MUKILTEO MULTIMODAL PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT

Transportation
Discipline Report

Prepared for:

U.S. Department of Transportation
Federal Transit Administration

Washington State
Department of Transportation

Washington State Ferries

June 2013

Transportation
Discipline Report

Mukilteo Multimodal Project
Final Environmental Impact Statement

Prepared by:

Ryan Abbotts, Parametrix
John Perlic, Parametrix

For:

Federal Transit Administration and
Washington State Department of Transportation

June 2013

Table of Contents

1 Introduction 1-1

1.1 Project Background 1-1
1.2 Purpose of the Transportation Discipline Report 1-3
1.3 Overview of Analysis and Regulatory Context 1-3

2 Affected Environment 2-1

2.1 Mukilteo Ferry Terminal Facility 2-1
2.1.1 Sailings and Scheduling 2-1
2.1.2 Ridership 2-2
2.1.3 Monthly Ridership Variation 2-2
2.1.4 Daily Ridership Variation 2-3
2.1.5 Average Weekday Ridership 2-4
2.1.6 Ferry Crossing Levels of Service 2-7
2.1.7 Terminal Operations 2-9
2.1.8 Navigable Waterways 2-15
2.1.9 Mukilteo Ferry Terminal Facility Safety 2-15
2.2 Roadway Network 2-16
2.2.1 Roadway Characteristics 2-16
2.2.2 Traffic Volumes 2-19
2.2.3 Traffic Operations 2-23
2.2.4 Roadway Network Safety 2-24
2.3 Non-Motorized Conditions 2-28
2.3.1 Pedestrian Conditions 2-28
2.3.2 Sidewalk and Crosswalk Conditions 2-28
2.3.3 Pedestrian Volumes and Destinations 2-29
2.3.4 Bicycle Facility Conditions 2-30
2.3.5 Non-Motorized Safety 2-31
2.4 Public Transportation Facilities 2-31
2.4.1 Transit Serving the Mukilteo Ferry Terminal 2-33
2.4.2 Transit Serving Clinton Ferry Terminal 2-35
2.4.3 Source: Island Transit Schedule Alignment 2-37
2.4.4 Average Passenger Loads 2-37
2.4.5 Operating Issues and Performance 2-39
2.4.6 Public Transportation Safety 2-40
2.5 Passenger Loading Areas 2-41
2.5.1 Location 2-41
2.5.2 Passenger Loading Area Safety 2-41
2.6 Parking 2-41
2.6.1 Mukilteo 2-41
2.6.2 Clinton 2-44
2.6.3 Parking Safety 2-45
2.7 Freight 2-45
2.7.1 Rail Operations 2-45
2.7.2 Truck Freight 2-45

2.7.3 Airports 2-45
2.7.4 Freight Safety 2-45

3 Transportation Effects 3-1
3.1 Proposed Alternatives 3-7
3.1.1 No-Build Alternative 3-7
3.1.2 Preferred Alternative 3-9
3.1.3 Existing Site Improvements Alternative 3-11
3.1.4 Elliot Point 1 Alternative 3-13
3.2 Development of the Travel Forecasts 3-15
3.2.1 Travel Demand Model Overview 3-15
3.2.2 Forecast Methodology 3-16
3.2.3 Transportation Forecasting Assumptions 3-16
3.3 Mukilteo Ferry Terminal 3-19
3.3.1 Sailings and Scheduling 3-20
3.3.2 Ferry Ridership Forecasts 3-20
3.3.3 PM Peak Vehicle Forecasts at the Terminal 3-21
3.3.4 PM Peak Walk-On Passenger Forecasts 3-22
3.3.5 Ridership Variation 3-24
3.3.6 Ferry Crossing Levels of Service 3-25
3.3.7 Terminal Operations 3-26
3.3.8 Navigable Waterways 3-31
3.3.9 Mukilteo Terminal Facility Safety and Security 3-31
3.4 Roadway Network 3-32
3.4.1 Roadway Modifications 3-32
3.4.2 Traffic Volumes 3-34
3.4.3 PM Peak Hour Ferry Vehicle Volumes and Circulation 3-35
3.4.4 Traffic Operations 3-43
3.4.5 Roadway Network Safety 3-46
3.5 Non-Motorized Transportation 3-47
3.5.1 Pedestrian Conditions and Facilities 3-47
3.5.2 Bicycle Facility Conditions 3-49
3.5.3 Non-Motorized Volumes and Destinations 3-50
3.5.4 Pedestrian Connections 3-56
3.5.5 Non-Motorized Safety 3-60
3.6 Public Transportation 3-62
3.6.1 Transit Serving Mukilteo Terminal 3-62
3.6.2 Transit Serving Clinton Terminal 3-65
3.6.3 Schedule Alignment and Reliability 3-65
3.6.4 Average Passenger Loads 3-66
3.6.5 Public Transportation Safety 3-68
3.7 Parking 3-69
3.7.1 Mukilteo Ferry Terminal Parking 3-69
3.7.2 Clinton 3-75
3.7.3 Parking Safety 3-75

3.8 Freight 3-75
3.8.1 Rail Operations 3-75
3.8.2 Truck Freight 3-76
3.8.3 Airports 3-76
3.8.4 Freight Safety 3-76

4 Construction Impacts 4-1
4.1 General Considerations for all Alternatives 4-1
4.1.1 Limited Access to the Mukilteo Ferry Terminal 4-1
4.1.2 Construction Timing and Activities 4-1
4.1.3 Duration of Construction 4-2
4.1.4 Duration of Mukilteo Ferry Terminal Closure 4-2
4.2 No-Build Alternative 4-3
4.3 Preferred Alternative 4-5
4.4 Existing Site Improvements Alternative 4-5
4.5 Elliot Point 1 Alternative 4-6

5 Indirect and Secondary Impacts 5-1

6 Cumulative Effects 6-1
6.1 Sound Transit Mukilteo Station 6-1
6.2 NOAA Fisheries Service Mukilteo Research Station Expansion 6-2
6.3 Port of Everett Mount baker terminal 6-2
6.4 Mukilteo Tank Farm Land Transfer and Mount Baker Crossing 6-2
6.5 SR 525 Bridge 6-3

7 Mitigation Measures 7-1
7.1 Intersections Projected to Exceed Level of Service Standards 7-1
7.1.1 SR 525/Front Street Intersection 7-1
7.1.2 SR 525/88th Street SW Intersection 7-2
7.1.3 SR 525/Fifth Street Intersection 7-2
7.2 Ferry Crossing Level of Service 7-3
7.3 Transit 7-4
7.4 Parking 7-5

8 Construction Mitigation 8-1
8.1 Long-Term Closure: No-Build and Existing Site Improvements Alternatives 8-1
8.2 Additional Mitigation for Mukilteo Station Parking Impacts 8-3

9 References 9-1

List of Exhibits

Exhibit 1-1 Mukilteo Multimodal Project Study Area 1-2
Exhibit 2-1 Monthly Mukilteo-Clinton Ferry Ridership Volumes (December 2009 to November 2010) 2-3
Exhibit 2-2 May 2010 Average Daily Ridership (Mukilteo-Clinton) 2-4
Exhibit 2-3 May 2010 Average Weekday Ferry Ridership (Clinton-Mukilteo) 2-5
Exhibit 2-4 May 2010 Average Weekday Ferry Ridership (Mukilteo-Clinton) 2-5
Exhibit 2-5 Mode of Choice for Walk-off Ferry Passengers Arriving at the Mukilteo Ferry Terminal from Clinton (2010 Average Weekday) 2-6
Exhibit 2-6 Mode of Choice for Walk-on Passengers Leaving the Mukilteo Ferry Terminal for Clinton (2010 Average Weekday) 2-7
Exhibit 2-7 Unmet Vehicle Demand (2010 Average Weekday) 2-8
Exhibit 2-8 Mukilteo-Clinton Ferry Route Level of Service 2-9
Exhibit 2-9 Walk Travel Times to the Mukilteo Ferry Terminal (PM Peak Period) 2-10
Exhibit 2-10 Ferry Unloading and Loading Average Duration at Mukilteo 2-11
Exhibit 2-11 2010 Queue Lengths at the Mukilteo Ferry Terminal 2-13
Exhibit 2-12 Walk Travel Times from the Mukilteo Ferry Terminal (PM Peak Period) 2-14
Exhibit 2-13 Reasons for Lost Sailings due to Issues with the Mukilteo Transfer Span 2-14
Exhibit 2-14 General Terminal Schematic 2-15
Exhibit 2-15 Study Area Intersections 2-18
Exhibit 2-16 Two-Way Traffic Volume Daily Distribution on SR 525 near 88th Avenue West 2-19
Exhibit 2-17 Two-Way Traffic Volume Daily Distribution on SR 525 near 76th Avenue West 2-20
Exhibit 2-18 Existing AM Peak Hour Vehicular Turning Movement Counts 2-21
Exhibit 2-19 Existing PM Peak Hour Vehicular Turning Movement Counts 2-22
Exhibit 2-20 Level of Service Ratings 2-23
Exhibit 2-21 2010 Level of Service Summary 2-24
Exhibit 2-22 Study Area Collision Trends along SR 525 (2005 through 2009) 2-25
Exhibit 2-23 Study Intersection Collision Trends (2005 through 2009) 2-26
Exhibit 2-24 Collision Types and Potential Causes 2-27
Exhibit 2-25 Existing Pedestrian Facilities near Mukilteo Ferry Terminal 2-29
Exhibit 2-26 Pedestrian Dispersion at Mukilteo Ferry Terminal 2-30
Exhibit 2-27 Bus and Rail Transit Routes Serving the Mukilteo-Clinton Ferry Route 2-32
Exhibit 2-28 Existing Transit Service Serving the Mukilteo Ferry Terminal 2-34
Exhibit 2-29 Transit Ridership Summary for Routes Serving the Mukilteo Ferry Terminal 2-34
Exhibit 2-30 Existing Bus Transit Service Serving the Clinton Ferry Terminal 2-36
Exhibit 2-31 Transit Ridership Summary for Routes Serving the Clinton Terminal 2-37

Exhibit 2-32 Average Boardings and Disembarkings for Transit Service 2-38
Exhibit 2-33 Average Load Factors 2-39
Exhibit 2-34 Designated Parking Areas near the Mukilteo Ferry Terminal 2-42
Exhibit 2-35 Existing Parking at Mukilteo 2-42
Exhibit 2-36 Residential Parking Zones in Mukilteo 2-43
Exhibit 2-37 Designated Parking Areas near the Clinton Ferry Terminal 2-44
Exhibit 3-1 No-Build Alternative 3-8
Exhibit 3-2 Preferred Alternative 3-10
Exhibit 3-3 Existing Site Improvements Alternative 3-12
Exhibit 3-4 Elliot Point 1 Alternative 3-14
Exhibit 3-5 Transportation Investments Potentially Affecting Ferry Ridership 3-18
Exhibit 3-6 Transportation Investments Affecting Transit and Roadways Facilities 3-19
Exhibit 3-7 2040 Ferry Ridership Volumes by Type (PM Peak Period) 3-21
Exhibit 3-8 PM Peak Period Vehicles and Vehicle Passenger Volumes 3-22
Exhibit 3-9 Northbound PM Peak Period Walk-On Passenger Volume by Access Mode 3-22
Exhibit 3-10 Southbound PM Peak Period Walk-Off Passenger Volume by Access Mode 3-23
Exhibit 3-11 Northbound PM Peak Period Walk-On Passenger Mode of Access at Mukilteo Ferry Terminal 3-23
Exhibit 3-12 Southbound PM Peak Period Walk-Off Passenger Mode of Egress at Mukilteo Ferry Terminal 3-24
Exhibit 3-13 Mukilteo-Clinton Ferry Route Level of Service 3-25
Exhibit 3-14 Mukilteo Ferry Terminal Unloading and Loading Times (Observed Winter 2010) 3-28
Exhibit 3-15 Typical Weekday Peak Period Ferry Shoulder Queue Length in Mukilteo 3-30
Exhibit 3-16 PM Peak Hour Total Entering Intersection Volumes for 2010 and 2040 Growth 3-34
Exhibit 3-17 Total Entering Vehicle Volume by Ferry and Non-Ferry-Related Traffic (2040 PM Peak Hour) 3-35
Exhibit 3-18 2040 PM Peak Hour Inbound Vehicle Volume Flows – No-Build Alternative 3-36
Exhibit 3-19 2040 PM Peak Hour Outbound Vehicle Volume Flows – No-Build Alternative 3-36
Exhibit 3-20 2040 No-Build Alternative PM Peak Hour Volumes 3-37
Exhibit 3-21 2040 PM Peak Hour Inbound Vehicle Volume Flows – Preferred Alternative 3-38
Exhibit 3-22 2040 PM Peak Hour Outbound Vehicle Volume Flows – Preferred Alternative 3-38
Exhibit 3-23 2040 PM Peak Hour Volumes for the Preferred Alternative – Ferry Terminal Vicinity 3-39
Exhibit 3-24 2040 PM Peak Hour Inbound Vehicle Volume Flows – Existing Site Improvements Alternative 3-40
Exhibit 3-25 2040 PM Peak Hour Outbound Vehicle Volume Flows – Existing Site Improvements Alternative 3-40
Exhibit 3-26 2040 PM Peak Hour Volumes for Existing Site Improvements Alternative – Ferry Terminal Vicinity 3-41
Exhibit 3-27 2040 PM Peak Hour Inbound Vehicle Volume Flows – Elliot Point 1 Alternative 3-42

Exhibit 3-28 2040 PM Peak Hour Outbound Vehicle Volume Flows – Elliot Point 1 Alternative 3-42
Exhibit 3-29 2040 PM Peak Hour Volumes for Elliot Point 1 Alternative – Ferry Terminal Vicinity 3-43
Exhibit 3-30 2040 Level of Service Summary (PM Peak Hour) 3-44
Exhibit 3-31 No-Build Alternative Level of Service Summary (PM Peak Hour) 3-44
Exhibit 3-32 Preferred Alternative Level of Service Summary (2040 PM Peak Hour) 3-45
Exhibit 3-33 Existing Site Improvements Alternative Level of Service Summary (2040 PM Peak Hour) 3-46
Exhibit 3-34 Elliot Point 1 Alternative Level of Service Summary (2040 PM Peak Hour) 3-46
Exhibit 3-35 2040 PM Peak Hour Inbound Non-Motorized Volume Flows – No-Build Alternative 3-51
Exhibit 3-36 2040 PM Peak Hour Outbound Non-Motorized Volume Flows – No-Build Alternative 3-51
Exhibit 3-37 2040 PM Peak Hour Inbound Non-Motorized Volume Flows – Preferred Alternative 3-52
Exhibit 3-38 2040 PM Peak Hour Outbound Non-Motorized Volume Flows – Preferred Alternative 3-53
Exhibit 3-39 2040 PM Peak Hour Inbound Non-Motorized Volume Flows – Existing Site Improvements Alternative 3-54
Exhibit 3-40 2040 PM Peak Hour Outbound Non-Motorized Volume Flows – Existing Site Improvements Alternative 3-55
Exhibit 3-41 2040 PM Peak Hour Inbound Non-Motorized Volume Flows – Elliot Point 1 Alternative 3-55
Exhibit 3-42 PM Peak Hour Outbound Non-Motorized Volume Flows – Elliot Point 1 Alternative 3-56
Exhibit 3-43 Pedestrian Pathways and Walk Distances to the Mukilteo Ferry Terminal 3-57
Exhibit 3-44 Estimated Walk Distances 3-57
Exhibit 3-45 Walk Travel Times to the Mukilteo Ferry Terminal (2040 PM Peak) 3-58
Exhibit 3-46 Walk Travel Times from the Mukilteo Ferry Terminal (2040 PM Peak) 3-58
Exhibit 3-47 Transit Travel Times Serving Mukilteo Ferry Terminal (PM Peak Period) 3-63
Exhibit 3-48 Projected 2040 Transit Average Passenger Loads (Arriving at Mukilteo between 3:00 PM and 7:00 PM) 3-67
Exhibit 3-49 Projected 2040 Transit Average Passenger Loads (Departing Clinton between 3:00 PM and 7:00 PM) 3-68
Exhibit 3-50 Parking Space Change by Alternative 3-70
Exhibit 3-51 No-Build Alternative Parking Area Map 3-71
Exhibit 3-52 Preferred Alternative Parking Area Map 3-72
Exhibit 3-53 Existing Site Improvements Alternative Parking Area Map 3-73
Exhibit 3-54 Elliot Point 1 Alternative Parking Area Map 3-75
Exhibit 7-1 Design Refinements for Existing Site Improvements Alternative 7-6

List of Appendices

A Collision Review

B Transportation Methods and Assumptions Technical Memorandum

Acronyms and Abbreviations

ADA	Americans with Disabilities Act
BAT	business access and transit
BRT	Bus Rapid Transit
coll/MVM	collisions per million vehicle miles
DART	Dial-A-Ride Transportation
EIS	Environmental Impact Statement
GMA	Growth Management Act
HCM	Highway Capacity Manual
HOV	high-occupancy vehicle
I-5	Interstate 5
LOS	level of service
mph	miles per hour
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
PDO	property damage only
PSRC	Puget Sound Regional Council
SEPA	State Environmental Policy Act
SR	State Route
TDR	Transportation Discipline Report
TRB	Transportation Research Board
WSDOT	Washington State Department of Transportation
WSF	Washington State Ferries

