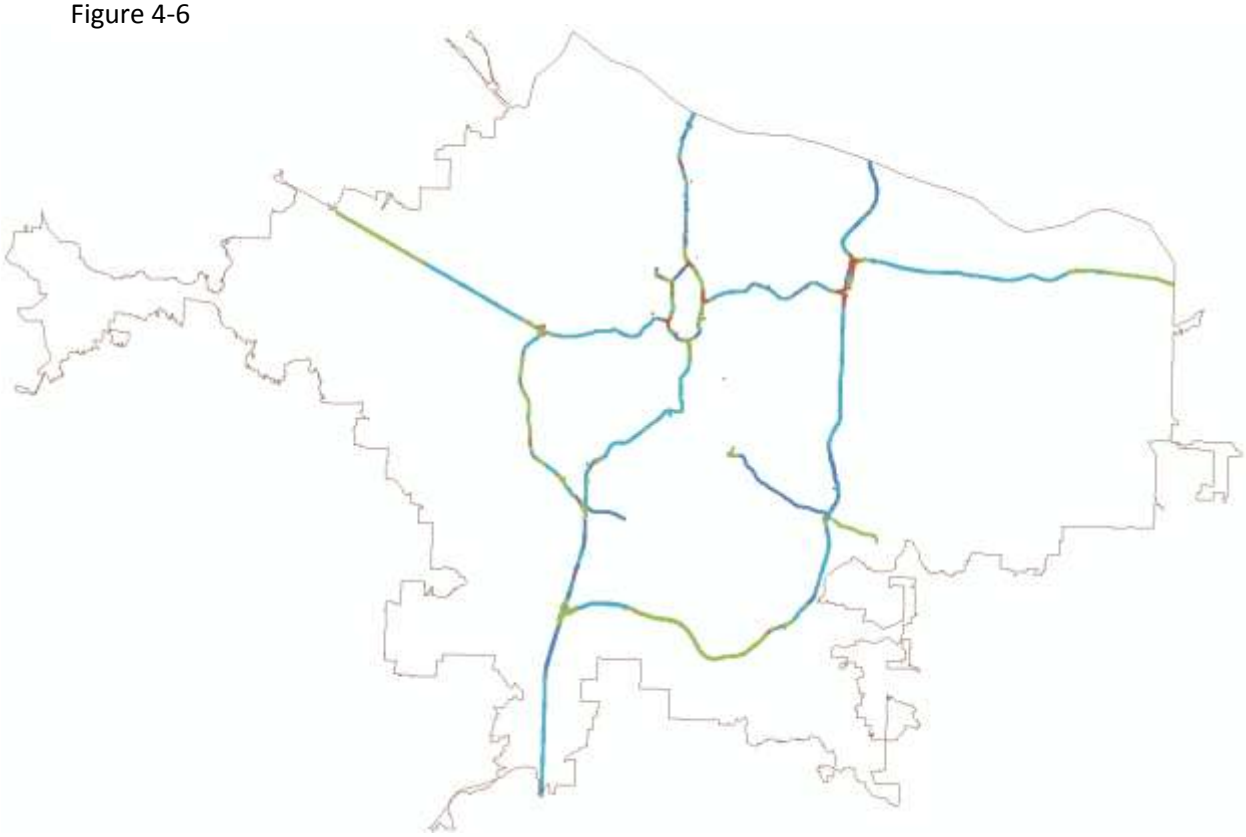


Figure 4-5

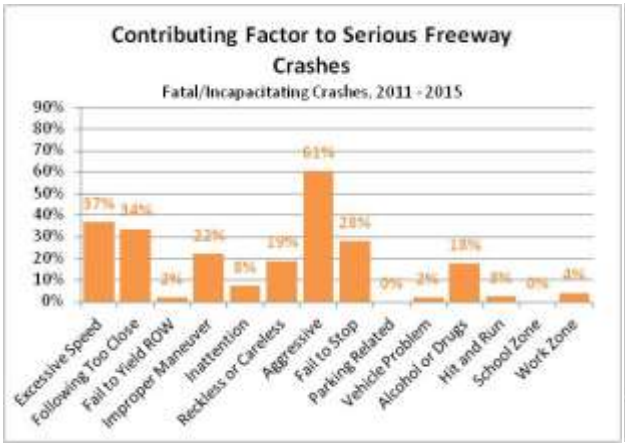
Figure 4-6



By Contributing Factor

Collision Type	2011-2015 Annual Crashes (Freeway)						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	915	1.8	16	96	375	488	18
Following Too Close	1,986	0.2	16	147	887	1,050	16
Fail to Yield ROW	79	0.4	1	9	24	33	1
Improper Maneuver	706	1.2	9	56	188	255	11
Inattention	192	0.6	3	19	81	104	4
Reckless or Careless	145.8	0.8	8	27	60	96	9
Aggressive	2,451	2.0	27	204	1,055	1,288	29
Fail to Stop	1,932	0.4	13	131	874	1,018	13
Parking Related	34.2	0.0	0	0	0	1	0
Vehicle Problem	98	0.2	1	3	7	11	1
Alcohol or Drugs	221	2.6	6	20	31	59	8
Hit and Run	221	0.0	1	12	78	91	1
School Zone	0	0.0	0	0	0	0	0
Work Zone	48	0	1.8	7.6	19.4	29	2
METRO	3,688	4.4	43	301	1,454	1,802	47

Figures 4-7 and 4-8



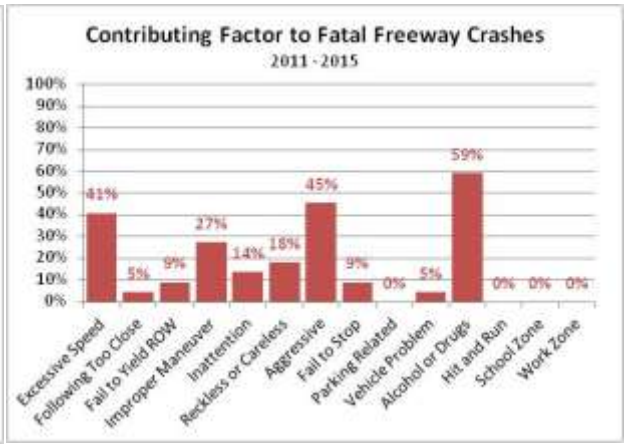


Figure 4-7 and 4-8 present the proportion of freeway crashes by contributing factor for serious and fatal crashes, respectively. Alcohol and Drugs, Aggressive Driving and Excessive Speed are the most common factors.

By Volume-to-Capacity Ratio

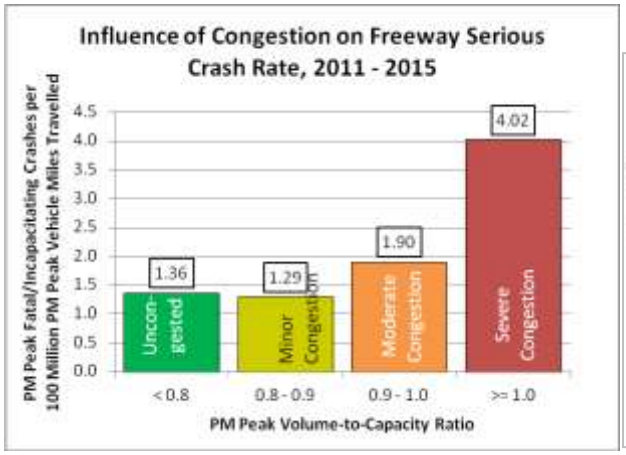
The combination of traffic data available from the region's travel demand model and crash data allowed for a comparison of traffic congestion with safety.

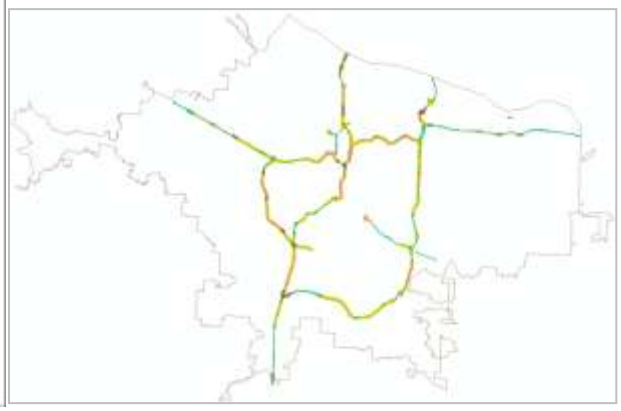
An analysis of serious crash rates compared to congestion levels for freeways was performed. The intent was to establish the relationship between congestion and safety.

PM peak 3-hour Volume-to-Capacity ratios as determined by the travel demand model were compared to the same 3-hours of weekday crash data. The results are shown in the table and Figures 4-9. Figure 4-10 presents the Volume-to-Capacity ratios for the region's freeways, including ramps.

PM Peak V/C Range	Total Length (miles)	PM Peak			Per Mile		Per VMT	
		VMT	All injury crashes	Fatal/ Incapac.	All injury crashes	Fatal/ Incapac.	All injury crashes	Fatal/ Incapac.
< 0.8	211.8	381,109,230	192	5	0.91	0.025	50.3	1.36
0.8 - 0.9	53.0	170,070,199	125	2	2.35	0.042	73.4	1.29
0.9 - 1.0	28.3	94,815,836	122	2	4.30	0.064	128.5	1.90
≥ 1.0	9.7	24,850,850	51	1	5.20	0.103	203.6	4.02

Figures 4-9 and 4-10





The serious crash rate per vehicle-mile travelled on freeways increased with moderate and severe congestion.

The relationship is quite different from the analysis of 2007 – 2009 data, largely because of significant differences in travel demand model assignment procedures used and resulting Volume-to-Capacity ratio estimate. In order to provide a more conclusive analysis of this relationship, use of a more accurate tool for measuring real-world congestion, such as probe data, would be recommended.

Section 5 – Pedestrians (Non-Freeway Crashes)

By Year

Year	Fatal Crashes (Fatalities)	Injury A Crashes	Injury B Crashes	Injury C Crashes	All Injury Crashes	Serious
2011	15 (15)	49	191	161	401	64
2012	24 (24)	62	238	184	484	86
2013	19 (20)	46	227	132	405	65
2014	22 (22)	57	238	154	449	79
2015	25 (25)	55	196	190	441	80
METRO	105 (106)	269	1,090	821	2,180	374

Figure 5-1

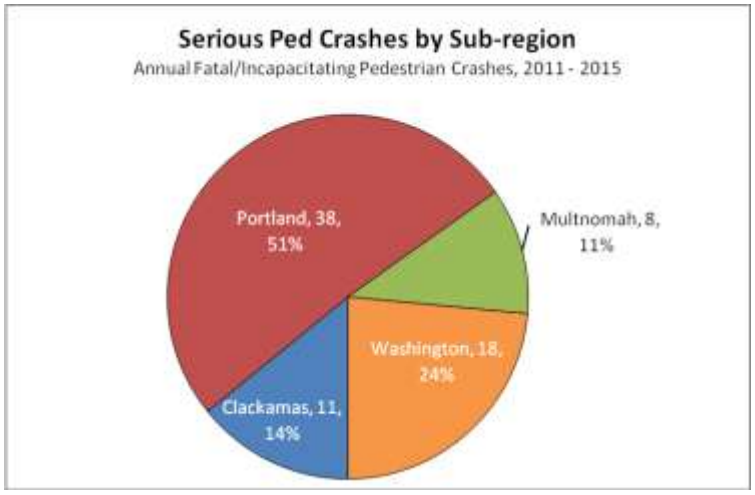
As presented in Figure 5-1, serious and fatal pedestrian crashes increased somewhat over the 5-year period.

By Sub-Region

Sub-Region	2011-2015 Annual Pedestrian Crashes					
	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Clackamas	3.0	8	25	19	51	11
Portland	10.4	28	119	86	232	38
Multnomah (excl. Portland)	1.8	7	27	18	52	8
Washington	5.8	12	47	42	101	18
METRO	21.0	54	218	164	436	75

Sub-Region	Population	Total VMT	Annual Pedestrian Injury Crashes		Annual Serious Pedestrian Crashes	
			per 1M residents	per 100M VMT	per 1M residents	per 100M VMT
Clackamas	290,630	1,047,952,697	176.2	4.89	36.5	1.01
Portland	620,540	2,095,570,120	374.5	11.09	61.6	1.82
Multnomah (excl. Portland)	152,611	548,334,475	339.4	9.45	55.0	1.53
Washington	539,448	2,030,869,086	186.5	4.95	32.6	0.87
METRO	1,614,998	5,722,726,378	270.0	7.62	46.3	1.31

Figure 5-2



With the highest population, transit usage, VMT, and likely the largest number of pedestrians, Portland has 51% of the region's serious pedestrian crashes (Figure 5-2). Portland also has the highest rate of serious pedestrian crashes per capita and per VMT. Multnomah (excludes Portland) also has high rates of serious pedestrian crashes per capita and per VMT. Clackamas County and Washington County have relatively low rates of serious pedestrian crashes, which is likely largely due to fewer people walking.

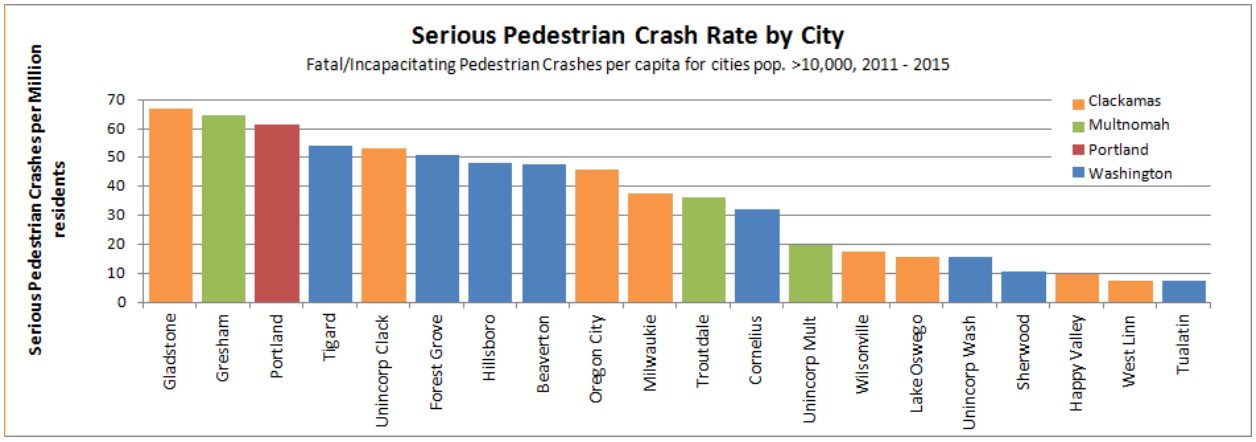
By City

City	2011-2015 Annual Pedestrian Crashes					
	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Beaverton	1.0	3.6	9.2	7.4	20.2	4.6
Cornelius	0.0	0.4	0.6	0.8	1.8	0.4
Durham	0.0	0.0	0.0	0.0	0.0	0.0
Fairview	0.0	0.0	1.4	0.4	1.8	0.0
Forest Grove	0.6	0.6	2.0	1.4	4.0	1.2
Gladstone	0.2	0.6	1.0	0.0	1.6	0.8
Gresham	1.6	5.6	22.6	14.4	42.6	7.2
Happy Valley	0.0	0.2	1.0	1.0	2.2	0.2
Hillsboro	2.0	2.8	13.0	13.0	28.8	4.8
Johnson City	0.0	0.0	0.0	0.0	0.0	0.0
King City	0.0	0.2	0.4	0.0	0.6	0.2
Lake Oswego	0.0	0.6	2.4	1.6	4.6	0.6
Maywood Park	0.0	0.2	0.0	0.0	0.2	0.2
Milwaukie	0.0	0.8	3.0	1.8	5.6	0.8
Oregon City	0.8	0.8	3.8	4.2	8.8	1.6
Portland	10.4	27.8	119.0	85.6	232.4	38.2
Rivergrove	0.0	0.0	0.0	0.0	0.0	0.0
Sherwood	0.2	0.0	2.0	0.8	2.8	0.2
Tigard	0.8	2.0	4.6	4.6	11.2	2.8
Troutdale	0.0	0.6	2.4	1.8	4.8	0.6
Tualatin	0.0	0.2	3.6	5.2	9.0	0.2
West Linn	0.0	0.2	1.4	0.4	2.0	0.2
Wilsonville	0.0	0.4	1.4	1.6	3.4	0.4
Wood Village	0.2	0.0	0.6	1.0	1.6	0.2
Uninc. Clackamas	2.0	4.0	11.0	8.2	23.2	6.0
Uninc. Multnomah	0.0	0.2	0.2	0.0	0.4	0.2
Uninc. Washington	1.2	2.0	11.4	9.0	22.4	3.2
METRO	21.0	53.8	218.0	164.2	436.0	74.8

While Portland has the largest number and rate of serious pedestrian crashes, it is apparent from Figure 5-3 that there are a number of other cities and areas with a high rate of serious pedestrian crashes per capita. Gladstone, Gresham, Tigard, unincorporated Clackamas County, Forest Grove, Hillsboro, Beaverton, and Oregon City all experience relatively high rates of serious pedestrian crashes.

City	Population (2015)	2011-2015 Annual Pedestrian Crashes	
		All Injury per capita	Serious per capita
Beaverton	96,704	208.9	47.6
Cornelius	12,389	145.3	32.3
Durham	1,430	0.0	0.0
Fairview	9,357	192.4	0.0
Forest Grove	23,630	169.3	50.8
Gladstone	11,990	133.4	66.7
Gresham	111,716	381.3	64.4
Happy Valley	20,835	105.6	9.6
Hillsboro	100,109	287.7	47.9
Johnson City	588	0.0	0.0
King City	3,817	157.2	52.4
Lake Oswego	38,156	120.6	15.7
Maywood Park	809	247.2	247.2
Milwaukie	21,365	262.1	37.4
Oregon City	35,004	251.4	45.7
Portland	620,540	374.5	61.6
Rivergrove	321	0.0	0.0
Sherwood	19,012	147.3	10.5
Tigard	51,642	216.9	54.2
Troutdale	16,486	291.2	36.4
Tualatin	26,617	338.1	7.5
West Linn	26,267	76.1	7.6
Wilsonville	22,932	148.3	17.4
Wood Village	4,056	394.5	49.3
Uninc. Clackamas	113,172	205.0	53.0
Uninc. Multnomah	10,187	39.3	19.6
Uninc. Washington	204,098	109.8	15.7
METRO	1,603,229	272.0	46.7

Figure 5-3



By Month

Month	2011-2015 Annual Pedestrian Crashes	
	All injury	Serious
January	48.6	11.0
February	38.6	7.2
March	33.4	5.4
April	27.0	4.2
May	30.2	4.0
June	26.2	4.6
July	29.2	3.8
August	28.0	6.0
September	31.2	5.8
October	44.0	6.6
November	47.8	8.0
December	51.8	8.2

Figure 5-4

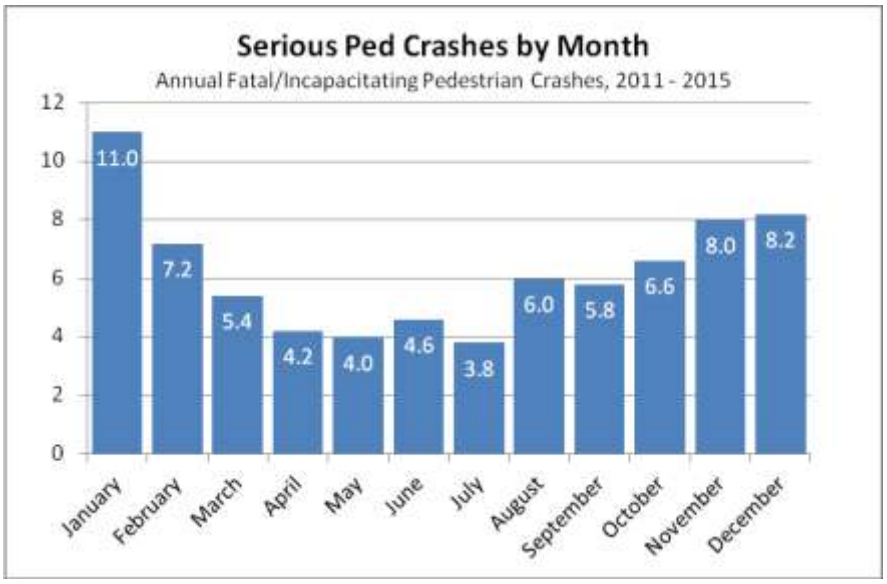


Figure 5-4 presents the annual average number of serious crashes by month. Fall and winter months generally have more serious pedestrian crashes.

