MUKILTEO MULTIMODAL PROJECT

Draft Environmental Impact Statement

Transportation Discipline Report

JANUARY 2012

Washington State Department of Transportation

U.S. Department of Transportation
Federal Transit Administration

Washington State Ferries

MUKILTEO MULTIMODAL PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Transportation
Discipline Report

Prepared for:

U.S. Department of Transportation
Federal Transit Administration

Washington State
Department of Transportation

Washington State Ferries

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Draft Environmental Impact Statement

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For:

Federal Transit Administration and
Washington State Department of Transportation

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Acronyms and Abbreviations

AA	Alternatives Analysis
ADA	American with Disabilities Act
BNSF	Burlington Northern Santa Fe
BAT	business access and transit
CFR	Code of Federal Regulations
coll/MEV	collisions per million entering vehicles
coll/MVM	collisions per million vehicle miles
DRT	Dial-A-Ride Transportation
EIS	Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
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
U.S.	United States
TDR	Transportation Discipline Report
TRB	Transportation Research Board
WSDOT	Washington State Department of Transportation
WSF	Washington State Ferries

1 INTRODUCTION

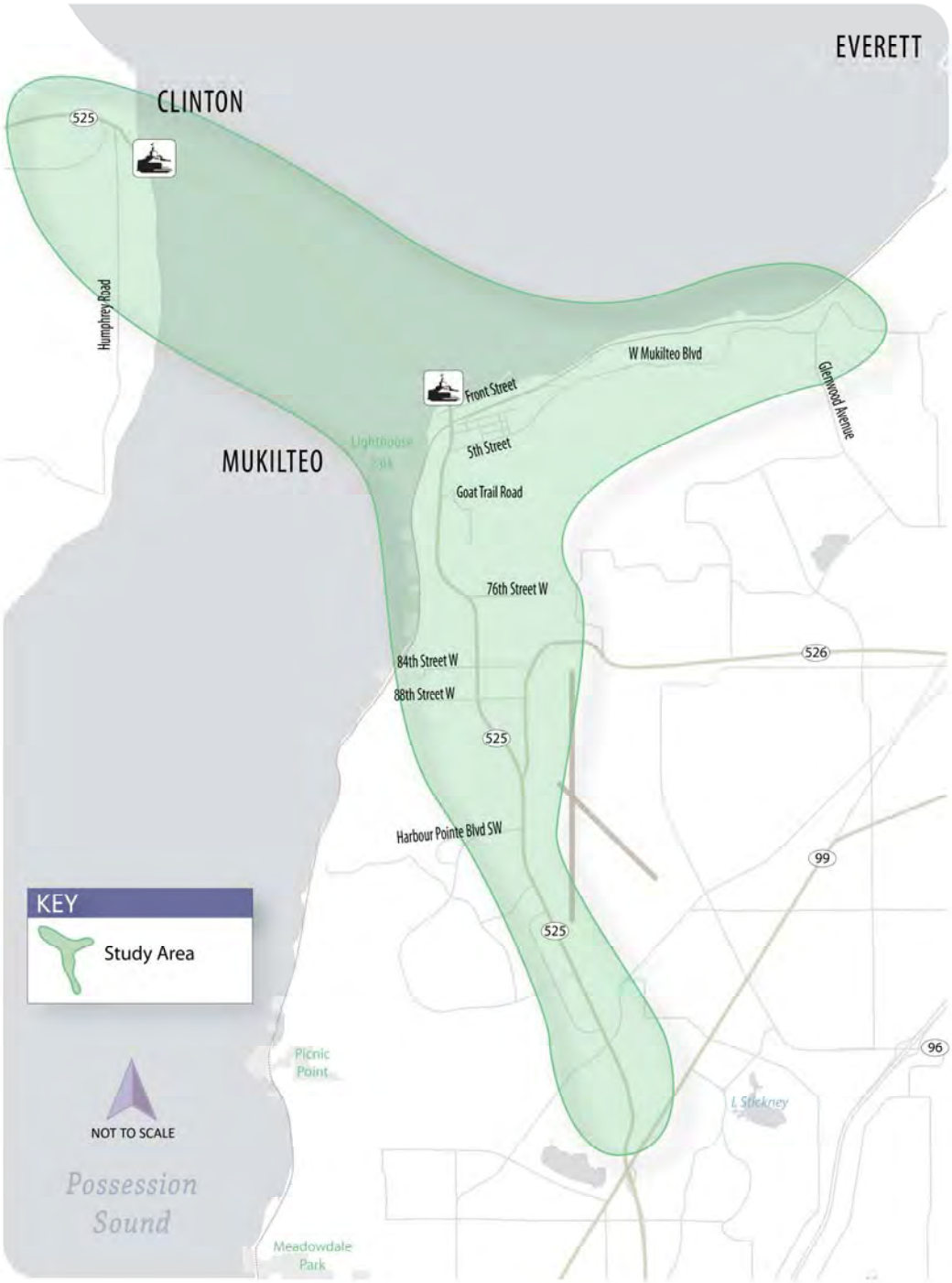
1.1 PROJECT BACKGROUND