1 INTRODUCTION

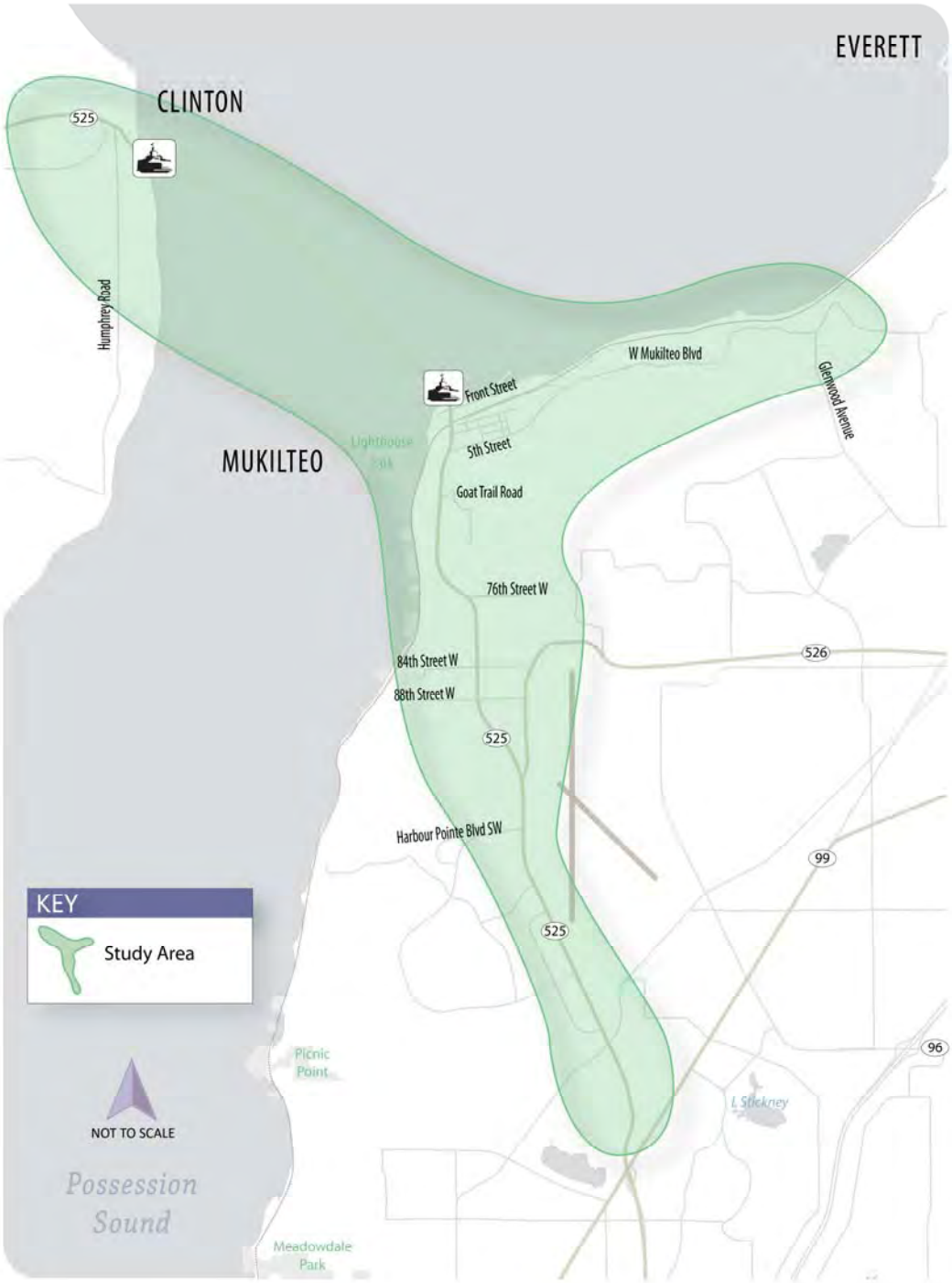
1.1 PROJECT BACKGROUND

The Washington State Ferries (WSF) intends to improve the Mukilteo ferry terminal. This project is known as the Mukilteo Multimodal Project. The Mukilteo ferry terminal has not had significant improvements since the early 1980s, and components of the facility are aging. The current terminal layout makes it difficult for passengers to get in and out of the terminal, which contributes to traffic congestion, safety concerns, and conflicts between vehicle and pedestrian traffic.

As part of the federal regulations and guidelines leading to funding for terminal improvements, WSF is preparing an Environmental Impact Statement (EIS), which will support the evaluation of several options for addressing multimodal connectivity, congestion, and safety at the terminal. As a result of transportation analyses, input received from stakeholders, and comments received, options for relocating the terminal to Edmonds or Everett were not recommended for more detailed evaluation in the EIS; only alternatives in Mukilteo are being considered for the location of the ferry terminal. Because the ferry connects Mukilteo and Clinton, the transportation network supporting these two terminals is described in Chapter 2 of this report.

Exhibit 1-1 shows the study area, which includes the State Route (SR) 525 corridor and the Mukilteo ferry terminal area.

Exhibit 1-1. Mukilteo Multimodal Project Study Area



1.2 PURPOSE OF THE TRANSPORTATION DISCIPLINE REPORT

The purpose of the Mukilteo Multimodal Project is to improve the operations and facilities serving the eastern terminus of the Mukilteo-Clinton ferry route.

This *Transportation Discipline Report* (TDR) is divided into six chapters as follows:

Chapter 1 provides a brief introduction to the project and describes the analysis and regulatory context for the TDR.

Chapter 2 summarizes the existing transportation conditions in the study area for the Mukilteo Multimodal Project. It describes the transportation characteristics in the study area and discusses the multimodal connections occurring at the ferry terminal. It also describes current traffic conditions, including ferry, bus, and rail ridership; vehicle and non-motorized volumes; intersection and ferry levels of service (LOS); and safety.

Chapter 3 describes the alternatives analyzed and reports the operational impacts associated with each alternative. The impact analysis considers long-term changes in ferry operations, the roadway network, non-motorized systems, public transportation, parking, and freight.

Chapter 4 describes the long-term construction impacts associated with each alternative. The characteristics of the construction impacts are described with respect to limiting and closing access to the Mukilteo ferry terminal, construction timing, types of activities, and the duration of construction.

Chapter 5 describes indirect and secondary impacts such as base land use assumptions and consistency with Washington State Growth Management Act (GMA) plans.

Chapter 6 identifies planned projects in the vicinity of the Mukilteo ferry terminal that, when combined with the impacts of the Mukilteo Multimodal Project, could contribute to cumulative impacts.

Chapter 7 proposes mitigation activities to reduce the operational impacts of the Mukilteo ferry terminal alternatives.

Chapter 8 proposes construction mitigation measures to reduce the impacts of constructing the Mukilteo ferry terminal alternatives.

Chapter 9 provides references used in developing this *Transportation Discipline Report*.

1.3 OVERVIEW OF ANALYSIS AND REGULATORY CONTEXT

This section provides a brief overview of the analysis methodology and regulatory context. The analysis of local traffic impacts was guided by the policy direction established in the numerous plans or policy documents adopted for the

Mukilteo/Everett area. These include, but are not limited to the Puget Sound Regional Council (PSRC) *Transportation 2040* Plan; *Comprehensive Plans* for the cities of Mukilteo and Everett, the *6-Year Transportation Improvement Program* for the cities of Mukilteo and Everett, and Community Transit's *Long-Range Transit Plan*.

The transportation analysis uses a variety of technical tools and approaches to evaluate transportation performance across all modes. This evaluation includes forecasts of future travel by mode, as well as travel times and delays, including intersection delays. Travel forecasts are an estimation of how many people will travel in a future year and how those people will choose to travel. The process for developing travel forecasts is described in Chapter 3.

2 AFFECTED ENVIRONMENT

This section summarizes existing transportation characteristics within the study area corridor along SR 525 and at the Mukilteo ferry terminal. It describes the existing road and non-motorized network, traffic volumes, bus and rail operations, parking, ferry terminal operations and scheduling, ferry ridership, multimodal connections, and freight operations. This section also includes an assessment of existing roadway and sidewalk network performance.

2.1 MUKILTEO FERRY TERMINAL FACILITY

WSF operates ferry service connecting Mukilteo to Clinton, on Whidbey Island, as part of SR 525. The Mukilteo ferry terminal is located where SR 525 meets Puget Sound along the northern boundary of the city of Mukilteo. The Mukilteo ferry terminal is a multimodal facility with connections to bus, commuter rail, parking facilities, SR 525, and local businesses.

2.1.1 Sailings and Scheduling

Ferry service operates weekdays from 4:40 AM to 1:00 AM and weekends from 5:30 AM to 1:05 AM. Sailing time between Mukilteo and Clinton is approximately 15 minutes. Unloading and loading times vary by number of passengers and vehicles. Vessel headways are approximately every 30 minutes (two sailings per hour) on weekdays from 4:40 AM to 9:30 PM; all other sailing times have 60-minute headways. For a summary of how ferry schedules align with transit service schedules, refer to *Section 2.4.3*. Service is provided by two ferries, the Kittitas and Cathlamet; both are Issaquah 124 Class ferries built in 1980 and 1981, respectively.

2.1.2 Ridership

Two ferry vessels operate at a time on the Mukilteo-Clinton route. Each vessel has the capacity to carry up to 1,200 walk-on passengers and 124 vehicles on average. The number of vehicles permitted on the ferry depends on the size of the vehicles on the ferry as well as how closely they are parked to one another; therefore, vessels could have slightly more or less than 124 vehicles per sailing.

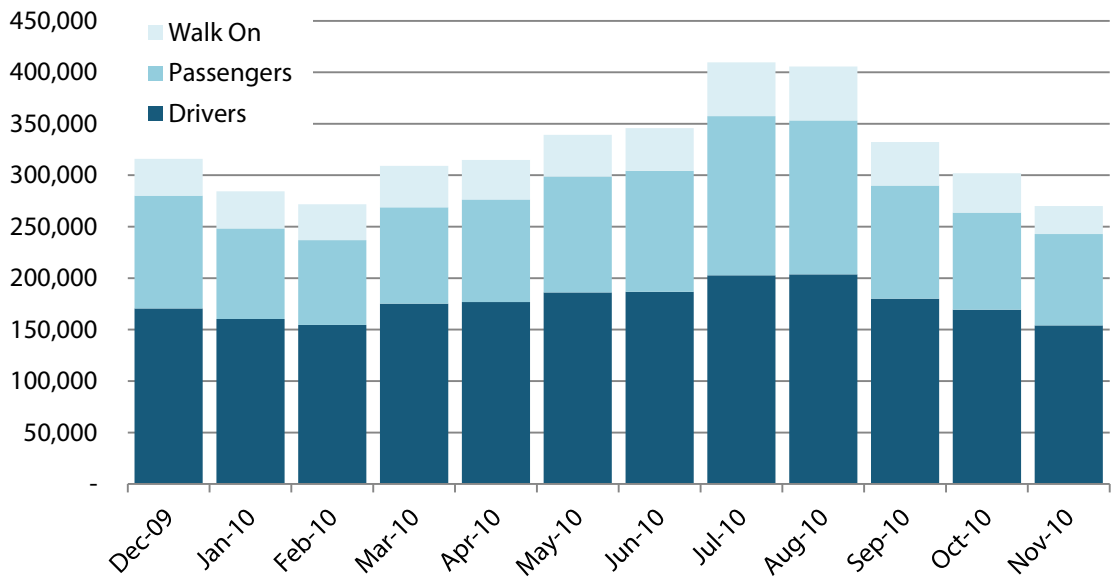
In 2012, the Mukilteo-Clinton route had the system's highest annual vehicle trips (2,090,400; down 1.3 percent from 2010) and the third-highest passenger ridership (1,744,500; down 1.3 percent from 2010). The total annual ridership (vehicles, vehicle passengers, and walk-on passengers) on the Mukilteo-Clinton route (3,835,000) is second behind the Seattle-Bainbridge Island (6,118,500).

2.1.3 Monthly Ridership Variation

Ferry ridership on the Mukilteo-Clinton route fluctuates throughout the year, with the highest ridership during July and August and the lowest ridership in November, January, and February. Exhibit 2-1 summarizes monthly ridership counts on the Mukilteo-Clinton route from December 2009 through November 2010, indicating vehicle driver, vehicle passenger, and walk-on passenger volumes.

The typical or average month for ferry ridership is May, which is consistent with the *WSDOT Ferries Division Final Long-Range Plan* and travel demand model. For planning purposes in the evaluation of existing and future conditions, the average monthly data are used, which is May.

Exhibit 2-1. Monthly Mukilteo-Clinton Ferry Ridership Volumes (December 2009 to November 2010)

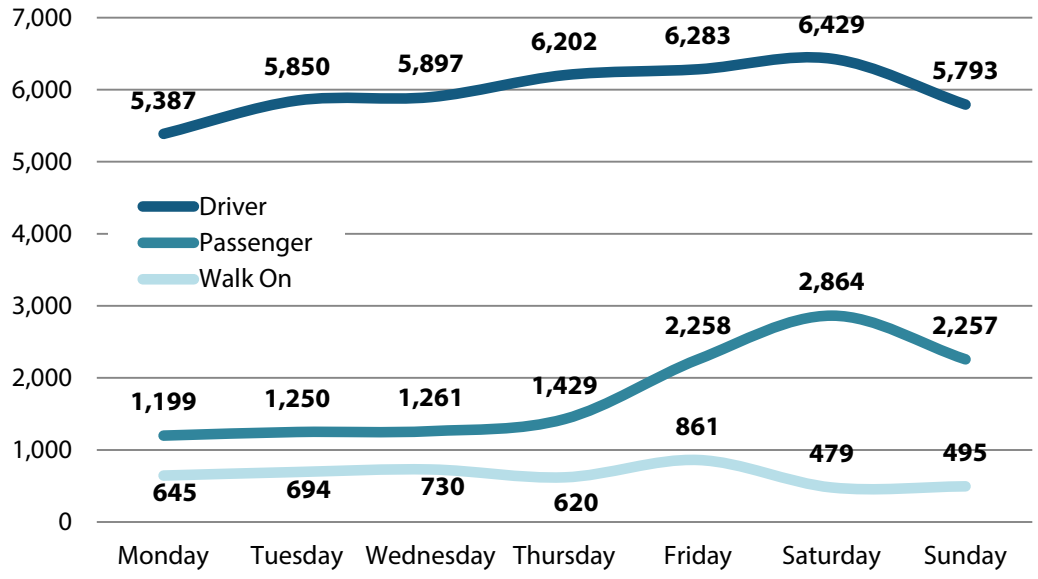


Source: WSF Fare Box Receipts

2.1.4 Daily Ridership Variation

Ridership varies only slightly throughout the week (Tuesday through Thursday) and generally increases during the weekend (Friday through Saturday); Sunday and Monday ridership varies. However, walk-on ridership decreases on weekends while vehicle volumes increase, primarily because there are fewer commute trips and more recreational trips on weekends. Exhibit 2-2 summarizes the average daily ridership for May 2010 recorded for all trips, southbound and northbound, for the Mukilteo-Clinton ferry route. The increase in driver and passenger ridership on weekends represents the addition of recreational and tourist travel. The decrease in walk-on passengers during Saturday and Sunday is because of the reduction in commuter-related trips using bus and commuter rail transit to travel after riding the ferry.

Exhibit 2-2. May 2010 Average Daily Ridership (Mukilteo-Clinton)



Source: WSF Fare Box Receipts

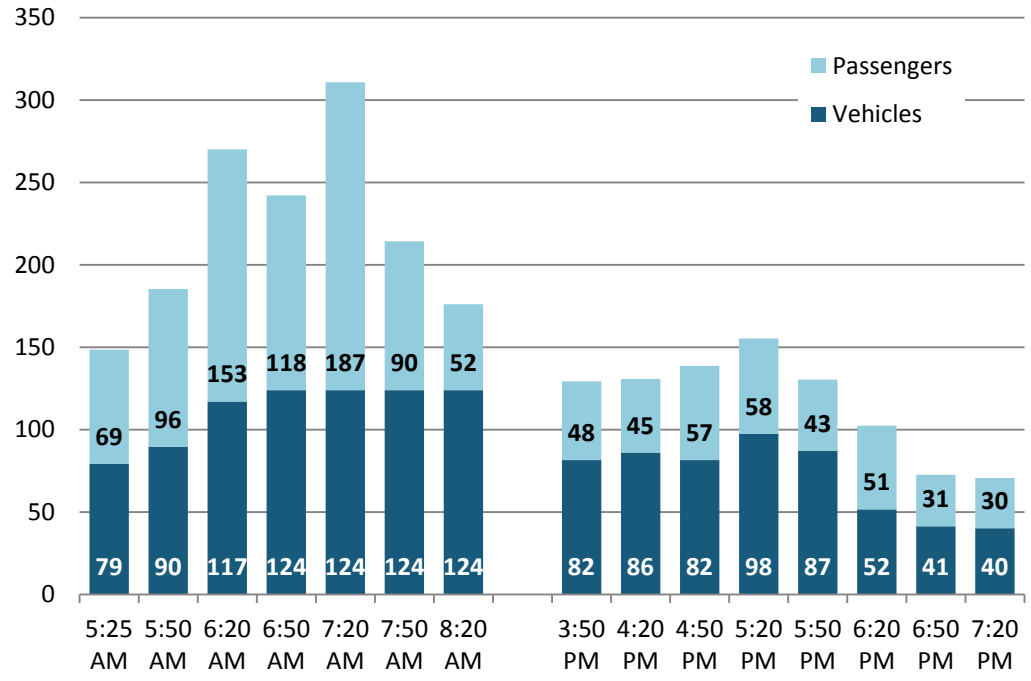
2.1.5 Average Weekday Ridership

Exhibits 2-3 and 2-4 summarize average weekday (Tuesday through Thursday) ferry ridership during May 2010 for the Mukilteo-Clinton route. (Vehicles include the driver and passengers are a combination of walk-on and vehicle passengers.) The Mukilteo-Clinton ferry route experiences high peak directional use as shown by the substantially higher southbound morning passengers traveling by ferry from Clinton to Mukilteo (see Exhibit 2-3) and the returning northbound evening passengers traveling by ferry from Mukilteo to Clinton (see Exhibit 2-4).

Total evening ridership volumes are higher than the morning peak. This is consistent with general transportation demand trends in the Puget Sound region, with morning peak periods primarily dominated by work-commute and school-commute trips. Late afternoon/evening peak periods typically include a greater mix of trip purposes, including work-commute and school-commute as well as discretionary trips such as shopping and entertainment.

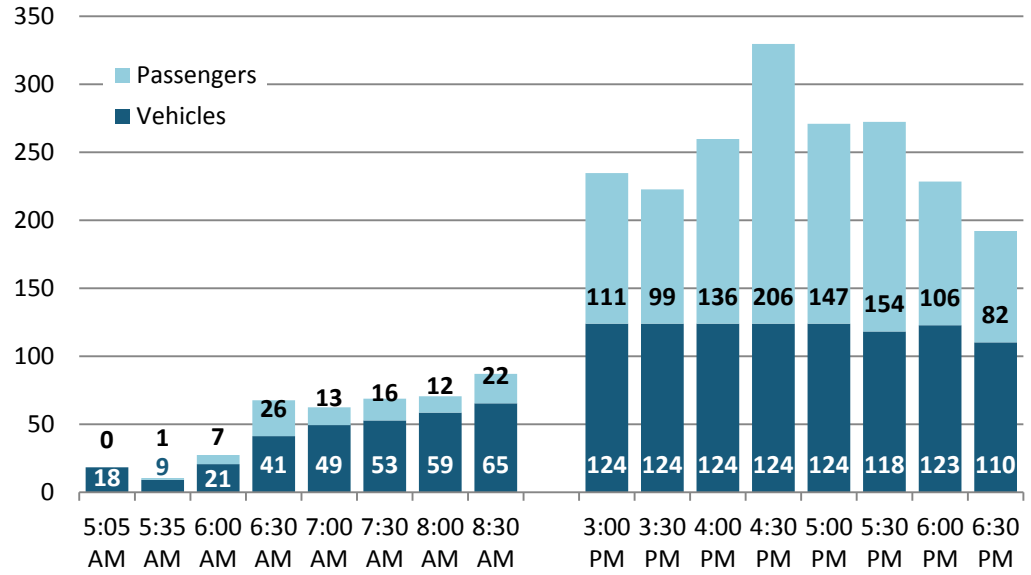
As ridership levels vary during the day, so does how people arrive and depart from the ferry. Because sailings during peak periods in the peak direction experience vehicle demand in excess of ferry capacity, ridership growth during these periods is possible only through an increase in walk-on passengers, vanpools (have priority loading over general vehicle traffic), and increased person occupancy in all other vehicles.