By Time of Day

Figure 5-5

Serious Crashes by Day of Week and Hour

Annual Fatal/Incapacitating Pedestrian Crashes, 2011 - 2015

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Hour	Average Wkday	Average Wkend
12 AM	0.2	0.0	0.0	0.0	0.2	0.4	0.8	12 AM	0.1	0.5
1 AM	0.6	0.0	0.2	0.0	0.0	0.0	0.0	1 AM	0.0	0.3
2 AM	1.0	0.0	0.0	0.2	0.2	0.4	0.4	2 AM	0.2	0.7
3 AM	0.2	0.2	0.2	0.0	0.0	0.2	0.2	3 AM	0.1	0.2
4 AM	0.2	0.0	0.0	0.0	0.0	0.0	0.0	4 AM	0.0	0.1
5 AM	0.0	0.4	0.0	0.6	0.4	0.0	0.2	5 AM	0.3	0.1
6 AM	0.0	0.2	0.8	0.6	0.2	0.6	0.2	6 AM	0.5	0.1
7 AM	0.2	0.0	0.2	0.4	0.2	0.2	0.0	7 AM	0.2	0.1
8 AM	0.0	1.0	0.2	0.2	0.0	0.8	0.0	8 AM	0.4	0.0
9 AM	0.6	0.0	0.2	0.2	0.4	0.2	0.2	9 AM	0.2	0.4
10 AM	0.0	0.0	0.0	0.2	0.0	0.0	0.4	10 AM	0.0	0.2
11 AM	0.2	0.4	0.2	0.4	0.6	0.8	0.4	11 AM	0.5	0.3
12 PM	0.0	0.4	0.0	0.2	0.2	0.0	0.2	12 PM	0.2	0.1
1 PM	0.0	0.2	0.4	0.4	0.2	0.4	0.4	1 PM	0.3	0.2
2 PM	0.4	0.8	0.4	0.2	0.8	0.4	0.4	2 PM	0.5	0.4
3 PM	0.4	1.2	1.2	0.6	1.2	1.2	0.8	3 PM	1.1	0.6
4 PM	0.2	0.6	0.6	1.2	0.6	0.8	0.6	4 PM	0.8	0.4
5 PM	0.6	1.0	1.6	1.0	1.0	0.6	0.0	5 PM	1.0	0.3
6 PM	0.6	0.8	1.2	1.2	1.4	1.8	1.6	6 PM	1.3	1.1
7 PM	0.8	0.2	0.8	0.8	1.8	1.2	2.2	7 PM	1.0	1.5
8 PM	0.8	0.2	1.4	0.4	0.6	0.6	0.8	8 PM	0.6	0.8
9 PM	0.8	1.0	0.4	0.4	0.8	0.6	0.6	9 PM	0.6	0.7
10 PM	0.6	0.6	0.2	0.2	1.0	0.8	0.6	10 PM	0.6	0.6
11 PM	0.2	0.0	0.4	0.2	0.6	0.6	0.4	11 PM	0.4	0.3

	Sun	Mon	Tue	Wed	Thu	Fri	Sat		Average Wkday	Average Wkend
All Day	8.6	9.2	10.6	9.6	12.4	12.6	11.4	All Day	10.9	10.0

Figure 5-5 presents the rate of serious pedestrian crashes by day of the week and hour of the day using a "heat map" format. Dark cells indicate the highest relative crash time periods; light cells indicate the lowest relative crash time periods. The average weekday and weekend day are summarized on the right side of the figure, while each day is summarized and compared at the bottom of the figure.

The weekday late afternoon and evening peak hours produce the highest number of serious pedestrian crashes. A larger proportion of evening crashes are evident as compared to all crashes. Late Friday night/early Saturday morning and late Saturday night show somewhat high rates of serious pedestrian crashes. Thursday, Friday, and Saturday have the highest rates of serious pedestrian crashes, predominantly evening crashes.

By Weather

2011-2015 Annual Pedestrian Crashes		
Weather	All injury	Serious
Cloudy/Clear	310	53.6
Rain/Fog	115	19.6
Sleet/Snow	2	0.2
Unknown	9	1.4
METRO	436	74.8

The majority (72%) of serious pedestrian crashes occurred in clear or cloudy conditions (Figure 5-6), as compared to 80% for all crashes (Figure 2-16).

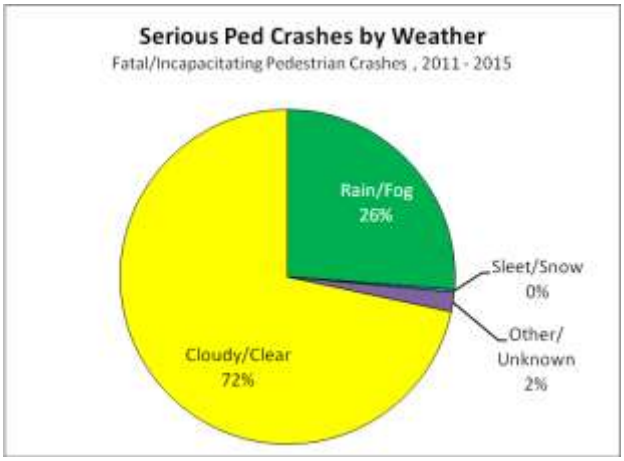


Figure 5-6

By Road Surface Condition

2011-2015 Annual Pedestrian Crashes		
Road	All injury	Serious
Dry	281	48.4
Ice/Snow	3	0.4
Wet	145	25.0
Unknown	7	1.0
METRO	436	74.8

The majority (65%) of serious pedestrian crashes occurred in dry conditions (Figure 5-7), as compared to 73% for all crashes (Figure 2-17).

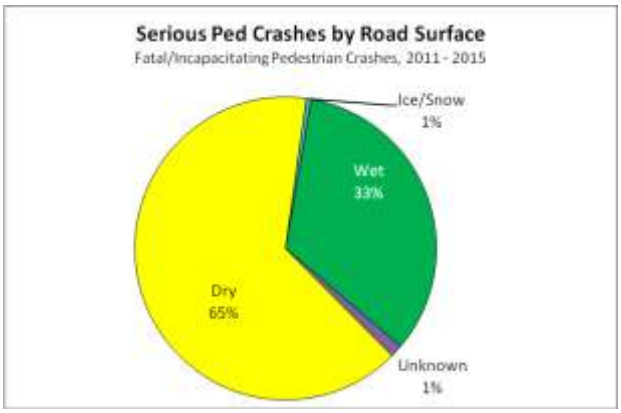


Figure 5-7

By Lighting

2011-2015 Annual Pedestrian Crashes		
Lighting	All injury	Serious
Daylight	224	27.2
Dawn/Dusk	42	8.4
Night - Dark	31	9.6
Night - Lit	138	29.6
Unknown	1	0.0
METRO	436	74.8

Only 36% of serious pedestrian crashes occurred in daylight (Figure 5-8), as compared to 59% for all crashes (Figure 2-18). Serious pedestrian crashes are significantly more likely after dark as compared to other modes.

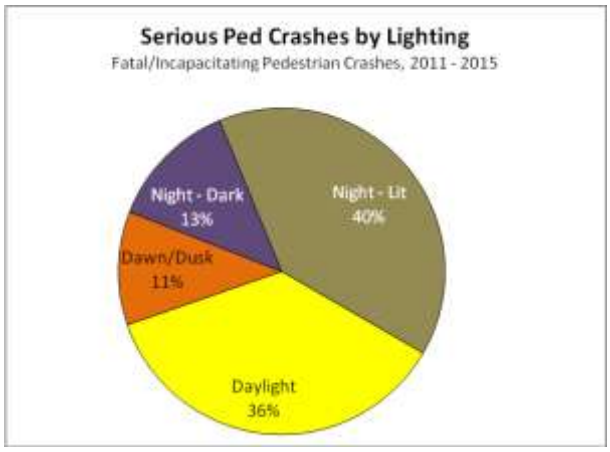
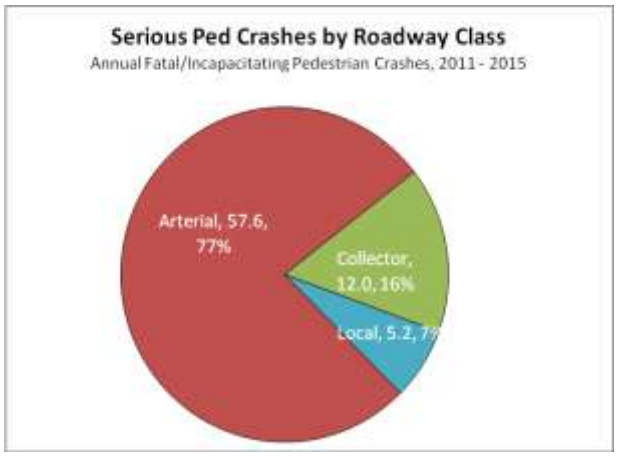


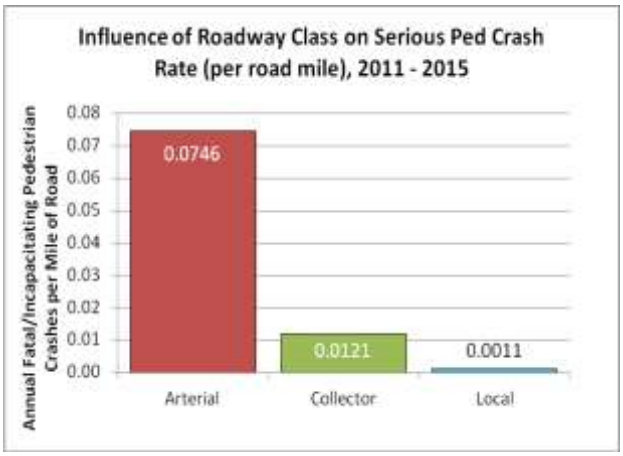
Figure 5-8

By Roadway Classification

Roadway Classification	Total Length (miles)	2011-2015 Annual Pedestrian Crashes		
		Serious	Serious per road-mile	Serious per VMT
Arterial	772	57.6	0.0746	1.35
Collector	994	12.0	0.0121	1.11
Local	4,565	5.2	0.0011	n/a
METRO	6,331	74.8	0.0118	--

Figures 5-9 and 5-10





As with overall crashes, the region's serious pedestrian crashes occur primarily on the arterials, accounting for 77% of these crashes. Figure 5-9 presents the distribution of serious pedestrian crashes by roadway classification. As can be seen in Figure 5-10, which presents the rate of serious pedestrian crashes per mile of roadway, arterial roadways are about 6 times as likely as collectors per mile to be the location of a serious pedestrian crash, and more than 65 times as likely as local streets per mile to be the location of a serious pedestrian crash.

As can be seen in Figure 5-11, when normalized by motor vehicle traffic volume, the serious pedestrian crash rate on arterials is still higher than on collectors. A reliable estimate of vehicle miles travelled was not available for local streets.

Many transit routes follow arterial roadways, increasing the need for people to cross these roadways safely.

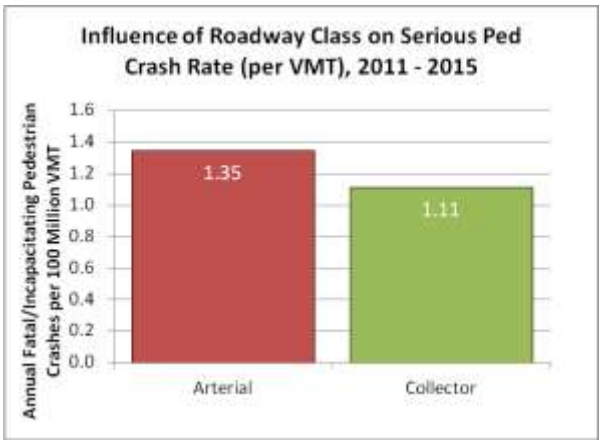


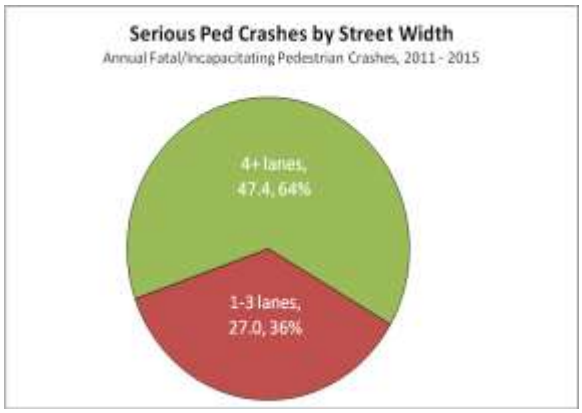
Figure 5-11

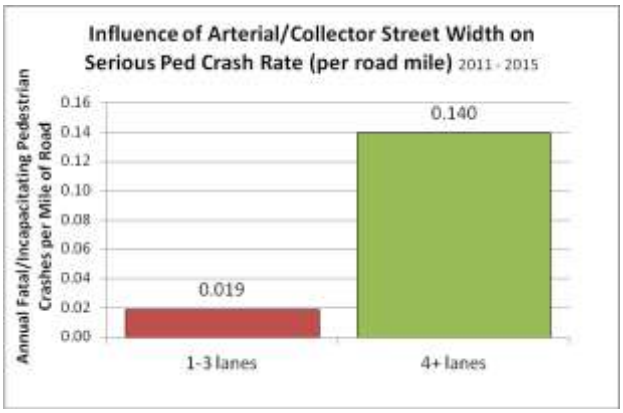
By Number of Lanes

Number of Lanes*	Total Length (miles)	2011-2015 Annual Pedestrian Crashes		
		Serious	Serious per road-mile	Serious per VMT
1 – 3 Lanes	1,427	27.0	0.019	0.91
4+ Lanes	340	47.4	0.140	1.73
METRO	1,766	74.4	0.042	0.88

* Arterial and Collector roadways only

Figures 5-12 and 5-13



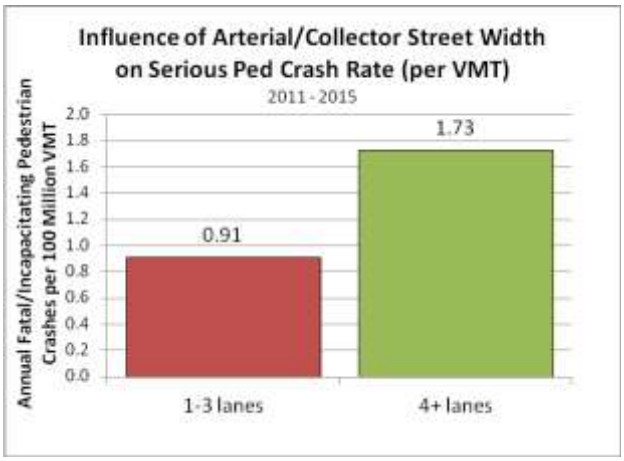


The influence of street width is consistent with the influence of roadway classification (Figure 5-12). Wider roadways are the location of a disproportionate number of serious pedestrian crashes in relation to both their share of the overall system (Figure 5-13) and the vehicle-miles travelled they serve (Figure 5-14). The serious pedestrian crash rate increases dramatically for roadways with 4 or more lanes. This effect is in spite of the fact that such arterials often discourage pedestrian travel in the first place, thereby reducing potential pedestrian exposure.

As can be seen in Figure 5-14, even when normalized by motor vehicle traffic volume, the serious pedestrian crash rate on wider roadways is still substantially higher than on narrower roads. Wider roadways are particularly hazardous to pedestrians.

Many transit routes follow wider roadways, increasing the need for people to cross these roadways safely.

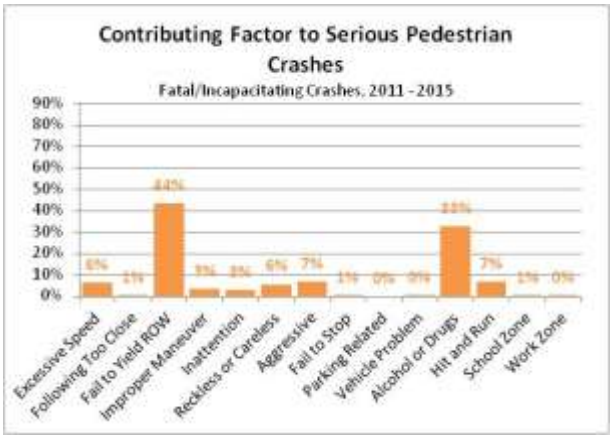
Figure 5-14



By Contributing Factor

Factor	2011-2015 Annual Crashes (Pedestrian)						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	9	2.2	3	3	2	9	5
Following Too Close	1	0.0	0	1	0	1	0
Fail to Yield ROW	295	8.4	24	144	116	293	33
Improper Maneuver	16	1.4	1	7	6	16	3
Inattention	10	0.4	2	5	3	10	2
Reckless or Careless	14.4	1.2	3	8	3	14	4
Aggressive	10	2.2	3	3	2	10	5
Fail to Stop	3	0.0	0	1	2	3	0
Parking Related	0.8	0.0	0	0	1	1	0
Vehicle Problem	53	0.2	0	0	1	1	0
Alcohol or Drugs	18	11.0	13	20	9	53	24
Hit and Run	18	3.2	2	6	6	17	5
School Zone	6	0.2	0	3	3	6	0
Work Zone	4	0	0.2	1.6	1.8	4	0
METRO	461	21.0	54	218	164	457	75

Figures 5-15 and 5-16



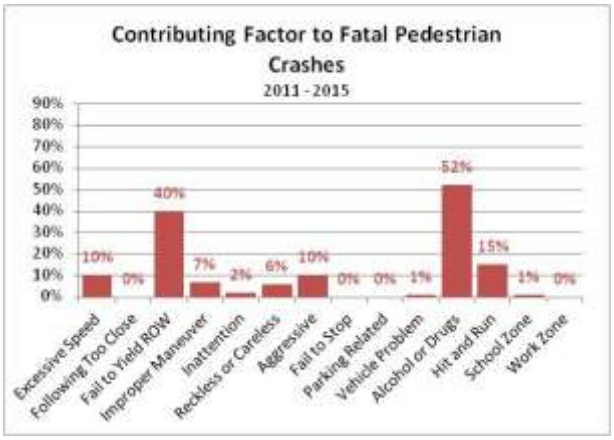
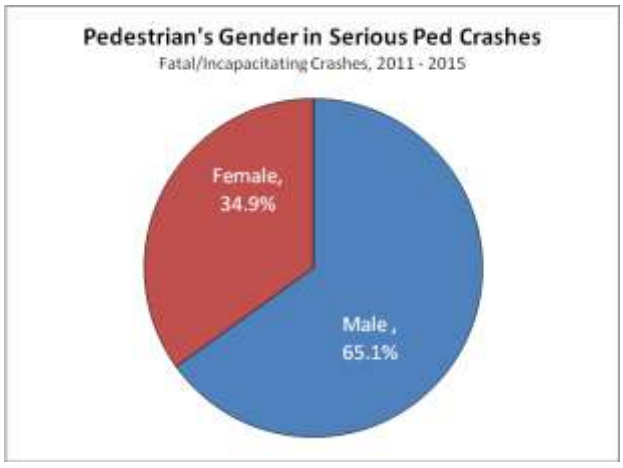


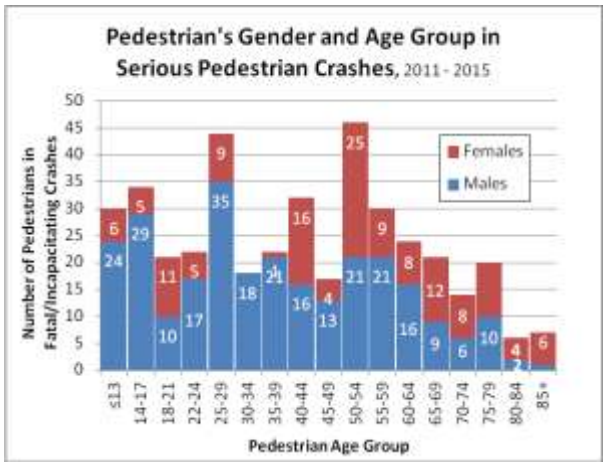
Figure 5-15 and 5-16 present the proportion of pedestrian crashes by contributing factor for serious and fatal crashes, respectively. Alcohol or Drugs and Failure to Yield are the most common factors. The data do not specify whether the driver, the pedestrian, or both were under the influence of alcohol. Other factors, such as Failure to Yield are for the driver.

By Pedestrian's Age and Gender

The age and gender of pedestrians involved in crashes are presented in the following table and Figures 5-17 and 5-18.

	Total Male Pedestrians (2011 – 2015)			Total Female Pedestrians (2011 – 2015)		
Age	All	Serious	Percent Serious	All	Serious	Percent Serious
≤13	117	24	20.5%	70	6	8.6%
14-17	126	29	23.0%	90	5	5.6%
18-21	113	10	8.8%	96	11	11.5%
22-24	101	17	16.8%	103	5	4.9%
25-29	154	35	22.7%	112	9	8.0%
30-34	105	18	17.1%	65	0	0.0%
35-39	59	21	35.6%	71	1	1.4%
40-44	97	16	16.5%	98	16	16.3%
45-49	110	13	11.8%	55	4	7.3%
50-54	113	21	18.6%	127	25	19.7%
55-59	73	21	28.8%	61	9	14.8%
60-64	61	16	26.2%	62	8	12.9%
65-69	33	9	27.3%	43	12	27.9%
70-74	26	6	23.1%	32	8	25.0%
75-79	23	10	43.5%	15	10	66.7%
80-84	11	2	18.2%	18	4	22.2%
85+	10	1	10.0%	22	6	27.3%
Unknown	66	1	1.5%	61	6	9.8%
METRO	1,398	270	19.3%	1,201	145	12.1%





Figures 5-17 and 5-18

Section 6 – Bicyclists (Non-Freeway Crashes)

By Year

Year	Fatal Crashes (Fatalities)	Injury A Crashes	Injury B Crashes	Injury C Crashes	All Injury Crashes	Fatal/ Incapac.
2011	4 (4)	28	283	166	477	32
2012	3 (3)	34	357	166	557	37
2013	0 (0)	33	320	132	485	33
2014	1 (1)	37	311	160	508	38
2015	2 (2)	33	261	181	475	35
METRO	10 (10)	165	1,532	805	2,502	175

Figure 6-1

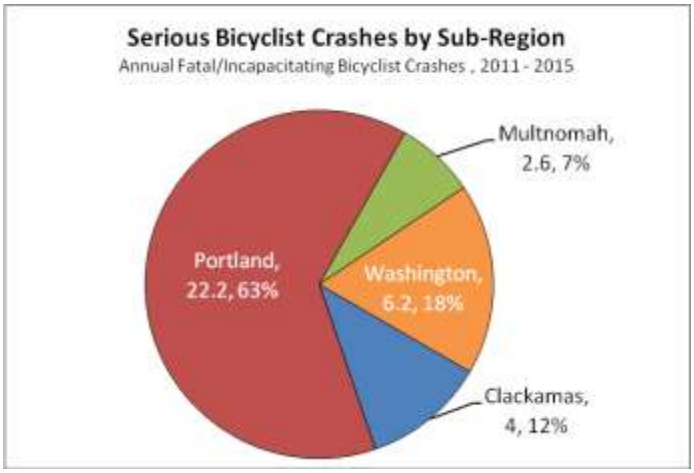
As presented in Figure 6-1, serious bicyclist crashes fluctuated over the 5-year period, while fatal bicycle crashes declined. No clear trend is evident.

