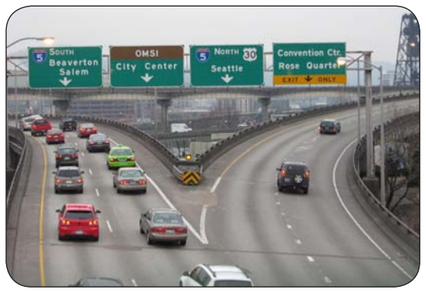
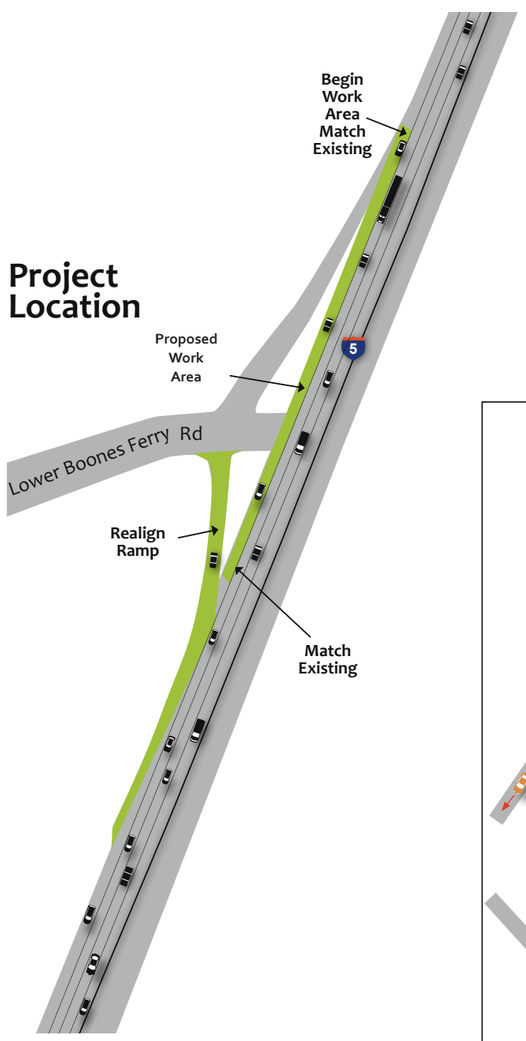
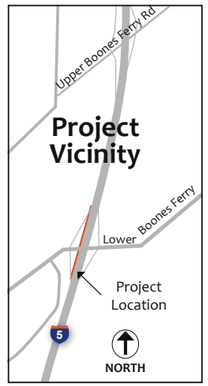
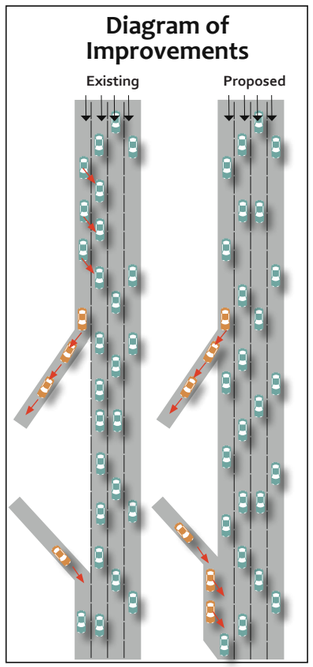
Project Atlas

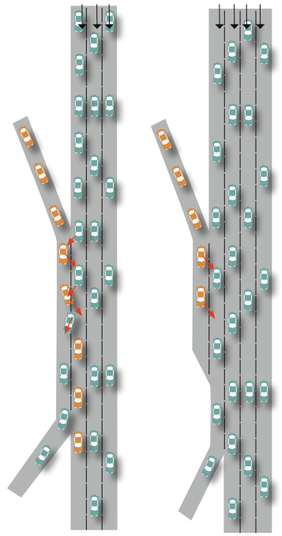
Corridor Bottleneck Operations Study - *ODOT Region 1*

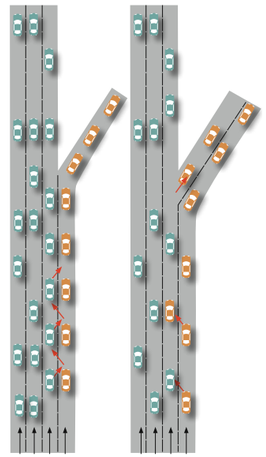












Project Atlas

Corridor Bottleneck Operations Study – ODOT Region 1

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Final Working Draft

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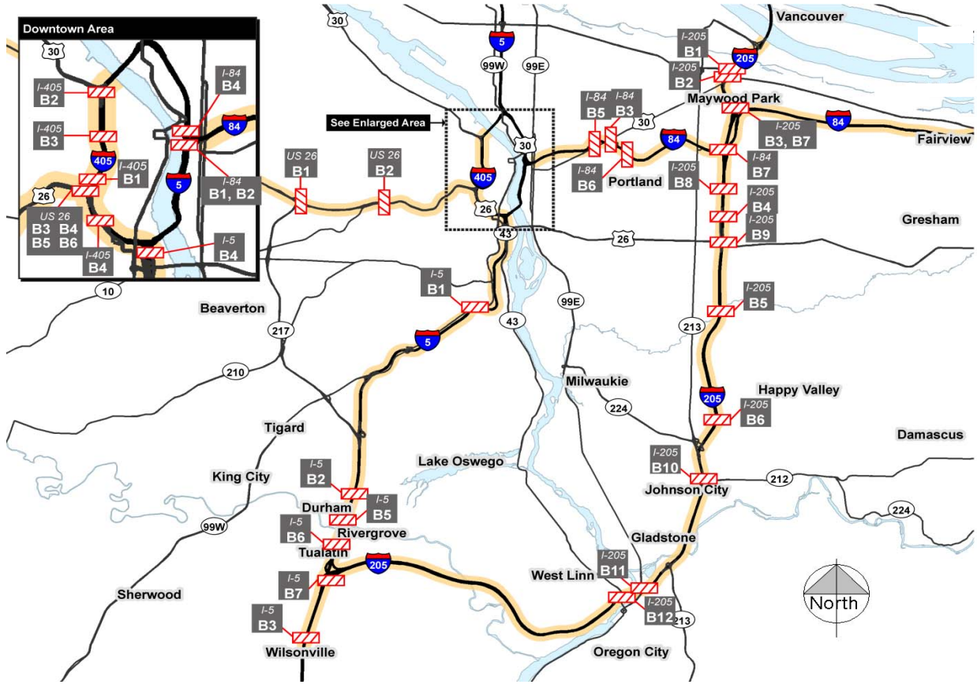
Regional Recurring Bottleneck Location Summary