Exhibit 2-3. May 2010 Average Weekday Ferry Ridership (Clinton-Mukilteo)



Source: WSF Fare Box Receipts (for vehicles) and Survey (for passengers)

Exhibit 2-4. May 2010 Average Weekday Ferry Ridership (Mukilteo-Clinton)



Source: WSF Fare Box Receipts (for vehicle) and Survey (for passengers)

As shown in Exhibits 2-3 and 2-4, sailings with a vehicle demand at or close to the vessel limit of 124 vehicles have a larger number of passengers, which comprises a larger number of walk-on passengers compared to vehicle passengers. Walk-on passengers take either one or a combination of modes on each side of the ferry to complete their trips, which includes driving to a park-and-ride lot or parking area, taking transit, getting dropped off or picked up, walking, or riding a bicycle.

Exhibit 2-5 shows the majority of passengers who walk off the ferry at Mukilteo are using bus transit at the Mukilteo ferry terminal in the morning.

Exhibit 2-5. Mode of Choice for Walk-off Ferry Passengers Arriving at the Mukilteo Ferry Terminal from Clinton (2010 Average Weekday)

Ferry Unloading at Mukilteo	Park-and-Ride	Drop Off	Bus Transit	Commuter Rail	Bicycle	Walk
5:25 AM	7	0	42	0	0	6
5:50 AM	21	0	28	12	0	3
6:20 AM	21	0	65	16	1	9
6:50 AM	18	0	24	21	1	7
7:20 AM	33	0	66	23	1	12
7:50 AM	18	0	43	0	1	5
8:20 AM	9	0	10	0	0	4
3:50 PM	1	7	2	1	0	4
4:20 PM	5	2	2	0	0	4
4:50 PM	9	2	1	2	0	4
5:20 PM	9	2	2	1	1	3
5:50 PM	7	2	2	0	1	3
6:20 PM	7	1	1	0	0	2
6:50 PM	10	2	2	0	1	4
7:20 PM	7	2	1	0	0	0

Source: Survey and WSF Model

In the evening, as shown in Exhibit 2-6, passengers who walk on the ferry at Mukilteo are also using bus transit as their preferred travel mode. The use of park-and-ride lots by people who live on Whidbey Island and leave vehicles overnight in Mukilteo, as well as commuter rail service, are prevalent modes of access for people arriving at Clinton on the ferry from Mukilteo. Access to the Mukilteo ferry terminal by walking, bicycling, and drop-off or pick-up is low; however, there is not an official drop-off/pick-up location at the existing Mukilteo ferry terminal.

Exhibit 2-6. Mode of Choice for Walk-on Passengers Leaving the Mukilteo Ferry Terminal for Clinton (2010 Average Weekday)

Ferry Load at Mukilteo	Park-and-Ride	Pick Up	Bus Transit	Commuter Rail	Bicycle	Walk
5:05 AM	0	0	0	0	0	0
5:35 AM	0	0	0	0	0	0
6:00 AM	3	1	1	0	0	0
6:30 AM	4	1	2	0	0	4
7:00 AM	2	0	2	4	0	0
7:30 AM	0	0	3	0	0	3
8:00 AM	0	0	0	0	0	2
8:30 AM	0	0	0	0	0	3
3:00 PM	12	3	29	0	0	4
3:30 PM	9	3	14	0	0	3
4:00 PM	18	4	25	0	0	4
4:30 PM	19	6	75	0	0	9
5:00 PM	17	2	20	26	2	14
5:30 PM	36	4	43	15	0	13
6:00 PM	22	2	21	15	1	3
6:30 PM	10	3	14	14	0	5

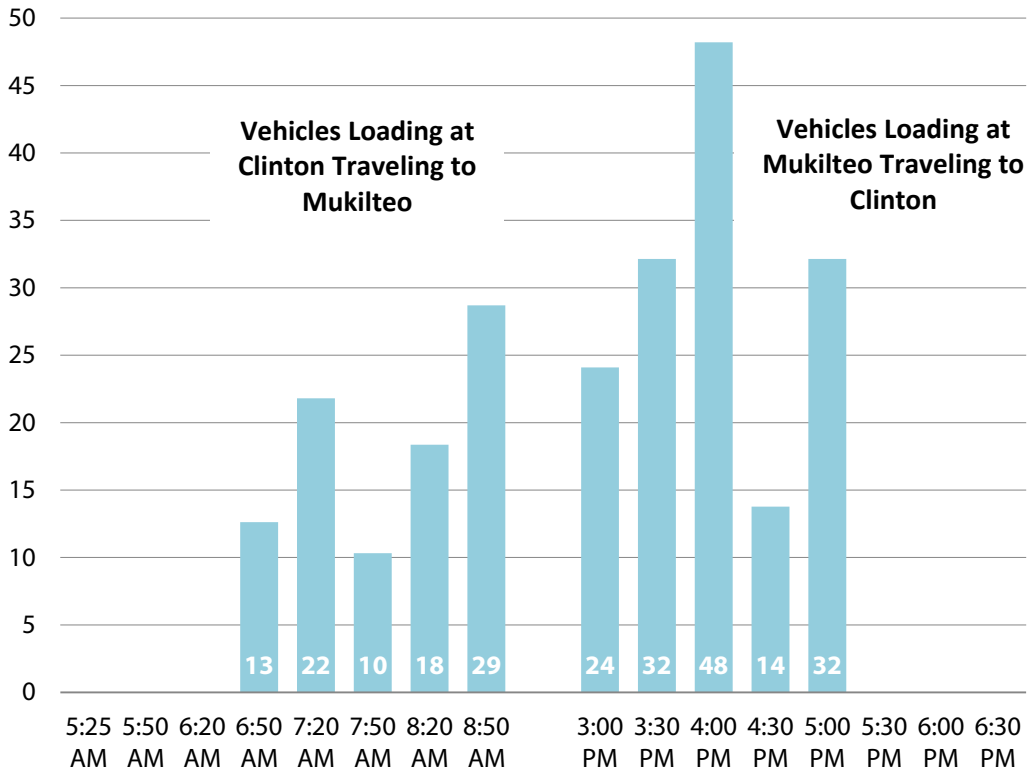
Source: Survey and WSF Model

2.1.6 Ferry Crossing Levels of Service

As a way to identify the point at which demand management or additional capacity investments may be necessary, the *WSDOT Ferris Division Long-Range Plan* identifies an LOS performance standard based on the percentage of total sailings operating at full capacity. When the Level 1 Standard is surpassed, pricing and operational strategies to spread demand are recommended; when the Level 2 Standard is surpassed, additional service is recommended.

Exhibit 2-7 summarizes the average number of vehicles unable to board the next immediate sailing for a typical month such as May because the sailings were at full capacity. This is referred to as "unmet demand" (i.e., on average, the 6:50 AM sailing fills the 124-vehicle capacity and 13 vehicles are unable to board). Exhibit 2-7 also shows some of the southbound morning and northbound evening sailings experience unmet demand. Currently, all walk-on passengers are able to board the next immediate sailing.

Exhibit 2-7. Unmet Vehicle Demand (2010 Average Weekday)



Source: WSF Fare Box Receipts and Survey

The importance of evaluating unmet demand is that it indicates where additional passenger growth can be accommodated. Presently, during sailings where all vehicles cannot be accommodated on the vessel, ridership growth is limited to vanpool, motorcycle, bicycle, and walk-on passengers. Also, unmet vehicle demand may indicate a condition where vehicles waiting for the ferry begin queuing in the shoulder lane outside of the designated ferry terminal holding area; the vehicle holding area for the Mukilteo ferry terminal comprises 24 holding lanes, which can accommodate approximately 10 vehicles per lane (the number of vehicles per lane depends on the length of vehicles).

The LOS performance standard from the *WSDOT Ferries Division Final Long-Range Plan* is used to describe the percent of total daily sailings in which ferries are at their full vehicle capacity for January, May, and August. If vehicle demand for space on ferries grows or continues to exceed vessel capacity, subsequent sailings will also be full, passing excess demand to the next sailing. Only after vehicle demand has decreased sufficiently for vessel capacity to serve waiting vehicles will ferry sailings drop below the performance measure threshold of having less than the ferries' full vehicle capacity.

Northbound travel in the PM peak period is used to calculate the ferry crossing LOS because it has an overall higher travel demand than southbound AM peak period.

Exhibit 2-8 summarizes the percentage of sailings that were full in 2010 and shows that August exceeded the Level 1 performance threshold, but not the Level 2 LOS performance threshold.

Exhibit 2-8. Mukilteo-Clinton Ferry Route Level of Service

Month	Level 1 Standard	Level 2 Standard	2010 Data
January	25%	65%	8%
May	25%	65%	20%
August	30%	75%	35%

Sources: WSDOT 2009 and WSF Fare Box Data

Note: Values are percent of total northbound sailings that are full.

For the Mukilteo-Clinton route, 20 percent of sailings with full vehicle loads is approximately 15 sailings a day (approximately 7.5 hours of service) where vehicles are not able to board the next immediate sailing.

Relationship of Level of Service Standard to Concurrency

Highways of statewide significance are exempt from municipal concurrency requirements, except for circumstances such as Whidbey Island, which has two exclusive connections to the mainland (SR 525, which is the Mukilteo-Clinton ferry route, and SR 20); highways of statewide significance concurrency requirements apply to these facilities. The conformity with concurrency requirements is based on the Level 2 Standard requirements stated in the *WSDOT Ferries Division Final Long-Range Plan*, which are not currently exceeded.

2.1.7 Terminal Operations

The Mukilteo ferry terminal accommodates multiple modes of traffic, each of which arrives at the terminal, loads and unloads, and departs in different manners.

Terminal Arrival

Walk-on passengers include people walking or bicycling from where their trip starts, drivers who park and walk, and transit riders who use bus and commuter rail. All walk-on passengers have an associated walking travel time to the SR 525/Front Street intersection, as well as some level of delay at this intersection prior to entering the passenger loading area. Exhibit 2-9 summarizes the modeled travel times for walking from the Mukilteo Station, bus zone, and southern parking lots to the Mukilteo ferry terminal. The modeled travel times assume a standard distribution of walking speeds, which does not fully account for passengers walking quickly to reach their destination.

Exhibit 2-9. Walk Travel Times to the Mukilteo Ferry Terminal (PM Peak Period)

Location	To Terminal (minutes)
Mukilteo Station	8.6
Bus Zone/Parking Lot South of Front Street	1.0
Parking Lot South of Second Street	4.8

Source: VISSIM Model 2012

Unlike most other WSF terminals, ferry and non-ferry vehicle traffic are not separated at the Mukilteo ferry terminal. The Mukilteo ferry terminal transfer span connects directly to the SR 525-Front Street intersection, which is not signalized. Front Street and SR 525 also serve non-ferry traffic traveling to destinations along the waterfront. These destinations include Mukilteo Lighthouse Park, Mukilteo Station, Mount Baker Terminal, NOAA Fisheries Service Mukilteo Research Station, park-and-ride lots, private residences, public access and waterfront facilities, and businesses along Front Street.

Vehicles arriving at the Mukilteo ferry terminal travel northbound along SR 525 and enter the holding lanes through one of three tollbooths. According to WSF, ferry staff can process approximately 2.5 vehicles per minute per booth, which includes accepting payment, giving change, and directing commuters to their holding lane. Holding lane 1 is for motorcycles and bicycles; lanes 2 and 3 are reserved for vanpools and registered carpools; lanes 4, 5, and 6 are reserved for larger-sized vehicles; and lanes 7 through 24 are for all other vehicles and unregistered carpool traffic.

Ferry Unloading and Loading

Walk-on passengers are allowed to walk off the ferry first while the vehicles remain on the ferry. It takes, on average, 19 seconds for all passengers to reach the passenger terminal (see Exhibit 2-10). Walk-on passengers who do not quickly cross the SR 525/Front Street intersection experience additional delay while vehicles unload. In early 2011, a traffic signal was constructed at the Mukilteo ferry terminal that stops unloading ferry traffic for 30 seconds, which occurs once, allowing pedestrians to cross the intersection.

The vehicle unloading pattern consists of releasing the center two lanes first (used by larger-sized vehicles), followed by the outer lanes on the main floor and the upper lanes last; all vehicles are received by two southbound lanes on SR 525 that taper to one lane on the south side of Fifth Street. Unloading vehicles takes just over 4 minutes, on average (see Exhibit 2-10). The sequence and durations of ferry unloading and loading were collected on December 15, 2010, and are summarized in Exhibit 2-10.

Exhibit 2-10. Ferry Unloading and Loading Average Duration at Mukilteo

Ferry Arrival	Walk-Off	Vehicle Unloading	Walk-On	Vehicle Loading
		(minutes)		
4:00 PM	0:24	4:14	1:02	7:54
4:30 PM	0:21	3:05	0:32	9:26
5:00 PM	0:12	5:13	0:49	7:56
Average	0:19	4:10	0:47	8:25

Source: Field Survey, December 2010

After the ferry has unloaded and is ready to load passengers destined for Clinton, all walk-on and bicycle passengers are loaded first. These commuters exit the passenger loading area and walk across the transfer span to the ferry, which typically takes less than 1 minute (see Exhibit 2-10).

After the walk-on passengers and bicyclists have boarded the ferry, WSF staff manually direct each vehicle holding lane for loading. Motorcycles, vanpools, and registered carpools are the first vehicles to load from ferry terminal holding lanes 1, 2, and 3. Larger-sized vehicles in holding lanes 4, 5, and 6 load third and queue in the two center lanes of the main floor of the ferry. The remaining vehicles in lanes 7 through 24 are loaded last; the lane order is dependent on the last lane loaded on the previous sailing. At any time during the loading process, the WSF staff traffic controller may stop loading to allow traffic on SR 525 and Front Street to pass through the intersection; however, loading will only be temporarily stopped after the entire lane has loaded. This is in part to allow buses to access the bus stop. The vehicle loading process takes less than 9 minutes (see Exhibit 2-10).

Finally, after the motor vehicles have finished loading, any remaining walk-on passengers in the passenger waiting area are allowed to board the ferry. The separation of walk-on passenger loading before and after the motor vehicles is done to minimize the risk of vehicle-to-pedestrian collisions.

During the ferry unloading and loading processes, which take approximately 14 minutes, queues tend to form in the ferry lane and along SR 525.

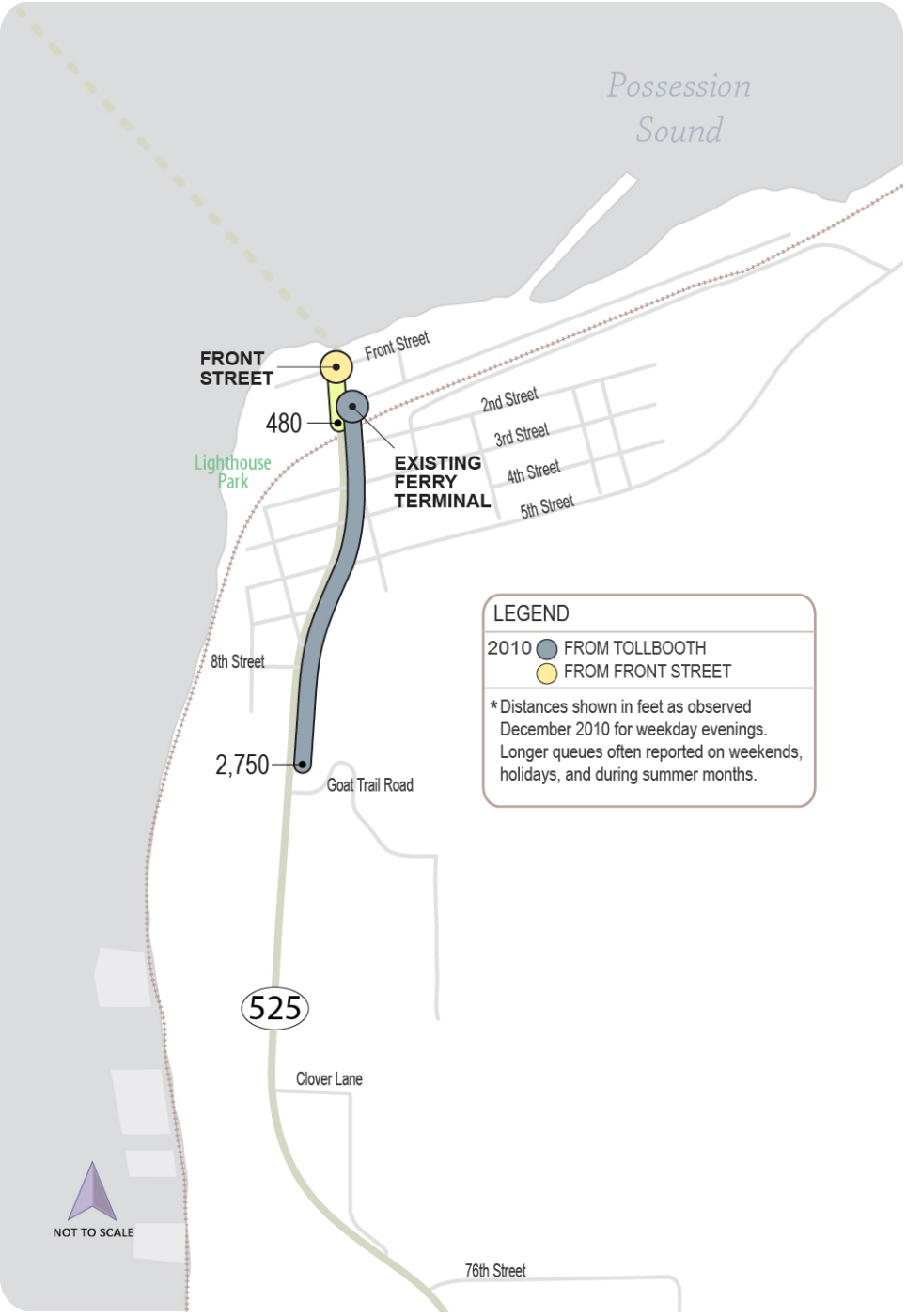
Ferry Shoulder Queuing

Exhibit 2-11 shows queue lengths from a field survey in December 2010, which provided a baseline for the analysis. Queues can be longer at other times of the year such as Fridays, holidays, and during the summer, when ferry shoulder queues can extend beyond Goat Trail Road. Queue lengths are a metric for evaluating the roadway operations and they indicate if the operations of one intersection affect an adjacent intersection. The queue lengths were included as part of the micro-simulation analysis of traffic conditions at the Mukilteo ferry terminal.