By Sub-Region

Sub-region	2011-2015 Annual Bicyclist Crashes					
	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Clackamas	0.2	3.8	26	13	43	4.0
Portland	1.2	21.0	193	98	312	22.2
Multnomah (excl. Portland)	0.0	2.6	24	15	42	2.6
Washington	0.6	5.6	63	35	103	6.2
METRO	2.0	33.0	306	161	500	35.0

Sub-region	Population (2015)	Total VMT	Annual Bicyclist Injury Crashes		Annual Serious Bicyclist Crashes	
			per 1M residents	per 100M VMT	per 1M residents	per 100M VMT
Clackamas	290,630	1,047,952,697	148.6	4.1	13.8	0.38
Portland	620,540	2,095,570,120	503.4	14.9	35.8	1.06
Multnomah (excl. Portland)	152,611	548,334,475	272.6	7.6	17.0	0.47
Washington	539,448	2,030,869,086	191.3	5.1	11.5	0.31
METRO	1,603,229	5,722,726,378	312.1	8.7	21.8	0.61

Figure 6-2



With the highest population, transit usage, VMT, and number of bicyclists, Portland has 63% of the region's serious bicycle crashes (Figure 6-2). Portland also has the highest rate of serious bicycle crashes per capita and per VMT. Multnomah (excludes Portland) has moderate rates of serious bicycle crashes per capita and per VMT. Clackamas County and Washington County have relatively low rates of serious bicycle crashes, which is likely partially due to fewer people cycling.

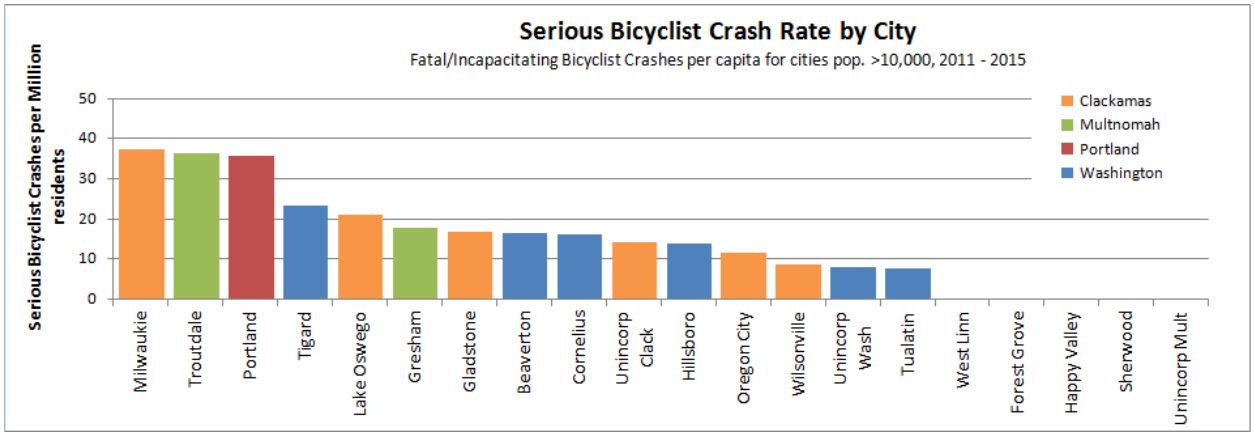
By City

City	2011-2015 Annual Bicyclist Crashes					
	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Beaverton	0.2	1.4	13.8	6.8	22.0	1.6
Cornelius	0.0	0.2	1.6	0.6	2.4	0.2
Durham	0.0	0.0	0.4	0.2	0.6	0.0
Fairview	0.0	0.0	1.2	0.2	1.4	0.0
Forest Grove	0.0	0.0	3.6	2.4	6.0	0.0
Gladstone	0.0	0.2	2.2	0.6	3.0	0.2
Gresham	0.0	2.0	18.2	11.6	31.8	2.0
Happy Valley	0.0	0.0	2.4	0.0	2.4	0.0
Hillsboro	0.2	1.2	15.4	11.0	27.6	1.4
Johnson City	0.0	0.0	0.0	0.0	0.0	0.0
King City	0.0	0.0	0.0	0.0	0.0	0.0
Lake Oswego	0.0	0.8	2.4	1.2	4.4	0.8
Maywood Park	0.0	0.0	0.4	0.0	0.4	0.0
Milwaukie	0.0	0.8	3.8	2.4	7.0	0.8
Oregon City	0.0	0.4	4.2	1.2	5.8	0.4
Portland	1.2	21.0	193.2	98.4	312.6	22.2
Rivergrove	0.0	0.0	0.0	0.0	0.0	0.0
Sherwood	0.0	0.0	1.4	0.8	2.2	0.0
Tigard	0.0	1.2	9.0	4.6	14.8	1.2
Troutdale	0.0	0.6	2.0	1.8	4.4	0.6
Tualatin	0.0	0.2	5.0	2.8	8.0	0.2
West Linn	0.0	0.0	1.4	0.4	1.8	0.0
Wilsonville	0.0	0.2	1.0	1.0	2.2	0.2
Wood Village	0.0	0.0	1.0	0.8	1.8	0.0
Uninc. Clackamas	0.2	1.4	8.6	6.2	16.2	1.6
Uninc. Multnomah	0.0	0.0	1.6	0.2	1.8	0.0
Uninc. Washington	0.2	1.4	12.6	5.8	19.8	1.6
METRO	2.0	33.0	306.4	161.0	500.4	35.0

While Portland has the largest number of serious bicycle crashes, it is apparent from Figure 6-3 that there are a several cities with a relatively high rate of serious bicycle crashes per capita. Troutdale, Milwaukie, and Portland all experiences relatively high rates of serious bicycle crashes between 2011 and 2015.

City	Population (2015)	2011-2015 Annual Bicyclist Crashes	
		All Injury per capita	Serious per capita
Beaverton	96,704	227.5	16.5
Cornelius	12,389	193.7	16.1
Durham	1,430	419.6	0.0
Fairview	9,357	149.6	0.0
Forest Grove	23,630	253.9	0.0
Gladstone	11,990	250.2	16.7
Gresham	111,716	284.7	17.9
Happy Valley	20,835	115.2	0.0
Hillsboro	100,109	275.7	14.0
Johnson City	588	0.0	0.0
King City	3,817	0.0	0.0
Lake Oswego	38,156	115.3	21.0
Maywood Park	809	494.4	0.0
Milwaukie	21,365	327.6	37.4
Oregon City	35,004	165.7	11.4
Portland	620,540	503.8	35.8
Rivergrove	321	0.0	0.0
Sherwood	19,012	115.7	0.0
Tigard	51,642	286.6	23.2
Troutdale	16,486	266.9	36.4
Tualatin	26,617	300.6	7.5
West Linn	26,267	68.5	0.0
Wilsonville	22,932	95.9	8.7
Wood Village	4,056	443.8	0.0
Uninc. Clackamas	113,172	143.1	14.1
Uninc. Multnomah	10,187	176.7	0.0
Uninc. Washington	204,098	97.0	7.8
METRO	1,614,998	309.8	21.7

Figure 6-3



By Month

Month	2011-2015 Annual Bicyclist Crashes	
	All injury	Serious
January	21.4	1.4
February	27.6	2.2
March	33.2	1.6
April	37.8	1.0
May	45.8	2.6
June	47.6	3.4
July	61.2	5.0
August	56.4	4.0
September	59.8	4.8
October	48.4	2.6
November	33.8	3.0
December	27.4	3.4

Figure 6-4

Figure 6-4 presents the annual average number of serious bicycle crashes by month. May through December generally have more serious bicycle crashes, with the peak corresponding to the summer months, likely related to the higher number of people cycling in the warm and dry months.

By Time of Day

Figure 6-5

Serious Crashes by Day of Week and Hour

Annual Fatal/Incapacitating Bicycle Crashes, 2007 - 2009

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Hour	Average Wkday	Average Wkend
12 AM	0.2	0.0	0.0	0.0	0.0	0.0	0.2	12 AM	0.0	0.2
1 AM	0.2	0.0	0.0	0.0	0.0	0.2	0.4	1 AM	0.0	0.3
2 AM	0.2	0.0	0.0	0.0	0.0	0.0	0.0	2 AM	0.0	0.1
3 AM	0.0	0.0	0.0	0.0	0.2	0.0	0.0	3 AM	0.0	0.0
4 AM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4 AM	0.0	0.0
5 AM	0.0	0.2	0.0	0.0	0.0	0.0	0.0	5 AM	0.0	0.0
6 AM	0.0	0.0	0.0	0.8	0.2	0.4	0.0	6 AM	0.3	0.0
7 AM	0.0	0.4	0.0	0.8	0.6	0.2	0.0	7 AM	0.4	0.0
8 AM	0.0	0.0	0.0	0.8	0.8	0.4	0.2	8 AM	0.4	0.1
9 AM	0.2	0.2	0.2	0.0	0.4	0.2	0.0	9 AM	0.2	0.1
10 AM	0.0	0.0	0.0	0.6	0.4	0.2	0.4	10 AM	0.2	0.2
11 AM	0.2	0.0	0.0	0.2	0.2	0.4	0.4	11 AM	0.2	0.3
12 PM	0.0	0.2	0.4	0.6	0.8	0.0	0.0	12 PM	0.4	0.0
1 PM	0.0	0.0	0.2	0.4	0.0	0.6	0.2	1 PM	0.2	0.1
2 PM	0.4	0.4	0.2	0.2	0.0	0.8	0.0	2 PM	0.3	0.2
3 PM	0.0	0.4	0.0	0.6	0.4	0.2	0.8	3 PM	0.3	0.4
4 PM	0.4	1.2	0.6	0.8	0.6	0.4	0.0	4 PM	0.7	0.2
5 PM	0.6	0.2	1.0	0.8	1.0	0.4	0.4	5 PM	0.7	0.5
6 PM	0.2	0.4	0.4	0.2	0.6	0.0	0.4	6 PM	0.3	0.3
7 PM	0.0	0.8	0.4	0.0	0.6	0.0	0.0	7 PM	0.4	0.0
8 PM	0.0	0.0	0.0	0.4	0.2	0.0	0.2	8 PM	0.1	0.1
9 PM	0.2	0.2	0.0	0.4	0.4	0.0	0.0	9 PM	0.2	0.1
10 PM	0.0	0.0	0.2	0.2	0.0	0.2	0.4	10 PM	0.1	0.2
11 PM	0.0	0.2	0.0	0.0	0.0	0.0	0.0	11 PM	0.0	0.0

	Sun	Mon	Tue	Wed	Thu	Fri	Sat		Average Wkday	Average Wkend
All Day	2.8	4.8	3.6	7.8	7.4	4.6	4.0	All Day	5.6	3.4

Figure 6-5 presents the rate of serious bicycle crashes by day of the week and hour of the day using a "heat map" format. Dark cells indicate the highest relative crash time periods; light cells indicate the lowest relative crash time periods. The average weekday and weekend day are summarized on the right side of the figure, while each day is summarized and compared at the bottom of the figure.

The weekday evening peak hours produce the highest number of serious bicycle crashes, mirroring the pattern for all crashes, with the 4:00 – 5:59 pm as the worst. Wednesday and Thursday are the two days with the highest number of bicycle crashes, which is consistent with the prior report's data from 2007 – 2009. No other clear trends are evident.

By Weather

2011-2015 Annual Bicyclist Crashes		
Weather	All injury	Serious
Cloudy/Clear	427.8	30.6
Rain/Fog	59.0	3.6
Sleet/Snow	0.4	0.4
Unknown	13.2	0.4
METRO	500.4	35.0

The majority (87%) of serious bicycle crashes occurred in clear or cloudy conditions (Figure 6-6), as compared to 80% for all crashes (Figure 2-16).

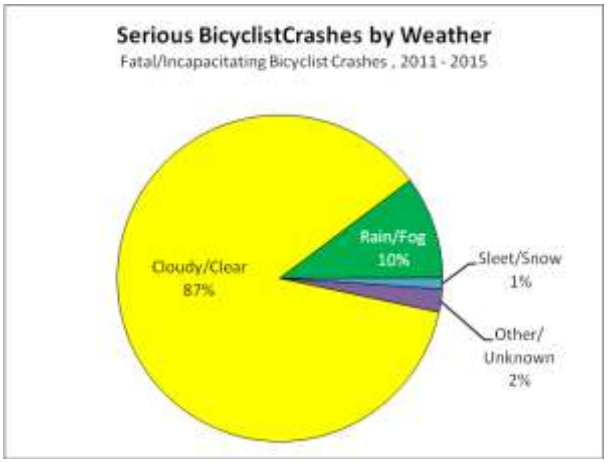


Figure 6-6

By Road Surface Condition

2011-2015 Annual Bicyclist Crashes		
Road	All injury	Serious
Dry	406.8	29.2
Ice/Snow	0.4	0.0
Wet	82.0	5.4
Unknown	11.2	0.4
METRO	500.4	35.0

The majority (84%) of serious bicycle crashes occurred in dry conditions (Figure 6-7), as compared to 73% for all crashes (Figure 2-17).

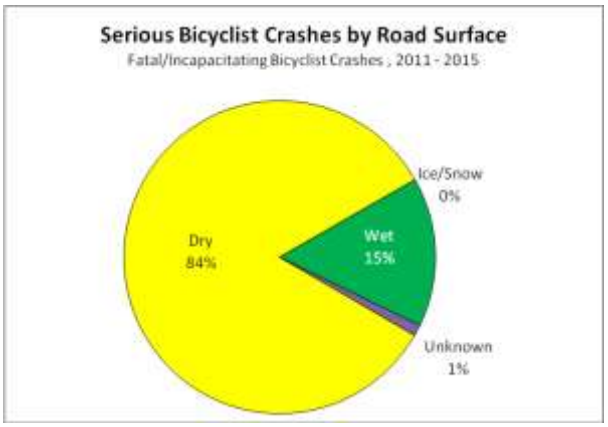


Figure 6-7

By Lighting

2011-2015 Annual Bicyclist Crashes		
Lighting	All injury	Serious
Daylight	373.6	24.4
Dawn/Dusk	40.8	2.8
Night - Dark	13.6	1.6
Night - Lit	71.4	6.2
Unknown	1.0	0.0
METRO	500.4	35.0

The majority (70%) of serious bicycle crashes occurred in daylight (Figure 6-8), as compared to 59% for all crashes (Figure 2-18).

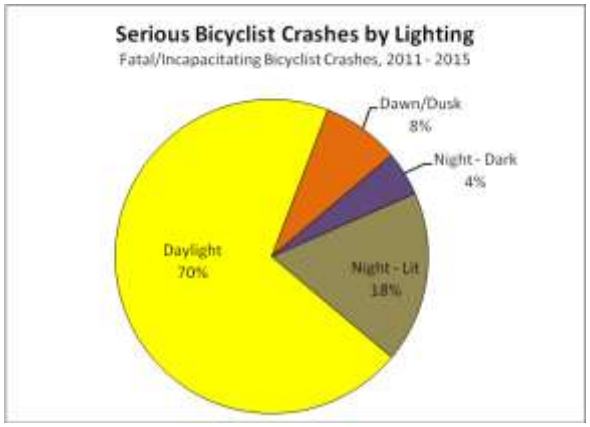
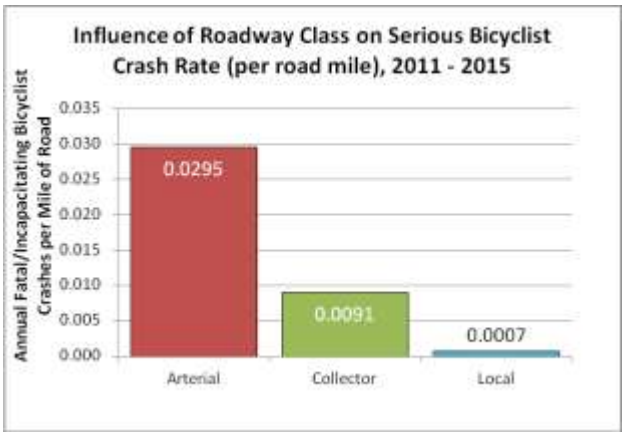


Figure 6-8

By Roadway Classification

Roadway Classification	Total Length (miles)	2011-2015 Annual Bicyclist Crashes		
		Serious	Serious per road-mile	Serious per VMT
Arterial	772	22.8	0.0295	0.533
Collector	994	9	0.0091	0.832
Local	4,565	3.2	0.0007	--
METRO	6,331	35.0	0.0055	--

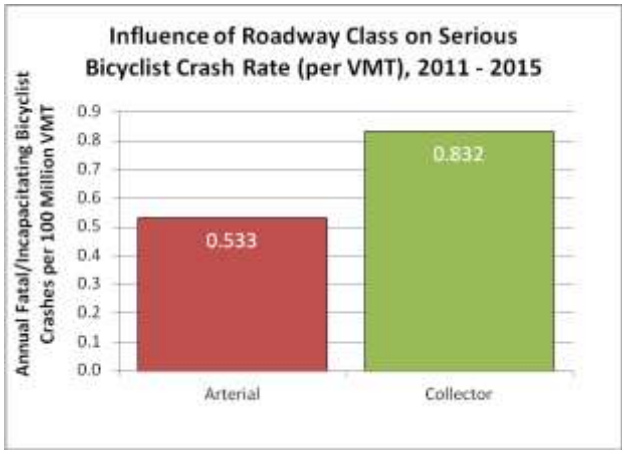
Figures 6-9 and 6-10



As with all crashes, the region's serious bicycle crashes occur primarily on the arterials, accounting for 65% of these crashes. Figure 6-9 presents the distribution of serious bicycle crashes by roadway classification. As can be seen in Figure 6-10, which presents the rate of serious bicycle crashes per mile of roadway, arterial roadways are more than three times as likely than collectors per mile to be the location of a serious bicycle crash, and more than 40 times as likely than local streets per mile to be the location of a serious bicycle crash.

As can be seen in Figure 6-11, when normalized by motor vehicle traffic volume, the serious bike crash rate on collectors is higher than on arterials. While the reason for this is not clear from the data, it may be related to a higher use of collector roads by cyclists relative to traffic volume as compared to arterials. Vehicle miles travelled was not available for local streets.

Figure 6-11

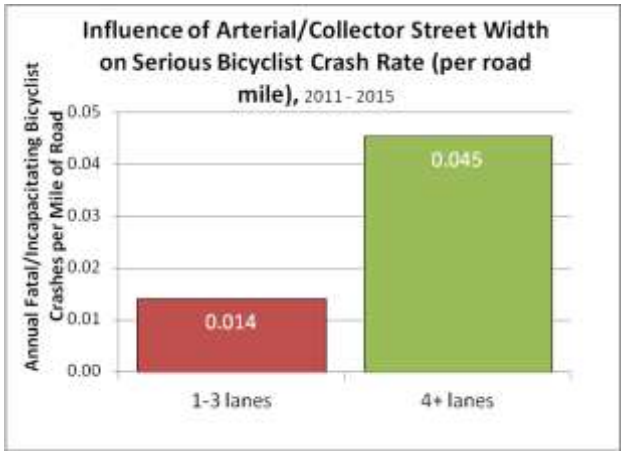


By Number of Lanes

Number of Lanes	Total Length (miles)	2011-2015 Annual Bicyclist Crashes		
		Serious	Serious per mile	Serious per VMT
1 – 3 Lanes	1,427	19.6	0.014	0.660
4+ Lanes	340	15.4	0.045	0.562
METRO	1,766	35.0	0.020	0.613

* Arterial and Collector roadways only

Figure 6-12 and 6-13



The influence of street width is consistent with the influence of roadway classification (Figure 6-12). Wider roadways are the location of a disproportionate number of serious bicycle crashes in relation to their share of the overall system (Figure 6-13), although the effect is not as pronounced as it is for serious pedestrian crashes. The serious bicycle crash rate per road mile increases dramatically for roadways with 4 or more lanes. This is a concern, given that in many parts of the region designated bicycling routes often follow arterial roadways with 4 or more lanes.

As can be seen in Figure 6-14, when normalized by motor vehicle traffic volume, the serious bike crash rate on narrower roads is higher than on wider roads. While the reason for this is not clear from the data, it may be related to a higher use of narrower roads by cyclists relative to traffic volume as compared to multi-lane roadways.