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 discusses current and future 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 impacts associated with each alternative. The analysis considers long-term impacts on ferry operations, the roadway network, non-motorized network, 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 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 potential mitigation activities to reduce the impacts of the effects associated with the Mukilteo ferry terminal alternatives.

1.3 OVERVIEW OF ANALYSIS AND REGULATORY CONTEXT

This section provides a brief overview of 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, and the *6-Year Transportation Improvement Program* for the cities of Mukilteo and Everett.

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.

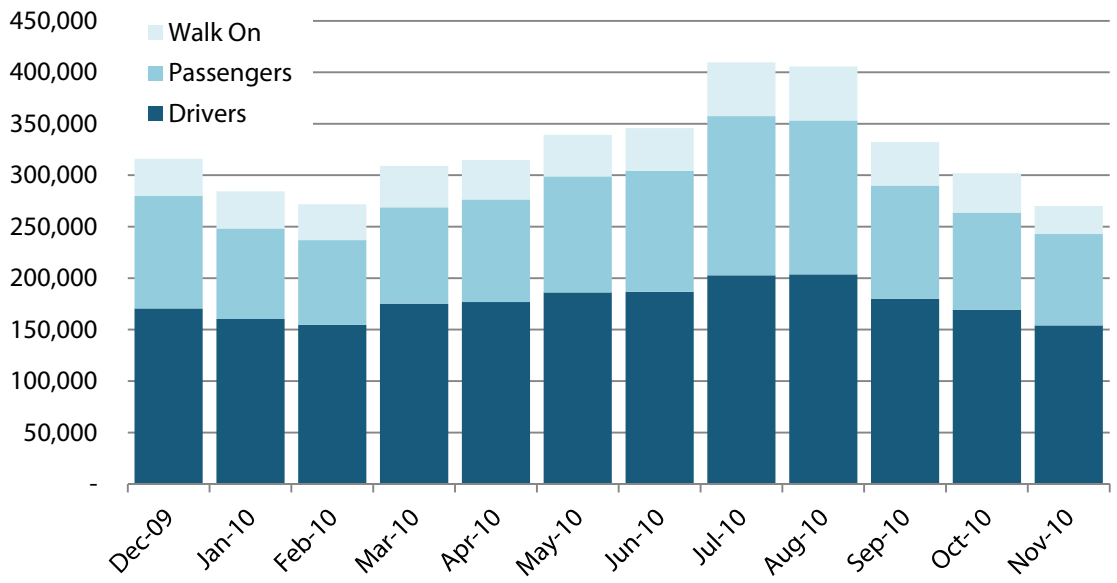
The Mukilteo-Clinton route has the second-highest annual vehicle ridership (2,227,000) and the third-highest passenger ridership (1,840,000) in the ferry system based on 2006 annual ridership reported in the 2009-2030 WSF Long-Range Plan. Total annual ridership (vehicles and passengers) on the Mukilteo-Clinton route (4,067,000) is third behind the Seattle-Bainbridge Island (6,417,000) and Edmonds-Kingston routes (4,257,000).

2.1.3 Monthly Ridership Variation

Ferry ridership on the Mukilteo-Clinton route fluctuates throughout the year, with the highest ridership during the months of July and August and the lowest ridership in November, January, and February. Exhibit 2-1 summarizes the most recent 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 WSF 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)