As summarized in Exhibit 2-11, the vehicle queue from the SR 525/Front Street intersection extends approximately 480 feet from Front Street to just north of the SR 525 bridge during the PM peak period. This queue length represents the maximum extent that vehicles spill back onto SR 525 from the Front Street intersection during the peak hour, which includes at least one ferry loading and unloading operation. The queue length on SR 525, south of Front Street, is not long enough to affect downstream intersections.

The shoulder queuing from the tollbooths along SR 525 affects a number of downstream intersections and driveways, as vehicles move slowly through the shoulder lane during times of higher ferry use. The City of Mukilteo reports the queues can extend as far as Olympic View Middle School, which is near 76th Street.

Exhibit 2-11. 2010 Queue Lengths at the Mukilteo Ferry Terminal



Source: Field Survey, December 2010

Terminal Departure

Walk-off passengers departing the Mukilteo ferry terminal experience additional delay at the SR 525/Front Street intersection due to local (non-ferry) traffic, and vehicle ferry traffic during unloading and loading operations. Exhibit 2-12 summarizes the travel times for the different destinations of walk-off passengers. Similar to Exhibit 2-9, these modeled travel times assume a standard distribution of walking speeds.

Exhibit 2-12. Walk Travel Times from the Mukilteo Ferry Terminal (PM Peak Period)

Location	From Terminal (minutes)
Mukilteo Station	12.8
Bus Zone/Parking Lot South of Front Street	2.1
Parking Lot South of Second Street	8.4

Source: VISSIM Model 2010

The walk times departing the terminal (see Exhibit 2-12) are longer than the arriving walk times (see Exhibit 2-9) because walk-off passengers crossing SR 525 typically have to wait for unloading vehicle traffic to pass. While vehicles unload from the ferry, traffic along SR 525 and Front Street is stopped by WSF staff. A traffic signal at the Mukilteo ferry terminal stops unloading ferry traffic for 30 seconds, which occurs once, allowing pedestrian and vehicle traffic on SR 525 and Front Street to proceed. Nearly all of the motor vehicle traffic departing the ferry travels south along SR 525 and very few vehicles have local destinations along Front Street.

Mukilteo Transfer Span

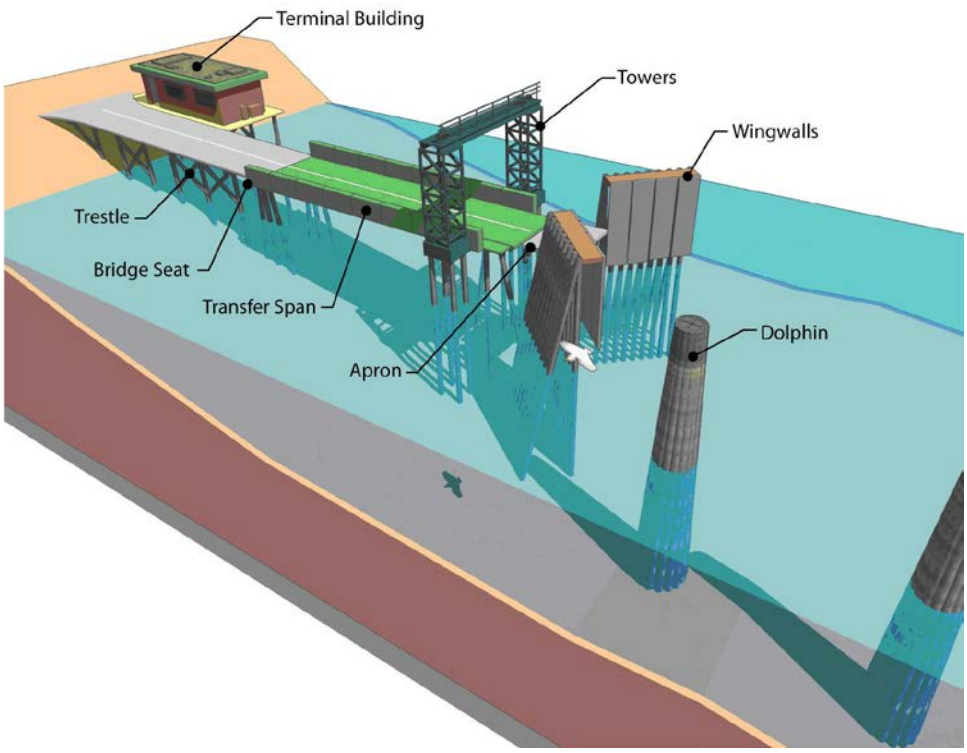
The Mukilteo transfer span is one of the oldest transfer spans currently used by WSF, and of the older transfer spans is the only one used regularly. Exhibit 2-13 summarizes the number of lost ferry trips on the Mukilteo-Clinton route occurring in the past 5 years due to mechanical and maintenance issues with the Mukilteo transfer span. See Exhibit 2-14 for an illustrated example of ferry terminal elements.

Exhibit 2-13. Reasons for Lost Sailings due to Issues with the Mukilteo Transfer Span

Year	Lost Trips due to Mechanical Failure	Lost Trips due to Maintenance
2006	2	6
2007	0	0
2008	26	0
2009	0	4
2010	0	0

Source: WSF

Exhibit 2-14. General Terminal Schematic



2.1.8 Navigable Waterways

The Rivers and Harbors Act defines navigable waters of the United States as those waters subject to the ebb and flow of the tide shoreward to the mean high water mark and/or presently used, or have been used in the past, or are susceptible for use to transport interstate or foreign commerce. This term includes coastal and inland waters, lakes, rivers, and streams that are navigable, and the territorial seas. The existing Mukilteo ferry terminal is situated in navigable waters and ferries traveling to and from Clinton across Possession Sound pass through an existing shipping lane. The existing Mukilteo-Clinton ferry route does not impede other vessels operating within or outside the shipping lane that follow general navigation rules.

2.1.9 Mukilteo Ferry Terminal Facility Safety

Potential safety issues within the ferry terminal are categorized into the following three groups:

- Vehicle-to-pedestrian collisions
- Vehicle-to-vehicle collisions
- Terminal enclosure

Striped crosswalks along pedestrian travel routes within the terminal, a separate walk-on passenger loading area, and separated walk-on and walk-off times help

minimize the potential for vehicle-to-pedestrian collisions. Over the past 5 years, there have been no vehicle-to-pedestrian collisions reported.

Vehicle-to-vehicle collisions within the terminal area are rare. Tollbooths assist in lowering speeds while boarding and WSF staff-directed and delineated holding lanes help minimize confusion.

Regulations under the Homeland Security Act require that the ferry terminal be enclosed such that traffic entering the terminal area cannot exit the area without boarding the ferry. The purpose of this regulation is to allow WSF to prevent public access to and from the facility during heightened security alerts. The existing terminal configuration does not allow WSF to lock down the facility and is not compliant with the Homeland Security Act.

2.2 ROADWAY NETWORK

Three components of the roadway network are described in this section: roadway characteristics, traffic volumes, and traffic operations.

Roadway characteristics refer to the collection of physical attributes and defined set of uses of the roadway system. The number of lanes and intersection control (e.g., traffic signal, stop sign, roundabout) are examples of physical attributes, and functional classifications and speed limits are examples of defined uses. This collection of roadway characteristics is important because they influence how drivers interact with their physical environment.

Traffic volumes are the number of motor vehicles that use the roadways and are further characterized by the time of day, direction of travel, and turning movements. These traffic volume characteristics influence how drivers interact with other drivers.

Traffic operations is the term used to describe how well or poorly the roadway network functions and is commonly referred to as congestion. The traffic operating conditions are the cumulative result of the interactions between drivers, their environment, and other drivers.

2.2.1 Roadway Characteristics

This section describes the major roadways in the study area that are used by passengers of the ferry system serving Mukilteo and Clinton. These roadways are of particular interest because they represent the locations where the project's impacts would most likely affect traffic.

SR 525 is the only roadway in the study area providing access to the Mukilteo ferry terminal tollbooths and holding area (Exhibit 2-15). SR 525 is a four-lane highway (two lanes in each direction) from the Interstate 5 (I-5)/I-405 interchange (Exit 182) and continues as a four-lane roadway to Lincoln Way. Within this section, access to SR 525 is allowed only at interchanges, and the posted speed limit is 60 miles per hour (mph). From north of Lincoln Way to Paine Field Boulevard, SR 525 (also known as

Mukilteo Speedway) has four lanes, access is allowed at intersections, and the posted speed limit is reduced to 40 mph. Traffic at intersections is controlled either with stop signs or traffic signals, and right- and left-turn lanes are provided at nearly all intersections. Between Paine Field Boulevard and Church Avenue, SR 525 narrows to a two-lane roadway, intersection turn lanes are less frequent, and the speed limit is lowered to 35 mph. There is a two-way left-turn lane along SR 525 from 84th Street SW to 76th Street SW; however, north of 76th Street SW the two-way left-turn lane is replaced with a ferry holding lane. North of Church Avenue to the ferry terminal, the posted speed limit is reduced to 25 mph.

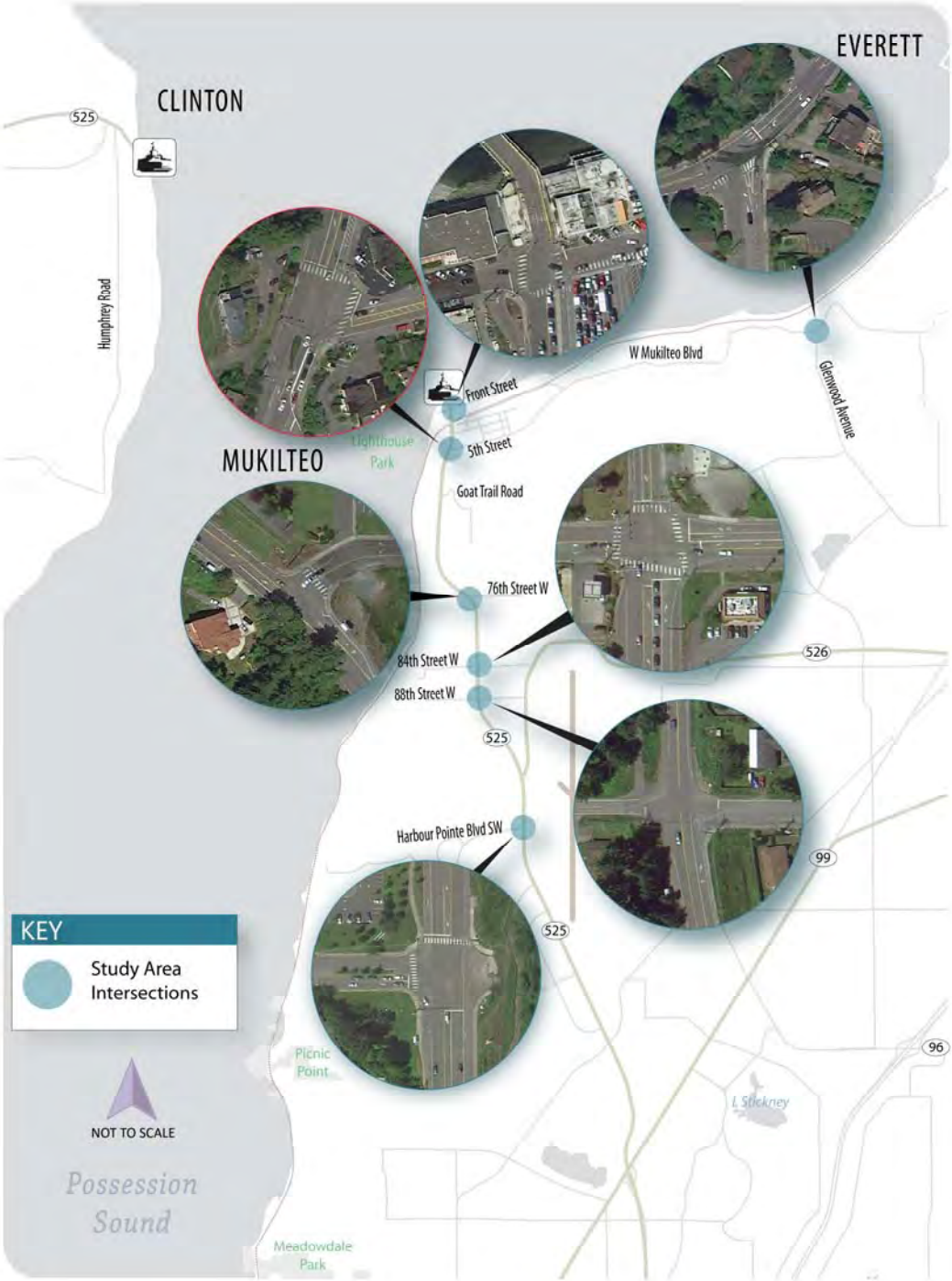
Fifth Street (also known as West Mukilteo Boulevard) connects the city of Mukilteo with the city of Everett. This two-lane roadway provides east-west travel with one lane in each direction. Intersections with public streets are typically controlled with stop signs and turning lanes are often absent. Although the length and connectivity of this roadway allows for regional travel, short intersection spacing, relatively low posted speed limits (25 to 35 mph), and frequent driveway connections indicate a balance between mobility and private property access.

SR 526 (also known as 84th Street SW and Boeing Freeway) originates as an intersection on the east side of SR 525 and extends east to an intersection with Paine Field Boulevard with two lanes in each direction. The posted speed limit in this section of SR 526 is 35 mph. Beyond its connection to Paine Field Boulevard, SR 526 transitions to a posted speed limit of 45 mph; a few intersections with turn lanes provide access to Boeing Company properties. East of Airport Road, SR 526 continues as a four-lane roadway (excluding acceleration/deceleration lanes) to connect with I-5, which is Exit 189; access along this portion of SR 526 is restricted to interchanges only and the posted speed limit is increased to 60 mph.

Mount Baker Avenue is a two-lane access road that provides a connection across the BNSF Railway tracks between Mukilteo Lane and properties to the north. Mount Baker Avenue provides emergency access to these properties and is not a public access road.

The remaining roadways within the study area are generally two-lane roads with speed limits ranging from 25 to 35 mph and accommodate moderate- to short-distance trips that connect to SR 525. As a result, the importance of these roadways, for the purposes of this study, is based on how they operate at their intersection with SR 525. The key intersections that are expected to experience the most traffic effects from the project have been selected as study intersections and are shown in Exhibit 2-15. The intersections of SR 525/Harbour Pointe Boulevard North, SR 525/ 84th Street SW, and SR 525/Fifth Street are controlled with traffic signals, while the remaining study intersections along the corridor are controlled with stop signs on the cross street. In addition to the roadway characteristics described above, intersection turn lanes play an important role in how the roadway network operates. The existence of multiple through lanes and exclusive left- or right-turn lanes affect the overall capacity and LOS of an intersection.

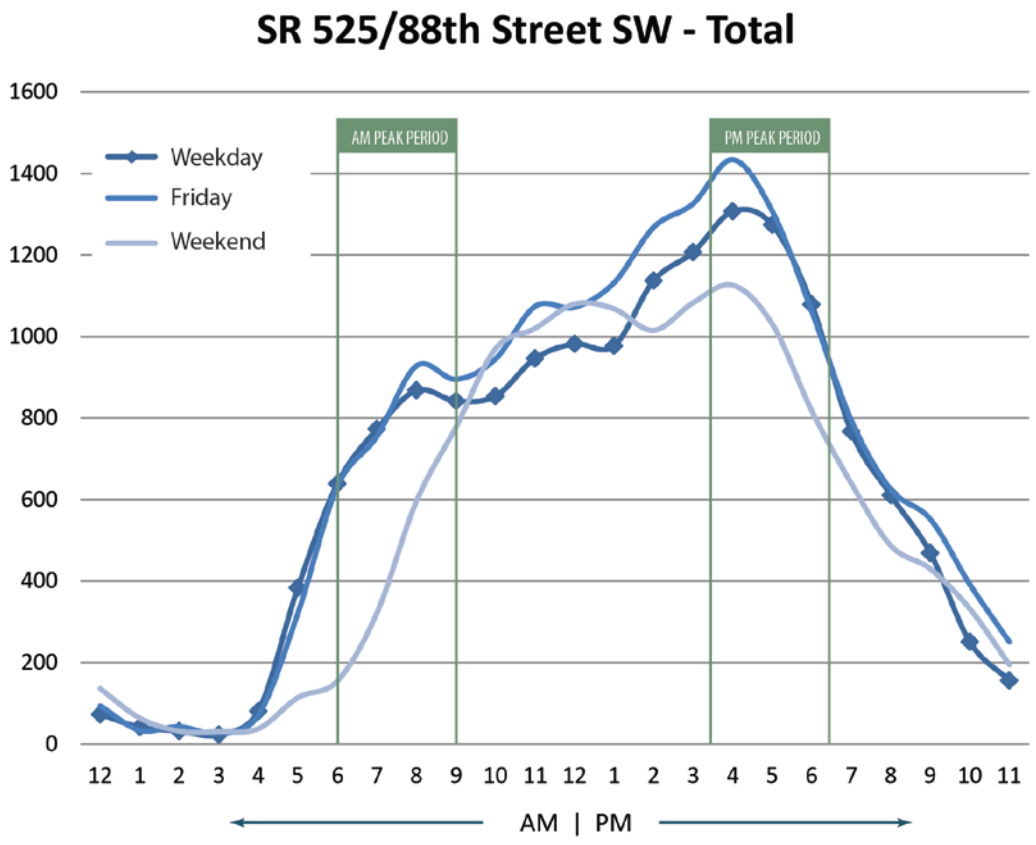
Exhibit 2-15. Study Area Intersections



2.2.2 Traffic Volumes

Twenty-four-hour traffic volume data were collected along seven sections of SR 525 from November 7, 2010, through November 13, 2010, and from January 18, 2011, through January 25, 2011. Exhibits 2-16 and 2-17 show the combined two-way vehicle volumes throughout the week on SR 525 near 88th Avenue West and 76th Avenue West, respectively.