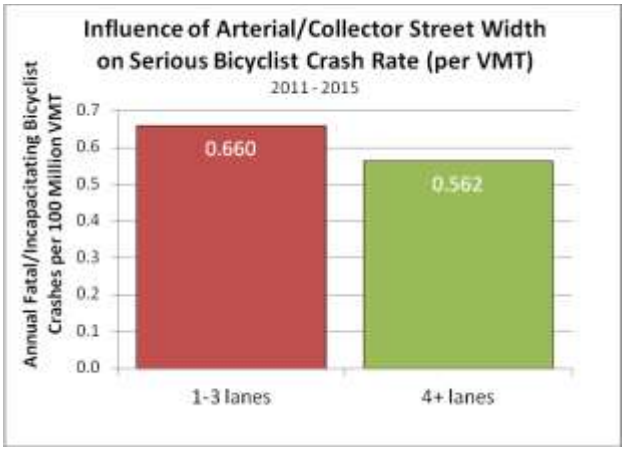
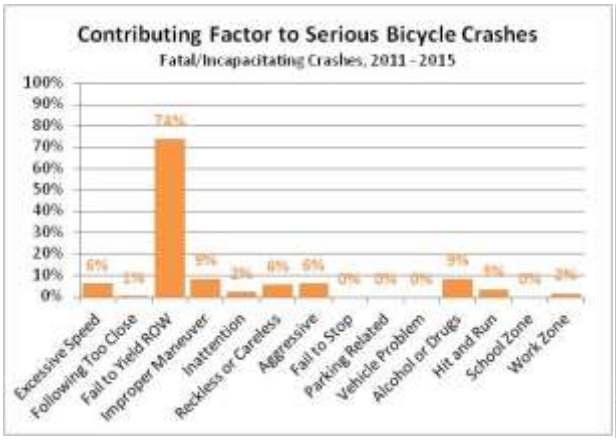


Figure 6-14

By Contributing Factor

Factor	2011-2015 Annual Crashes (Bicycle)						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	22	0.4	2	14	6	22	2
Following Too Close	13	0.2	0	7	4	11	0
Fail to Yield ROW	379	1.0	25	228	116	370	26
Improper Maneuver	44	0.4	3	26	15	44	3
Inattention	6	0.0	1	3	2	6	1
Reckless or Careless	12.2	0.4	2	7	3	12	2
Aggressive	33	0.4	2	20	9	30	2
Fail to Stop	3	0.0	0	2	1	3	0
Parking Related	0.4	0.0	0	0	0	0	0
Vehicle Problem	18	0.0	0	0	0	0	0
Alcohol or Drugs	14	0.8	2	10	4	17	3
Hit and Run	14	0.6	1	8	3	13	1
School Zone	4	0.0	0	2	2	4	0
Work Zone	3	0	0.6	1.6	1.2	3	1
METRO	518	2.0	33	306	161	502	35

Figures 6-15 and 6-16



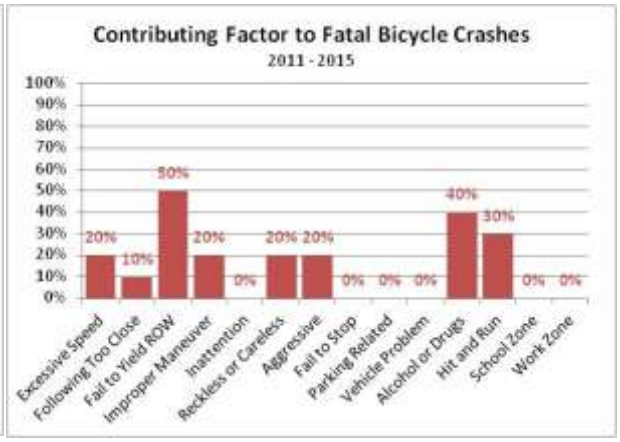


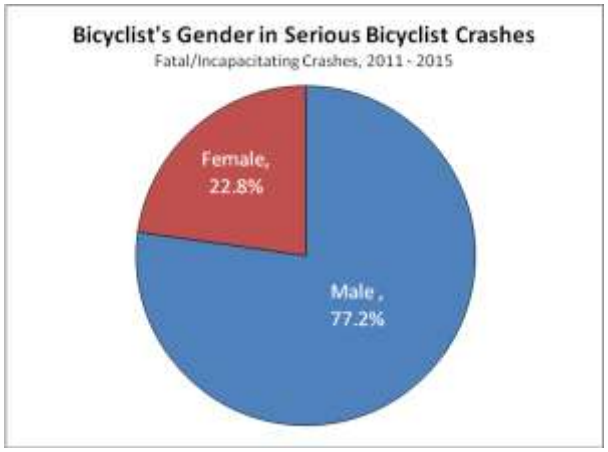
Figure 6-15 and 6-16 present the proportion of bicycle crashes by contributing factor for serious and fatal crashes, respectively. Alcohol or Drugs and Failure to Yield are the most common factors. The data do not specify whether the driver, the bicyclist, or both were under the influence of alcohol. Other factors, such as Failure to Yield, Excessive Speed, and Aggressive Driving, are for the driver.

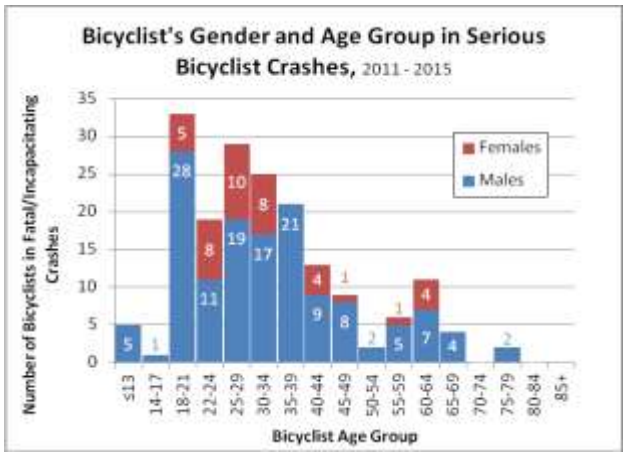
By Bicyclist's Age and Gender

The age and gender of bicyclists involved in serious crashes are presented in the following table and Figures 6-17 and 6-18.

	Total Male Bicyclists (2011 – 2015)			Total Female Bicyclists (2011 – 2015)		
Age	All Crashes	Serious	Percent Serious	All Crashes	Serious	Percent Serious
≤13	98	5	5.1%	39	0	0.0%
14-17	131	1	0.8%	23	0	0.0%
18-21	164	28	17.1%	54	5	9.3%
22-24	236	11	4.7%	81	8	9.9%
25-29	223	19	8.5%	149	10	6.7%
30-34	262	17	6.5%	107	8	7.5%
35-39	150	21	14.0%	66	0	0.0%
40-44	154	9	5.8%	48	4	8.3%
45-49	156	8	5.1%	47	1	2.1%
50-54	116	2	1.7%	28	0	0.0%
55-59	96	5	5.2%	16	1	6.3%
60-64	71	7	9.9%	18	4	22.2%
65-69	20	4	20.0%	2	0	0.0%
70-74	17	0	0.0%	0	0	--
75-79	11	2	18.2%	0	0	--
80-84	0	0	--	0	0	--
85+	6	0	0.0%	0	0	--
Unknown	154	0	0.0%	39	0	0.0%
METRO	2065	139	6.7%	717	41	5.7%

Figures 6-17 and 6-18





Section 7 – Crash Type Detail

In this section, the four crash types identified in Section 2 as most prevalent are reviewed relative to all crashes in more detail to identify patterns. As documented in Section 2, the most common serious crash types were Rear End and Turning, while the most common fatal crash types were Fixed Object and Pedestrian. More detail on Rear End, Turning, Fixed Object, and Pedestrian crashes are presented here.

For each crash type, detailed crash information was summarized for all crashes of that type. The information includes crash severity and contributing factors.

Crash Severity

Every crash is assigned a crash severity based on the most critically injured victim. From worst to best, the classifications are: Fatal, Injury A, Injury B, Injury C, and PDO (property damage only).

"**Serious Crashes**" in this report refers to the total number of Fatal and Injury A crashes.

"**Injury A**" and "**Incapacitating injury**" are used interchangeably. Incapacitating injuries typically are injuries that the victim is not able to walk away from. They are synonymous with the term "**Severe injury**"

"**Injury B**" and "**Moderate injury**" are used interchangeably.

"**Injury C**" and "**Minor injury**" are used interchangeably.

"PDO" means property damage only. Crashes must result in $3,000 or more in damages to be counted.

Contributing Factors

The State Department of Motor Vehicles assigns causes and errors to participants in each crash, along with identifiers for certain risk factors, including alcohol and drugs. Several causes, errors, and/or factors may apply to any single crash. Based on these causes, errors, and risk factors, crashes were evaluated for 14 contributing factors, defined for this analysis as follows:

Defined Contributing Factor	DMV codes included in factor	Report Causes	Report Errors
Excessive Speed	Speed too fast for conditions; Driving in excess of posted speed; Speed racing; Failed to decrease speed for slower moving vehicle; Driving too fast for conditions	1, 30, 31	42, 47, 50, 53
Following Too Close	Following too closely	7	43
Fail to Yield ROW (right-of-way)	Did not yield ROW; Passed stop sign or flashing red; Disregarded traffic signal; Disregarded other traffic control device; Disregarded officer or flagman; Disregarded emergency vehicle; Disregarded Railroad signal or sign or flagman; Failed to obey mandatory turn signal, sign or lane markings; Left turn in front of oncoming traffic; Did not have ROW over pedalcyclist; Did not have ROW; Failed to yield ROW to pedestrian; Passed vehicle stopped at crosswalk for pedestrian	2, 3, 14,	3, 4, 20, 21, 23, 24, 25, 27, 28, 29, 33
Improper Maneuver	Drove left of center on two-way road; Improper overtaking; Made improper turn; Other improper driving; Wide turn; Cut corner on turn; Left turn where prohibited; Turned from or into wrong lane; U-turned illegally; Improper signal or failure to signal; Backing improperly (not parking); Improper start from stopped position; Disregarded warning sign, flares, or flashing amber; Passing on a curve, on wrong side, on straight road under unsafe conditions, at intersection, on crest of hill, in no passing zone, or in front of oncoming traffic; Driving on wrong side of road; Straddling or driving on wrong lanes; Improper change of lanes; Wrong way	5, 6, 8, 10	1, 2, 5, 6, 7, 8, 10, 11, 14, 22, 30, 31, 32, 34, 35, 36, 37, 39, 44, 45, 46
Inattention	Driver drowsy/fatigued/sleepy; Inattention	16, 27	
Reckless/Careless	Reckless driving; Careless driving	32, 33	
Aggressive	Excessive Speed or Following too Close, as defined above	1, 7, 30, 31	42
Fail to Stop	Failed to avoid stopped or parked vehicle ahead other than school bus		26
Parking Related	Improperly parked; Improper start leaving parked position; Improper parking; Opened door into adjacent traffic lane		12, 13, 18
Vehicle Problem	Improper or no lights; Driving unsafe vehicle (no other error apparent); Overloading or improper loading of vehicle with cargo or passengers		15, 17, 85
Alcohol or Drugs	Alcohol, Drugs		
Hit and Run	Hit and Run		
School Zone	School Zone		
Work Zone	Work Zone		

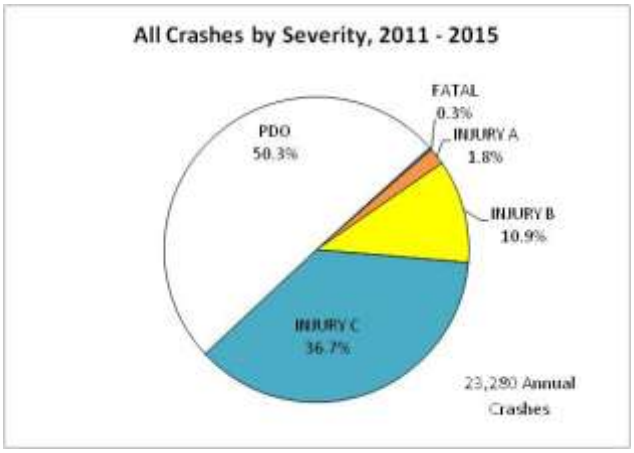
All Crash Types

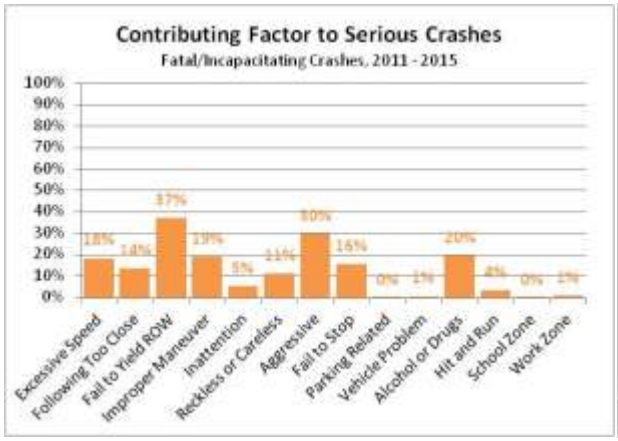
The following table summarizes all crashes in the region by severity and contributing factor, as defined on the previous page.

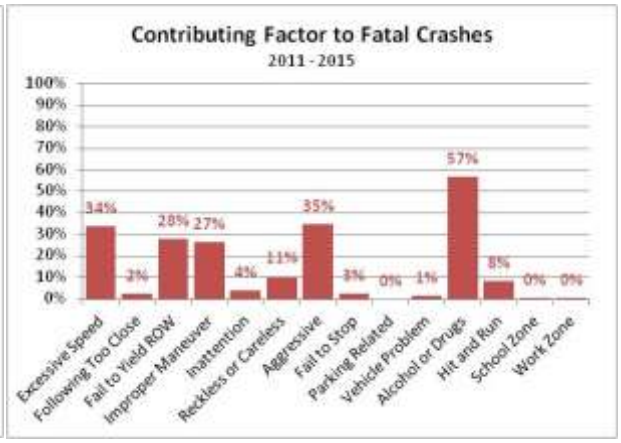
Factor	2011-2015 Annual Crashes (All Crashes)						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	2,891	20.6	68	369	1,018	1,475	88
Following Too Close	7,778	1.4	64	482	3,649	4,197	66
Fail to Yield ROW	6,802	17.0	162	1,160	2,273	3,612	179
Improper Maneuver	4,514	16.2	76	376	1,091	1,559	92
Inattention	1,173	2.4	23	148	491	664	26
Reckless or Careless	1022.6	6.4	48	220	345	620	55
Aggressive	9,633	21.2	122	766	4,186	5,096	143
Fail to Stop	8,972	1.6	73	511	4,226	4,812	75
Parking Related	115.2	0.0	0	4	18	22	0
Vehicle Problem	1,056	0.8	3	13	31	47	4
Alcohol or Drugs	1,382	34.4	60	215	265	575	94
Hit and Run	1,382	5.0	12	104	452	572	17
School Zone	66	0.2	1	13	26	39	1
Work Zone	177	0.2	5	24.6	69	99	5
METRO	23,280	60.8	420	2,547	8,545	11,573	481

Figure 7-1 presents the crash severity distribution of all crashes. Figure 7-2 presents the percentage of crashes of serious severity (fatal or injury A) with each contributing factor. Each crash may have several contributing factors.

Figures 7-1 and 7-2







Alcohol and Drugs, Aggressive driving (defined as either excessive speed or following too close), Excessive Speed, and Failure to Yield are the most common contributing factors to serious crashes in the region.

Rear End Crashes

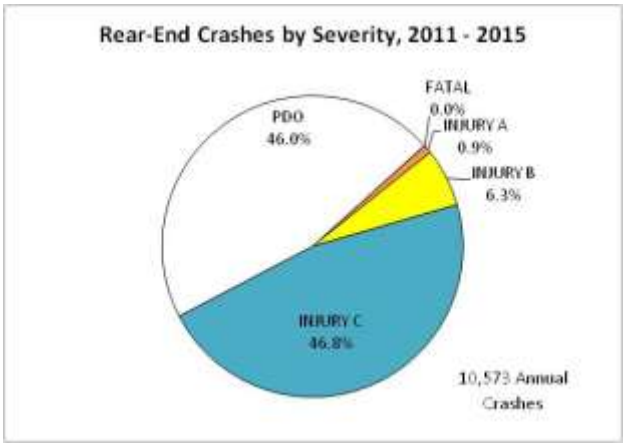
A Rear End crash results when a vehicle traveling in the same direction or parallel on the same path as another vehicle, collides with the rear end of a second vehicle. In this type, the direction of travel was parallel but continuous.

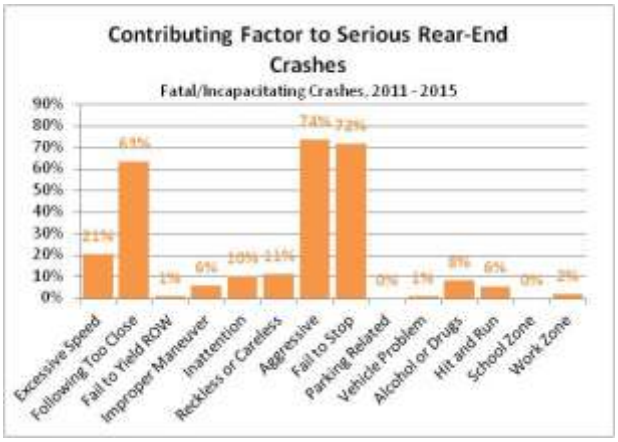
Rear End is the most common crash type in the region, and although it is rarely fatal it is often serious. Rear End crashes constitute 7% of fatal crashes, 21% of serious crashes, and 45% of all crashes in the region.

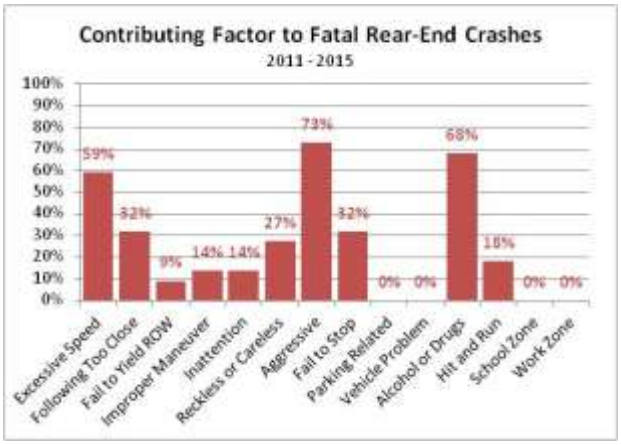
	2011-2015 Annual Crashes (Rear-End Crashes)						
Factor	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	1,590	2.6	18	130	726	877	21
Following Too Close	7,625	1.4	62	468	3,591	4,123	63
Fail to Yield ROW	53	0.4	1	7	22	30	1
Improper Maneuver	421	0.6	5	29	171	206	6
Inattention	785	0.6	10	71	391	472	10
Reckless or Careless	382.8	1.2	10	62	192	266	11
Aggressive	8,235	3.2	71	519	3,858	4,451	74
Fail to Stop	8,742	1.4	70	500	4,165	4,737	72
Parking Related	28	0.0	0	0	1	1	0
Vehicle Problem	256	0.0	1	2	14	17	1
Alcohol or Drugs	553	3.0	5	36	110	154	8
Hit and Run	553	0.8	5	32	264	302	6
School Zone	21	0.0	0	2	11	13	0
Work Zone	89	0	1.8	9.4	42.4	54	2
METRO	10,573	4.4	96	661	4,948	5,710	100

Figure 7-3 presents the crash severity distribution of Rear End crashes. Figure 7-4 presents the percentage of Rear End crashes of serious severity (fatal or injury A) with each contributing factor. Each crash may have several contributing factors.

Figures 7-3 and 7-4







Rear End crashes are less severe than most crashes, producing a high proportion of injury C and PDO crashes. Aggressive driving is a factor in most Rear End crashes. Failure to stop, Following too Closely, and Excvessive Speed are all factors in a substantial proportion of Rear End crashes of serious severity.

Turning Crashes

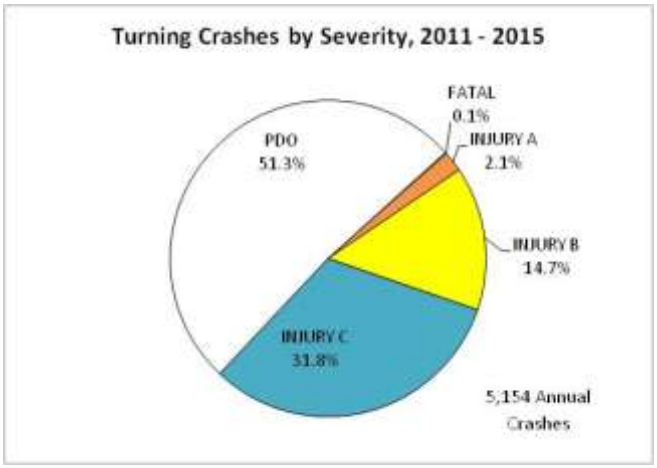
A Turning crash results when one or more vehicles in the act of a turning maneuver is involved in a collision with another vehicle. It differs from an Angle crash in that Turning crashes involve vehicles traveling on the same street, whereas Angle crashes involve vehicles traveling on intersecting streets or driveways.

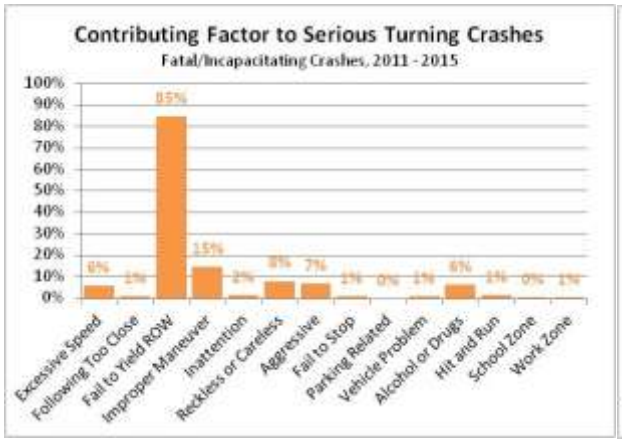
Turning is the second most common crash type in the region, as well as the most common serious crash type. Turning crashes constitute 10% of fatal crashes, 24% of serious crashes, and 22% of all crashes in the region.

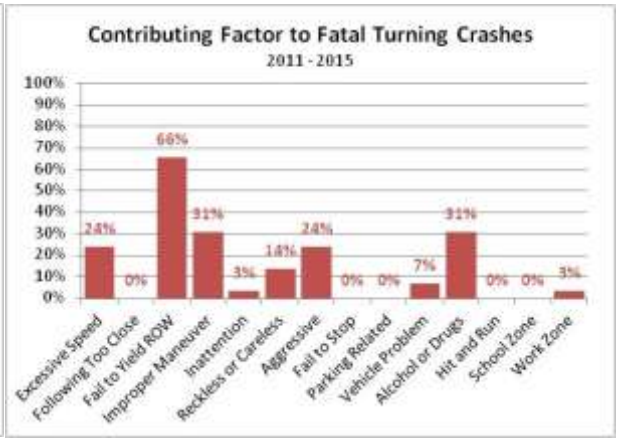
Factor	2011-2015 Annual Crashes (Turning Crashes)						
	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	172	1.4	5	30	54	91	7
Following Too Close	95	0.0	1	6	37	43	1
Fail to Yield ROW	3,930	3.8	93	650	1,311	2,057	97
Improper Maneuver	1,131	1.8	15	95	287	398	17
Inattention	43	0.2	2	9	14	25	2
Reckless or Careless	115.6	0.8	8	34	38	82	9
Aggressive	230	1.4	6	32	78	118	8
Fail to Stop	86	0.0	1	3	34	38	1
Parking Related	11.8	0.0	0	0	0	0	0
Vehicle Problem	102	0.4	1	2	4	7	1
Alcohol or Drugs	241	1.8	6	25	31	63	7
Hit and Run	241	0.0	2	20	66	88	2
School Zone	18	0.0	0	5	6	11	0
Work Zone	25	0.2	0.6	4.8	7.2	13	1
METRO	5,154	5.8	108	758	1,638	2,510	114

Figure 7-5 presents the crash severity distribution of Turning crashes. Figure 7-6 presents the percentage of Turning crashes of serious severity (fatal or injury A) with each contributing factor. Each crash may have several contributing factors.