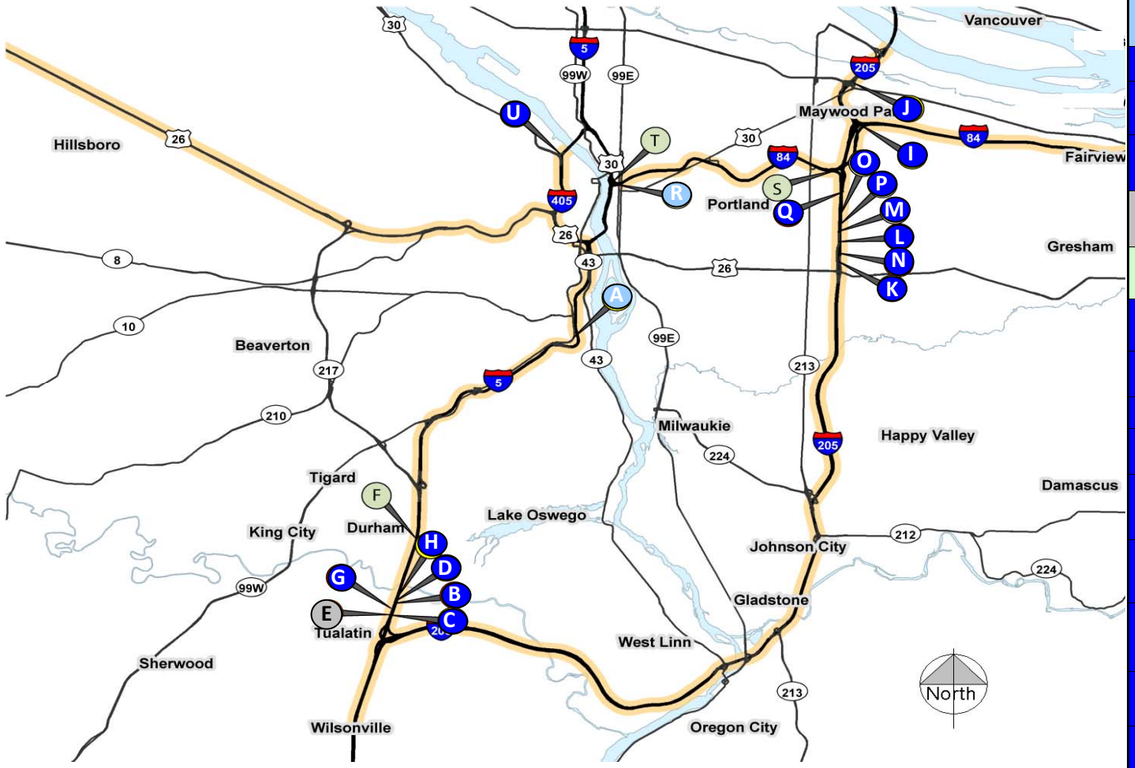
Recurring Bottleneck Location

Recurring Bottleneck ID	Recurring Bottleneck Locations	Cause		Congestion Speed (MPH)	Congestion Duration (Hours)	See Bottleneck Detail sheet on page #
		Decision Point	Physical Constraint			
I-5 Bottlenecks						
B1	I-5 NB: Terwilliger Boulevard Entrance Ramp (AM & PM)	X	X	20	4	Page | 3-5
B2	I-5 NB: Lower Boones Ferry Road Exit Ramp (AM)	X		30	1.25	Page | 3-5
B3 *	I-5 NB: Westbound Elligsen Road Entrance Ramp (PM)	X		*	*	Page | 3-5
B4	I-5 SB: Hood Avenue Exit Ramp (PM)	X		10	2.75	Page | 3-6
B5	I-5 SB: Carman Drive Lane Drop (PM)	X		10	2.25	Page | 3-6
B6	I-5 SB: Nyberg Street Exit Ramp (PM)	X		25	2.5	Page | 3-6
B7 **	I-5 SB: I-205 Entrance Ramp (PM)	X		**	**	Page | 3-6
I-205 Bottlenecks						
B1	I-205 NB: Sandy Boulevard/Columbia Boulevard Entrance Ramp (PM)	X		20	3	Page | 3-7
B2	I-205 NB: Columbia Boulevard/Hwy 30 Exit Ramp (PM)	X		35	Inconclusive	Page | 3-7
B3	I-205 NB: Westbound I-84 Entrance Ramp (PM)	X		5	5.25	Page | 3-7
B4	I-205 NB: Division Street Entrance Ramp and Hwy 26/Powell Blvd. Entrance	X		10	2.75	Page | 3-7
B5	I-205 NB: Foster Road Exit Ramp (AM & PM)	X		20	4	Page | 3-7
B6	I-205 NB: Sunnybrook Road Entrance Ramp (PM)	X		30	2.25	Page | 3-7
B7	I-205 SB: Westbound I-84 Exit Ramp (AM & PM)	X		5	4.25	Page | 3-8
B8	I-205 SB: Stark/Washington Street Entrance Ramp (PM)	X		10	3.25	Page | 3-8
B9	I-205 SB: Hwy 26/Division Street/Powell Boulevard Exit Ramp (PM)	X		25	3.25	Page | 3-8
B10	I-205 SB: 212/224 Entrance Ramp (PM)	X		35	1	Page | 3-8
B11	I-205 SB: 99E/McLoughlin Boulevard Exit Ramp (AM)	X		20	1.25	Page | 3-8
B12	I-205 SB: Hwy 43 Entrance Ramp (AM)	X		30	2	Page | 3-8
I-84 Bottlenecks						
B1	I-84 EB: I-5 SB Entrance Ramp (AM & PM)	X		10	12	Page | 3-9
B2	I-84 EB: I-5 SB/NB Merge (PM)		X	5	4	Page | 3-9
B3	I-84 EB: 39th Avenue Entrance Ramp (PM)	X		Inconclusive	Inconclusive	Page | 3-9
B4	I-84 WB: I-5 Diverge (AM & PM)	X		20	8+	Page | 3-10
B5	I-84 WB: 33rd Avenue Entrance Ramp (AM)	X		15	4	Page | 3-10
B6	I-84 WB: Glisan Entrance Ramp (AM)	X		Inconclusive	Inconclusive	Page | 3-10
B7	I-84 WB: I-205 SB to I-84 WB Ramp	X		Inconclusive	Inconclusive	Page | 3-10
I-405 Bottlenecks						
B1	I-405 NB: US 26/12th Ave (PM)	X		5	3	Page | 3-11
B2	I-405 SB: US 30 Entrance Ramp (PM)	X		5	3	Page | 3-12
B3	I-405 SB: Everett Street Entrance Ramp to US 26 Exit Ramp Weave (PM)	X		5	3	Page | 3-12
B4	I-405 SB: US 26 Entrance Ramp to Broadway Exit Ramp Weave (PM)	X		5	3	Page | 3-12
US 26 Bottlenecks						
B1	US 26 EB: Oregon 217 Entrance Ramp (AM)	X		10	3	Page | 3-13
B2	US 26 EB: Skyline/Scholls Ferry Entrance Ramp (AM & PM)	X		Inconclusive	Inconclusive	Page | 3-13
B3	US 26 EB: I-405 Positioning/Curves/Tunnel (AM & PM)	X	X	15	8	Page | 3-13
B4	US 26 EB: Ramp to I-405 SB (AM & PM)	X	X	5	8	Page | 3-13
B5	US 26 EB: Ramp to I-405 NB (AM & PM)	X	X	5	7	Page | 3-13
B6	US 26 WB: I-405 Ramps/US 26 merge (PM)	X	X	10	3	Page | 3-14

* Construction of NB Auxilary Lane in 2011

** Construction of SB Auxilary Lane in 2010

Potential Regional Projects Summary