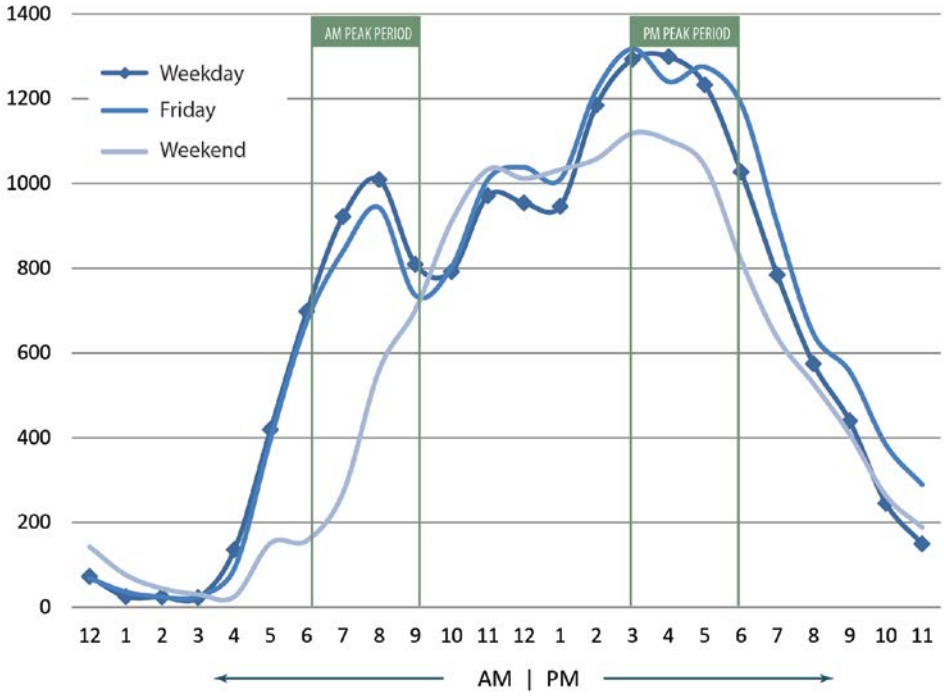
Exhibit 2-16. Two-Way Traffic Volume Daily Distribution on SR 525 near 88th Avenue West



Source: November 2010 Traffic Counts

As shown in Exhibits 2-16 and 2-17, weekday (Tuesday through Thursday), average vehicle volumes on SR 525 are only slightly lower than Friday volumes, but are higher than weekend volumes. Also, the evening peak period volumes are almost double the morning peak period vehicle volumes because vehicular traffic builds gradually during the day from roughly 4:00 AM to 5:00 PM.

Exhibit 2-17. Two-Way Traffic Volume Daily Distribution on SR 525 near 76th Avenue West

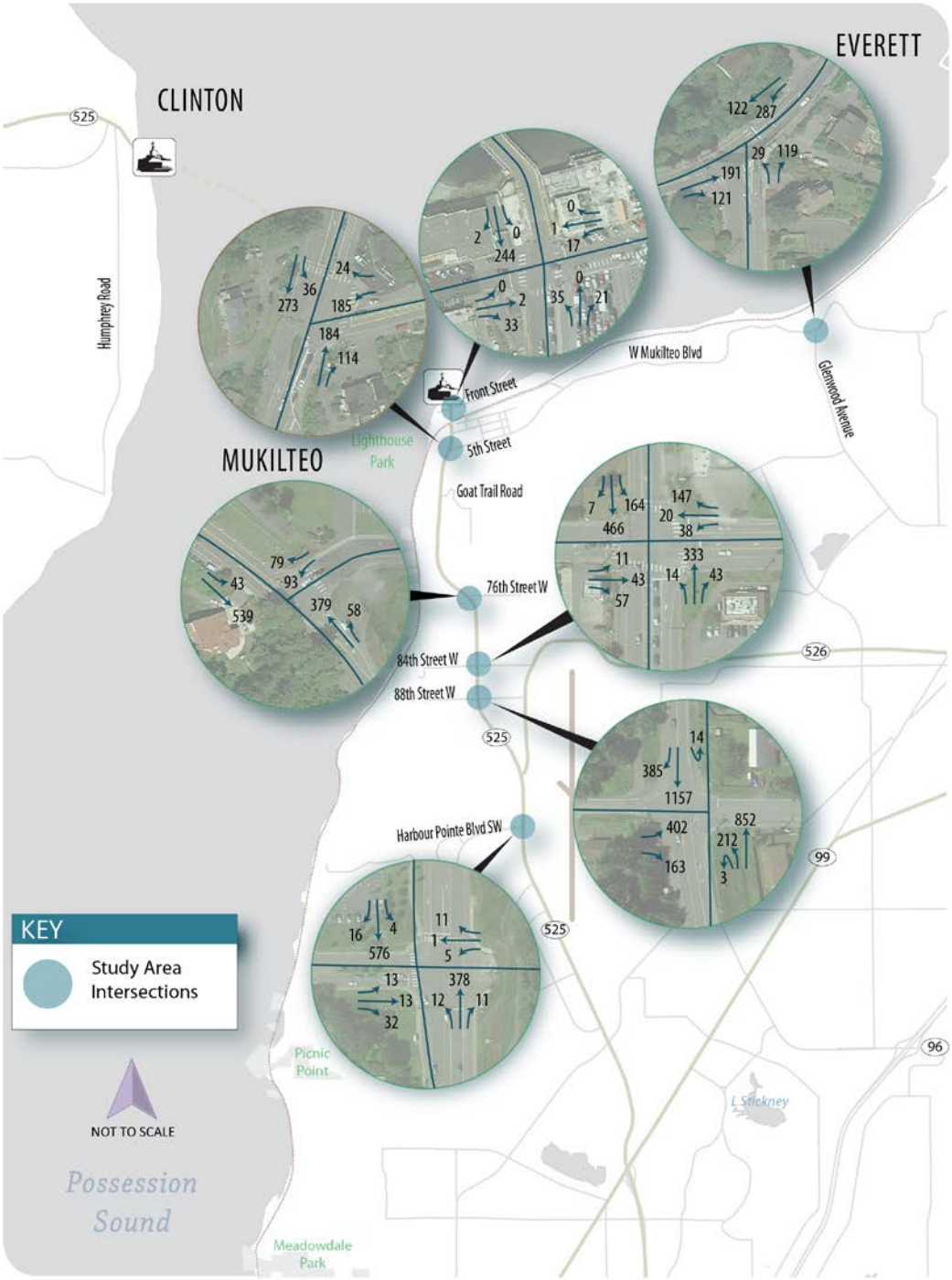


Source: January 2011 Traffic Counts

Study area intersections are illustrated in Exhibits 2-18 and 2-19. Intersection turning moving counts were collected on September 15, 2010, November 9 and 10, 2010, and January 19 and 20, 2011. Morning peak period counts were collected from 6:30 AM to 9:00 AM and evening peak period counts were collected from 3:30 PM to 6:30 PM. The system-wide peak hours (8:00 AM to 9:00 AM and 4:30 PM to 5:30 PM) were used for the traffic analysis.

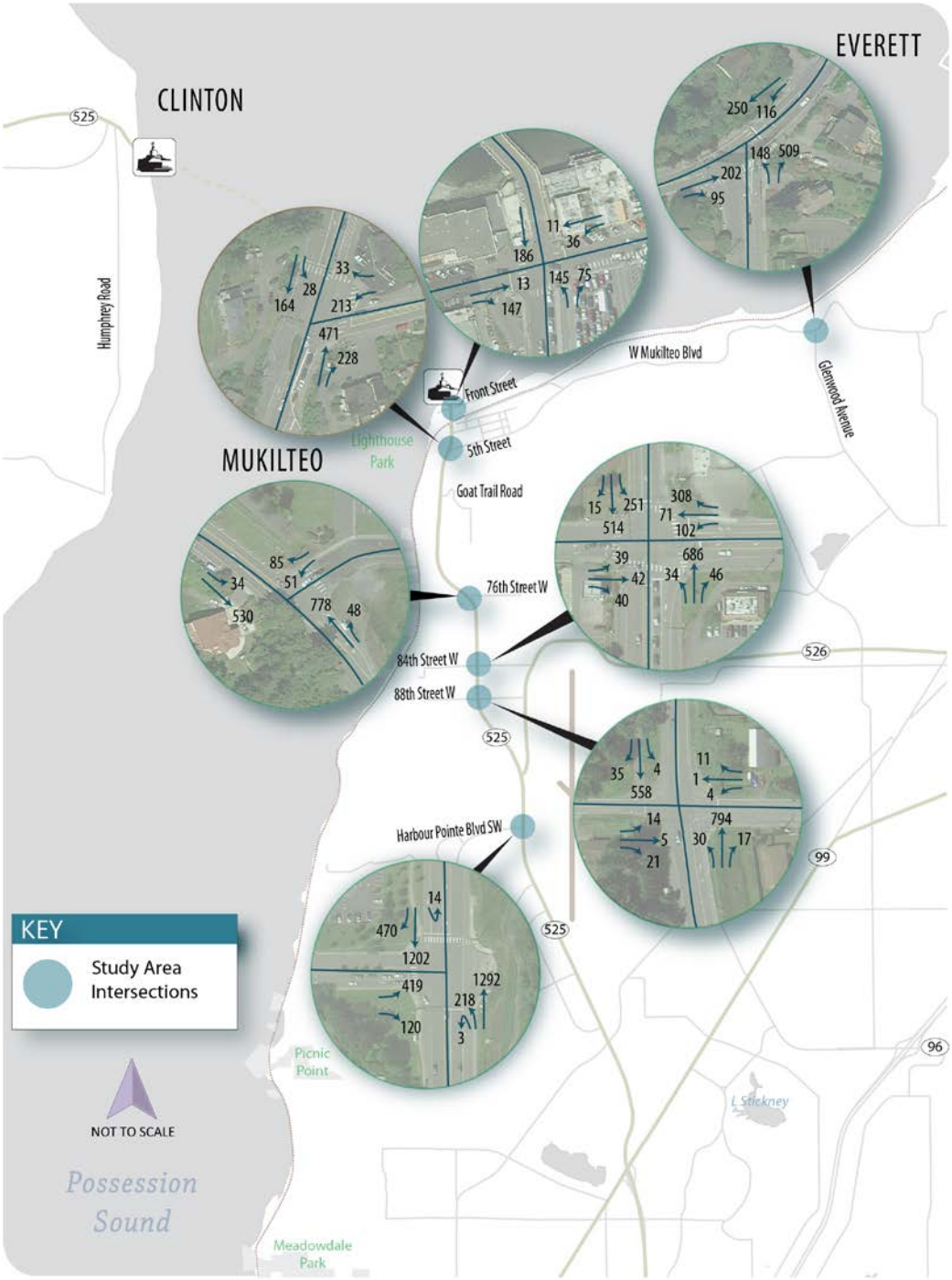
Because the WSF ferry ridership model was developed to estimate typical ridership (May is considered a typical month, see Section 2.1.3), the Washington State Department of Transportation (WSDOT) *Assignment of Factors Report* (WSDOT 2008) was used to adjust November and January traffic volumes to May. The *Assignment of Factors Report* is prepared by WSDOT using data collected year-round and provides seasonal adjustment factors that are used to standardize data. Based on this report, traffic volume data collected in September were multiplied by a seasonal adjustment factor of 98.9 percent, November data were multiplied by a seasonal adjustment factor of 107.6 percent, and January data were multiplied by a seasonal factor of 113.0 percent (WSDOT 2008). Exhibits 2-18 and 2-19 show the peak hour intersection turning movement counts, which have been seasonally adjusted to the month of May.

Exhibit 2-18. Existing AM Peak Hour Vehicular Turning Movement Counts



Source: WSDOT, September 2010, November 2010, and January 2011 Traffic Counts

Exhibit 2-19. Existing PM Peak Hour Vehicular Turning Movement Counts



Source: WSDOT, September 2010, November 2010, and January 2011 Traffic Counts

2.2.3 Traffic Operations

LOS is a quantified estimate of how well, or poorly, the transportation system functions. The most common industry standard for evaluating LOS is based on the *Highway Capacity Manual* (HCM), Special Report 209 (Transportation Research Board [TRB] 2000). Using this methodology, traffic conditions are assessed with respect to the average intersection delay (seconds/vehicle). The letter A is used to describe the least amount of congestion and best operations; the letter F indicates the highest amount of congestion and worst operations. The 2000 HCM LOS ratings are shown in Exhibit 2-20.

Exhibit 2-20. Level of Service Ratings

Level of Service (LOS) Rating	Average Delay for Signalized Intersections (seconds/vehicle)	Average Delay for Unsignalized Intersections (seconds/vehicle)
A	0–10	0–10
B	> 10–20	> 10–15
C	> 20–35	> 15–25
D	> 35–55	> 25–35
E	> 55–80	> 35–50
F	> 80	> 50

Source: Highway Capacity Manual (TRB 2000)

An LOS analysis was conducted for the study intersections using the software program Synchro 7 (Build 773) for intersections outside of the ferry terminal. For the SR 525/Front Street intersection, the software program VISSIM 5.2 was used due to the complex boarding patterns that include manual traffic control by WSF staff. Only the PM peak hour was assessed because it has higher traffic volumes when compared to the AM peak hour.

As summarized in Exhibit 2-21, during the PM peak hour, the SR 525/88th Street SW and SR 525/Front Street intersections operate at an LOS E, which indicates a high level of delay. This LOS fails to meet the City of Mukilteo LOS D standard, which is the maximum level of delay the City has defined as acceptable. All other study intersections operate at LOS D or better during the AM and PM peak hours.

Exhibit 2-21. 2010 Level of Service Summary

Intersection	Control Type	LOS Standard	AM Peak LOS	AM Peak Delay (seconds per vehicle)	PM Peak LOS	PM Peak Delay (seconds per vehicle)
SR 525/Harbour Pointe Boulevard North	Signal	D	C	23	C	21
SR 525/88th Street SW	Stop Sign	D	C	21	E	43
SR 525/84th Street SW and SR 526	Signal	D	A	6	C	28
SR 525/76th Street SW	Stop Sign	D	C	20	C	20
SR 525/Fifth Street	Signal	D	B	11	D	51
SR 525/Front Street	Stop Sign	D	n/a	n/a	E	48
West Mukilteo Boulevard/Glenwood Avenue	Stop Sign	D	B	11	B	14

Source: Existing 2010 Synchro Model and Existing 2010 VISSIM Model for SR 525/Front Street intersection

2.2.4 Roadway Network Safety

As described above, the roadway characteristics influence how drivers interact with the physical environment, traffic volumes influence how drivers interact with other drivers, and LOS is a means to describe and quantify the cumulative interactions with respect to how well, or poorly, the system operates.

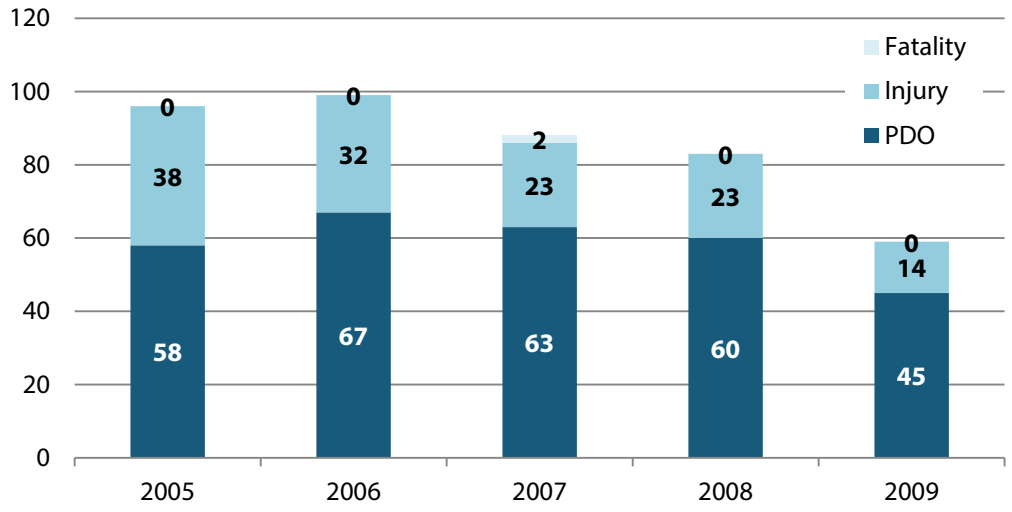
To describe these cumulative interactions with respect to safety, an analysis of the collision history of the roadway network is required. Unlike traffic operations, collision analyses primarily rely on trends, because there are additional factors that play a role in a collision. As a result, collision analyses attempt to identify trends in collision frequency, severity, and type; other factors such as surface and lighting conditions may also be examined if trends in frequency, severity, and type are evident.

To identify trends in collision frequency, severity, and type, collision data for the past 5 complete and consecutive years were analyzed (2005 through 2009). Collision data older than 5 years were not analyzed because changes to the transportation system occur over a span of 5 or more years and their causes may not be representative of recent conditions. Collision data for 2010 were also not included because all collision data for 2010 had not been compiled and prepared at the time when the analysis was completed.

The collision analysis for this project covered the length of the SR 525 corridor within the study area (milepost 5.15 to milepost 8.47) and the West Mukilteo

Boulevard/Glenwood Avenue intersection that is included in the traffic analysis. Exhibit 2-22 shows the general trends in collision frequency, severity, and type for the SR 525 corridor and West Mukilteo Boulevard/Glenwood Avenue intersection as a whole.

Exhibit 2-22. Study Area Collision Trends along SR 525 (2005 through 2009)



Source: WSDOT 2005 to 2009 data

Exhibit 2-22 shows that the proportion of collision severity (property damage only [PDO], injury, and fatality) has remained similar over the last several years and that the overall frequency of collisions for the SR 525 corridor has been in decline. The annual average collision rate, based on 2005 to 2009 data, is 1.33 collisions per million vehicle miles (coll/MVM) traveled, which is lower compared to other principal arterials in the area (2.77 coll/MVM; WSDOT 2006).

Within the SR 525 corridor, it is also helpful to examine the collision frequency and severity by location to determine if there are specific areas that experience more collisions than others. Exhibit 2-23 provides collision data at the study intersections; the full list of intersections along SR 525 and their collision rates is provided in Appendix A.