Figures 7-5 and 7-6







Fixed Object Crashes

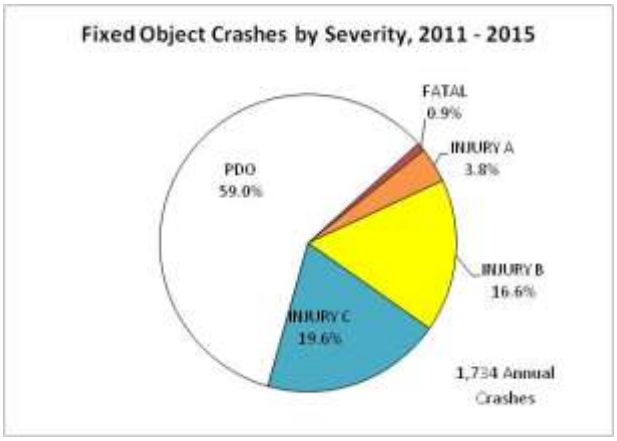
A Fixed Object crash results when one vehicle strikes a fixed or other object on or off the roadway.

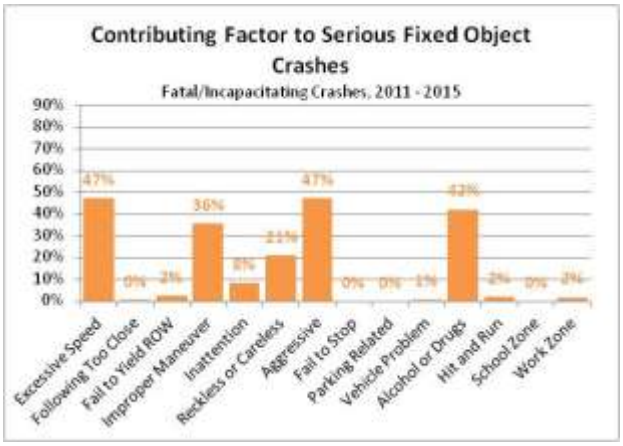
Fixed Object is the second most common fatal crash type in the region. Fixed Object crashes constitute 26% of fatal crashes, 17% of serious crashes, though only 7% of all crashes in the region.

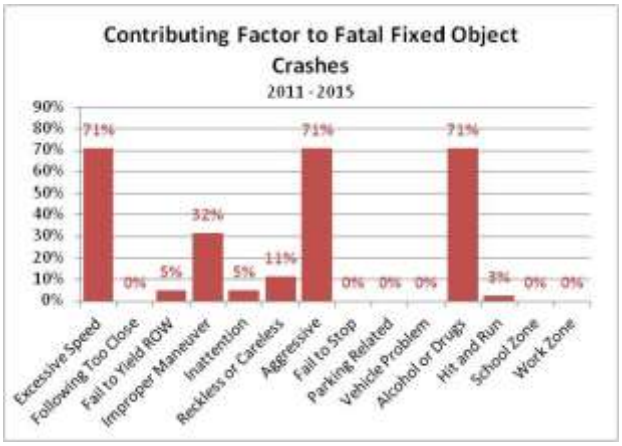
	2011-2015 Annual Crashes (Fixed Object Crashes)						
Factor	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	755	11.2	28	136	145	320	39
Following Too Close	9	0.0	0	2	2	5	0
Fail to Yield ROW	30	0.8	1	6	5	13	2
Improper Maneuver	632	5.0	24	97	113	239	29
Inattention	200	0.8	6	39	43	89	7
Reckless or Careless	298.8	1.8	16	68	51	136	17
Aggressive	760	11.2	28	137	146	323	39
Fail to Stop	6	0.0	0	1	2	2	0
Parking Related	32.8	0.0	0	0	1	1	0
Vehicle Problem	401	0.0	1	3	6	10	1
Alcohol or Drugs	133	11.2	24	89	59	183	35
Hit and Run	133	0.4	1	18	14	33	2
School Zone	9	0.0	0	2	2	3	0
Work Zone	22	0	1.4	4.2	5	11	1
METRO	1,734	15.8	67	289	341	712	82

Figure 7-7 presents the crash severity distribution of Fixed Object crashes. Figure 7-8 presents the percentage of Fixed Object crashes of serious severity (fatal or injury A) with each contributing factor. Each crash may have several contributing factors.

Figures 7-7 and 7-8







Fixed Object crashes have a higher rate of severity including fatalities compared to other crash types. Excessive speed, aggressive driving, and alcohol or drugs are often involved in Fixed Object crashes.

Pedestrian Crashes

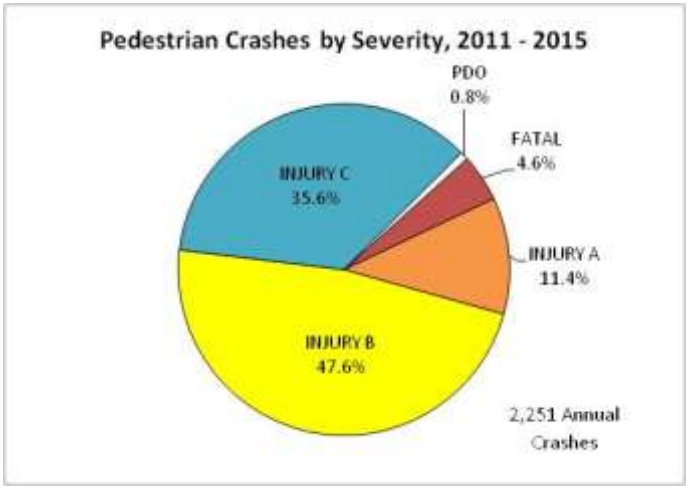
A Pedestrian crash results when the first harmful event is any impact between a motor vehicle in traffic and a pedestrian. It does not include any crash where a pedestrian is injured after the initial vehicle impact.

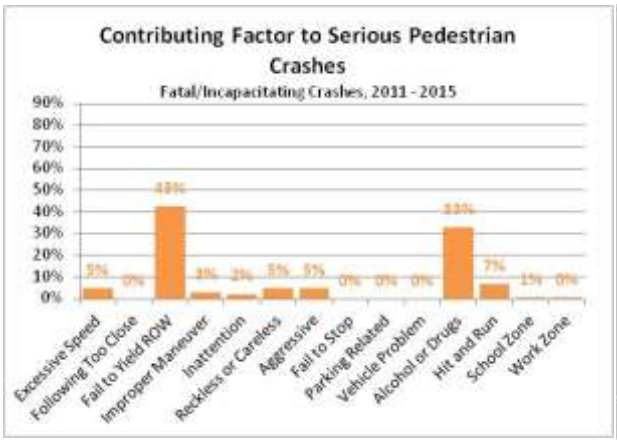
Pedestrian is the most common fatal crash type in the region, and the most common crash type to be fatal. Pedestrian crashes constitute 34% of fatal crashes, 15% of serious crashes, though only 2% of all crashes in the region. Pedestrian trips are 10% of all trips in the region.

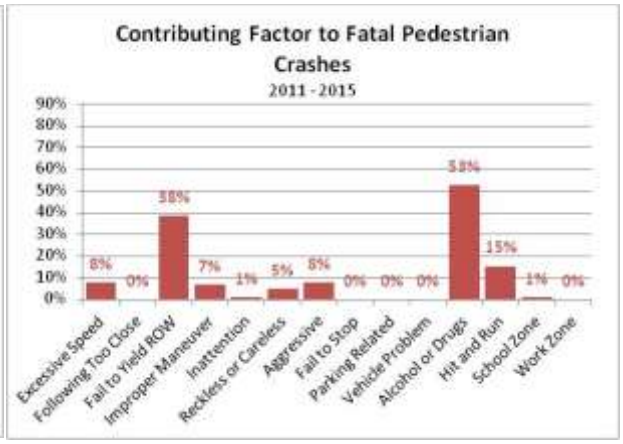
	2011-2015 Annual Crashes (Pedestrian Crashes)						
Factor	All	Fatal	Injury A	Injury B	Injury C	All Injury	Serious
Excessive Speed	7	1.6	2	2	1	7	4
Following Too Close	0	0.0	0	0	0	0	0
Fail to Yield ROW	292	8.0	23	143	116	290	31
Improper Maneuver	12	1.4	1	5	4	11	2
Inattention	9	0.2	1	5	3	9	2
Reckless or Careless	13	1.0	3	7	2	13	4
Aggressive	7	1.6	2	3	1	7	4
Fail to Stop	1	0.0	0	0	0	1	0
Parking Related	0.4	0.0	0	0	1	1	0
Vehicle Problem	52	0.0	0	0	0	0	0
Alcohol or Drugs	17	11.0	13	19	9	52	24
Hit and Run	17	3.2	2	6	6	17	5
School Zone	6	0.2	0	3	3	6	0
Work Zone	4	0	0.2	1.6	1.8	4	0
METRO	450	20.8	51	214	160	447	72

Figure 7-9 presents the crash severity distribution of Pedestrian crashes. Figure 7-10 presents the percentage of Pedestrian crashes of serious severity (fatal or injury A) with each contributing factor. Each crash may have several contributing factors.

Figures 7-9 and 7-10







Pedestrian crashes have the highest severity of any crash type. Failure for the driver to yield right of way and alcohol or drug involvement are the two most coming contributing factors.

Memo

Metro
600 NE Grand Ave.
Portland, OR 97232-2736

Date: November 9, 2017
To: Metro Technical Advisory Committee (MTAC) and interested parties
From: Lake McTighe, Senior Transportation Planner
Subject: Update on 2018 RTP Transportation Design - Designing Livable Streets and Trails Guide

Purpose
The purpose of this memorandum and associated materials and presentation is to provide MTAC with an update on the progress of the Designing Livable Streets and Trails Guide. The Design Technical Work Group has been guiding the project (refer to **Attachment 1)**. An Annotated Outline of the Designing Livable Streets and Trails Guide has been completed and will be the focus of presentation (**Attachment 2**).

Action Requested
No formal action is requested. This is an opportunity for MTAC to ask questions and provide input on the Annotated Outline of the Designing Livable Streets and Trails Guide and understand next steps moving forward.

Background
Metro is updating regional street design guidelines – the Creating Livable Streets, Green Streets and Trees for Green Streets handbooks - as part of the update of the 2018 Regional Transportation Plan RTP). The updated handbooks will be consolidated into one handbook, the Designing Livable Streets and Trails Guide ('the Guide"), which will include new regional trail design guidance.

Metro has been working with a Technical Work Group on the update since June 2017. The Work Group has met twice and has completed the Annotated Outline of the Guide. The Annotated Outline identifies the overall structure and topics that will be covered in the Guide. The next phase of the project, beginning in early 2018 will be to complete the content for the Guide.

MTAC last provided input on the Designing Livable Streets and Trails Guide at the August 2, 2017 meeting. At that meeting, MTAC received an overview of the project provided input on the draft table of contents. Comments from MTAC were provided to the Technical Work Group and were addressed in the Annotated Outline.

Annotated Outline Overview
The Annotated Outline (**Attachment 2)** describes what is and is not proposed to be included in the updated Guide, and provides an understanding of the intent and level of detail for the content (percentages attached to each heading indicate the amount of space dedicated to that Chapter relative to the whole Guide).

- The content will be a combination of existing material from existing regional design guidelines (and with reference to the Green Trails and Wildlife Crossings guides which are not being updated) and new information from current policies and best practices.
- As opposed to individual handbooks, all of the content will combined into one Guide to emphasize the interrelatedness of the elements (different modes, stormwater management, street trees, habitat protection, etc). Additional on-line resources will support implementation.

- Realistic examples and case studies and a decision making framework will support implementation in constrained environments and with limited funding.
- The Guide will emphasize a context sensitive and performance based design approach to achieve desired outcomes, such as zero fatal and severe injury crashes safety and reduced greenhouse gas emissions.

In addition to development of the Guide and online resources, the project will reviewing and updating the Regional System Design and Placemaking Concept section of Chapter 2 of the RTP, including the Regional Design Classifications Map.

Next Steps
Development of the content of the Guide will begin in early 2018. A Resource List developed with input from the Work Group identifies resources that will be consulted for content. Members of the Technical Work Group will provide technical review as the content is developed. Periodic updates to TPAC and MTAC will provide further opportunity for comment. Overall policy guidance will be provided by the Metro Council, MPAC and JPACT. It is anticipated that the Guide and additional resources should be substantially completed by the end of 2018.

Meeting dates of the Technical Work Group for 2018 have not yet been set.

- **January 17 & 26 – MTAC and TPAC**: Draft 2018 RTP policies – this will include draft updates to the Regional System Design and Placemaking Concept section of Chapter 2 of the RTP.

- **February 6 – Metro Council**: Draft 2018 RTP policies (including design section)

- **February 15 & 28 – JPACT and MPAC**: Draft 2018 RTP policies (including design section)

- **May 16 & 16 MTAC and TPAC**: Update on Designing Livable Streets and Trails Guide and updates to the Regional Design Classifications Map in Chapter 2 of the RTP.

Attachments
1. List of Design Technical Work Group members
2. Annotated Table of Contents – Designing Livable Streets and Trails Guide
3. Meeting minutes – Design Work Group meeting #2

Metro

www.oregon**metro.gov/rtp**

10/18/17

2018 REGIONAL TRANSPORTATION PLAN

Roster for Technical Design Work Group

Metro is working with local, regional and state partners and the public to update the region's shared vision and strategy for investing in the regional transportation system for the next 25 years.

To support development of the 2018 Regional Transportation Plan, Metro staff are convening seven technical work groups to provide input to the project team on implementing policy direction from the Metro Council and regional policy advisory committees. In this role, the work group members review and provide feedback to Metro staff on draft materials and analysis, keep their respective elected officials and agency/organization's leadership informed to identify issues and concerns early on, and integrate input from partners and the public. The work groups also help identify areas for further discussion by the Metro Council and regional technical and policy advisory committees.

Work group members include topical experts and representatives from the Metro Technical Advisory Committee (MTAC) and the Transportation Policy Alternatives Committee (TPAC) or their designees, and other community, business, city and county partners. Meetings of the technical work groups are posted on Metro's calendar at www.oregonmetro.gov/calendar and www.oregonmetro.gov/rtp.

	Name	Affiliation
1.	Lake McTighe	Metro lead
2.	Anthony Buczek	Metro
3.	Robert Spurlock	Metro
4.	Carly Rice Chris Strong (alternate)	City of Gresham
5.	Denver Igarta (planning) Scott Baston (engineering) Zef Wagner (alternate)	Portland Bureau of Transportation
6.	Jeff Owen	TriMet
7.	Dyami Valentine (planning) Rob Saxton (engineering, alternate)	Washington County
8.	James Reitz Richard Blackmun (alternate)	City of Forest Grove
9.	Jeannine Rustad	Tualatin Hills Park and Recreation District
10.	Scott Hoelscher (planning) Rick Nys (engineering)	Clackamas County
11.	Carol Chesarek	Community member/ MTAC laternate
12.	Stephanie Noll	The Street Trust
13.	Zach Weigel	City of Wilsonville
14.	Rich Crossler-Laird Lidwien Rahman (project liaison)	Oregon Department of Transportation
15.	Ryan Guy Hashagen	Better Blocks PDX
16.	Brendon Haggerty	Multnomah County – Public Health
17.	Bob Galati Julia Hajduk (alternate)	City of Sherwood
18.	John Boren	City of Hillsboro
21.	Kathryn Doherty-Chapman	Oregon Walks

22.	Nico Larco	Sustainable Cities Initiative, University of Oregon
23.	Eileen Cunningham	Multnomah County – Planning and Engineering
24.	Tim Kurtz	Portland Bureau of Environmental Services
25.	Mary Coolidge	Audubon Society of Portland
26.	Stacy Revay	City of Beaverton

Attachment 2

KITTELSON & ASSOCIATES
610 SW ALDER STREET, SUITE 700
PORTLAND, OR 97205
P 503.228.5230 F 503.273.8169

The purpose of this memorandum is to provide a draft Annotated Outline combining the existing *Creating Livable Streets*, *Green Streets*, and *Trees for Green Streets* guides (Referred to herein as "Existing Metro Guide". This update is referred to as "New Metro Guide"). The content for the New Metro Guide will be a combination of existing material from the Existing Metro Guides (with reference to the *Green Trails and Wildlife Crossings guides)* and new information from current policies and best practices. This memorandum builds on the completed Table of Contents (TOC) – text shown in black – and provides a Draft Annotated Outline where the narrative in *blue italics* indicates specific information anticipated for each chapter and section based on discussion and themes from the project management team (PMT) and technical working group (TWG). Percentages next to each Chapter heading indicate the amount of space dedicated to that section relative to the whole document.

METRO DESIGNING LIVABLE STREETS & TRAILS GUIDE
DRAFT ANNOTATED OUTLINE

CHAPTER 1: INTRODUCTION [5%]

1.1 **Purpose**

- Making a Great Place
  - *Describes how diverse people, education, land use, transportation choices, job choices, green infrastructure, access to parks and natural areas, housing choice and affordability, etc. come together to create a great place.*
- Regional 2040 Growth Concept
  - *Overview of the concept and how transportation helps achieve it.*
- Regional Transportation Plan (RTP) Vision and Goals
  - *Overview of the goals and reference the Regional Transportation Plan for additional details.*
  - *The Regional Transportation Plan, Chapter 2, Section 2.4 Regional System Definition will be used as a reference for developing this section.*

1.2 **Who Will Use the Guide**

- *This subsection will describe the audience the New Metro Guide is intended for and guide them to the areas that might be most useful:*
  - *Planners, landscape architects, and engineers – for best practices.*
  - *Public sector practitioners for best practices and project development guidance.*
  - *It will be public-facing and lay-person friendly.*
  - *Technical appendices (e.g., Trees for Green Streets) will provide more detail.*
- *This section will use information from the current guides, but require major updates.*

1.3 How to Use the Guide

- *This subsection will describe that this New Metro Guide is a tool for creating a great place and implementing the 2040 Growth Concept and the Regional Transportation Plan.*
- *Describe on-line resources.*
- *Reference the Regional Transportation Functional Plan (RTFP) and highlight that the RTFP is the regional implementation plan that jurisdictions follow.*
- *This section will use information from the current guides, but require major updates.*

1.4 Chapter Highlights

- *Includes key features and "take-aways" presented in each chapter of the New Metro Guide.*
- *A graphic will illustrate how outcomes, design functions, design classifications and design elements relate to each other. The graphic will be used as a device to throughout the document to remind the reader of the flow/structure.*
- *This section introduces and defines the themes and structure of the following chapters by clearly communicating the following:*
  - ***Chapter 2:***
    - ***Desired Outcomes** – what are the things that make our region a great place?*
  - ***Chapter 3:***
    - ***Design Functions** – how do our transportation corridors contribute to the **outcomes?***
    - *Design Classifications – what **functions** are typically served by each regional classification?*
  - ***Chapter 4:***
    - ***Design Elements** – which **elements** serve the core **functions** for each type of travelway**?***
  - ***Chapter 5:***
    - *How can the elements be combined to create the different regional design classifications in different land use contexts?*
  - ***Chapter 6:***
    - *How do practitioners make design decisions using a performance-based design approach?*
  - ***Chapter 7:***

- *What implementation strategies can help the region move towards the envisioned system?*

Notes: The project team anticipates Metro leading the development of this upfront content.

CHAPTER 2: DESIGN POLICY AND DESIRED OUTCOMES [8%]

Introduction

Chapter 2 will describe the "story" of the Existing Metro Guides and what has changed over the years. It includes some history, lessons learned, emerging trends, desired outcomes, policies to achieve those outcomes (performance-based design), as well as how the design policy relates to other regional, state, national, and local policies.

2.1 **Street and Trail Design in a Land Use Context**

This section puts this edition of the guidance (New Metro Guide) in a historical context, acknowledging that the core idea of linking land use context and design is one of the key original ideas of the Existing Metro Guides. It will articulate a design approach that takes a broad perspective of all users and desired outcomes, and connects the land use (existing and future) context and the function(s) of the street.

- Lessons Learned

  Describes what we as a region have learned since the 2040 Growth Strategy was adopted and the Existing Metro Guides were completed, along with many transportation projects.
  - *Street design is not "one size fits all"*
  - *Nature can be part of the street, and designs need to concurrently maintain wildlife corridor connectivity and remove barriers for wildlife, and use best practices to mitigate hazards for wildlife from lighting, sound barrier walls, etc*
  - *Green infrastructure leads to improved environmental and public health outcomes*
  - *Regional trails are part of transportation system*
  - *Protecting water quality and stormwater management are responsibilities of transportation planners and engineers*
  - *Street design can reduce serious and fatal crashes*
  - *Economic impacts of livable street design*
  - *Past 15 years of significant green street applications have occurred regionally and design standards/guidelines are continually evolving*
- Emerging Trends

  Describes emerging trends that are influencing how we design streets:

- *Population growth and demographic shifts (diversity and aging population)*
- *Climate change and extreme weather events and the need for building community and environmental resiliency*
- *Autonomous and driverless vehicles/connected vehicles, ride-hailing Lyft, Uber, etc.*
- *Rising use of e-shopping and door-to-door delivery of goods*
- *Rising severe crashes, especially for non-motorized users (pedestrians and bicyclists)*
- *Growing demand for Safe Routes to School, transportation options, trails, bicycle commute options*
- *Green street design standards and guidelines are being incorporated holistically in a project and not necessarily treated in isolation, as well as being applied for all design classifications*

2.2 **Desired Outcomes: Designing for Today and the Future**

Desired Outcomes are the results we want to support (e.g. healthy people, sustainable economy) through street and trail design.