Recommended Project Location

Map ID	Recurring Bottleneck ID	Potential Solution Identified	Potential Regional Projects	Est. Cost	See Project Sheet on page #
I-5 Potential Projects					
A	I-5: B1	Further Analysis	I-5 NB: Terwilliger Blvd. Entrance Ramp Extension.	$30M - $40M	Page | 4-7
B	I-5: B2	Yes	I-5 NB: Phase 1 - Lower Boones Ferry Road Exit Ramp Reconfiguration	$1M - $2M	Page | 4-8
C	I-5: B2	Yes	I-5 NB: Phase 2 - Nyberg Rd. Interchange to Lower Boones Ferry Rd. Interchange - Auxiliary Lane Extension	$11.5M - $13.5M	Page | 4-9
D	I-5: B2	Yes	I-5 NB: Phase 3 - Lower Boones Ferry Rd. Interchange to Carman Dr. Interchange - Auxiliary Lane Extension	$17M - $21M	Page | 4-10
E	I-5: B2	Project Phased	This Project is Phased into I-5 NB Projects B, C and D.	$18M - $22M	Page | 4-12
F	I-5: B5	Constructed August 2012	I-5 SB: Phase 1 - Carman Dr Entrance Ramp to Lower Boones Ferry Exit Ramp - Auxiliary Lane	$1.25M	Page | 4-11
G	I-5: B6	Yes	I-5 SB: Phase 2 - Lower Boones Ferry Rd. Exit to Lower Boones Ferry Rd. Entrance Auxiliary Lane	$7.2M - $8.5M	Page | 4-13
H	I-5: B6	Yes	I-5 SB: Phase 3 - Lower Boones Ferry Rd. to I-205 Auxiliary Lane Extension	$10M -$18M	Page | 4-14
I-205 Potential Projects					
I	I-205: B3	Yes	I-205 NB: Phase 1 - I-84 WB Entrance Ramp to Sandy Blvd. Exit Ramp - Auxiliary Lane	$6.7M	Page | 4-19
J	I-205: B3	Yes	I-205 NB: Phase 2 - Sandy Blvd. Exit Ramp to Columbia Blvd. Exit Ramp - Auxiliary Lane Extension	$6.5M	Page | 4-20
K	I-205: B4	Yes	I-205 NB: Powell Blvd. Entrance Ramp to Division St. Entrance Ramp - Auxiliary Lane Extension and 2-Lane Exit at Washington St.	6.5M - $7.5M	Page | 4-21
L	I-205: B4	Yes	I-205 NB: Phase 1 - Powell Blvd Entrance Lane to Washington St. Exit Ramp - Auxiliary Lane Extension	$6.0M - $6.9M	Page | 4-22
M	I-205: B4	YES	I-205 NB: Phase 2 - Washington St. Exit Ramp to Glisan St. Exit Ramp - Auxiliary Lane Extension	$2.4M - $2.8M	Page | 4-23
N	I-205: B4	Yes	I-205 NB: Phase 3 - Glisan St. Exit to I-84 WB Exit Ramp - Auxiliary Lane Extension	$2.2M - $2.5M	Page | 4-24
O	I-205: B4	Yes	I-205 NB: Phase 4 - Division Street Entrance Ramp to Stark St./Washington St. Exit Ramp - Auxiliary Lane Extension w/ 2-lane Exit at Washington Street	$1.7M - $2.0M	Page | 4-25
P	I-205: B4	Yes	I-205 NB: Division St. entrance ramp to I-84 WB Exit Ramp - Auxiliary Lane Extension w/2-lane Exit at Washington St.	$7.6M - $8.M	Page | 4-26
Q	I-205: B8/B9	Yes	I-205 SB: I-84 EB Entrance ramp to Stark St./Washington St. exit Ramp - Auxiliary Lane	$7.0M - $8.5M	Page | 4-27
I-84 Potential Projects					
R	I-84: B2	Further Analysis	I-84 EB: Grand Ave. Entrance Ramp Extension	$4.4M - $5.2M	Page | 4-33
S	I-84: B3	Construction 2013	I-84 EB: Halsey St.Exit Ramp to I-205 NB Entrance Ramp - Auxiliary Lane	$5.9M	Page | 4-34
T	I-84: B4	Construction 2013	I-84 WB: I-5 NB and I-5 SB Diverge Re-striping	$0.5M	Page | 4-35
I-405 Potential Projects					
U	I-405: B2	Yes	I-405 SB/US30 EB: Entrance Ramp Lane Re-arrangement	$0.5M - $1.0M	Page | 4-41