Exhibit 2-23. Study Intersection Collision Trends (2005 through 2009)

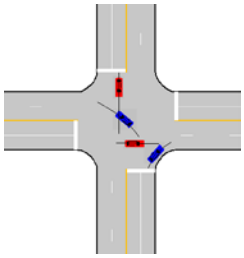
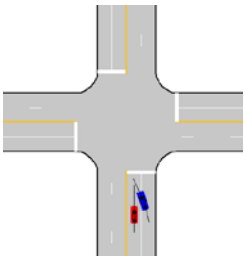
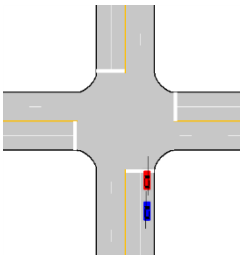
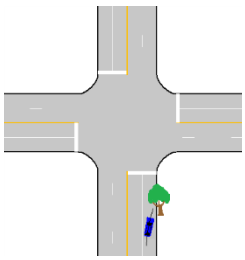
Intersection	SR 525/ Harbour Pointe Boulevard N	SR 525/ 88th Street SW	SR 525/84th Street SW	SR 525/ 76th Street SW	SR 525/ 5th Street	W Mukilteo Blvd /Glenwood Avenue	Subtotal
Property Damage Only	59	6	27	5	21	3	**121**
Injury	30	2	16	6	7	0	**61**
Fatality	0	0	0	0	0	0	**0**
Head On	0	0	2	0	1	0	**3**
At Angle	13	5	12	5	11	0	**46**
Sideswipe	11	0	1	1	1	0	**14**
Rear End	53	2	21	4	10	3	**93**
Front End	2	0	3	0	3	0	**8**
Object	6	0	1	1	1	0	**9**
Ditch/Over turn	0	1	1	0	0	0	**2**
Pedestrian/ Bicycle	4	0	2	0	1	0	**7**
Subtotal	**178**	**16**	**86**	**22**	**56**	**6**	
Daily Volume	46,725	18,675	27,088	19,075	14,213	16,513	
Average Annual Collisions (5 Years)	17.8	1.6	8.6	2.2	5.6	0.6	
Average Annual Collision Rate (coll/MEV)	1.04	0.23	0.87	0.32	1.08	0.10	

Source: WSDOT

Exhibit 2-23 also shows that the majority of collisions at these intersections result in property damage only. The most frequent collision types at these intersections include at-angle, sideswipe, rear end, and fixed object.

Intersections with collision rates higher than 1.00 coll/MEV are typically considered to have a relatively high collision rate that may merit additional investigation from a safety perspective. The SR 525/Harbour Pointe Boulevard North and SR 525/ Fifth Street intersections have collision rates slightly higher than 1.00 coll/MEV. Although it is nearly impossible to identify a single cause or set of causes for a collision, Exhibit 2-24 provides insight on the most frequent contributing factors to collisions in addition to driver error.

Exhibit 2-24. Collision Types and Potential Causes

Collision Type	Potential Causes
At-Angle 	1. Poor sight distance of left-turn vehicle to oncoming through traffic 2. High left-turn and/or oncoming through volume, insufficient gaps 3. Excessive approach speeds 4. Inappropriate signal timings
Sideswipe 	1. Travel lanes not properly marked 2. Roadway tapers 3. Other roadway design deficiencies
Rear End 	1. Inappropriate signal timings 2. Poor visibility of traffic signals 3. Excessive approach speeds 4. Stop-and-go congestion
Fixed Object 	1. Roadway horizontal and/or vertical curvatures and poor sight distance 2. Insufficient lateral clearance 3. Excessive approach speeds

2.3 NON-MOTORIZED CONDITIONS

2.3.1 Pedestrian Conditions

SR 525 is the only roadway link between the Mukilteo city center and the ferry terminal. The SR 525 pedestrian facilities crossing the BNSF tracks consists of 3-foot-wide sidewalks on both sides of the bridge. These facilities meet some but not all Americans with Disabilities Act (ADA) standards, and do not meet current WSDOT design standards for 4-foot-wide sidewalks.

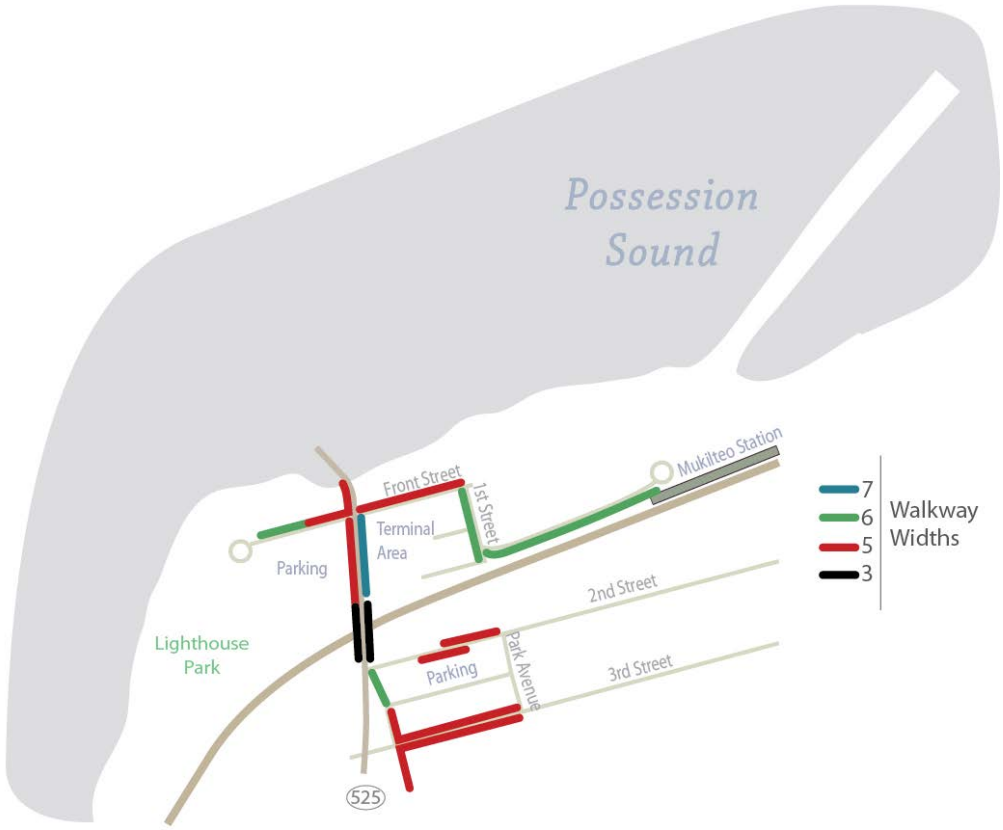
The terminal facility was built in the 1950s and includes a single sidewalk connection on the west side of the ferry ramp to Front Street from the passenger facilities building. Between Front Street and the BNSF bridge, there is a 5-foot-wide sidewalk on the west side of SR 525 and a 7-foot-wide sidewalk on the east side of SR 525 adjacent to the ferry terminal holding area.

2.3.2 Sidewalk and Crosswalk Conditions

East of the Mukilteo ferry terminal along Front Street, between SR 525 and First Street, there is a 5-foot-wide sidewalk on the north side, adjacent to existing retail, restaurants, and the motel. On the south side of Front Street, there is a 7-foot-wide painted sidewalk located between the travel lanes on Front Street and the ferry holding lanes. West of the Mukilteo ferry terminal and SR 525 along Front Street, there are sidewalks on both sides of the street except for a short segment on the south side in front of the Diamond Knot Brewery. First Street includes a 6-foot-wide sidewalk on the west side of the road between Front Street and the entrance to Mukilteo Station.

The SR 525/Front Street intersection is unsignalized and includes designated crosswalks across all four legs of the intersection. Signs forbid pedestrians from crossing between the northeast and northwest corners of the intersection when the ferry is loading and unloading vehicles. A southbound bus stop with a two-coach layover area, shelter, and schedule sign post is located on the southwest corner of the intersection. The northbound bus stop is an in-lane stop on SR 525 south of Front Street. Community Transit and Everett Transit buses terminate service at the ferry terminal and drop off passengers on the northwest corner of the SR 525/Front Street intersection. Exhibit 2-25 illustrates the existing pedestrian system of sidewalks and crosswalks around the Mukilteo ferry terminal.

Exhibit 2-25. Existing Pedestrian Facilities near Mukilteo Ferry Terminal



The existing pedestrian facilities are not ideal for two primary reasons: 1) pedestrians are exposed to motorized traffic at the SR 525/Front Street intersection during ferry loading, and 2) they must navigate narrow sidewalks. During the ferry loading and unloading procedure, WSF personnel help to control traffic at the SR 525/Front Street intersection by intermittently assisting pedestrian crossings and non-ferry traffic through the intersection.

Pedestrians accessing the ferry terminal or areas west of the terminal from the east side of the terminal must either wait for all vehicles to load or find a safe gap in the loading of vehicles. Pedestrians who use the SR 525 bridge to access the terminal must walk on sidewalks that are 3 feet wide. WSDOTs *Design Manual* (version M 22.01.07), Section 1501.05(2)(a)3 states "the minimum clear width for an ADA pedestrian accessible route is 4 feet."

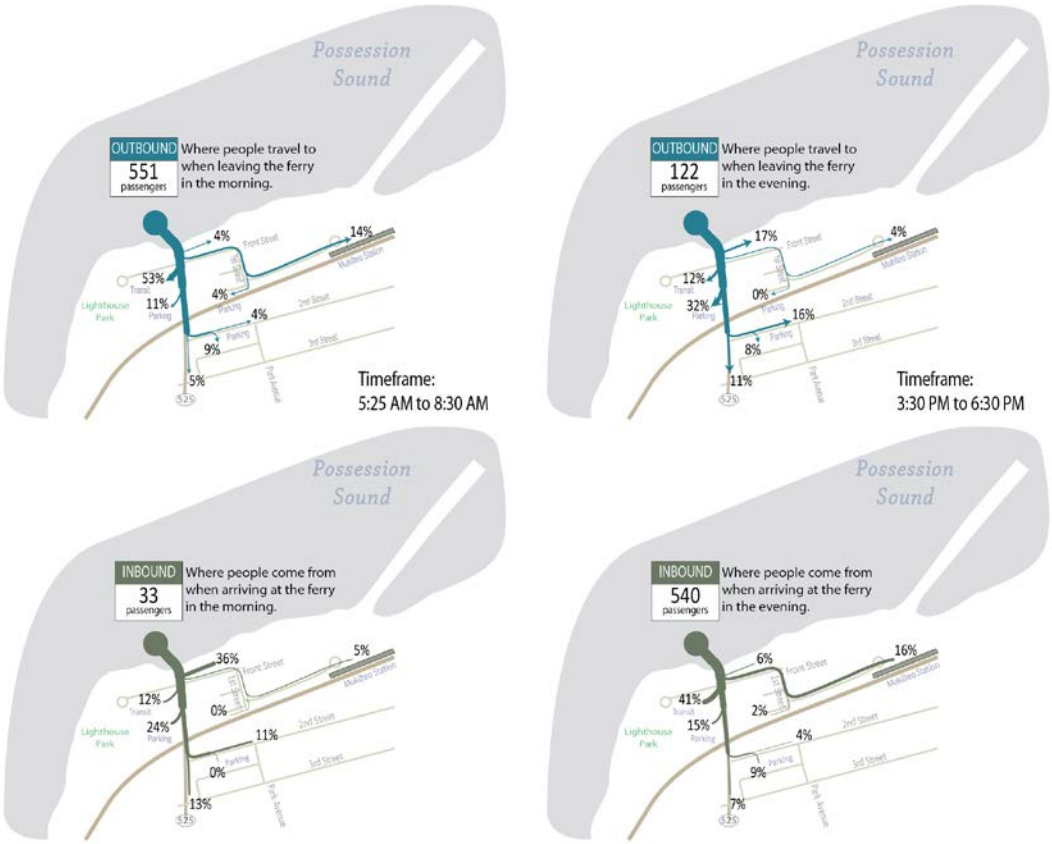
2.3.3 Pedestrian Volumes and Destinations

Pedestrian traffic operations at the Mukilteo ferry terminal were observed in November and December 2010 and normalized for typical monthly activity

(determined to be May, see Section 2.1.3). Pedestrian traffic flows during the morning and evening peak periods are illustrated in Exhibit 2-26. Pedestrians who walk off the ferry prior to vehicles have unrestricted access to cross Front Street. Common destinations include the parking lot behind Diamond Knot Brewery, the bus stop at the SR 525/Front Street intersection, the SR 525 bridge to Mukilteo and to other parking lots, and Mukilteo Station. Some passengers are picked up at the terminal.

The highest pedestrian flows between the Mukilteo ferry terminal and the bus stops occur during peak periods. As shown in Exhibit 2-26, approximately 53 percent of all walk-off traffic in the AM peak period is from the ferry to the bus (compared to 12 percent that walk on), and 41 percent of walk-on traffic in the PM peak period is from the bus to the ferry (compared to 12 percent that walk off).

Exhibit 2-26. Pedestrian Dispersion at Mukilteo Ferry Terminal



2.3.4 Bicycle Facility Conditions

There is limited bicycle use of the ferry terminal; most cyclists leave the Mukilteo ferry terminal in the AM peak period and return to board the ferry in PM peak

period (see Exhibits 2-5 and 2-6). None of the streets to or from the ferry terminal has dedicated bicycle lanes. Cyclists can legally use the same roadway space as motorized vehicles. Cyclists disembarking from the ferry bound for Mukilteo or points to the east must ascend SR 525 in mixed vehicular traffic, sharing the outside travel lane. Some cyclists wait for all vehicles to finish unloading from the ferry before ascending SR 525.

2.3.5 Non-Motorized Safety

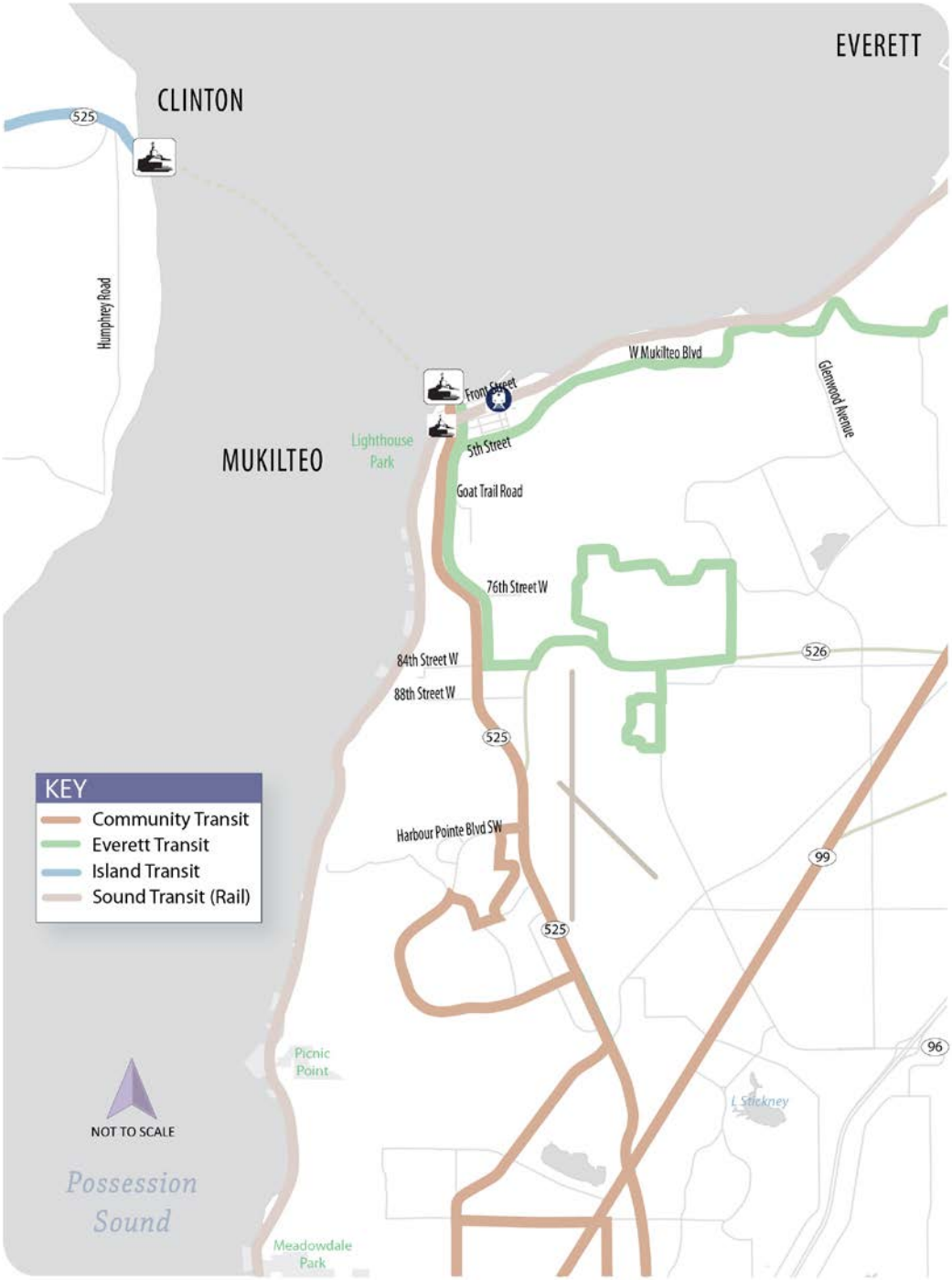
A total of eight collisions involving non-motorized traffic were reported from 2005 to 2009: four at SR 525/Harbour Pointe Boulevard North, two at SR 525/84th Street SW, one at a private driveway north of Goat Trail Road, and one at the SR 525/Sixth Street intersection (refer to Exhibit 2-23 in Section 2.2.4 and Appendix A). The majority of these collisions were the result of the driver failing to yield to a pedestrian while turning right; none of the collisions resulted in a fatality.

2.4 PUBLIC TRANSPORTATION FACILITIES

Community Transit, Everett Transit, Island Transit, and Sound Transit provide transit service in the study area, but only Island Transit operates service on Whidbey Island, serving the Clinton terminal. Sound Transit operates Sounder commuter rail service with a station in Mukilteo. Although Amtrak rail service passes through Mukilteo, it does not stop at the Mukilteo Station. The primary transit corridors in the study area are SR 525, Fifth Street and West Mukilteo Boulevard, SR 526, and the BNSF Railway line. In their *Transit Development Plan* (2012–2017), Community Transit has identified SR 525 as a *transit emphasis corridor*, which is a corridor intended for future service expansion.