This section will clearly show how design functions relate to desired outcomes, e.g., the design function of providing space for physical activity is related to the design outcome of increased public health. Desired outcomes are overarching and will not be organized for each street and trail design type. Each bullet (in black text below) will be elaborated with a sentence, short paragraph, and/or references, but will not be an extensive discussion.

- Safety– Vision Zero
  - *Summarize that the Vision Zero's objective it to eliminate serious and fatal crashes.*
  - *Highlight that street design can contribute to the elimination of serious and fatal crashes, including slowing auto traffic speeds and providing more separation of modes, as well as discouraging undesired human behavior.*
- Transportation Choices
  - *More people have ability to choose to walk, bike, take transit, use rideshare safely and efficiently.*
- Efficient and Reliable Travel
  - *People can get to where they need to go efficiently and reliably by any mode.*
- Healthy People
  - *Through more opportunities for physical activity*
  - *Increased bicycle, pedestrian, and transit mode share*

- *Lower asthma rates through reduced GHG , and through increased tree canopy and reduced heat island effect*
- *Through increased access to nature, parks and greenspaces*
- *By eliminating traffic fatalities and severe injuries*
- *Decreased stress through quieter, safer, well lit and greener streets*

- Security
  - *Personal security through "eyes on the street,"*
  - *Awareness of other users regardless of their mode choice.*
- Healthy Environment
  (Draw on Existing Green Streets Guide: section 2.0 Why Green Streets?)
  - *Reducing and mitigating environmental and/or natural resource impacts, including hazards related to light pollution by adhering to best practices in lighting design and incorporating green infrastructure in design stage to ensure and maximize compatibility*
  - *How design may influence mode choice and the environmental impacts it may have by reducing single occupancy vehicles (SOV) trips.*
  - *How management of the stormwater run-off in the street design benefits street users*
    - *Mitigates downstream water quality and flow control problems*
    - *Protects urban natural resources.*
    - *Mitigates urban heat island effect through strategic tree planting.*
    - *Maintains and restores natural processes*
    - *Conserves, protects and restores habitat quantity and quality*
- Reduced Green House Gas Emissions
- Sustainable Economic Prosperity
  - *Business benefits from walkable and bicycle-friendly areas*
  - *Freight access to industrial jobs and growth in export and import activity*
  - *Employees have transportation choices to access jobs*
  - *Tourism*
- Social Equity
  - *Consider racial equity in transportation design process as a way to address equity for all vulnerable groups: lower income, low English proficiency, older adults, youth, people with disabilities*
  - *People empowered process*
  - *Looking carefully for unintended biases*
  - *Preventing displacement through gentrification*
  - *Streets are intuitive and easy to use regardless of age, ability, cultural background, language*

- *Streets and trails are welcoming and safe and comfortable for all and provide transportation options to jobs, schools, health care, food, nature, etc.*
- *Impacts and access to benefits of infrastructure are equitable*

- Vibrant Communities
  - *Efficient urban form (supported by transportation)*
  - *Quiet – noise mitigation*
  - *Traffic calming*
  - *Light pollution mitigation*
  - *Place-making*
  - *"Right-sizing" transportation facilities*
- Resiliency
  - *Resiliency during natural disasters, during extreme weather events and other major events*
- Fiscal Stewardship
  - *Speak to asset management, return on investment*

2.3 Performance-Based Design

This section is the KEY overarching design policy from Metro.

- *Describe the need for flexibility in design and context sensitive solutions through performance-based design*[1]
- *Federal Highway Administration (FHWA) and State Policies are supportive of design flexibility and establishing similar guidance. Describe the relationship between adopted standards and flexibility, and when diverging from standards is a smart choice.*

2.4 Policy Context

(Draw on Existing Green Streets guide: section 3.4 – Regulatory Context)

Regional Policy

Provides a succinct overview of the key regional policies and provide references to specific policy documents for additional details. Discusses how policies support innovative and flexible design, while also limiting what can and cannot be done. Could be presented in a table.

---

[1] ***Performance-Based Design*** *is an approach for understanding the desired outcomes of a project and selecting performance measures aligning with those outcomes. This approach provides a framework for practitioners to track design decisions, which can support practitioners in implementing flexible designs. This outcome-oriented framework helps identify the design elements that will achieve identified goals, e.g., increase bicycle/pedestrian mode share. Those elements that help achieve goals are used.*

- *2040 Regional Land Use Types – 2040 Growth Concept*
- *RTP - Regional Design and Functional Classifications, outcomes based planning, moving people*
- *Regional Transportation Functional Plan (RTFP) – jurisdictions must allow use of guidelines*
- *Urban Growth Management Functional Plan – including Title 2 (Parking), Title 6 (Centers and Corridors), Title 13 (Nature in Neighborhoods)*
- *Goal 5 – Nature in Neighborhoods, fish and wildlife protection*
- *Regional Modal and Topical Plans*
- *Climate Smart Strategy*
- *Regional Transportation Safety Strategy: Vision Zero*
- *Strategic Plan to Advance racial Equity, Diversity and Inclusion*
- *Cap and Trade SB 557 if passed through legislature*

State Policy

- *This subsection will highlight State agency support of design flexibility through performance-based design. References to specific state policies will be included.*
- *Include discussion about Oregon Highway Plan, Policy 1B, which describes that transportation serves the land use.*
- *This will be coordinated with Oregon Department of Transportation (ODOT) as the Urban Design Initiative (UDI) progresses.*
- *Depending on timing, may note certain statewide policies and/or guidance that is under revision or is being updated.*
- *Reference to the "Bicycle Bill" and State Land-Use and Transportation Goals, Transportation Planning Rule*
- *ODOT's policy code of building all regional trails 16 feet wide (12 with two 2-foot shoulders)*
- *Potential to include pull-out quotes from state legislators, Oregon Transportation Commission (OTC), or ODOT*

National Policy

- *This subsection will highlight FHWA support of design flexibility that includes the direction of national guidance and evolution toward performance-based design compared to code-based design.*
- *It will note key legislation that impacts how streets are designed: National Highway System designations, Federal Clean Water Act, Title VI, Executive Order Environmental Justice, Americans with Disability Act (ADA), Architectural Barriers Act (limits what can be done on trails in parks)*

- *Potential to include pull-out quotes from transportation secretary or United States Department of Transportation (USDOT) officials*

Relationship to Local Policies

This subsection will explain how local agencies should use Metro design guidance:

- *Local jurisdictions often take the new lead with innovative design (e.g., Portland bike boxes, Gresham stormwater) – their initiative in design makes it easier for other jurisdictions.*
- *Following this design process and guidance is required for projects competing for Regional Flexible Funds Allocation (RFFA) funding.*
- *Local agencies should use this design guidance in shaping the documents that influence design in local jurisdictions. This section will describe types of local document and discuss how they influence design. These influencing documents include:*
  - *Development Code*
  - *Engineering Design Manuals/Standards*
  - *Comprehensive plans – land use elements/contexts*
  - *Transportation system plans – functional classifications, cross sections, etc.*
  - *"Action Plans" (e.g. safety action plan, climate action plan)*
  - *Specific ordinances (e.g. lighting ordinance, green street ordinance)*
- *Potential to include pull-out quotes from Metro-area agency leaders.*

Notes: The project team anticipates Metro leading the development of specific sections in this chapter.

CHAPTER 3: DESIGN FUNCTIONS AND CLASSIFICATIONS [20%]

Introduction

Chapter 3 will introduce and describe the functions of streets and trails, and how they relate to the desired outcomes in Chapter 2. It will then introduce the Regional Design Classifications (captured in the policy chapter of the Regional Transportation Plan) and which functions each should be designed to serve. The Design Classification Map in Chapter 2 of the RTP is a policy map which identifies the design concepts that need to be considered to address federal, state and regional transportation planning mandates. While regional trails and some local and collector roadways are part of the regional bicycle and pedestrian networks, the design classification map identifies design concepts only for major roadways because it is these roadways where the greatest trade-offs in design must be considered.

3.1 Design Functions

Design Functions describe the universe of uses (e.g. physical activity, moving goods) that streets and trails can serve and thereby contribute to the desired outcomes.

- *This subsection will provide a brief description of design functions (~2-3 sentences each).*
- *Will include a matrix that connects the functions to the desired outcomes from the previous chapter.*
- *Discuss how Regional Mobility Corridors serve functions within the corridor, and that not all functions necessarily need to be served on one street. There are twenty-four overlapping Regional Mobility Corridors in the region. Each is several miles wide and long and encompasses many highways, streets and trails.*

- Pedestrian Access and Mobility: People walking and people using a mobility device
  - *Describe the importance of walking and walkability to the thriving places*
  - *Brief discussion of destinations where it is most critical to prioritize pedestrian access (transit, schools, etc.)*
- Bicycle Access and Mobility: People riding bicycles
  - *Brief discussion of destinations where it is most critical to prioritize bicycle access (transit, schools, etc.)*
- Transit Access and Mobility: People accessing and using transit
  - *Include various transit modes and brief discussion of the functions/destinations served by each. (light rail, bus, bus rapid transit, enhanced transit, frequent bus, paratransit, and standard bus).*
  - *This will include mention of potential for future driverless transit.*
- Truck Freight Access and Mobility: Moving Goods, deliveries, e-commerce
  - *Discussion of situations where it is critical to prioritize truck/freight.*
- Auto Access and Mobility: People driving, ridesharing, automated and driverless vehicles/connected vehicles
  - *Currently the most "complete" network – this function is constrained by congestion/delay, rather than completeness like the other modes.*
  - *Include discussion of need for safe spaces for rideshare drop-off and pick-up that do not impede the flow of other modes of traffic.*
  - *Will include discussion of autonomous vehicles/connected vehicles and how access considerations may differ for them. Later sections will note specific design considerations related to that type of vehicle.*
- Place-Making and Public Space

- *Describe how streets/trails can be a place for recreation, civic life, public space, or a canvas for public art*
- *Public enjoyment of street trees and green street elements (such as rain gardens).*

- Corridors for Nature and Stormwater Management
  (Draws on Existing Green Streets guide: Section 1.2, What is a Green Street, 3.2, Understanding the hydrologic cycle, and Section 4.2, Factors related to location and design)
  - *Sustainable stormwater solutions in the public right-of-way protects downstream water quality and flow control problems protecting urban natural resources.*
  - *Discussions of wildlife habitat and corridors, wildlife crossings, and crossing stream corridors, including lighting mitigation and other hazard mitigation practices, which will impact the functional utility of those corridors.*
  - *Utilizing tree canopy to reduce urban heat island effect and provide stormwater management benefits.*
  - *Discussion of how site conditions (soil, infiltration, slopes, utilities, contamination and other right of way improvements) impact green street design solutions in various applications.*
  - *Discuss management goals for green street applications (volume reduction, flow control, water quality) and approach (regional vs. distributed)*
  - *Street trees benefits: runoff reduction and detention; conveyance attenuation, water quality mitigation*
  - *Green communities and provide access to nature*
- Utility Corridors
  - *Brief description of the need to design for power, water, communication, data, etc. infrastructure, and the benefits of coordination*
- Stationary Space
  - *Stationary space is a function that can correspond to each travel mode, and streets/trails may include this function for 1 or more modes:*
    - *auto parking (autos), storage of personal property;*
    - *ride hailing – pick-up and drop-off (autos)*
    - *loading zones (freight/trucks);*
    - *bicycle parking, bikeways behind transit stop (bicycle);*
    - *transit stops/stations (transit);*
    - *benches/seating (pedestrian)*
- Physical Activity

- *Discussion of how streets/trails serve as a place for physical activity. Potential to move mention of "recreation" to this section instead of, or in addition to, in "Place-making and public space".*

- Emergency Response
  - *Describe the function of providing emergency access and the different needs of emergency vehicles.*
  - *Describes "Designated Emergency Routes"*
  - *Include discussion of "evacuation routes"*

3.2 Regional Functional and Design Classifications

- *This section will briefly describe the modal networks and functional classifications in the policy chapter of the Regional Transportation Plan.*
- *Link to maps:* ***https://gis.oregonmetro.gov/rtp/***

- Arterial and Throughways Network and Functional Classifications
- Transit Network and Functional Classifications
- Freight Network and Functional Classifications
- Bicycle Network and Functional Classifications (includes Trails)
- Pedestrian Network and Functional Classifications (includes Trails)
  - *This section will provide a description of the regional design types assigned to Arterials and Throughways and shown on the Regional Design Classification map in the policy chapter of the Regional Transportation Plan. Not all streets, and no trails, identified on the bicycle and pedestrian modal networks will have a regional design type assigned to them. Bicycle and pedestrian elements, including regional trails within the right-of-way, are part of the design type description.*
  - *Link to Design Classification map:* ***https://gis.oregonmetro.gov/rtp/***
  - *Metro will work with agency partners and key stakeholder's to finalize the design classifications and update the Regional Design Classification map.*
  - *Design types are general by nature; in practice the ultimate design and function of Regional Boulevards, for example, will be different based on context and desired outcomes.*
  - *This section will include a matrix that describes which functions should typically be served by which design types. (Potentially specifying primary, secondary, and "optional" functions.) For example: An Industrial Street's primary function may be freight access, with optional stationary space, while a Regional Boulevard's main function is multi-modal access and place-making, with optional freight access. It will point to Regional Mobility Corridors and the corridor approach to serve different functions within a corridor (e.g. Industrial Street with nearby regional trail).*
  - *This will review how adjacent land uses impact design classifications.*

- *May acknowledge and/or draw on the functional classification system described in "National Cooperative Highway Research Program (NCHRP) 15-52: Developing a Context-Sensitive Functional Classification System for More Flexibility in Geometric Design" to note the national trends for functional classification.*

- Throughways: *propose to no longer separate into "freeways" and "highways." This design type is for grade separated limited access facilities. Defines number or lanes. Essential function is throughput and mobility.*
- Regional Boulevards: *propose to no longer distinguish between "regional" and "community" boulevards. This design type would be for major and minor arterials that serve as a "main street" and are typically located in centers and activity centers. Discuss number of lanes, when boulevards are couplets. Balancing access and mobility. Further discussion needed on name. "boulevard" may not be the correct name.*
- Regional Streets: *propose to no longer distinguish between "regional" and "community" streets. This design type would be for major and minor arterials that serve as commercial corridors and connect centers, employment, industrial areas and activity centers. Discuss number of lanes, couplets. Balance between mobility and access.*
- Industrial Streets: *propose to eliminate design classifications on roads outside of the Metropolitan Planning Area boundary. Propose to assign the "industrial streets" design classification to streets identified as Intermodal Connectors on the regional freight map. Essential function of these streets is access to intermodal facilities, while balancing safety and access to transit and other destinations.*

Note: In Phase II, the development of the guide, the Technical Work Group will have further discussion on design classifications and determine an approach for this guide that accounts for trails and bicycle boulevards. Work Group, TPAC and MTAC will have opportunity to weigh in.

CHAPTER 4: DESIGN ELEMENTS [20%]

Introduction

Chapter 4 includes the lowest-level (1000-foot view; most down-to-earth) content, discussing on-the-ground physical design elements and design considerations.

4.1 **Performance-Based Design**

- *Performance-based design is an approach to designing streets and trails that starts with the desired functions and outcomes of the project and then selects*

the design elements to support achieving those functions and outcomes performance based design is the key principle underlying the selection of elements and design of streets and trails.

- *Communicates the importance of the interaction between design elements based on the context and the need to evaluate how different combinations may contribute to the overall performance of the street.*
- *Embraces the interaction of safety, operations and design together rather than focusing on design elements and their respective dimensions.*
- *Discusses balancing overall width with serving desired functions*

4.2 Design Elements

Design Elements are engineering and design solutions (e.g. wide sidewalks, freight aprons) used to support the various functions (e.g. physical activity, goods movement) and desired outcomes of livable streets and trails (e.g. healthy people, sustainable economy).

Information in this subsection will be based on some of the information in the Existing Creating Livable Streets Guide (Chapter 3), the Existing Green Streets Guide, and the resources identified in the Resource List (e.g., Reference Designing for Truck Movements and other large vehicles in Portland (October 2008)), and will emphasize best practices (e.g. protected bikeways).

- *Intended to include design elements that support the desired outcomes and design functions described in Chapter 2 and 3, respectively.*
- *Each element will be covered in approximately 2-3 pages, and will include the following sections:*
  - *Basic description/definition*
  - *Functions – which does it serve? (The "benefits" of this design element)*
  - *Design Guidance*
  - *Design Considerations/Challenges (will replace much of the envisioned content from "Design Considerations in Context"; design considerations will frequently include discussion of Green Streets infrastructure options)*
  - *Additional Resources*
- *Will not give prescriptive dimensions or detailed design guidance, but will provide ranges and brief guidance for selecting appropriate dimensions depending on context.*

Introduction: The Travelway Realm

- *Describe the on-street/travelway realm, transition realm, pedestrian realm, land use realm. Note that modal facilities may appear in more than one of these*

realms depending on the street and context. (e.g., bicycles and transit may have dedicated space in the travelway or in the transition realm – therefore each of these have their own organizational section)

- *Will include an overarching 3D graphic/illustration that shows the different realms, and also shows how some areas overlap.*
    - *Intersections and Crossings (Nodes) are discussed in their own section.*
    - *Trails are discussed in their own section*
    - *Additional elements for "all realms" included in final section*

Land Use Realm

(Existing guide: Adjacent Land Use, page 44-53, minimal modifications)

- *This section will not include separate "elements" but will treat the land use realm as an "element" – since this guide is not focused on architectural design.*
- *Adjacent land-use (current and planned) guides transportation design.*
- *Brief discussion of building frontage impacts/relationship to key functions of the street; include references with more detail.*
- *Best practices: transparency, edge treatments, etc*

Pedestrian Realm (Sidewalk)

This section will include elements that are primarily found in the pedestrian realm on the sidewalk side of the curb. Numbered entries are the "elements".

(Existing guide: Pedestrian Realm, page 29, minimal modifications)

1. Frontage Zone of buildings and adjacent parking lots
    - Signage (businesses)
    - Sidewalk cafes, seating
2. Pedestrian Through Zone (Existing guide: Sidewalks, page 30-35, significant reorganization/modification)
    - ADA – Universal design
    - Range of widths for different land use contexts and street types
    - Option for shared space: Reference to trails section – in some cases this is an appropriate design for the pedestrian realm adjacent to streets and in street corners.
3. Street Furniture Zone (Existing Guide: Streetscape features and Landscaping and Planter Strips, page 42-43, significant modification)
    - Street furniture
    - Utility vaults *(limits other pedestrian facilities that can be offered, interfere with other design elements)*

- Transit stops and shelters (reference transit section)
- Reference wayfinding and lighting (in final section)
- Bikeshare stations
- Street trees (Existing Guide: Street Trees, page 36-37; minimal modifications)
    - *Include seven roles of urban street trees (Street Design the Secret to Great Cities and Towns)*
    - *Desirable characteristics (wide spread canopies, tolerate urban pollutants, etc)*
    - *Climate resilient*
    - *Preservation of existing tree resources (especially large form trees) by allowing flexibility in design (retrofitting street with existing trees)*
    - *Sidewalks around existing trees - species that would not damage sidewalk*
    - *Include Appendix with updated Green Trees Guide content.*
- Flow through or infiltration stormwater planters

4. Street Corners
    - Curb extensions
    - Curb ramp design
    - Inclusion of ADA elements
    - Bus pullouts
    - Flow through or infiltration stormwater planters on curb extensions
    - Reference Crossings (discussed in "Nodes" section)

Transition Realm

This section will include elements that are found in the on-street curbside area. This area has the most variation in different contexts and different streets. Additional mode-specific detail is found in the "bikeways" and "transitways" sections. Numbered entries are the "elements."

5. Planters, swales, and basins for stormwater management
    - Discuss site conditions *(infiltration, slopes, utilities, contamination)*
    - Management goals (volume reduction, flow control, water quality)
    - Stormwater approach (regional vs. distributed)
    - Manufactured technologies (structural soils; tree filter systems)
    - Maintenance
6. Curb: On-Street Parking and Other Uses

(Existing guide: On-Street Parking, page 38-39, some modifications, significant additional information)

- Diagonal (front and back-in)
- Parallel
- Publicly shared vehicle parking
- Management strategies for flex-space
- Loading and unloading zones
- Pick-up / drop-offs
- Electric vehicle charging
- Bicycle corrals
- Bike-share stations
- Transit stops (reference transit section for further transit-related design)
- Pervious pavement and structural soils (green street infrastructure considerations)

7. Surface Stormwater Conveyance and Detention
    - Inlets, runnels
    - Management approaches
    - Detention pools
    - Considerations: should include stormwater infrastructure type: combined sewer, UIC, or MS4. Design requirements (design storm size; water quality and flow control requirements) can vary substantially for each type.
8. Other buffer elements
    - Between pedestrians and travelway (bicycle or auto)
    - Between bicycle and auto
    - Buffers to visually narrow the lanes
    - Street seats
    - Noise mitigation – *sound walls (use of materials that minimize collision hazards, i.e., specification of marked glass or other non-transparent, bird safe material); Light pollution mitigation/shielding to prevent light trespass, which has potential to impact human health; use of green walls when possible that provide secondary benefits in addition to noise mitigation.*

Center Travelway Realm

Include discussions on what types and general widths of facilities are needed depending on the context of vehicular activity (e.g. speeds, volumes, number of

lanes, heavy vehicles). A discussion how to treat couplets and number of lanes will be included. Numbered entries are the "elements".