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CHAPTER 1:
HOW TO USE THIS PROJECT ATLAS

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Chapter 1: How to Use This Project Atlas

This Project Atlas provides a collection of maps, tables, and project sheets that can be used in a variety of different ways, depending on the user's needs. This combined document identifies bottleneck locations along five metro area corridors (I-5, I-205, I-84, I-405, and US 26) and correlates locations of congestion with recommended enhancement measures.

This chapter is to help the users understand and locate important information in this Project Atlas. The following sections provide a few examples of how this Project Atlas can be used, as well as detailed directions for how to read key figures throughout the document.

1.1 How is This Atlas Organized?

The **Table of Contents** on page iii of this Project Atlas provides a high-level overview of the document layout.

The Introduction, in **Chapter 2**, provides a project overview, defines the study area, and provides the methodology to identify the bottlenecks for the Atlas.

1.2 Where are the Bottlenecks and How Much do They Contribute to Congestion?

Chapter 3 deals with the identification and evaluation of bottlenecks and potential solutions. Bottlenecks are compared and evaluated in several different ways throughout the document.

How is Key Information Evaluated for Corridor Operations Bottlenecks?

The Corridor Bottleneck Operations analysis (I-5: **Figures 3-2 and 3-3**, I-205: **Figures 3-4 and 3-5**, I-84: **Figures 3-6 and 3-7**, I-405: **Figures 3-8 and 3-9**, and US26: **Figures 3-10 and 3-11**) provide a detailed bottleneck-specific perspective of identified bottlenecks along each metro area corridor.

These figures allow users to evaluate key information, including:

- Location
- Influence area
- Congestion duration and time periods
- Contributing factors
- Reported crashes
- Operations summary

Exhibit 1-1 provides a high-level overview of how to read the Bottleneck Operation Detail figures.

In these detailed figures, each bottleneck is labeled by its Bottleneck ID and classified by direction (northbound or southbound), time of day (AM Peak or PM Peak), and location, along with a description of the contributing factors. Each corridor has two figures, each of which is specific to one direction of travel.

Each bottleneck has an influence area that is illustrated by two dotted red lines, and within that influence area is a red-hatched activation range (the segment that contains the start of a new/confounding bottleneck). Historical crash data (5 years) from ODOT's Online Crash Database is shown along the length of the corridor to visually assess correlations between crash frequency and lane geometry on the facilities. Next to the corridor image, the important information for each bottleneck is summarized in a text box along with the data sources that were used to identify and validate the bottleneck.

How are Bottlenecks Compared Throughout the Region?

The Regional Bottleneck Summary Figure (**Figure 3-12**) provides a regional perspective of all identified bottlenecks along the five metro area corridors (I-5, I-205, I-84, I-405, and US 26). This figure allows users to understand the type of bottleneck, and evaluate the relative severity of congestion related to each bottleneck (duration and speed) throughout the region.

How are Potential Recommended Projects Evaluated Throughout the Region?

Table 3-1 provides a summary of the analysis and evaluation of the bottlenecks that were identified in the Regional Bottleneck Summary (**Figure 3-12**). From the analysis process, the bottlenecks are refined and identified as potential projects to address the bottlenecks. This table includes the potential project location, description, estimated cost of the project, and traffic analysis findings. The table has a recommended action for each potential project. The Potential Regional Projects (**Figure 3-13**) provide a corridor-specific perspective of identified bottlenecks along each metro area corridor (I-5, I-205, I-84, I-405, and US 26) and identifies potential solutions that have been in the analysis.