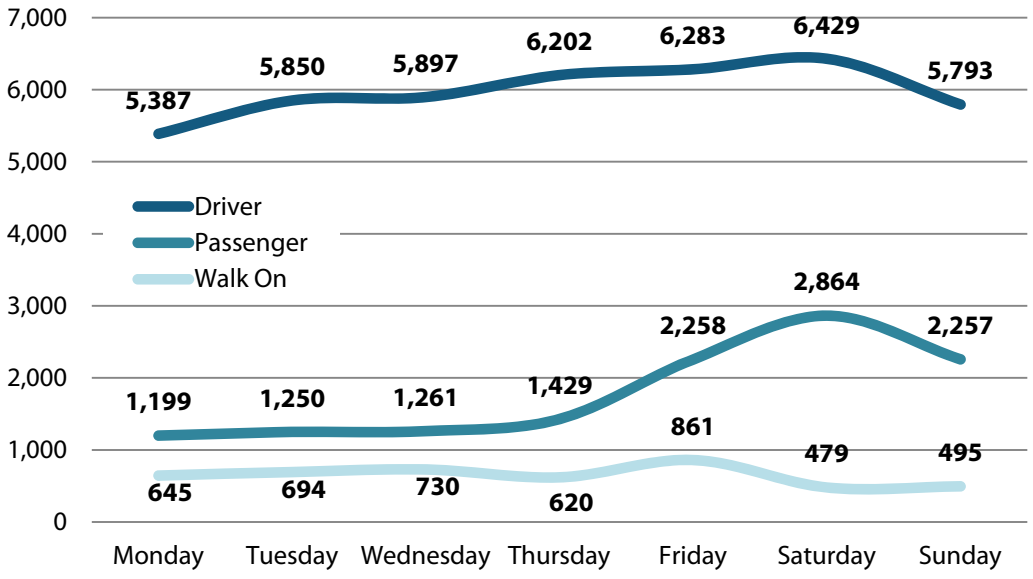


Source: WSF Fare Box Receipts

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

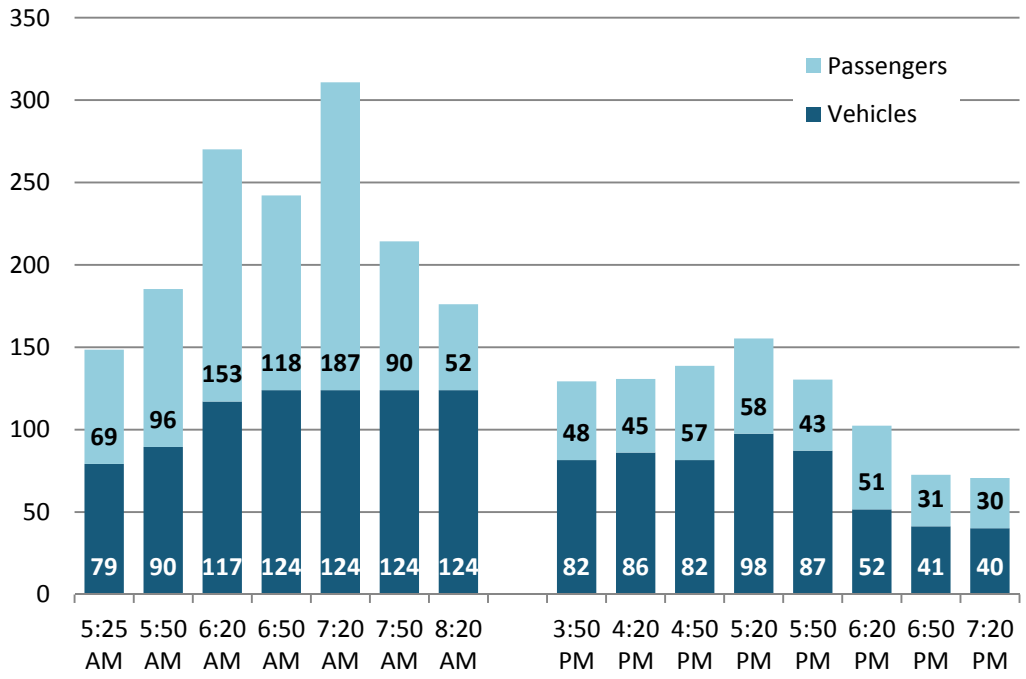
2.1.5 Average Weekday Ridership

Exhibit 2-3 and Exhibit 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 travelling by ferry from Clinton to Mukilteo (see Exhibit 2-3) and the returning northbound evening passengers travelling 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.