9. Motor-Vehicle Travel Lanes (existing guide: Travel Lane Width, page 15, with significant modifications)
    - Widths and attributes for:
        - Transit
        - Freight
        - Emergency vehicles
        - Autonomous/driverless vehicles/Connected Vehicles
            - *Outlines challenges and considerations, starting with list developed by Urbanism Next*
    - Turn-lanes
    - Shy distance
10. Medians (existing guide: Medians, page 16-18, minimal modifications)
    - Landscaped or hard surface
    - Consider flow through or infiltration stormwater planters
11. Traffic Calming
    - Vertical Speed Controls
    - Horizontal Speed Controls
        - *Include overall discussion that reducing speeds does not always mean the creation of congestion. Some discussion on how lower speeds does not always mean a significant increase in travel times (particularly over shorter distance trips).*
12. Access Management/Driveways
13. Shared Streets
    - Auto/bicycle shared lanes
    - Bus/bicycle lanes
    - All modes (woonerf-style)
    - Traffic diversion

Bikeway Design

This section will include elements related to on-street bikeways. Bikeway intersection design is covered under the Intersections section. Multi-use paths in the right-of-way are covered under the trails section. Numbered entries are the "elements".

14. Dedicated bicycle facilities (Existing guide: Bicycle Lanes, page 21-22, significant modifications

- Protected bikeways (consideration, driveways)
- Buffered bicycle lanes
- Standard bicycle lanes
- Bicycle-specific Signing and Markings
  - Striping options
  - Bicycle boxes
  - Reference wayfinding element

15. Shared spaces
    - Bus and Bikeway Interactions
    - Freight, bicycle, and pedestrian interactions
    - Mixing zones *(e.g., right turns and bicycles)*
    - Shared travel lanes
      - *greenways, bike boulevards, neighborhood bikeways, etc. – routes that are parallel to major streets*

Transitway Design

This section will include elements related to transit access and mobility. Numbered entries are the "elements".

Existing guide: Public Transit, page 40-41, significant reorganization, modification)_

16. Transit stops (show design in conjunction with bicycle facilities, shared and separate spaces)
17. Transit priority treatments
    - Lanes (Business Access & Transit (BAT), Pro-time transit, shoulder, etc.)
    - Queue jumps
    - Signal priority
    - Enhanced transit treatments *(Portland developing toolkit)*
18. Transit in travelways
    - High Capacity Transit (HCT) bus
    - High Capacity Transit (HCT) rail
    - Streetcar
    - Center-running / side-running

Intersections and crossings (nodes)

This section will include elements related to intersections and crossings for all facility types and modes. Numbered entries are the "elements". Will include considerations for inclusion of green streets infrastructure described in other elements.

(Existing guide: Intersections, page 23-26, significant reorg of info)

19. Midblock crossings (Existing guide: page 19-20, significant modifications)
    - Pedestrian

- Bicycle
  - *Discuss the interaction of pedestrians/bicycles using crossings and how crossings span the pedestrian realm and the center travelway; also discuss serving potential transit at crossings*
- Trail
- Wildlife Crossings
  - *This section will primarily reference the existing Wildlife Crossings Guide (which will not be updated through the New Metro Guide process), noting considerations of lighting impacts on wildlife and hazard mitigation (e.g. marked glass)*
  - *Consideration: hazard mitigation, including addressing of lighting.*
- Consider flow through or infiltration stormwater planters (discussed under street corners)

20. Un-signalized intersections
    - Crosswalks
    - Bicycle crossings
    - Stop controls
    - Reference traffic diversion from shared streets element
    - Curb radii
    - Driveway crossings
21. Signalized intersections
    - Crosswalks
    - Bicycle crossings
    - Signalization considerations
    - Turn lanes
    - Conflict points - Multimodal Considerations at Complex Intersections
    - Curb radii / freight aprons
22. Roundabouts/mini-roundabouts
    - including mountable curbs for freight trucks
    - Planter strips/central island – design opportunities
23. Unique / Gateway / Transition Contexts
    - Raised intersections/treatments

Regional Trails and On-Street Multi-Use Paths

This section will describe the different regional trail typologies in different contexts. A graphic will depict a trail moving through different land use contexts from rural/sparsely populated to dense urban core to illustrate how different trail

*typologies respond to context.[2] The focus of the regional trails discussion is on trails for **transportation**. Numbered entries are the "elements".*

24. Multi-use paths on independent alignment
    - *On levees, along railroads, utility corridors*
    - *Widths for different contexts and users*
    - *Separating modal users – lane striping, pavements, etc*
    - *Consideration of maintenance and emergency vehicles*
    - *Multi-use paths in riparian corridors – (reference to Green Trails guidance, lighting impacts, Clean Water Services guidance)*
    - *Crime Prevention Through Environmental Design approaches*
    - *Special considerations for trails: ADA, slope (running and cross slope) Architectural Barriers Act, maintenance*
25. Multi-use paths in roadway right-of-way
    - *Adjacent to roadway >35 mph*
    - *Adjacent to roadway < 35 mph*
    - *Attached to roadway*
    - *Widths and separation for different contexts and users*
    - *Consideration of maintenance and emergency vehicles*
26. Connections to other facilities
    - Transitions between on- and off-street facilities
    - Detour due to road closure
    - Access points
27. Bridges, boardwalks and structures
    - *consider load factor resistance design*
    - *rails, walls and fences - use of materials that minimize collision hazards (i.e., specification of marked glass or other non-transparent, bird safe material) and/or green walls*
28. Trail Crossings
    - mid-block
    - end block
    - intersections

[2] *For example the graphic could show a trail moving from a soft surface trail in a dense forest, to a shared multi-use path alongside a rural road, to a slightly wider multi-use path through a small suburban along an active rail line, to a shared path through a utility corridor, to a wide shared use path alongside a riparian corridor in a dense inner city neighborhood, to a shared use path with separation between walking and bicycling in the ROW alongside a busy arterial, to a 20ft wide shared use path in a dense city center along a major river with a separate protected bikeway.*

- driveways
- Undercrossing/ culverts
- Rail road
- Overcrossing
- Mixing zones (to address conflict points)
- Bollards

Design Elements for All Realms

This section will provide an overview of design elements that apply in various realms.

29. Street and Trail Surfaces
    - Pervious surfaces – where can they be applied
    - Permeable pavers
    - Varying surfaces to separate users
    - Materials options specific to Metro region
30. Lighting
    - Types of lighting and best practices
    - When and where to use lighting
    - Lighting for safety
    - Pedestrian scale lighting
    - Wildlife sensitivity
    - Dark skies
31. Wayfinding
    - Signing and striping for wayfinding
    - Trails
    - Bicyclists and pedestrians
32. Place-making Amenities
    - Art
    - Water-fountains
    - Seating

4.3 Design Considerations Checklist

Section 4.3 is a checklist of design considerations that may influence design. These considerations are described in above sections, so this is a "summary" that will help practitioners easily identify the elements they need to consider. Some of these considerations have an influence on design even if they are not contributing to the core function of the street.

- How is emergency vehicle access provided? Is this an emergency vehicle route? Evacuation route?

- Is this street within ¼ mile of a school? (Safe Routes to School Access)
- Is this a transit route?
- Is this a Metro freight route? Is it an ODOT "Hole in the Air" route (i.e., ORS 366.215)?
- Is this an National Highway System (NHS) route?
  - *Reference the Guide for Integrating Goods and Services Movement by Commercial Vehicles in Smart Growth Environments.*
- Are there environmental constraints? (parks, wetlands, streams, sensitive wildlife habitat) Are there opportunities to protect natural resources, improve natural resources, and increase access to natural resources?
- Cultural or historical constraints or influences?
- What is the topography / Slope and structures? (Retaining Walls, Bridges)
- Do we need to design for automated and driverless vehicles/connected vehicles, emerging technologies?
- How would this street be impacted by extreme weather events? (heat, more rain, street trees, shade, shelter, pavement)
- What are the maintenance needs – above and underground?
  - *this can be a particular challenge in areas with low home-ownership (e.g., street trees, bioswales)*
- Traffic diversion (from street calming, bicycle boulevards, etc)
- What are the Public Input and Community Desires?
  - *may include perception of design strategies, such as "road diets" or trails*.
- Are there conflicting policies from different jurisdictions?
- Are there parallel routes to serve certain functions (e.g. parallel bicycle routes)?

CHAPTER 5: VISUALIZING DESIGN CLASSIFICATIONS IN CONTEXT [12%]

Introduction

Chapter 5 will provide illustrative examples of what the design elements look like for the design classifications and in a variety of contexts (e.g., existing, constrained Regional Boulevard in a dense older neighborhood, new Regional Street in a new development, retrofit/incremental change). The examples will include several schematic drawings for each design type to illustrate that one size does not fit all and flexibility in design. Photos of existing streets and trails in the region (that people recognize!) and show different design elements on the various street types can also be used to illustrate how the design elements come together o create livable streets and trails.

- *This chapter will focus on "visualization" of the classifications through schematics and cross-sections. Photos may also be used to show existing examples.*

- *Visualizations and cross sections represent design classifications from Section 3.2 and include elements from Chapter 4: how treatments fit within the different contexts; including stormwater and trees treatments; Potential to show some sample metrics about performance.*
    - Throughways
        - *Below grade in urban area, four motor-vehicle travel lanes, bus rapid transit lanes, concrete divider, adjacent multi-use path with lighting, trees and stormwater treatments and green elements on embankments.*
    - *Below grade, six vehicle motor-travel lanes, concrete separator, adjacent light rail, trees stormwater treatments and green elements on embankment.*
    - *At grade in suburban area, greenway separation, pedestrian/bicycle over and undercrossings.*
    - Regional Boulevards
        - *One to four story mixed use development, frequent transit corridor, bicycle and pedestrian parkway, four motor-vehicle travel lanes, transit priority lane, median with trees, turn lane, roundabout at intersection, adjacent multi-use path with two way bikeway and pedestrian zone, ADA.*
        - *Intersection with bicycle treatments, paving treatments, raised crosswalk, roundabout, ADA.*
        - *Two to four story mixed use development, frequent transit corridor, bicycle and pedestrian parkway, freight route, four motor-vehicle travel lanes, separated two-way bikeway, planted buffer with bikeshare station and bio-swales, wide sidewalk, ADA.*
        - *One to two story mixed use development and single family housing, frequent transit corridor, pedestrian parkway, two motor-vehicle travel lanes, median and turn lane, planted buffer with electric vehicle charging and bio-swales, wide sidewalk, bicycle boulevard one street over, ADA.*
        - *One to four story mixed use development, frequent transit corridor, bicycle and pedestrian parkway, freight route, four motor-vehicle travel lanes, median with trees, turn lane, separated bikeways, wide sidewalk with transit stations, regional trail one street over, ADA.*
        - *Similar to examples above but with couplet.*
    - Regional Streets
        - *Commercial development, big box, mixed use at intersections, frequent transit, freight route, bicycle and pedestrian parkway. Four motor-vehicle travel lanes, transit priority lanes, median, turn lane, wide sidewalk with transit stations, bicycle boulevard one street over, ADA.*

- *Commercial development, big box, frequent transit, freight route, bicycle and pedestrian parkway. Two motor-vehicle travel lanes, transit priority lanes, buffered bikeway, planted buffer with bikeshare station and bio-swales, wide sidewalk, freight aprons at curb, , ADA.*
- *Commercial development, big box, mixed use at intersections, frequent transit, and pedestrian parkway. Two motor-vehicle travel lanes, median and turn lane, planted buffer with electric vehicle charging and bio-swales, wide sidewalk, ADA.*
- *Similar to examples above but with couplet.*

- Industrial Streets
  - *Industrial development, large lots, access to intermodal facility. Four motor-vehicle travel lanes, wider streets, wider turning radii at intersections and driveways, adjacent multi-use path separated from street by planted buffer, ADA.*
  - *Two lane roadway through town center connecting to intermodal facility. wider turning radii at intersections and driveways, adjacent multi-use path separated from street by planted buffer, ADA.*
  - *Intersection with freight apron, mountable curbs.*

CHAPTER 6: DECISION-MAKING IN CONTEXT [18%]

Introduction

Chapter 6 is intended to provide practitioners with a framework to guide decision-making. Ultimately, the decision-making guidance in this chapter will need to be flexible enough that a variety of jurisdictions can use it to make decisions, and also use it to explain their decision-making process to other agency stakeholders, members of the public, elected officials, etc.

- *Will emphasize consistency with previous chapters – policies focus on **desired outcomes** (6.1), and the performance-based design process (6.2) is based on serving design **functions** by combining design **elements.***

6.1 Policy Guides Decision-Making

- Policy Guidance
  - *Policies and desired outcomes should guide transportation design*
  - *Restate Metro's overarching policy from Chapter 2, Section 2.4 – performance-based design.*
- Focus on Desired Outcome
  - *Emphasize that desired outcomes and functions must be clearly determined prior to embarking on design.*

- *Also acknowledge that streets and trails are not developed in a "perfect world". Funding constraints, competing policy objectives, existing infrastructure and traditional approaches to designing streets are part of the reality in which street designs are developed.*

6.2 **Performance-Based Design: Decision-Making**

This subsection will outline a decision-making process or flow-chart for travelway design, drawing on NCHRP 785: Performance-Based Analysis of Geometric Design of Highways and Streets.[3] The process/flow will draw on content from earlier chapters in this New Metro Guide, with practitioners guided through a series of questions (the following questions are examples/possibilities).

- Developing Complete Networks to Serve the Design Functions
  - *What is the land use context and regional (or local) classification of the travelway?*
  - *For which networks is this travelway critical? For which networks are there alternate/parallel routes that can serve?*
    - *Walking?*
    - *Biking?*
    - *Driving?*
    - *Driverless vehicles?*
    - *Transit?*
    - *Freight?*
    - *Nature/habitat corridors?*
      - *This subsection will highlight how function and modal priorities can be evaluated in the context of the greater transportation network. This is intended to help practitioners decide when trade-offs can be made given the nature and presence of parallel routes.*
      - *Safety considerations will be included in this section. If the project team states that a street is going to serve a particular mode, then it should include safety-related design treatments for that particular mode.*
- Defining Priorities and Needed Functions for Each Travelway

[3] *Reference NCHRP Report 785, Performance-Based Analysis of Geometric Design of Highways and Streets, as well as direction from Federal Highway Administration (FHWA) encouraging states to implement performance-based practical design to address system performance, mobility, and safety needs in the current era of financial limitations.*

- *What design functions must be included or improved to further the desired outcome?*
  - *And/or: What design functions must be maintained…?*
  - *And/or: What design functions are not carrying us towards the desired outcome?*
  - *Potentially specify primary, secondary, and "optional" functions.*
- *What metrics will be used to evaluate the function of existing (if applicable) and future design options?*

- Flexibility in Design – Combining Elements
  - *Based on answers to above and guidance outlined within the design elements, what design elements or design solutions should be considered (develop alternatives)?*
  - *How well do the design elements serve the desired functions?*
  - *How do these alternatives compare to the available right-of-way (ROW)? (Are you designing for a travelway that has the opportunity to obtain more ROW, or is it constrained to the existing ROW?)*
    - *This subsection would provide guidance (e.g., range of dimensions) for different travelway design types.*
  - *What are the key design controls and influences? (speeds, sight distance)*
- Data to support decision making
  - *Include discussion of typical data that would be available or that can be collected to support decision-making and evaluate the impacts of the selected design (before/after implementation).*
- Evaluating Trade-offs
  - *If right-of-way is constrained, insert series of questions/process that will help identify trade-offs to guide the practitioner, e.g.:*
    - *Can an alternate/parallel route within this corridor serve one or more of the desired functions (typically bicycle mobility)? – If alternate/parallel routes are identified those parallel routes must be included in the overall project, including:*
      - *Access to the parallel travelway; distinctive bicycle parking and wayfinding for intuitive access*
      - *For walking and biking, special consideration must be given when walking and biking routes intersect with travelways and when people walking and biking access destinations on that travelway. This is especially important if the travelway has a high traffic volume with high speeds, as people walking and biking may be less visible to people driving*

- *Can widths of particular design elements be minimized without sacrificing the function? (and/or is more research needed to determine appropriate widths?)*
- *Is there an existing function that can be removed from this travelway, keeping in mind the desired outcomes?*
- *Can the travelway space be allocated in different ways depending on time of day?*
- *Can a particular mode be de-emphasized?*

CHAPTER 7: IMPLEMENTATION STRATEGIES AND EXAMPLES [17%]

Introduction *This chapter will consider implementation strategies illustrated with actual implemented projects to describe the project development and how the design comes together following the decision-making process in Chapter 6. This chapter will rely heavily on case studies, which will cover a range of topics and projects, aiming to show a variety of themes that different agencies can relate to. Each case study will be 1-2 pages and will include images and potential diagrams as well as explanatory text. Case studies will be either completed, or based on potential redesigns of existing streets.*

7.1 New Streets and Trails

- *Discussion of balancing overall width with achieving desired outcomes and serving desired functions. Note that the maximum width for new streets/trails is not necessarily the optimal even if it serves the most functions, due to impacts on the surrounding land uses and nature and the potential for it to be a barrier.*
- *Include case study of new street that is successful at this.*
- *Trail case study: South waterfront example of separating bicycles and pedestrians into two facilities. Good design for the context, but not appropriate for all regional trails. The point is that one size does NOT fit all.*

7.2 Retrofit / Redesigns

- Temporary/Pilot Implementation
  - Moving the curb with paint
  - Parklets
  - Temporary street closures
  - Pilot bus lanes (suburban example: Everett, Massachusetts and urban example: Pittsburgh, Liberty Avenue)
  - Interim public plazas
    - *Include a case study illustrating these methods.*
    - *Discuss who needs to be involved, what type of code allows these, what potential barriers to consider.*

- Low-cost
  - *Will discuss low-cost strategies for improving outcomes in the near-term. Include discussion of:*
    - *Metro policy on constructing active transportation facilities – fill gaps first*
    - *Low-cost does not need to mean low-quality*
    - *Outline different examples of low-cost changes and discuss how they change the function of the travelway.*
    - *How might a low-cost/near-term implementation impact the potential for a larger project in the future?*
  - *Discuss strategies that leverage routine repaving and maintenance to make improvements.*
  - *Include a case-study of a project that has been implemented with re-striping / paint only.*
- Incremental change (e.g. lot-by-lot through development)
  - *Discussion of factors that influence whether incremental change is feasible (e.g., street frontage improvements)*
  - *What types of design elements provide benefit when they are constructed incrementally (e.g. sidewalks)*
  - *Discussion of best practices for timing of construction (including consideration of nature, e.g. Avoiding Impacts on Nesting Birds—Vegetation and Construction projects*
  - *Include a case-study of a street that has gone through incremental change over time, with each parcel redeveloping, or dedicating ROW. (?)*
  - *Multi-use path construction*

7.3 **Intersection Project**

- *Urban and suburban example*

7.4 **Evaluation: Before and After Implementation**

- *Discuss the importance of documenting before and after metrics. Evaluation should be included in all implementation.*
- *Include summary of relevant performance measures and include references with more detail.*
  - *Include a matrix of project-level performance measures that align with the RTP system performance measures (though they will not be the same measures in most cases.)*

Attachement 3

Meeting minutes

Metro
600 NE Grand Ave.
Portland, OR 97232-2736

Meeting:	**RTP Transportation Design Work Group Meeting #2**
Date:	Thursday, September 28, 2017
Time:	9 – 11 a.m.
Place:	Metro Regional Center, Council Chamber
Purpose:	Review Draft Annotated Outline for the Designing Livable Streets and Trails Guide
Outcome(s):	Input on Draft Annotated Outline

Work Group Attendees
Scott Batson, PBOT
Denver Igarta, PBOT
Zef Wagner, PBOT
Anthony Buczek, Metro
Lake McTighe, Metro (Project Manager)
Mary Coolidge, Audubon Society of Portland
Rich Crossler-Laird, ODOT
Brendon Haggerty, Multnomah County Public Health
Julia Hajduk, Sherwood
Scott Hoelscher, Clackamas County
Tim Kurtz, BES, Portland
Nico Larco, Sustainable Cities Initiative, U. of Oregon
Jeff Owen, TriMet
Stacy Revay, Beaverton
Jeannine Rustad, Tualatin Hills Parks and Recreation Dept.
Rob Saxton, LUT, Washington County
Dyami Valentine, Washington County
Chris Strong, Gresham
Joanna Valencia, Multnomah County
Zach Weigel
Lidwien Rahman, ODOT (PMT)
Karla Kingsley, Kittelson and Associates (PMT)
Mike Corrente, Greenworks (PMT)

Work Group Members Unable to Attend
Robert Galati, Sherwood
Mike Houck, UGI
Joseph Auth, ODOT
Rick Nys, Clackamas County
Richard Blackmun, Forest Grove
James Reitz, Forest Grove
Robert Spurlock, Metro
Kathryn Doherty-Chapman, Oregon Walks
Ryan Guy Hashagen, Better Blocks PDX
Stephanie Noll, The Street Trust
Eileen Cunningham, Multnomah County

Interested Parties/ Metro Staff Attendees
Luke Norman, Clackamas Community College
Tim Collins, Metro (Freight Plan)
Jamie Snook, Metro (Transit Plan)

Action items

- ✓ TWG members submit additional comments by Oct. 6
- ✓ Seek input from staff working in maintenance to identify considerations and challenges
- ✓ Develop workshop and forum topics
- ✓ Send out Final Annotated Outline on November 9. TWG and members of TPAC and MTAC has until November 30 to provide final comments on the annotated outline.

NOTE: Summary includes comments provided by work group members and interested parties after the meeting, including comments from the Audubon Society attached at the end of this document; all recommendations from the Audubon have been accepted and incorporated.

Project overview
Lake McTighe of Metro provided an overview of the approach to the project, and reviewed the progress to date. In the last TWG meeting, work group members provided input on the Draft Table of Contents (TOC) and the resource list. The meeting notes include the project team's responses to comments from the last meeting.