1.3 What and Where Are the Recommended Projects?

In **Chapter 4**, the individual recommended projects are presented by corridor and by individual project sheets. The chapter is organized by the five corridors; each corridor has a bottleneck identification figure and specific recommended projects figure. Recommended projects are compared and evaluated in several different ways throughout the document. The following sections identify the appropriate figures to use, based on the information desired.

How are Bottlenecks Compared for a Specific Corridor?

The corridor-specific Bottleneck Summary Figures (**Figure 4-1, Figure 4-3, Figure 4-5, Figure 4-7,** and **Figure 4-9**) provide a corridor-specific perspective of identified bottlenecks along each metro area corridor. These figures allow users to evaluate the relative severity of congestion related to each bottleneck (duration and speed) along a corridor.

How are Recommended Projects Compared for a Specific Corridor?

The corridor-specific Recommended Project Figures (**Figure 4-2, Figure 4-4, Figure 4-6, Figure 4-8,** and **Figure 4-10**) provide a corridor-specific perspective of recommended projects along each metro area corridor.

How to Read the Bottleneck and Recommended Projects Figures?

Exhibit 1-2 provides a high-level overview guide of how to read the bottlenecks and recommended projects for each corridor figures.

How is Key Information Evaluated for Each Recommended Project?

The project sheets (provided in **Chapter 4**) provide a detailed project-specific perspective of recommended projects along each metro area corridor.

Exhibit 1-1: How to Read the Bottleneck Detail Figures

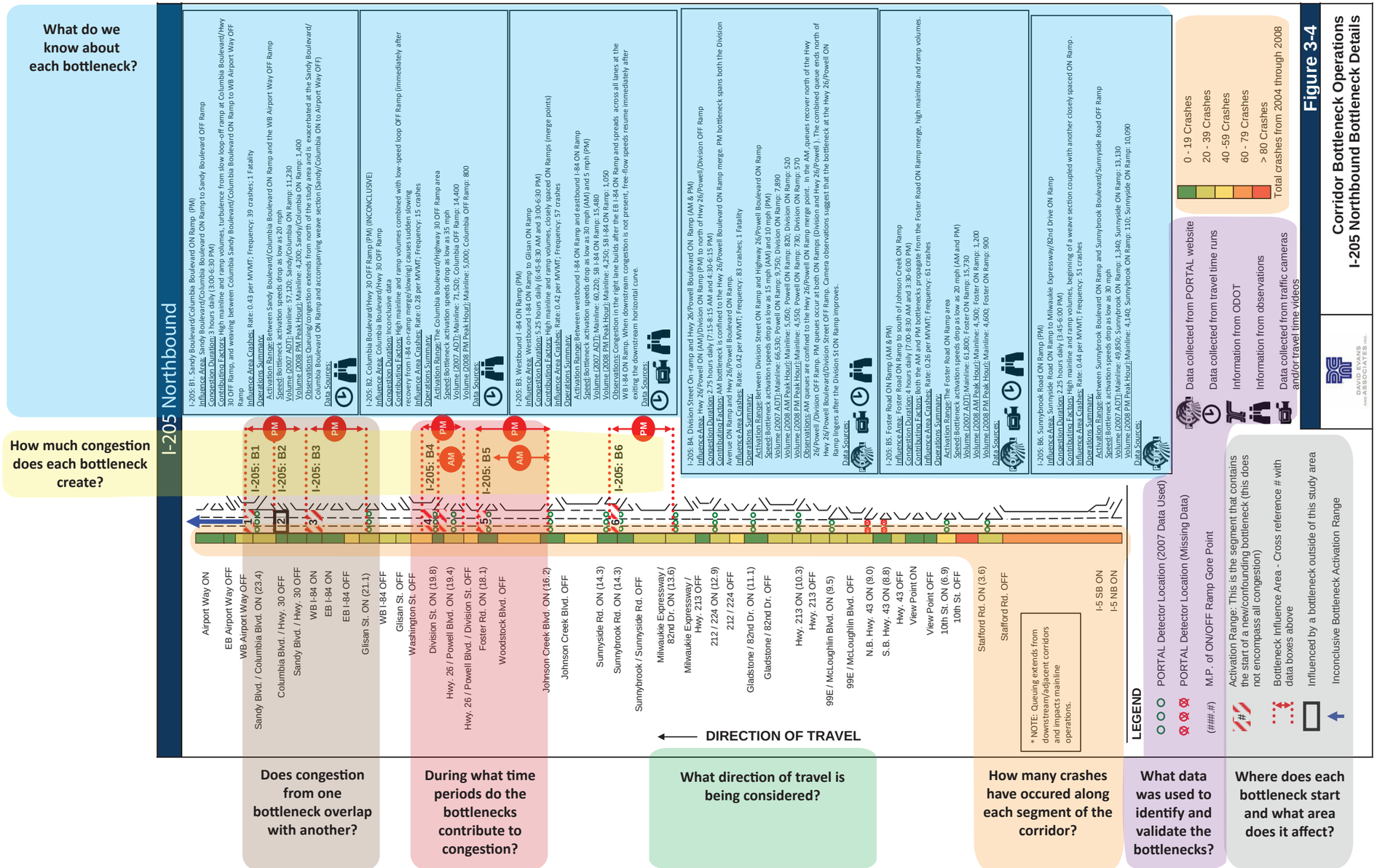
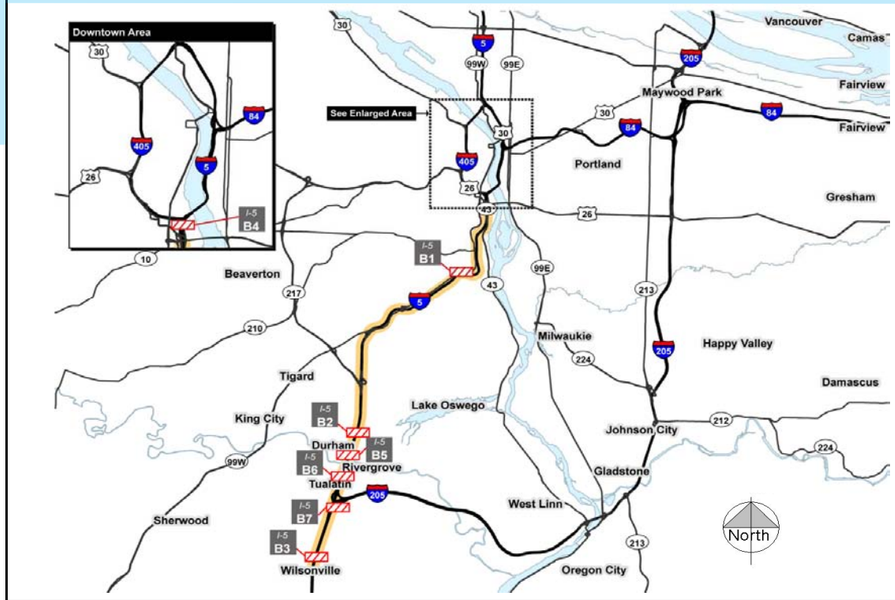