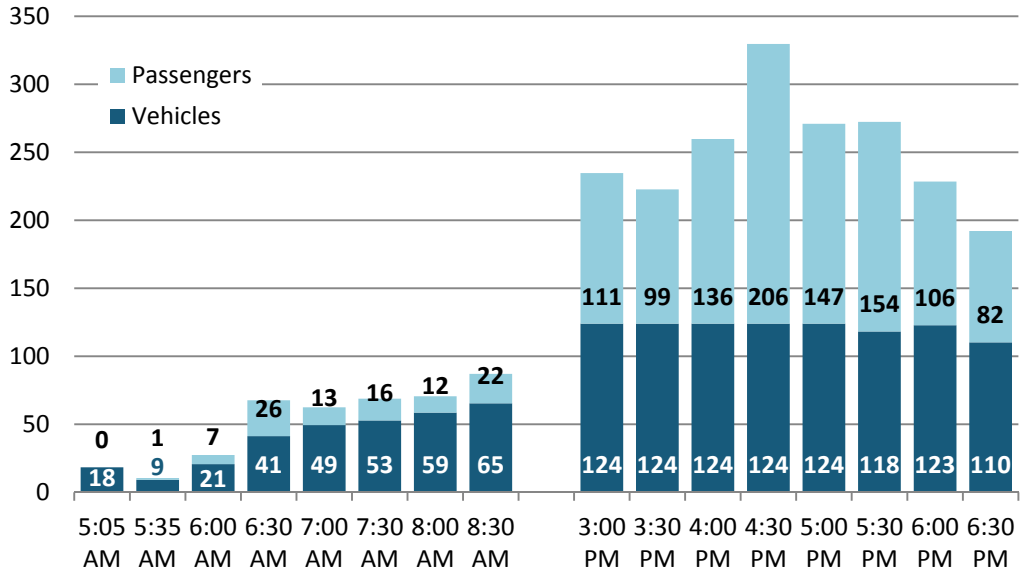
As ridership levels vary over the day, so does how people arrive and depart from the ferry. Because sailings during peak periods in the peak direction experience vehicle demand in excess of ferry capacity, ridership growth during these periods is possible only through an increase in walk-on passengers, 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 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 biking.

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 Unload at Mukilteo	Park-and-Ride	Drop Off	Bus Transit	Commuter Rail	Bike	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, and commuter rail service are also 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	Bike	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

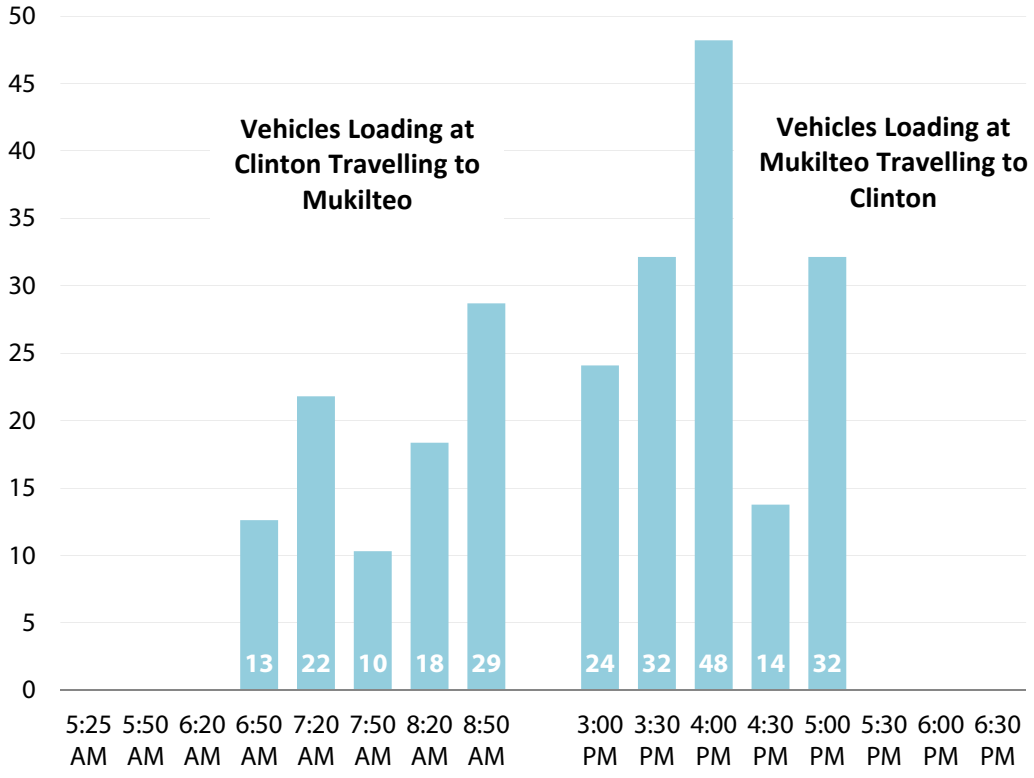
Source: Survey and WSF Model

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 WSF Long-Range Plan identifies an LOS performance standards 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 and 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 WSF 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%

Source: WSF 2009 Long-Range Plan, WSF Fare Box Data; 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 WSF 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 the SR 525/Front Street intersection prior to entering the passenger loading area. Exhibit 2-9 summarizes the modeled

travel times for walking among the Mukilteo Station, bus zone, southern parking lots, and 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	9
Bus Zone/Parking Lot South of Front Street	2
Parking Lot South of Second Street	5

Source: VISSIM Model 2010

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 unsignalized. 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 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 toll booths. 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 takes 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. Queue lengths are a metric for evaluating the roadway operations and they indicate if the operations of one intersection affect an adjacent intersection. The 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 impact downstream intersections.