Exhibit 2-27 illustrates the service coverage provided by bus and commuter rail service in the study area. Transit service connects the Mukilteo ferry terminal to major destinations such as downtown Seattle, the University District, Lynnwood Transit Center, Everett Station, and Edmonds Community College. Transit service also connects to major employers in the Puget Sound region such as Microsoft, Seattle Children's Hospital, and Boeing.

Exhibit 2-27. Bus and Rail Transit Routes Serving the Mukilteo-Clinton Ferry Route



2.4.1 Transit Serving the Mukilteo Ferry Terminal

Bus service to and from the Mukilteo ferry terminal is operated by Community Transit and Everett Transit, which use a dedicated pull-out bus zone at the Front Street/SR 525 intersection. The Mukilteo Station is located approximately 0.25 mile southeast of the terminal. Exhibit 2-28 lists existing transit service at the Mukilteo ferry terminal by agency, route number, service areas, and weekday schedule frequency; schedule frequency is referred to as headway, which is the scheduled time between buses serving a bus stop. Exhibit 2-29 is a summary of transit ridership (boardings and disembarkings) for the Front Street bus stop by service provider.

Community Transit

Community Transit operates a commuter express bus service during weekday peak commute periods, generally only in the peak direction. For example, Routes 417 and 880/885 operate from Mukilteo to downtown Seattle and the University District, respectively, in the morning and operate in the reverse direction in the evening peak period. Community Transit operates all-day local bus service between the Mukilteo ferry terminal and the Lynnwood Transit Center, including bus service between the Mukilteo ferry terminal and Edmonds Community College during class times.

Vanpool service in Mukilteo is provided by Community Transit; currently, four vanpools serve Redmond (e.g., Microsoft) and Children's Hospital in Seattle. Vanpool participants are responsible for keeping vehicles at their residence and no vanpool parking is provided at the Mukilteo ferry terminal.

Community Transit's Dial-A-Ride Transportation (DART), which is a paratransit service, provides service to the Mukilteo ferry terminal. In 2010, an average of seven trips to and from the terminal were made using DART each month. Paratransit service is a curb-to-curb service for registered, eligible persons with a disability who are unable to use the regular bus service.

Community Transit service restructuring in 2012 resulted in some service reductions at the Mukilteo ferry terminal.

Exhibit 2-28. Existing Transit Service Serving the Mukilteo Ferry Terminal

Transit Agency	Route Number	Schedule Frequency at the Mukilteo Ferry Terminal (minutes)			Service Areas
		AM Peak	Midday	PM Peak	
Community Transit	417	30	no service	30	Mukilteo Ferry Terminal, SR 525, Swamp Creek Park-and-Ride, and Downtown Seattle
	113	30	30	30	Mukilteo Ferry Terminal, SR 525, Harbour Pointe Boulevard North, Beverley Park Road, Swamp Creek Park-and-Ride, Alderwood Mall, and Lynnwood Transit Center
	880/885	30	no service	15-30	Mukilteo Ferry Terminal, SR 525, Swamp Creek Park-and-Ride, Ash Way Park-and-Ride, Lynnwood Transit Center, and University District
Everett Transit	18	30	60	30	Mukilteo Ferry Terminal, West Mukilteo Boulevard, and Everett Station
	70	45–60	no service	45–60	Mukilteo Ferry Terminal, SR 525, SR 526, Boeing Gate 68, Boeing Gate 72, and Boeing Gate 78
Sound Transit	Sounder	30	no service	30	Everett, Mukilteo, Edmonds, and Seattle

Source: Community Transit, Everett Transit, and Sound Transit 2012 Schedules

Note: The 2012 Schedule restructuring eliminated Community Transit's Route 190. The connection to Edmonds Community College can still be made by transferring between other bus routes.

Exhibit 2-29. Transit Ridership Summary for Routes Serving the Mukilteo Ferry Terminal

Transit Agency	Route Number	Annualized Ridership	2009 Average Ridership		
			Weekday	Saturday	Sunday
Community Transit	417	90,000	353	no service	no service
	113	418,100	1,352	859	no service
	880/885	102,050	398	no service	no service
	190	50,510	197	no service	no service
Everett Transit	18	no data	150	35	no service
	70	no data	210	no service	no service
Sound Transit	Sounder	no data	1,070	no service	no service

Source: Community Transit, 2009 Community Transit Annual System Performance Report

Note: The 2012 Schedule restructuring eliminated Community Transit's Route 190. The connection to Edmonds Community College can still be made by transferring between other bus routes.

Everett Transit

Everett Transit operates local bus service, which serves the Mukilteo ferry terminal using a pull-out bus stop located near the Front Street/SR 525 intersection. Route 70 is a commuter bus service connecting the Mukilteo ferry terminal to Boeing and operates for a few hours during the morning and evening commuter periods. Route 70 also provides service to non-Boeing employees who transfer to other routes at the Boeing plant. Most of these riders transfer to Route 3 and Route 8 serving the Seaway Boulevard/Hardeson Road industrial areas.

Everett Transit operates local bus service between the Mukilteo ferry terminal and Everett Station from the morning peak period to the evening peak period; there is no Sunday service. Everett Transit also operates paratransit service. The number of requests (demand) for paratransit service to serve the Mukilteo ferry terminal averages two per month. Everett Transit does not offer vanpool service.

Everett Transit does not anticipate bus system service changes through 2012. Longer-range service changes are anticipated to increase the number of trips scheduled for Route 18 on weekdays and to implement service on Sundays. (Sunday service would be comparable to current Saturday levels of service.)

Sound Transit

Sound Transit operates peak-period Sounder commuter rail service (see Exhibits 2-28 and 2-29) at a station in Mukilteo with connections to Everett, Edmonds, and Seattle. The average weekday boardings in 2008 for Sounder commuter train service between downtown Seattle and Everett were 1,070.

Amtrak

Amtrak provides long-distance intercity rail service. Although Amtrak rail service passes through Mukilteo, it does not stop at the Mukilteo Station.

2.4.2 Transit Serving Clinton Ferry Terminal

Bus transit serving the Clinton ferry terminal is operated by Island Transit, which has one bus stop located at the terminal. Island Transit serves three other bus stops, which connect parking facilities to the Clinton ferry terminal. Patrons of Island Transit can choose to use non-motorized connections from any of these bus stops within walking distance of the Clinton ferry terminal. Exhibit 2-30 summarizes Island Transit service near the Clinton ferry terminal by location, route number, service areas, and weekday schedule frequency. Exhibit 2-31 is a summary of estimated transit ridership (boardings and disembarkings) for Island Transit routes serving the Clinton ferry terminal.

Island Transit

Island Transit operates two types of bus service, which share their service between the Clinton ferry terminal and the park-and-ride lots near the terminal off Humphrey Road and the Deer Lake Road/SR 525 intersection. Island Transit has one commuter express bus service, which is operated between the Clinton ferry terminal and Oak Harbor Station Transfer Center. Commuter express bus service is operated on weekdays during peak commute periods. Unlike typical commuter bus service, Island Transit's Route 1 provides bidirectional express services. Island Transit operates all-day local bus service on Routes 1, 7, and 8, which provide access to communities and destinations across Whidbey Island. Only Route 1 operates on Saturday from the Clinton ferry terminal, and there is no Sunday service. Some local bus routes are "demand stop"; passengers wanting to get off need to ask the driver to stop.

Island Transit provides vanpool services on Whidbey Island. There are currently 104 vanpools with 744 passengers serving areas such as Seattle, Redmond, Bellevue, and Everett. Island Transit vanpools also serve major employers such as Boeing, University of Washington, the U.S. Navy, and Microsoft. Vanpool participants are responsible for keeping vehicles at their residence and no vanpool parking is provided at the Mukilteo ferry terminal. There are currently 36 Island Transit vanpools using the Mukilteo ferry terminal.

Island Transit also operates paratransit service. Island Paratransit is based upon the same days and hours, by route structure, as the regularly scheduled route service. The basic service encompasses a corridor centered on the scheduled route but extends 0.75 mile on either side of the route. Currently, Island Transit will serve ADA-eligible patrons living outside the corridor structure.

Exhibit 2-30. Existing Bus Transit Service Serving the Clinton Ferry Terminal

Bus Stop Location	Route Number	2012 Schedule Frequency at the Mukilteo Ferry Terminal (minutes)			Service Areas
		AM Peak	Midday	PM Peak	
Clinton Ferry Terminal, Humphrey Road, Deer Lake Road	1	60	60	60	Clinton Ferry Terminal, Bayview, South Whidbey State Park, Greenbank, Keystone Terminal (Saturday only), Coupeville Park-and-Ride, and Oak Harbor
	1 Express	20–30	no service	45	Clinton Ferry Terminal, Bayview, Greenbank, Coupeville Park-and-Ride, and Oak Harbor
Clinton Ferry Terminal, Humphrey Road, Deer Lake Road	7	60	60	60	Clinton Ferry Terminal, Langley, Bayview, and Freeland
Clinton Ferry Terminal, Deer Lake Road	8	30–60	120	30–60	Clinton Ferry Terminal, Satchet Head, Maxwelton, Langley, and Bayview

Source: Island Transit 2012 Schedule

Exhibit 2-31. Transit Ridership Summary for Routes Serving the Clinton Terminal

Transit Agency	Route Number	Annualized Ridership	2010 Average Ridership		
			Weekday	Saturday	Sunday
Island Transit	1	183,520	680	185	no service
	7	64,640	250	no service	no service
	8	9,940	40	no service	no service

2.4.3 Source: Island Transit Schedule Alignment

To improve the competitiveness of transit as a mode of choice for travelers, transit agencies attempt to schedule their bus and rail service to match the need at high-demand locations, such as a ferry terminal. Characteristics of transit routes (i.e., route length, roadway congestion, number of buses serving a route) can make it difficult to align transit schedule times with ferry schedule times. Generally, Community Transit, Everett Transit, and Island Transit buses are scheduled to leave or arrive within minutes of ferry arrival and departure times. Because it takes a few minutes for walk-on passengers to walk off the ferry and walk to the bus stop, bus drivers may wait for passengers. On average during the morning peak period, buses are scheduled to leave approximately 12 minutes after ferry arrivals at the Mukilteo ferry terminal.

2.4.4 Average Passenger Loads

Although transit agencies serving the Mukilteo and Clinton ferry terminals constantly strive to match service supply to demand, there is the potential to exceed the available seat and standing capacity on buses—the conditions where the desirable number of passengers per bus is either exceeded or where buses must bypass waiting passengers. A method for measuring average passenger loads is to calculate the load factor, which is the average passenger loads on a bus at any one time during the trip divided by the number of seats. Transit agencies use load factors to assist in planning the number of buses required to service routes.

The average passenger load factor at the Mukilteo and Clinton ferry terminals was calculated from a sample study collected in November 2010. Exhibit 2-32 summarizes the average passenger boardings and disembarkings for buses serving the Mukilteo and Clinton ferry terminals. A load factor of 1.0 indicates all seats on the bus are occupied and a load factor exceeding 1.5 indicates a bus is carrying more than the desirable maximum number of passengers. A larger sample size was not available because Community Transit, Everett Transit, and Island Transit do not regularly collect substantial passenger boarding and disembarking data for every stop. Exhibit 2-33 summarizes the load factors for all observed bus transit routes.

Mukilteo Ferry Terminal

None of the buses serving the Mukilteo ferry terminal was overloaded and all bus patrons were able to be seated. Because buses begin their route at the Mukilteo ferry terminal, the bus stop will not be skipped due to overloading. Buses serving the Mukilteo ferry terminal operated by Community Transit and Everett Transit have a desired maximum number of passengers of 40 for 40-foot-long buses and 60 for 60-foot-long buses (i.e., Routes 417 and 880). The highest observed load factor was 0.48 for Everett Transit Route 70 in the AM peak period, which had an average of 29 boardings per bus. All other buses for both the AM peak period and PM peak period had observed load factors of less than 0.20.

Exhibit 2-32. Average Boardings and Disembarkings for Transit Service

		Morning Peak Period		Evening Peak Period	
Transit Agency	Route Number	Leaving Terminal	Arriving at Terminal	Leaving Terminal	Arriving at Terminal
Community Transit	417	11.2			7.5
	113	3.1	0.4	1.0	3.7
	880	4.4			4.3
	190	4.0			2.7
Everett Transit	18	5.7	0.4	1.0	5.3
	70	29.0			
Sound Transit	Sounder	15.3	1.3	2.0	17.3
Island Transit	1	3.0	25.7[a]	26.4[a]	2.5
	7	2.5	15.9	8.2	1.8
	8		7.7	9.0	

[a] Observed buses with loads exceeding 40 passengers, which indicates some patrons were required to stand.
Source: 2010 Field Data

Exhibit 2-33. Average Load Factors

Transit Agency	Route Number	Morning Load Factors		Evening Load Factors	
		Leaving Terminal	Arriving at Terminal	Leaving Terminal	Arriving at Terminal
Community Transit	417	0.12			0.08
	113	0.05	0.01	0.02	0.06
	880	0.05			0.05
	190	0.07			0.04
Everett Transit	18	0.09	0.01	0.02	0.09
	70	0.48			
Island Transit	1	0.05	0.43	0.44	0.04
	7	0.04	0.26	0.14	0.03
	8		0.13	0.15	

Source: 2010 Field Data

Clinton Ferry Terminal

Island Transit Route 1 had a maximum observed load factor of 0.44, and some buses experienced passenger loads exceeding the available bus seat capacity of 40 passengers; buses serving the Clinton ferry terminal operated by Island Transit have a desired maximum of 60 passengers. Routes 7 and 8 had no observed overloading. The average passenger load for Route 1 traveling to the Clinton ferry terminal in the morning and leaving the Clinton ferry terminal in the PM peak period was approximately 26 passengers. Routes 7 and 8 had average load factors of 0.26 or less.

2.4.5 Operating Issues and Performance

Issues Identified by Operating Agency Staff

Bus service can be affected by events, construction, unusual and unexpectedly high traffic volumes, and delays due to late ferry arrivals and ferry operations.

Everett Transit and Community Transit have reported that transit buses regularly encounter bus zone capacity deficiencies. The primary bus zone, on southbound SR 525, just south of Front Street, accommodates only two buses at a time. Because six routes terminate at the Mukilteo ferry terminal and fare payment causes long wait times, arriving buses must proceed to the Mukilteo Lighthouse Park to turn around,

which is not a preferred location by the transit agencies or the City of Mukilteo. Furthermore, buses cannot turn around at the park during market days; moreover, when future phases of the park are completed, Mukilteo has reported that transit buses may no longer be able to use the park.

Queuing within the SR 525/Front Street intersection is an issue, because westbound buses along Front Street making a left turn into the primary bus zone must stay east of the bus stop pole/flag. This can block the SR 525/Front Street intersection when the bus zone is occupied. Another challenge for buses is accessing the bus zone because eastbound vehicles on Front Street can queue during ferry loading and unloading and block buses from accessing the bus zone. The transit agencies have also identified the tight left-turn turning radii as problematic, as evidenced by the broken curb on the northwest corner of the SR 525/Front Street intersection.

Buses at the Mukilteo ferry terminal accessing the bus stop can be delayed by vehicles being unloaded from the ferry. The delay buses encounter during ferry operations can range from 2 to 5 minutes, depending on the number of vehicles being unloaded from the ferry.

2.4.6 Public Transportation Safety

Safety issues related to transit most often consist of two components:

- Potential vehicle-to-pedestrian (or bicyclist) collisions while traveling to and from transit facilities (e.g., bus stops and train stations).
- Potential for criminal activity while waiting for transit.

The first component listed above is addressed in *Section 2.1.9* (*Mukilteo Ferry Terminal Facility Safety*) because this project's potential effect on safety is limited to the vicinity of the ferry terminal.

For the second component, adequate lighting around transit facilities is implemented, in part, to discourage criminal activity. Specific to this terminal, several WSDOT personnel are located at the ferry terminal and proximate to the bus stop and Mukilteo Station areas, which could further deter criminal activity in addition to the lighting features provided.

During 2009, the Mukilteo ferry terminal had two days where some sailings were cancelled due to suspicious activity. Since 2006, there have been 29 events reported for customer behavior, disorderly conduct, driving under the influence, suspicious behavior and packages, and other security concerns.

2.5 PASSENGER LOADING AREAS

The passenger loading area refers to the location where pedestrians wait to board the ferry and where they walk when disembarking.

2.5.1 Location

The existing Mukilteo ferry terminal has one passenger loading area located in the northwest corner of the SR 525/Front Street intersection. The passenger loading area also serves as the drop-off area for many commuters. As drivers approach Front Street from SR 525, they are allowed to either turn left or right to drop off ferry walk-on passengers. Then they turn around using on-street or off-street parking areas and leave the ferry terminal area on SR 525. A small ramp provides the final connection between the loading area and the ferry. The incline of this ramp varies with the tide levels and currently poses challenges to individuals in wheelchairs and with strollers. Although these incline challenges do not preclude walking on or off the ferry, the incline is not desirable and increases pedestrian travel times.

2.5.2 Passenger Loading Area Safety

Potential safety issues at the passenger loading area are similar to those described above in *Section 2.4.6*. Positioning appropriate lighting and WSDOT staff around the passenger loading area deters criminal activity.

2.6 PARKING

Because the ferry vehicle capacity is reached during peak periods, ferry passengers have adjusted their travel patterns to make use of available park-and-ride lot facilities on one or both ends of the Mukilteo-Clinton ferry route. Some Whidbey Island commuters use park-and-ride facilities to get to the ferry in Clinton (or use other means such as taking transit, walking, or being dropped off) and others leave a car in an overnight parking area in Mukilteo, boarding the ferry on foot.

2.6.1 Mukilteo

Near the Mukilteo ferry terminal, parking for various uses is provided at a number of locations, including on-street parking spaces, off-street parking lots that are for public or paid use, ferry employee parking, and dedicated South Transit parking for Sounder commuter rail. Exhibits 2-34 and 2-35 show the number and type of parking spaces in the Mukilteo ferry terminal vicinity.