Exhibit 1-2: How to Compare Bottlenecks and Recommended Projects in the Region

Where are the existing bottlenecks?

Figure 4-1: I-5 Recurring Bottleneck Locations



Recurring Bottleneck Location

Where are the bottlenecks throughout the region, and how can they be located in the Atlas?

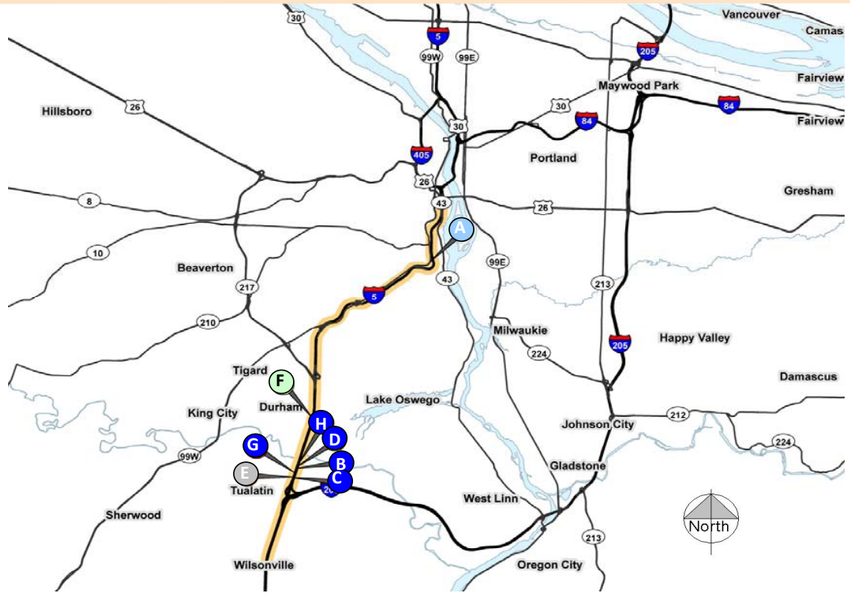
Bottleneck ID	Recurring Bottleneck Location	Cause: Decision Point	Cause: Physical Constraint	Congestion Speed (MPH)	Congestion Duration (Hours)	See Bottleneck Detail Sheet on page #
I-5 Bottlenecks						
B1	I-5 NB: Terwilliger Boulevard Entrance Ramp (AM & PM)	X	X	20	4	Page | 3-5
B2	I-5 NB: Lower Boones Ferry Road Exit Ramp (AM)	X		30	1.25	Page | 3-5
B3	I-5 NB: Westbound Elligsen Road Entrance Ramp (PM)	X		30	Inconclusive	Page | 3-5
B4	I-5 SB: Hood Avenue Exit Ramp (PM)	X		10	2.75	Page | 3-6
B5	I-5 SB: Carman Drive Lane Drop (PM)	X		10	2.25	Page | 3-6
B6	I-5 SB: Nyberg Street Exit Ramp (PM)	X		25	2.5	Page | 3-6
B7	I-5 SB: I-205 Entrance Ramp (PM)	X		Inconclusive	Inconclusive	Page | 3-6

What are the common causes of recurring bottlenecks?

What is the congestion speed (MPH) in the bottleneck?

How long does the congestion last?

Figure 4-2: I-5 Recommended Projects



Recommended Project Location (indicates Potential Solution Recommendation)

Where are the recommended projects located?