The shoulder queuing from the tollbooths along SR 525 impacts a number of downstream intersections and driveways, as vehicles move slowly through the shoulder lane. These queues can extend south along SR 525 as far as Goat Trail Road (approximately 0.75 mile from the ferry terminal holding area entrance) during the PM Peak Period. During times of higher ferry use, such as Fridays, holidays, and during the summer, ferry shoulder queues can extend past Goat Trail Road. 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 extra delay at the SR 525/Front Street intersection due to local (non-ferry) traffic, and unloading and loading vehicle ferry traffic. 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
Bus Zone/Parking Lot South of Front Street	2
Parking Lot South of Second Street	7

Source: VISSIM Model 2010

The walk times from the terminal (Exhibit 2-12) are longer than the walk times to it (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

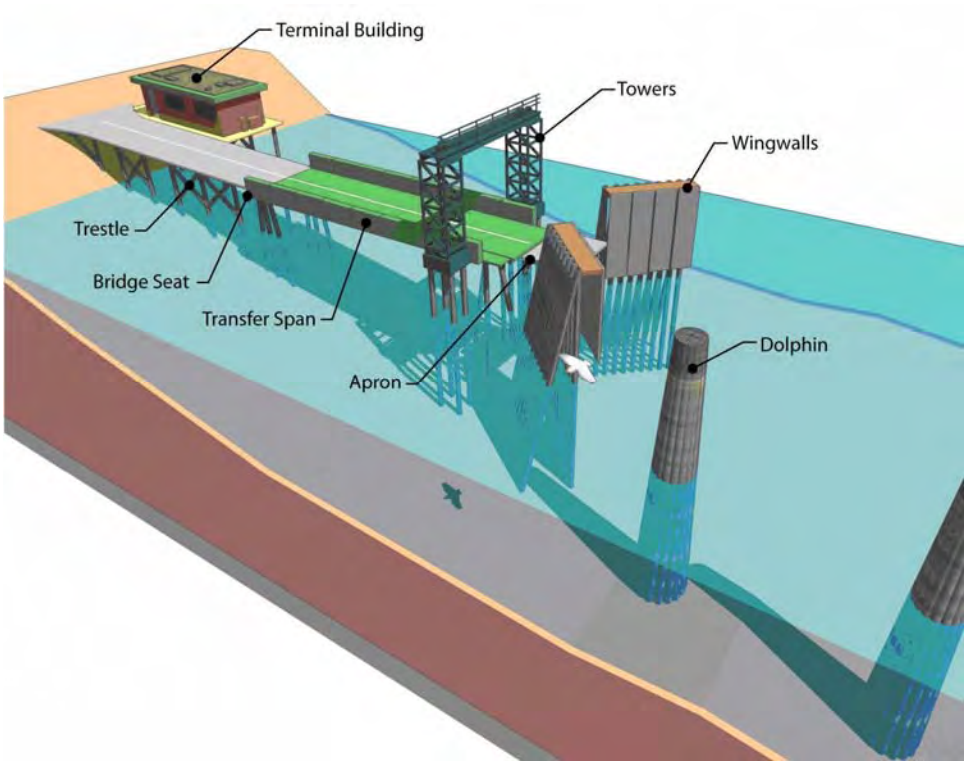
The Mukilteo transfer span is one of the oldest transfer spans currently used by WSF, and of the older transfer spans is the only one used regularly. Exhibit 2-13 summarizes the number of lost ferry trips on the Mukilteo-Clinton route occurring in the past 5 years due to mechanical and maintenance issues 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. Toll booths 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 effects would most likely impact traffic.

State Route (SR) 525 is the only roadway in the study area providing access to the Mukilteo ferry terminal toll booths and holding area (see 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 limited 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.