Exhibit 2-34. Designated Parking Areas near the Mukilteo Ferry Terminal

Exhibit 2-35. Existing Parking at Mukilteo

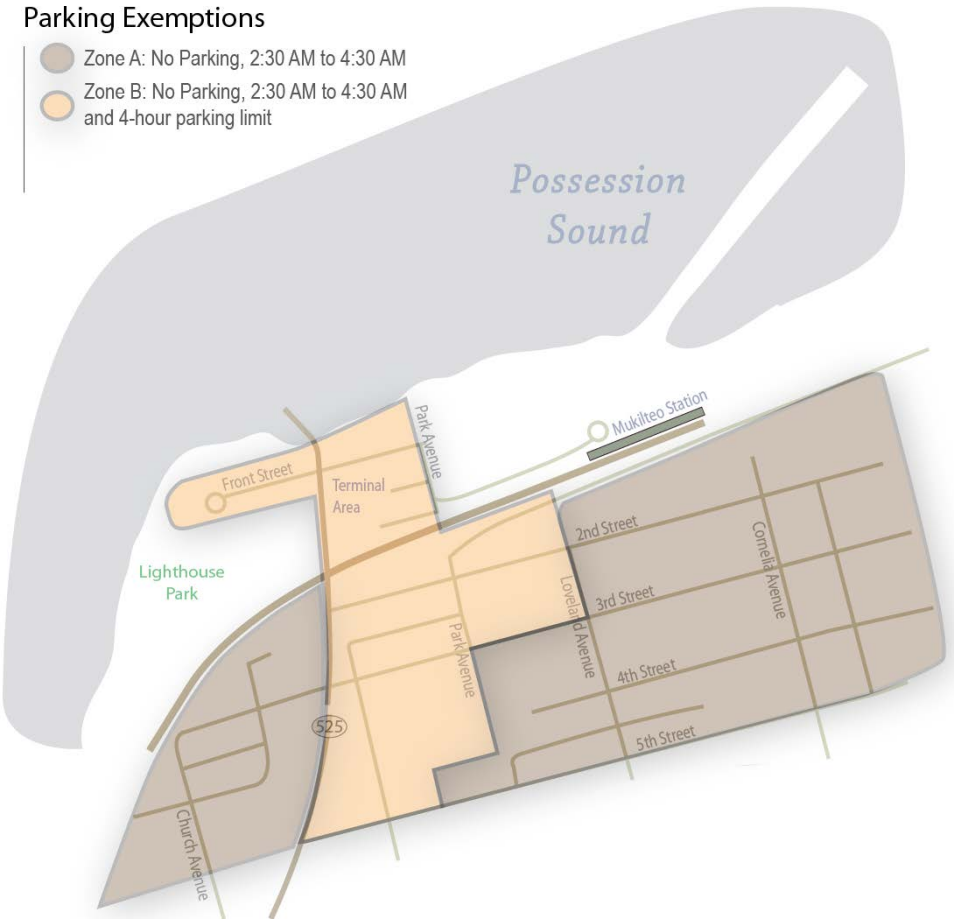
		Existing Parking at Mukilteo	
PARKING LOT	Parking Location		Notes
A	Southwest corner of SR 525 and Front Street	98	Off-Street private lot / paid (total does not include 5 vendor and 6 unmarked stalls)
B	Second Street between SR 525 and Park Avenue	40	Off-Street private lot / paid
C	Former Buzz Inn property (southwest corner of Front Street and Park Avenue)	n/a	This 45-space lot for Ivar's Mukilteo Landing is not included in totals because its use would be displaced
D	Port of Everett Mount Baker Terminal	30	Combined Port of Everett and public lot
E	Mukilteo Station Parking	63	Sound Transit park-and-ride lot
	Subtotal	231	
ON-STREET			
F	First Street between SR 525 and Park Avenue	25	On-street / time restrictions / parking passes
G	Park Avenue between Front Street and First Street	18	On-street / time restrictions / parking passes
H	Front Street between SR 525 and Park Avenue	26	On-street / time restrictions / parking passes
	Subtotal	69	
	Total Parking Lot and On-Street Parking Spaces	**300**	
WSF PARKING			
I	WSF employee parking (west of SR 525)	20	
J	WSF employee parking (at Mukilteo ferry terminal)	23	WSF employees only
	Subtotal	43	WSF employees only

A parking study was conducted on December 15, 2010 near the Mukilteo ferry terminal to report on parking utilization. This study found that approximately 16 to 48 percent of parking lot A, 31 to 46 percent of parking lot B, and 63 percent of parking lot F are occupied during a typical weekday. Ferry passengers were observed using these lots.

On-street parking near the Mukilteo ferry terminal is regulated by two residential parking zones as illustrated in Exhibit 2-36; parking permits are available to residents of Mukilteo but not available to ferry commuters. Resident Zone A permit holders are exempt from the no parking restriction from 2:30 AM to 4:30 AM and Resident Zone B permit holders are exempt from the no parking restriction from 2:30 AM to 4:30 AM and the 4-hour parking limit. The 4-hour time limit discourages commuter traffic and these parking stalls are typically used by local business patrons.

The public parking area located in the southwest corner of the Front Street/Park Avenue intersection (Lot C) is reserved for Ivar's restaurant patrons. On-street parking on First Street east of Park Avenue (Lot E) is restricted to Mukilteo Station patrons.

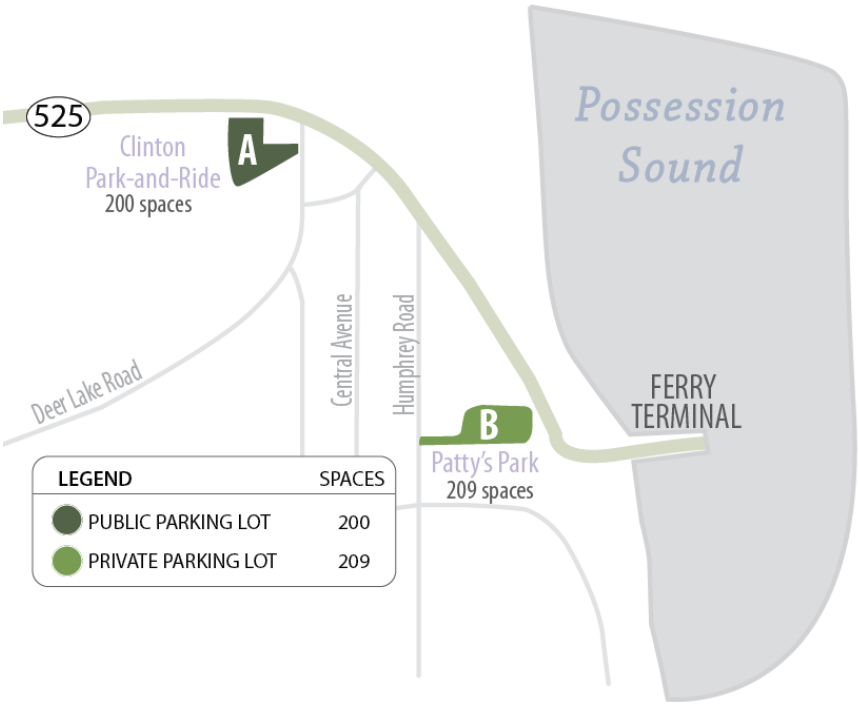
Exhibit 2-36. Residential Parking Zones in Mukilteo



2.6.2 Clinton

Near the Clinton ferry terminal, a private parking area (Patty's Park) for ferry traffic is provided on the west side of SR 525 (above the bluff) and is accessed from Humphrey Road (Exhibit 2-37). This parking area (Parking Area D) has 209 stalls in total; 109 stalls require a monthly permit and the remaining 100 stalls can be paid for on an hourly basis. The November 10, 2010, parking study showed a 35 percent to 41 percent utilization rate. This parking area is not specifically reserved for ferry traffic; however, the lack of connecting transit and residential land uses surrounding the parking area make non-ferry traffic parking unlikely. The non-motorized field data collection effort on November 17 and 18, 2010, also observed that all of the commuters in Parking Area D continued towards the ferry, which substantiates the assumption that this lot is primarily used by ferry traffic.

Exhibit 2-37. Designated Parking Areas near the Clinton Ferry Terminal



For off-site parking in Clinton, most ferry-related traffic uses the Clinton Park-and-Ride lot in the southwest corner of the SR 525/Deer Lake Road intersection (Parking Area E). This park-and-ride lot is free of charge, has 200 parking stalls, and provides transit connections to Island Transit bus Routes 1, 7, and 8. With frequent service between the park-and-ride lot and the ferry terminal, this location serves the majority of off-site parking demand for the ferry. The November 10, 2010, parking study showed a 110 percent utilization rate. There are other park-and-ride lots on Whidbey Island that provide access to transit serving the Clinton ferry terminal. The Bayview, Freeland, Coupeville Prairie Station, and Greenbank Park-and-Rides provide another 223 parking stalls, which

are approximately 68 percent occupied during a normal weekday; the 85 parking stalls at the Bayview Park-and-Ride are usually 100 percent occupied.

2.6.3 Parking Safety

Safety issues within parking areas largely consist of parking area design and lighting, both of which are design characteristics. Additionally, because collisions within parking areas are typically less severe, many collisions within parking areas are not reported and little data are available.

On-street parking along residential streets has the potential to affect collision frequency; however, collisions along these roadways historically have not been a concern. It would be difficult to separately identify ferry-related and non-ferry-related collisions in any collision data for these roadways.

2.7 FREIGHT

2.7.1 Rail Operations

The BNSF Railway mainline runs generally along the eastern edge of Puget Sound and passes through the project area. This railway connects Seattle to British Columbia, Canada. Amtrak passenger rail and Sounder commuter rail share this railway with freight service. Only Sounder service stops at Mukilteo Station. Nearby Amtrak stations are located in Seattle, Edmonds, and Everett. The Port of Everett Mount Baker Terminal is located to the east of the Mukilteo ferry terminal.

2.7.2 Truck Freight

Truck freight uses multiple roadways in the study area, most notably SR 525. Between 4 million and 10 million metric tons per year are carried on the SR 525 corridor.

2.7.3 Airports

There are no major airports in the study area. Airports near the study area provide limited commuter service, such as Paine Field. A number of businesses around Paine Field, such as Boeing, have employees, patrons, and freight cargo passing through the study area using roadways and transit service.

2.7.4 Freight Safety

Potential safety issues related to freight are similar to those described above in Sections 2.1 and 2.2. However, freight vehicles typically require a larger area to complete turns, and the existing terminal site layout requires two turns to board the ferry (a left turn onto Front Street and a right turn onto SR 525/transfer span and into the ferry). This potential safety issue, however, is mitigated by the

position and sequencing of boarding larger vehicles. When larger-sized vehicles are allowed to board from lanes 4, 5, and 6, lanes 1 through 3 have already boarded and therefore there are no vehicles on the left side of the larger-sized vehicle that could conflict with the left turn onto Front Street. As the larger-sized vehicle turns right onto the SR 525/transfer span, all other cross street traffic is stopped, thereby minimizing the risk for vehicle-to-vehicle conflict. As a result, while wide-turning larger-sized vehicles create an increased potential for vehicle-to-vehicle collisions, the risk is very low due to the ferry boarding patterns.

3 TRANSPORTATION EFFECTS

This chapter summarizes the transportation effects within the study area corridor along SR 525 and at the potential ferry terminal locations in Mukilteo.

The project is considering four alternatives:

- *No-Build*, as required under the National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA), which maintains the existing facility but does not improve it and provides a basis against which to compare the effects of the Build alternatives.
- *Preferred Alternative*, which would relocate the terminal and multimodal center in the western portion of the Mukilteo Tank Farm and remove the existing terminal.
- *Existing Site Improvements*, which would construct an improved multimodal facility largely at the existing ferry terminal site on the Mukilteo waterfront.
- *Elliot Point 1*, which would relocate the terminal in the eastern portion of the Mukilteo Tank Farm as part of an integrated multimodal facility and remove the existing terminal.

This chapter describes the project's impacts on the existing motorized and non-motorized network, bus and rail operations, parking, ferry terminal operations and scheduling, multimodal connections, and freight operations. It summarizes the analysis year (2040) traffic volumes and ferry ridership and assesses roadway and non-motorized network performance.

No roadway or terminal improvements are planned for the Clinton ferry terminal as part of this project, although indirect effects from the increased ferry ridership on parking and transit ridership on Whidbey Island are addressed.

3.1 PROPOSED ALTERNATIVES

This section provides a summary of the proposed alternatives considered for evaluation. Subsequent sections include a comparative analysis among the alternatives for the multimodal components including the terminal facility; the roadway network; non-motorized characteristics; public transportation access and service; passenger loading; employee, ferry, and Sound Transit parking; and freight.

3.1.1 No-Build Alternative

The No-Build Alternative provides a baseline against which to compare the effects of the Build alternatives. It includes what would be needed to maintain the existing ferry terminal at a functional level. Maintenance and structure replacements would occur in accordance with legislative direction to maintain and preserve ferry facilities, but WSDOT would make no major investments for improvements. Exhibit 3-1 illustrates the planned maintenance and preservation activities currently assumed.

Nearly all of the ferry docking, loading, and unloading facilities would need to be replaced because they will have reached the end of their lifespan by 2040. The existing vehicle holding area would remain at its current location. The terminal supervisor's building, passenger and maintenance building, and the three existing toll booths would be replaced at their current locations. This alternative would not improve substandard conditions related to congestion, vehicular and pedestrian conflicts, poor sight distance, and security.

N

0 150 300
FEET

No-Build Alternative

Elements to be Replaced

Ferry Traffic Control Light

Figure 3-1. **No-Build Alternative**

3.1.2 Preferred Alternative

The Preferred Alternative is a slightly modified version of the Elliot Point 2 Alternative that was studied in the Draft EIS. This alternative would develop the project on the western portion of the Mukilteo Tank Farm(Figure 3-2). The existing ferry berth and all of its marine structures would be removed, including the Port of Everett fishing pier and day moorage. The Preferred Alternative would reconstruct the fishing pier and day moorage as part of the new multimodal facility.

A new passenger building and a maintenance building would be combined as a two-story building and aligned parallel to the shoreline. The building would bridge over the vehicle driveway to the ferry trestle, and an overhead passenger loading ramp would connect to the second story of the building.

The new vehicle holding area would have the holding capacity for up to 266 vehicles and the current vehicle holding area would be vacated. The holding area was expanded to reduce the typical queues extending onto SR 525, compared to the Elliot Point 2 design used for the Draft EIS. Four new toll booths would be located west of the vehicle holding area.

To access the multimodal facility, First Street would be realigned and extended as a four-lane roadway beginning on a retained fill structure at a new signalized intersection with SR 525. The First Street improvements would reconstruct the intersection with Park Avenue. The roadway would descend to near the existing grade at Front Street, and continue to a signalized entrance to the new ferry terminal. First Street then continues as a two-lane road to a new bus transit and paratransit facility and the Mount Baker crossing at the east end of the site. One section of the roadway approaching the transit center would have an additional lane for transit layover. The new transit center would have six bus bays and an area for passenger drop-off and pick-up. The transit facility also would include an area for ferry employee parking.

The Preferred Alternative modifies the access road to the Mukilteo Station and its parking, which would also be between the BNSF railroad and the new First Street extension. The alternative also develops a public parking area between the BNSF railroad and the new First Street, near SR 525, to replace displaced street parking. This would require cutting into the existing hillside and building a retaining wall parallel to the railroad.

Sidewalks and bicycle lanes would be provided along the First Street extension. A pedestrian walkway would be built along the edge of the terminal from First Street to a shoreline promenade located west of the ferry slip. Other sidewalks would link the Mukilteo Station and the transit center, which would also have relocated commuter rail parking and a shoreline promenade. The Preferred Alternative would include new security fences and gates surrounding the holding area and terminal.

Figure 3-2. **Preferred Alternative (Elliot Point 2)**

3.1.3 Existing Site Improvements Alternative

The Existing Site Improvements Alternative would construct an improved multimodal facility by replacing the existing Mukilteo ferry terminal with an expanded terminal on and around the current site. Its key features are shown on Exhibit 3-3.

All of the existing ferry facility marine and upland features would be replaced. The ferry dock and trestle would be rebuilt facing due north to provide a straighter alignment with SR 525. The Port of Everett fishing pier and seasonal day moorage would be would be removed and need to be relocated.

The existing vehicle holding area would remain at the same general location and would still store approximately 216 vehicles, the equivalent of one-and-one-half 144-vehicle vessels. Toll booths and a supervisor's building would be constructed nearby. A new passenger and maintenance building would be constructed east of the ferry access driveway expanding into areas currently occupied by other uses. Overhead passenger loading ramps would connect to the second story of the new passenger building.

Front Street and Park Avenue would become one-way streets, and First Street would be extended west to a new signalized intersection with SR 525. A new transit center would be constructed east of the vehicle holding lanes, combined with a parking area for ferry employees. Paratransit parking would be provided on Front Street near the passenger building.

N

0 150 300
FEET

- Existing Site Improvements
- Ferry
- To be removed
- Ferry Traffic Control Light

Figure 3-3. **Existing Site Improvements Alternative**

3.1.4 Elliot Point 1 Alternative

The Elliot Point 1 Alternative would develop the Mukilteo Multimodal Project on the eastern portion of the Mukilteo Tank Farm. Its key features are shown on Exhibit 3-4.

Because the shoreline slopes more gradually in this location, the ferry slip would need to be located about 250 feet offshore, which would require a longer pier and trestle. A new passenger building and a maintenance building would be located over water on the new concrete trestle; this shortens walk distances and allows the nearby shoreline area to be developed for open space and stream restoration purposes. An overhead passenger loading ramp would connect to the second story of the new passenger building.

The Tank Farm Pier would be removed. WSDOT would remove the existing ferry terminal, including buildings and marine structures, and the Port of Everett fishing pier and day moorage at the current terminal site would be relocated. The current vehicle holding area would be vacated.

This alternative would also provide parking for commuter rail, the Mount Baker Terminal shoreline access area, and ferry employees. The alternative includes tollbooths, ferry vehicle holding areas, and shoreline promenades on each side of the new ferry dock. Japanese Creek, which currently runs in a pipe culvert below the Mukilteo Tank Farm, would be restored to an open stream north of the extended First Street, with a 50-foot buffer on either side. The stream would be crossed by a pedestrian bridge near the shoreline. New lighting would illuminate First Street and the terminal facilities, including the vehicle holding areas.

The vehicle holding areas would have capacity for approximately 216 vehicles. A terminal supervisor's building would be constructed above four new toll booths east of the holding area. New lighting would illuminate First Street and the terminal facilities, including the vehicle holding areas.

First Street would be realigned and extended as a four-lane roadway from SR 525 to the Mount Baker Terminal, with sidewalks and bicycle lanes. A new signalized intersection with SR 525 would be constructed. A rebuilt First Street/Park Avenue intersection would provide access to a reconfigured parking and access area for Mukilteo Station.

A new transit center with six bus bays would be west of the new terminal. Access and parking for Mukilteo Station would be configured to connect to the First Street extension. New security fences and gates would secure the holding and terminal area during periods of heightened security, as required by the U.S. Coast Guard.