Map ID	Bottleneck ID	Potential Solution Identified	Recommended Projects	Est. Cost	See Project sheet on page #
I-5 Recommended Projects to Move Forward					
B	I-5: B2	Yes	I-5 NB: Phase 1 - Lower Boones Ferry Road Exit Ramp Reconfiguration	$1M - $2M	Page | 4-8
C	I-5: B2	Yes	I-5 NB: Phase 2 - Nyberg Rd. Interchange to Lower Boones Ferry Rd. Interchange - Auxiliary Lane Extension	$11.5M - $13.5M	Page | 4-9
D	I-5: B2	Yes	I-5 NB: Phase 3 - Lower Boones Ferry Rd. Interchange to Carman Dr. Interchange - Auxiliary Lane Extension	$17M - $21M	Page | 4-10
F	I-5: B5	Constructed August 2012	I-5 SB: Phase 1 - Carman Dr Entrance Ramp to Lower Boones Ferry Exit Ramp - Auxiliary Lane	$1.25M	Page | 4-12
G	I-5: B6	Yes	I-5 SB: Phase 2 - Lower Boones Ferry Rd. Exit to Lower Boones Ferry Rd. Entrance Auxiliary Lane	$7.2M - $8.5M	Page | 4-13
H	I-5: B6	Yes	I-5 SB: Phase 3 - Lower Boones Ferry Rd. to I-205 Auxiliary Lane Extension	$10M -$18M	Page | 4-14
I-5 Recommended Projects for Additional Analysis and Evaluation					
A	I-5: B1	Further Analysis	I-5 NB: Terwilliger Blvd. Entrance Ramp Extension.	$30M - $40M	Page | 4-7
Project Deleted					
E	I-5: B2	Delete Project	I-5 NB: Nyberg Rd. Interchange to Carman Dr. Interchange - Auxiliary Lane Extension w/ 2-lane Exit at Lower Boones Ferry Rd.	$18M - $22M	Page | 4-11

Where are the recommended projects throughout the region, and what is the project sheet page #?

What is the status of the potential solution?

What recurring bottleneck is addressed by the potential solution?

What are the costs of these projects?

How to Read the Recommended Project Sheets?

Each of the recommended projects has a summary sheet that presents the significant information in an organized and concise manner. **Exhibit 1-3** provides a high-level overview of how to read these project sheets.

Across the top of the project sheet is the name of each recommended project, along with the Bottleneck ID, Tracking ID, and Map ID. These different ID numbers are found throughout the Project Atlas within the tables and figures. The Bottleneck ID is the number assigned to each bottleneck; the number is referenced in all regional and corridor-specific bottleneck figures in the Project Atlas. The Tracking IDs correspond with the ODOT naming convention that was used throughout the development of the recommended projects. The Map ID is the letter that was assigned to each of the recommended projects within the summary graphics and tables in the Project Atlas.

The project sheets summarize existing operational s, including the duration of congestion and queue length, as well as average speed and the density d. This information is based upon existing observations and traffic analysis (Highway Capacity Software (HCS). The project sheets also explain the key points of existing conditions, proposed improvements and the operations/safety benefits of each recommended project.

An operations diagram in the middle of the sheet illustrates the existing and proposed improvements of the traffic movements. Generally, the diagram shows the proposed improvements operations/safety benefits by reducing the traffic conflicts that result in traffic queuing and congestion.

A concept design is displayed on the right half of the sheet and includes an overview map showing the location of the project in region. The concept illustrates the conceptual layout of the improvement.

Project impacts are unique and may include, but are not limited to: right-of-way acquisition, structural changes, safety concerns, environmental impacts, and duration of construction. These impacts are a result of the preliminary design and traffic evaluation process; they are provided to give an understanding of any constraints to the project and how feasible it is to construct. If the project could benefit from additional follow-up phases, the follow-up project is listed along with its benefit and estimated cost.

1.4 What Is the Best Way to Select a Recommended Project Based on Limited Funds Available?

This Project Atlas can serve as a menu of cost-effective, small-scale (primarily $1 million to $20 million range) projects to accomdate limited funding sources. As funds become available, the corridor-specific Recommended Project Figures (**Figure 4-2, Figure 4-4, Figure 4-6, Figure 4-8,** and **Figure 4-10**) can be evaluated together to assess the highest priority projects that can be completed within the available budget.

The project sheets in **Chapter 4** provide a project recommendation and project improvement with a recommended project concept. If the project analysis and evaluation were inconclusive, the project is recommended for further study.

Exhibit 1-3: How to Read the Recommended Project Sheets

How do I locate this project throughout the document?
These can be found throughout the Atlas within the tables and figures.
Map IDs: *Correspond with recommended projects.*
Bottleneck IDs: *Correspond with existing recurring bottlenecks.*
Tracking IDs: *Help link recommended projects with supporting documentation developed throughout the evaluation process.*

What is the conceptual layout of the project?

Map ID	F
Bottleneck ID	I-5: B5
Tracking ID	3
Direction	SB

I-5 SB: Phase 1 - Carman Dr Entrance Ramp to Lower Boones Ferry Exit Ramp - Auxiliary Lane

Project Analysis/Evaluation

What is the status and estimated cost of this project?

Potential Solution	Cost Estimate
Constructed 2012	$1.25M

What are the existing operations at the bottleneck?
This information is based upon existing observations and traffic analysis (HCS and/or VISSIM).

Existing Operations*

Variable	Existing
Duration (hours)	2.25
Queue (miles)	< 1.8
Average Speed (mph)	< 10
Density (veh/mi/ln)	55

Key Points

Existing Conditions

What are the existing conditions and issues?
This information can be found on the bottleneck operation figures (Chapter 3).

Currently the Carman Dr. lane drop results in queues extending to approximately the Haines St. exit-ramp in all lanes. The cause of the queuing is a combination of the high volume of traffic from OR217 merging onto I-5 and the tendency of the majority of those drivers to merge quickly onto I-5, thus not fully utilizing the entire extent of the auxiliary lanes. An additional bottleneck exists downstream at the Nyberg St. exit-ramp; however, the section of roadway between the two bottlenecks is relatively unaffected (speed greater than 35 mph).

Proposed Improvements

What is the recommended project and what are the operations and safety benefits of the project?

This project would extend the current lane drop just south of the Carman Dr. exit ramp to the Lower Boones Ferry Rd. exit-ramp, where it would become a drop lane.

Operations/Safety Benefits

This is expected to minimize queuing on I-5 from the OR217 merge by 1 mile, and reduce the queuing on OR217 approaching I-5. This is expected to result in a decrease of 1 hour of congestion along I-5.