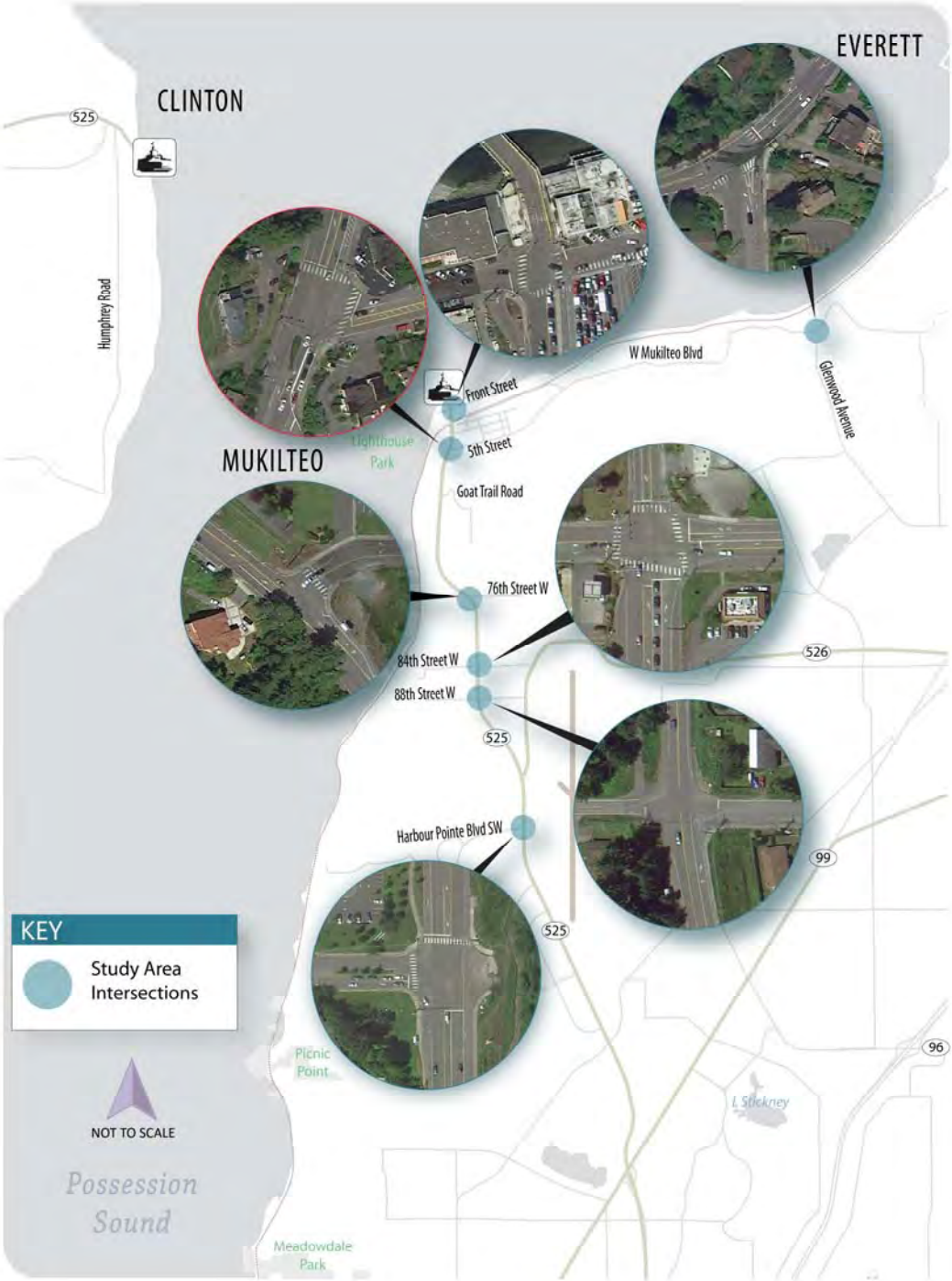
Fifth Street (also known as West Mukilteo Boulevard) connects the City of Mukilteo with the City of Everett. This two-lane roadway provides east-west travel with one lane in each direction. Intersections with public streets are typically controlled with stop signs and turning lanes are often absent. 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 impact 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.