Draft Annotated Outline – TWG comments and staff response

Karla Kingsley, of Kittelson and Associates Inc., provided an overview of the draft Annotated Outline (based on the Draft TOC) and the organizational approach. Lake and Karla then led a discussion of each chapter. Work group members provided input on the Draft Annotated Outline. *The meeting summary includes comments from work group members provided via email after the meeting.*

General Comments

1. Will the guide provide policy guidance for the allocation of space in the public ROW?

   Yes, from the perspective of performance based planning. Most likely in Chapter 6 and 7.

2. Include the word Regional in the main title since only regional facilities are assigned design classifications? **While only regional throughways and roads are assigned a design classification in the RTP, the design guidance is applicable to any roadway or shared use path.**

3. Incorporate climate resiliency (rainfall patterns, heat, air quality) in some way? **Yes. The importance of design to consider resiliency will be included, as well as**

specific design tools (e.g. increased tree canopy, covered transit stops, stormwater detention and management).

4. Chapter 2: The Designing Livable Streets and Trails Guide touches on numerous policies, some of which have not yet been adopted. Is there a reason the update can't be postponed until after the RTP is adopted? **The project cannot be postponed. It is underway with a consultant team on contract and Metro would like to have the guidelines updated in coordination with the RTP as laid out in the 2018 RTP scope of work. Update of the guidelines and policies in the RTP are coordinated and complimentary. Even if proposed new policies, such as the Vision Zero target, are not adopted in the 2018 RTP Metro does not anticipate that the approach and content of the guidelines would change. Safety for all modes, for example, would still be an important element of the design guidelines and the guidelines are highlighting best practices in accepted engineering and design practices that have been proven to reduce fatal and severe crashes, which is consistent with current adopted RTP policy.**
5. State up front the envisioned network of streets and trails to which Designing Livable Streets and Trails Guide is envisioned to support. Regional network, not local streets. **The purpose and use of the guidelines will be clearly explained (consistent with Chapter 1 of the current Creating Livable Streets handbook).**
6. The outline reflects an ambitious undertaking. I suggest streamlining and reducing redundancy within the document and with other documents wherever possible. **Yes, that is a goal! Luckily we are updating existing guides so a lot of the work has been done.**
7. Ch. 2, Section 2.2 Freight/goods movement should be noted as an important consideration under "Efficient and Reliable Travel". **Change made.**
8. Ch. 4 Management and treatment of stormwater is an ever evolving topic, and very dependent on context. Ensure the broad range of options are reflected. **The guidelines will include current best practices in stormwater management for a variety of contexts.**
9. How does equity fit in? I believe this may have been mentioned at the last meeting, but wanted to make sure. **Social equity will be a theme throughout the guide. How streets and trails are designed has a big impact on social equity.**

Chapter 2 Design in Context (now Design Policy and Desired Outcomes)

Audubon provided comments on this section. See attached. All recommendations have been accepted.

Chapter 3 Regional Street and Trail Design Types (Now Design Functions and Classifications)

1. Think about adding a design classification for trails. **There will be trail typologies- see Chapter 4. The trail typologies help guide trail design, and in which context is paramount. However, the trail typologies will not be assigned to alignments on the Regional Trails Map, nor will trails be added to the Design Classification Map. The map is focused on high traffic volume roads that are regional corridors on the 2040 Growth Concept and that intersect regional centers.**
2. Trail Classification: I echo some of the comments that it could be helpful to provide a trail classification. Through the classification or elsewhere it would be very helpful to provide trail cross-sections in different contexts (adjacent to boulevards, in natural areas, etc.) **We will absolutely be providing cross-sections of regional trails in different contexts. I think I need to clarify that we be defining trail typologies (shared use path, share use path in ROW, on street connector, etc) but we will not be applying the typologies to specific trail alignments on the map. There are too many unknowns about how trails will be designed. Or, we may want to explore adding "Regional Trail" as a design classification to the Design Classification map – it doesn't provide any new information but it would address concerns that trails were not being included.**
3. Sec 3.1 – Is there significance to the order of the functions, e.g. modal hierarchy? **In a sense. It starts with pedestrians, then bicycles, transit, freight trucks, auto – following what is typically referred to a green hierarchy.**
4. Perhaps decide on an order and keep that order throughout, so perhaps start with placemaking as a function since land use and placemaking are the first elements. **We will keep this under consideration as the project moves forward. Additional reorganization will likely be needed.**
5. Clarify that prioritization is about prioritizing investments and not access for one mode over another, particularly in example of prioritizing pedestrian investments near schools or transit. **The Guide will take the approach that prioritization should be informed by a performance based approach – guided by policy to achieve desired outcomes.**
6. Need a policy that pedestrians are never the mode "to go" (sacrifice) if trade-offs are needed – pedestrian access needs to be everywhere. **Current regional and state polices and laws support this. The Guide will reflect these existing policies.**
7. Term boulevard is confusing. Boulevards are wide, have a planted median, faster moving traffic, moving through rather than stopping. Very different than the Main Street type functions that many of the streets with the boulevard function are. **The Work Group will have more opportunity to weigh in on the classification terms, concepts and maps. More work is needed!**
8. If you retain the Boulevard, perhaps you do not need regional in front of it? There are not local Boulevards. **Will keep under consideration.**

9. Confused about what Throughways covers – clarify. **Will do.**
10. Like the use of Industrial Streets.
11. We should look at how the regional design classifications relate to the Federal functional classification approach and possibly apply that to the region – NCHRP 15-50. **There are synergies between this approach and the current regional classifications. The project team is looking at how incorporating this concept into the design classifications could work. the Work Group will be consulted.**
12. It would be really great if you could make sure that the Federal, state (ODOT), and Metro functional classifications are consistent and that the design classifications do not contradict each other. **We will work towards this, it may be challenging but a desired outcome.**
13. ODOT process and Metro process should dovetail and not contradict each other. Would be good to look at the national level and be consistent with that. **That is the goal.**
14. Are the streets that would be labeled as "Industrial Streets" already mapped? It would be good to share the mapped streets with the work group. **They are being mapped by the regional freight group as part of the update of the regional freight plan and are referred to as Intermodal Connectors.**
15. Clarify what the purpose of the Design Classification map is. **Additional information added to the Introduction of Chapter 3. A description of the purpose will be added to Chapter 2 of the RTP.**
16. Will the streets designated on the Design Classification map remain the same? Is there an opportunity to update? **There is an opportunity to update. This will happen in early-mid 2018 as part of the RTP update.**
17. Can you confirm that even though the Design Classifications are not applied to facilities outside of the MPA boundary that Metro will still be involved in Regional Trails that go outside the MPA boundary? **Metro will continue to be involved in regional trails that go outside the MPA boundary.**
18. Can you explain why not all of the bike and pedestrian routes identified on the Regional Bike and Ped functional maps (e.g. Bicycle Parkways on local roads) will not be assigned a Design Classification on the design classification map? I think every route on a functional classification map should be assigned a design classification. **While regional trails and some local and collector roadways are part of the regional bicycle and pedestrian networks, the design classification map identifies design concepts only for major roadways because it is these roadways where the greatest trade-offs in design must be considered. The Guide addresses design elements and implementation for all types of regional facilities, including bicycle boulevards and trails.**

19. Assigning design classifications to arterials only makes sense because it is about resolving trade-offs and conflicts between modes.
20. Think about regional corridors, not only streets – take the corridor approach. It is not always possible to serve every mode perfectly on every street, but if you take a corridor approach you can serve travel needs in that corridor. Need to define corridor for this purpose. **There may be an opportunity to convene a smaller group to work through the details of the classification system.**

Chapter 4 Design Elements and Considerations

1. For the land use element – please mention/touch on elements such as transparency, edge treatments (e.g. for parking lots), etc. **Done**
2. Element 8 – perhaps change title. Portland uses curbzone, but not ideal. **Still considering multiple options.**
3. Include curbside access in #8 **Included – referred to as pick up and drop off.**
4. Curbside etc (#8) and the ped furnishing zone have a lot of overlap. Confusing to have separated out. **Project team is still working on the best ways to differentiate these different and overlapping zones.**
5. May be useful to show the different realms as overlapping geographically in the visual. **Good idea.**
6. Include in the "buffer section" a buffer between two opposing lanes – painted buffer, narrow median, rumble strips. NYC used painted buffers on the side of the road to narrow the visual field and slow traffic, but still allow for freight movements. **Will look at.**
7. Make sure to capture how to use paint and different surface types to provide visual distinction, e.g. bike/ped separation on a MUP. **Will include.**
8. 4.2 Design Elements: Pedestrian Realm (Sidewalk) / 3. Street Furniture Zone – Stormwater needs to be included in the bullet list here. The space between the curb and sidewalk is very frequently used for stormwater management. Zef Wagner did comment on this during the 9/28 meeting (in regards to the blurring of the Curbside and Pedestrian Realm), but I wanted to stress this point. **Added, also in the transition realm.**
9. 4.2 Design Considerations Checklist: should include stormwater infrastructure type: combined sewer, UIC, or MS4. Design requirements (design storm size; water quality and flow control requirements) can vary substantially for each type. **Added to Transition Realm, #7**
10. Regional Trails: Other areas to cover in the trail design guidelines: stairs, switch backs, chicanes, wheel gutters, amenities along a trail such as benches (what does ADA recommend e.g. every so many feet/miles), striping, native plants/grass or

gravel on the shoulders, trees along trails, and interpretive, way-finding and mileage signage. At grade crossing of RR tracks. You listed some of these, but not all.

11. Regional trails: Trail under crossings of RR tracks and streets (e.g. 99-W for Ice Age Tonquin Trail in Sherwood). Good example along Burke Gilman Trail in Bothell, WA. These are generally unpopular with trail users (safety, lighting, OM, construction costs, etc.) **added**
12. Regional trails: Trails in culverts. (Kelley Creek in Gresham along Johnson Creek on SE Foster Rd. is a partial example). Most culverts don't allow ped/bike use. What can we do about new wider culverts? Boones Ferry Rd? Hwy. 43 at Terwilliger **added**
13. Regional Trails: Sections 25. & 26. would be very helpful. I would love to able to reference in the future for grant proposals, guidance for internal trails, and discussions with city and county partners. Perhaps more in common with transition zone? **We want this to be helpful. This is most likely where we will describe the different trail typologies. So, this section will be expanded.**

Chapter 5 Visualizing Design Classifications in Context

1. Please provide examples of one way streets/couplets and guidance on how to design them to serve all modes and be livable. Sometimes couplets can lead to wider, faster and more auto capacity. That should not be the purpose of the couplet. Also sometimes one side of the couplet can be a "main street" and the other side not. **Will add as an example.**
2. Some Industrial Streets only have one lane in each direction. Please include an example like this. **Will do.**
3. Need to provide explicit guidance on "how far away is too far" for a parallel alternative route for bikes, e.g. bike boulevard. **Yes. This will be captured in the visualizations as well as in Chapters 6 and 7.**
4. Do not only show throughways that are below grade. For example, 99W in Sherwood is not below grade. **Have added an at-grade example. The throughway examples are for limited access roadways.**
5. Provide multiple examples of how to handle stormwater, not only bio-swales. Washington County does not use bio-swales. **Will do.**
6. Include ADA treatments (including signal heads, sounds) in the examples. **Will do.**
7. It would be good if the Guide would provide guidance on the spacing of enhanced crossings. And include in the visualizations. **Yes this will be included.**
8. Bio-swales are called out for Regional Boulevards and Regional Streets, but not for Throughways or Industrial Streets. While it may be reasonable to assume they'll

play a larger role in the two Regional classifications, they could certainly be present in the design of all four. **Will be added.**

9. Regional Streets: Include an example with an adjacent multi-use path. Also are buffered bikeways appropriate with freight routes and high vehicle speeds? Perhaps supplement or replace with protected bikeways. **We will include an example with an adjacent multi-use path to a Regional Street. We will also include some stand alone trails. And, yes we will show the highest level of protection on higher speed, volume and truck routes. Other work group members have also brought that up. Thank you for catching that.**

Chapter 6 Decision Making in Context

1. If there are trade-offs, don't sacrifice bike and ped widths first automatically.
2. Seems like a very important chapter.
3. Need to think about trade-offs at the very start of the process and document all of the decisions taking place and why certain trade-offs are made. Look at WashDOTs "design decision process" – ODOT may use something like this.
4. A visual flow chart is helpful, one that maps out the process and prompts with considerations and questions. **Will consider.**
5. Will the process cover both development driven and whole corridor approach? Development driven projects are important to capture, and the processes are different. **Yes.**
6. Questions in 4.3 could be folded into this chapter 6 – to avoid redundancy. **Will consider.**
7. Decisions about design determined by what is codified at the local level. Guidance should be useful for when local jurisdictions are updating their code.
8. Include example scenario in this or Chapter 7. **Will consider.**
9. Need to make sure that data is being used to guide the decision making and be consistent with adopted policies, especially the racial equity layer. **Will add guidance on this.**
10. Process should provide for and facilitate easy documentation. **Yes, process will recommend this and provide tools.**
11. 6.2 Performance Based Design: Connect back to the 4.3 Design Considerations Checklist? **Will consider.**
12. Not sure if it goes here or in Chapter 7, but discussion of permitting, environmental and archeological / historic perspectives for trails and MUPs. I think we have developed a list/matrix in the past (Mel Huie). **Will look at.**

13. 6.2 Performance-Based Design – If alternate/parallel routes are identified for walking and biking, special consideration must be given when walking and biking routes intersect with travelways and when people walking and biking access destinations on that travelway. This is especially important if the travelway has a high traffic volume with high speeds, as people walking and biking may be less visible to people driving. **Absolutely. This is a very important point. Your comments have been included in the annotated TOC.**

Chapter 7 Implementation Strategies

1. This and Chapter 6 seem like a very important chapter. Maybe reduce the % of space dedicated to Ch 5 and give more "space" to Ch 6 and 7. **Agreed.**
2. Perhaps fold Ch 5 into Ch 7? **Not at this point but will look at.**
3. Include cost estimating methodologies and formulas. Professional standards on cost estimating. Contingencies. –Where to get cost estimating training. **Will look at including.**
4. Glad to see that there will be examples with regional trails. There is no one size fits all for trails and building trails into urban areas is very challenging – there are so many constraints and the need to meet ADA make achieving "desired widths" very hard in some cases. Giving examples on best practices for what to do in constrained and sensitive environments would be helpful.
5. ODOT's strict adherence to trail width standards of 12' plus 1' on each side are making it difficult to complete trail projects. **Guide will promote context based design and design flexibility (to achieve optimum performance) rather than strict adherence to strict standards.**
6. Regional Trails: taking advantage of culvert widening to provide bike/ped undercrossing. **Will consider as example.**
7. Temporary/Pilot Implementation: Include pilot bus lanes; suburban example: https://www.citylab.com/transportation/2017/02/when-street-parking-becomes-a-pop-up-bus-lane/517404/ & urban example: http://triblive.com/local/allegheny/12759704-74/downtown-pittsburgh-experiments-with-liberty-avenue-bus-lane-sidewalk-extension.

   Incremental change: Would be helpful to see an example with a multi-use path construction. **Thank you for the suggestions, we will include them in the mix.**

Resource List additions

- Metro recreation ecology literature review (Oct. 2017)
- Avoiding Impacts on Nesting Birds—Vegetation and Construction projects (Portland BES)

Next meetings of RTP Design work group

TBD. Most likely in March or April 2018. The Nov 9, 2017 TWG meeting is cancelled.

Attachement 3

Thank you for the opportunity to participate in the RTP Design Work Committee and to provide feedback on the Draft Table of Contents for the Designing Livable Streets and Trails Guide. We believe that it is critical that green infrastructure, natural resource protection and enhancement, natural resource hazard mitigation, climate action goals, and community access and equity considerations are priorities that do not lose out to traditional infrastructure considerations. The draft Table of Contents document appears to be on the right track to accomplish this, however, we want to emphasize that green infrastructure should be integrated into all transportation classifications. Historically speaking, commercial and industrial have too often been exempt from natural resource requirements, which has contributed to tree canopy deficiencies and has resulted in disproportionate impacts to adjacent communities, which are often of lower socioeconomic status. Therefore, we want to reiterate that the framework of the discussion should focus on how to ensure adherence to these guiding priorities at all scales of transportation planning.

Please accept the following specific comments and recommendations:

In CHAPTER 1: INTRODUCTION

Section 1.1 Purpose Making a Great Place: "Describes how land use, parks and natural areas, etc., recommend adding green infrastructure to this list; green infrastructure needs to be inserted into the dialogue early in the layout of this document.

In CHAPTER 2: DESIGN POLICY AND DESIRED OUTCOMES

Section 2.1 Under *Street and Trail Design in a Land Use Context*, subsection *Lessons Learned* states that: "nature can be part of the street and designs need to maintain wildlife corridor connectivity and remove barriers for wildlife."

- We recommend including language here to address the need to concurrently mitigate hazards for wildlife, including incorporation of best practices in lighting design to minimize impacts to birds, wildlife, and plants, as well as specifying selection of materials for noise barriers that do not present collision hazards for birds.

- Also recommend adding a bullet under lessons learned to indicate that Green infrastructure in street design leads to improved environmental and public health outcomes

- Also recommend adding language to the bullet on "Climate change and extreme weather events" to include building community and environmental resiliency

Section 2.2 Desired Outcomes

- Under *Healthy People*, recommend adding bullet point with explicit language about access to nature, parks and greenspaces, which contributes to both livability and health
- Under *Healthy People*, "Lower asthma rates through reduced GHG" recommend adding "and through increased tree canopy and reduced urban heat island effect"
- Under *Healthy Environment*, in first bullet point that addresses "reducing environmental and/or natural resource impacts", recommend adding "and mitigating hazards" including hazards related to light pollution by adhering to best practices in lighting design. Also include language that calls for incorporation of green infrastructure in design stage to ensure and maximize compatibility
- Under *Racial Equity* add a new bullet: "Ensure access to nature"
- Under *Racial Equity,* last bullet that begins "Impacts and benefits", insert *"and access to benefits"*
- Under *Vibrant Communities,* recommend adding a bullet on Light Pollution mitigation.

Section 2.4 Regional Policy

- Recommend adding Goal 5 to this list
- Recommend adding Cap and Trade SB 557 if passed through legislature

Section 2.7 Relationship to Local Policies

Recommend including the following policy references:

- Portland's Climate Action Plan https://www.portlandoregon.gov/bps/article/531984
- Portland and Multnomah County's 100% Renewable Pledge https://www.portlandoregon.gov/auditor/article/642811
- Multnomah County Dark–sky Ordinance https://multco.us/node/31711
- Multnomah County Comprehensive Plan https://multco.us/file/55879/download
- Wilsonville Exterior Lighting Ordinance http://www.ci.wilsonville.or.us/DocumentCenter/Home/View/2744
- Hillsboro Exterior Lighting Ordinance http://qcode.us/codes/hillsboro/?view=desktop&topic=12-12_50-12_50_240
- City of Portland 2035 Comprehensive Plan https://www.portlandoregon.gov/bps/70936
- City of Portland 2035 Central City Plan https://www.portlandoregon.gov/bps/article/644114

CHAPTER 3 DESIGN FUNCTIONS AND CLASSIFICATIONS

Section 3.1 Design Functions

Under Corridors for Nature and Stormwater Management

- In bullet discussing wildlife habitat and corridors, wildlife crossings and crossing stream corridors, recommend including discussion of lighting mitigation and other hazard mitigation practices, which will impact the functional utility of those corridors
- Recommend adding a bullet that focuses on providing access to nature for communities

CHAPTER 4: DESIGN ELEMENTS

Introduction: The Travelway Realm

Under Pedestrian Realm Subheading, in Section 3. Street Furniture Zone:

- Lighting (pedestrian scale, wildlife sensitivity—dark skies, recommend adding Ecosystem considerations, human safety and glare reduction
- Under Street trees, recommend prioritizing preservation of existing tree resources (especially large form trees) by allowing flexibility in design.

Under Curbside/Transition/Buffer realm

Section 7. Stormwater Management

- Recommend adding a bullet addressing that this priority doubles as an opportunity to reach other goals (equity, urban heat island, air quality, habitat)

Section 9. Other buffer elements:

- The last bullet addresses "Noise mitigation – sound walls"; recommend adding language that specifies use of materials that minimize collision hazards, i.e., specification of marked glass or other non-transparent, bird safe material.
- Recommend adding Light Pollution Mitigation/shielding to prevent light trespass, which has potential to impact human health
- Recommend considering use of green walls when possible that provide secondary benefits in addition to noise mitigation.

Bikeway Design

- Recommend adding a bullet addressing need for protection or buffer areas around natural areas and other sensitive natural resources

Under Intersections and crossings (nodes), under section 20. Midblock crossings, bullet about Wildlife Crossings, recommend discussion of hazard mitigation, including addressing of lighting considerations.

Regional Trails and on-street multi-use Paths

Section 25. Different trail types

- Multi use paths in riparian corridors—Green Trails Guidance; Recommend referencing lighting design best practices and setbacks to protect natural resources
- Section 26, Trail elements Widths for different contexts and levels of use:
  Bullet on Lighting; when to light, types, wildlife sensitivity. Recommend adding discussion of how to light with reference to best practices.
- Bullet on Railings, walls, recommend adding language that specifies use of materials that minimize collision hazards (i.e., specification of marked glass or other non-transparent, bird safe material) and/or green walls

Section 4.3 Design Considerations Checklist:

- Are there environmental constraints? Recommend adding language that asks: "Are there opportunities to protect natural resources, improve natural resources, and increase access to natural resources?"

CHAPTER 6: DECISION MAKING IN CONTEXT

Under 6.2 Performance-Based Design: Decision-Making:

- Bullet on Nature/habitat corridor: recommend adding language about minimizing impact on habitat and natural resources

CHAPTER 7: IMPLEMENTATION STRATEGIES AND EXAMPLES

7.1 New Streets and Trails:

- Bullet discussing balancing width with desired functions and impacts on surrounding land uses, recommend adding protection of natural resources

- 7.2 Incremental change
  Discussion of best practices for timing of construction; recommend including specific reference to BES's document: *Avoiding Impacts on Nesting Birds*—Vegetation and Construction projects https://www.portlandoregon.gov/bes/index.cfm?a=322164