What are the operations improvements and the proposed traffic improvements? What are the high-level potential impacts that have been identified throughout the preliminary design and traffic evaluation process?

Potential Follow-Up Phases

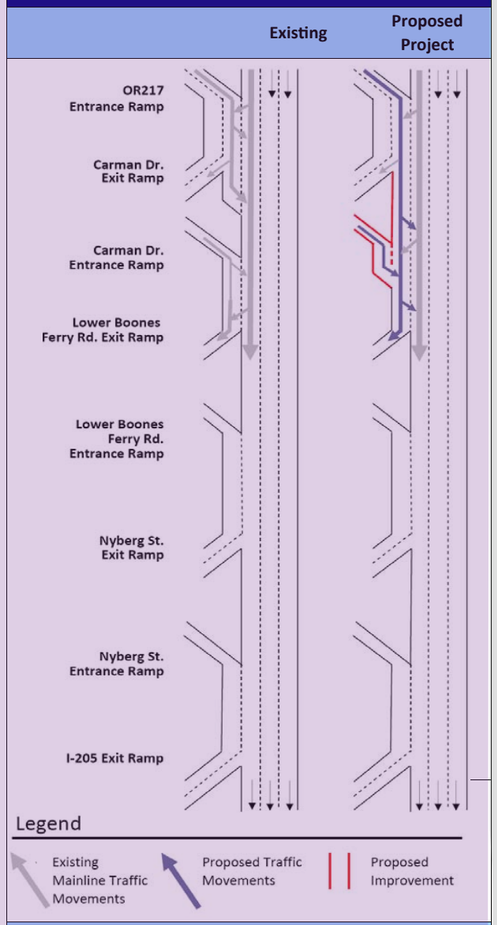
Could this project have additional benefits when combined with another recommended project?

Project Title:	Extend I-5 SB aux. lane from Lower Boones Ferry exit-ramp to Lower Boones Ferry entrance-ramp.
Notes:	

Bottleneck ID	*Tracking ID*	*Map ID*	*Cost*
I-5: B6	3a-1	G	$7.2M - $8.5M

*PM Peak Hour

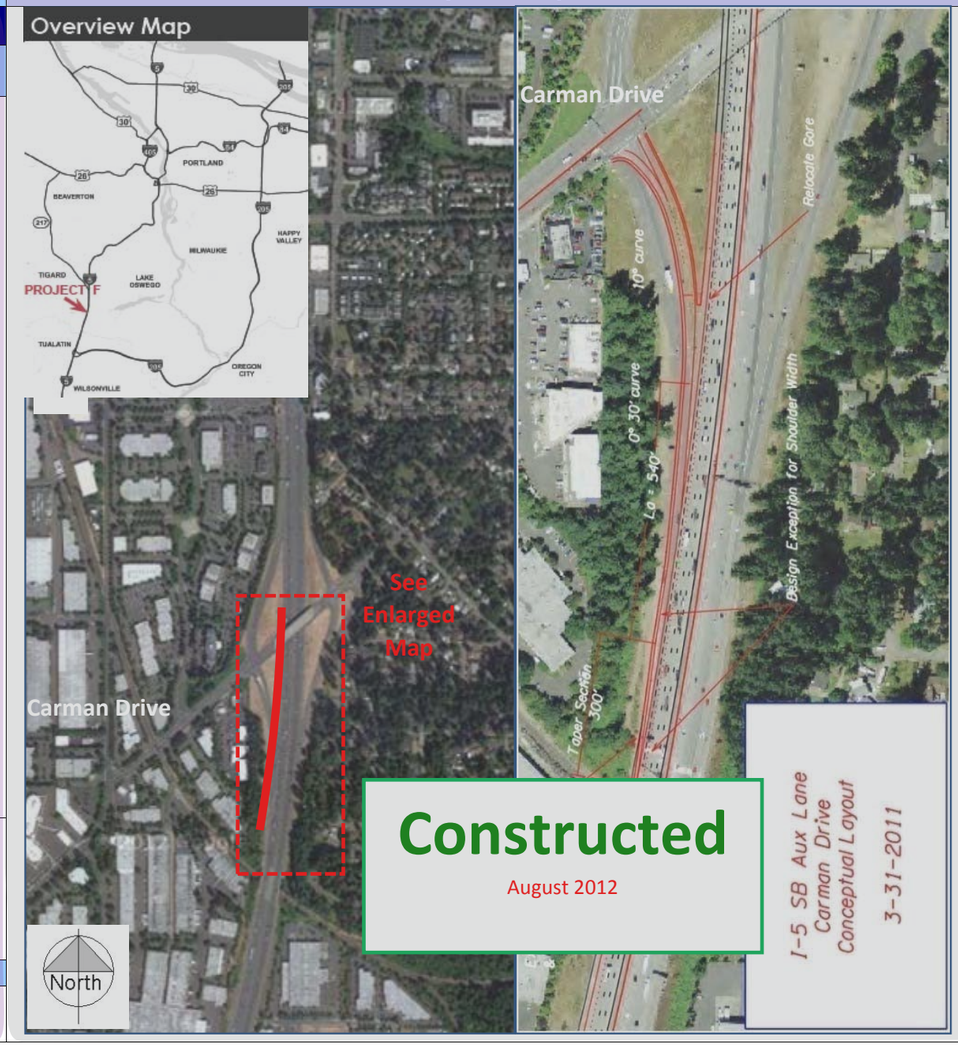
Operations Diagram



Impacts

ROW: Would occur within existing ROW
Structures: Widening possible under existing structure
Environment: No environmental impacts

Project Concept



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