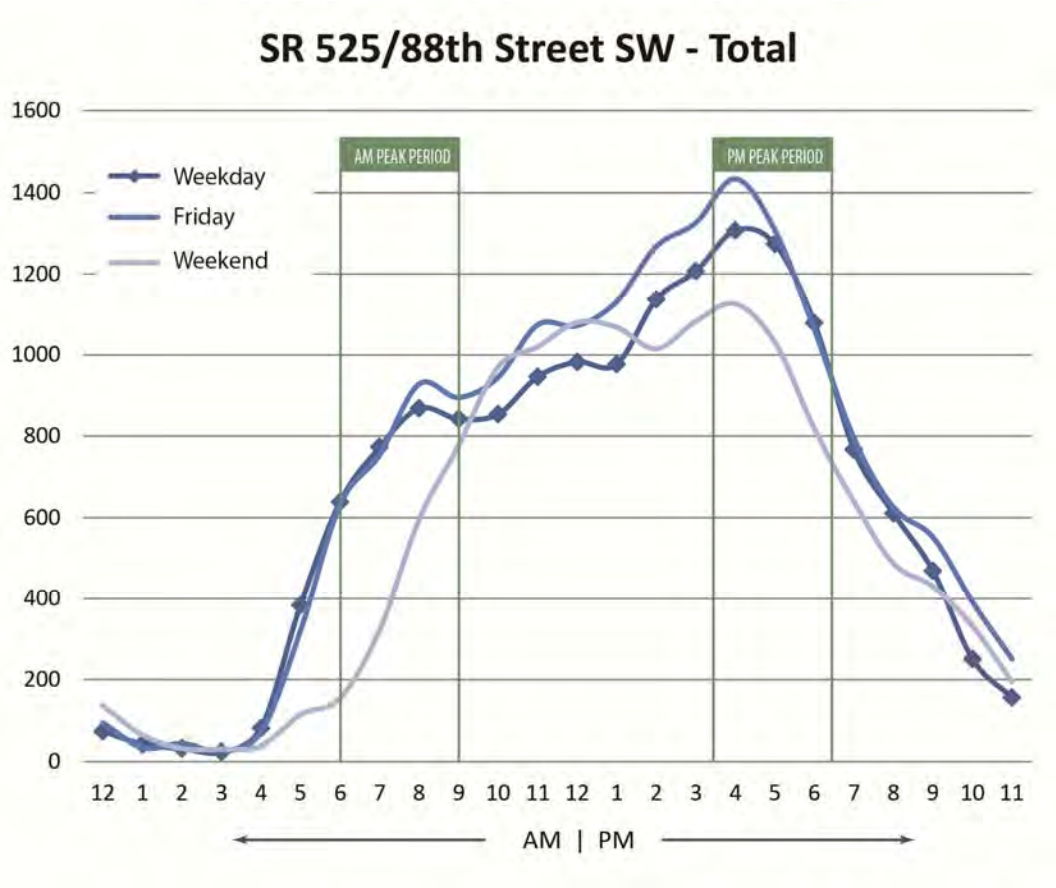
Exhibit 2-15. Study Area Intersections



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.

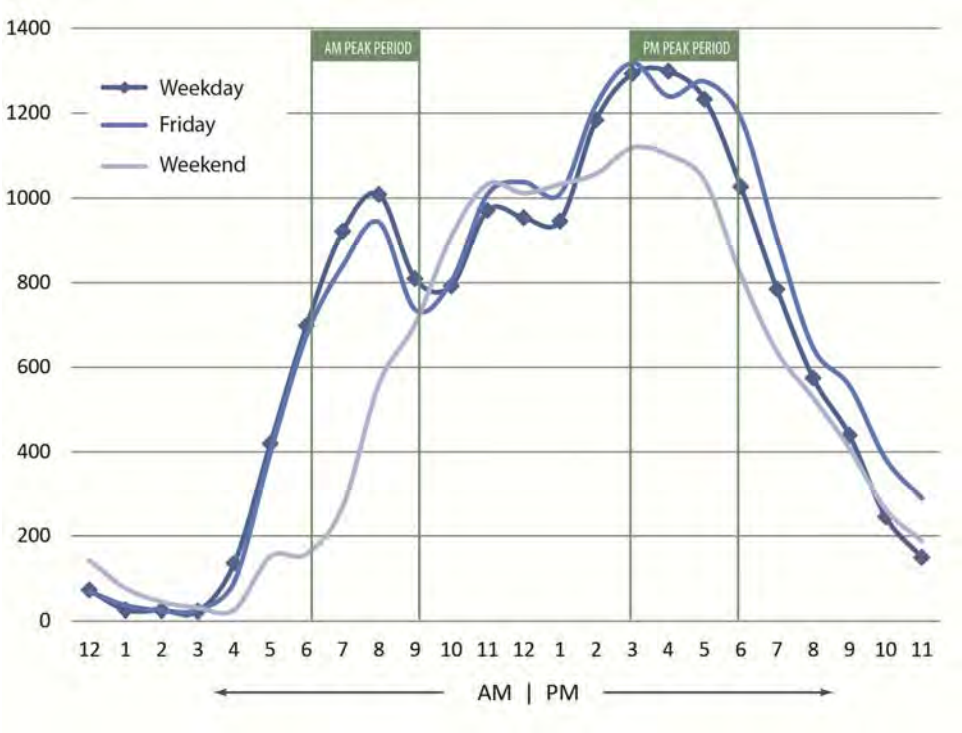
Exhibit 2-16. Two-Way Traffic Volume Daily Distribution on SR 525 near 88th Avenue West



Source: November 2010 Traffic Counts

As shown in Exhibit 2-16 and Exhibit 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 over 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

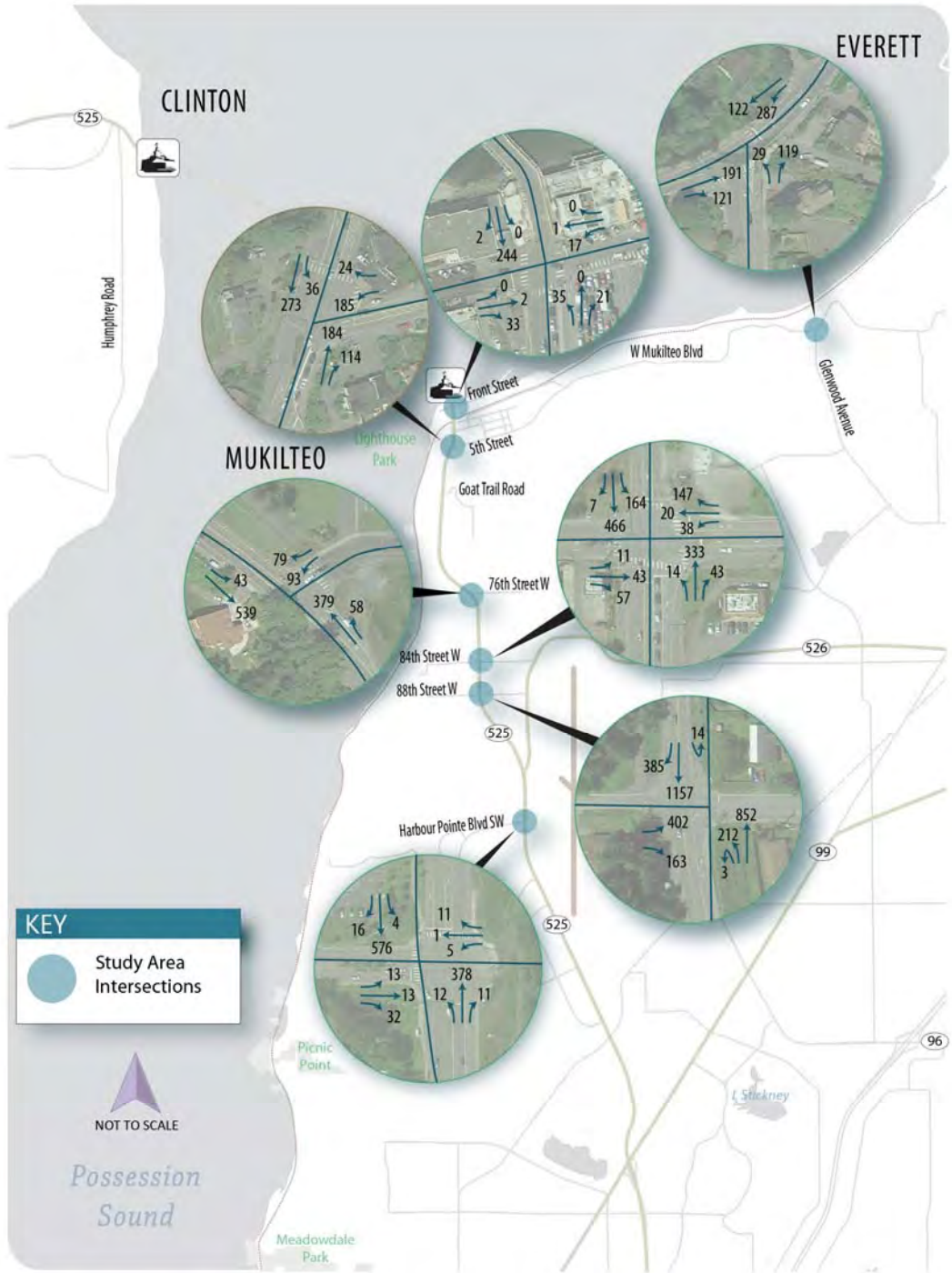


Source: January 2011 Traffic Counts

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 and 5:30 PM) were used for the traffic analysis.

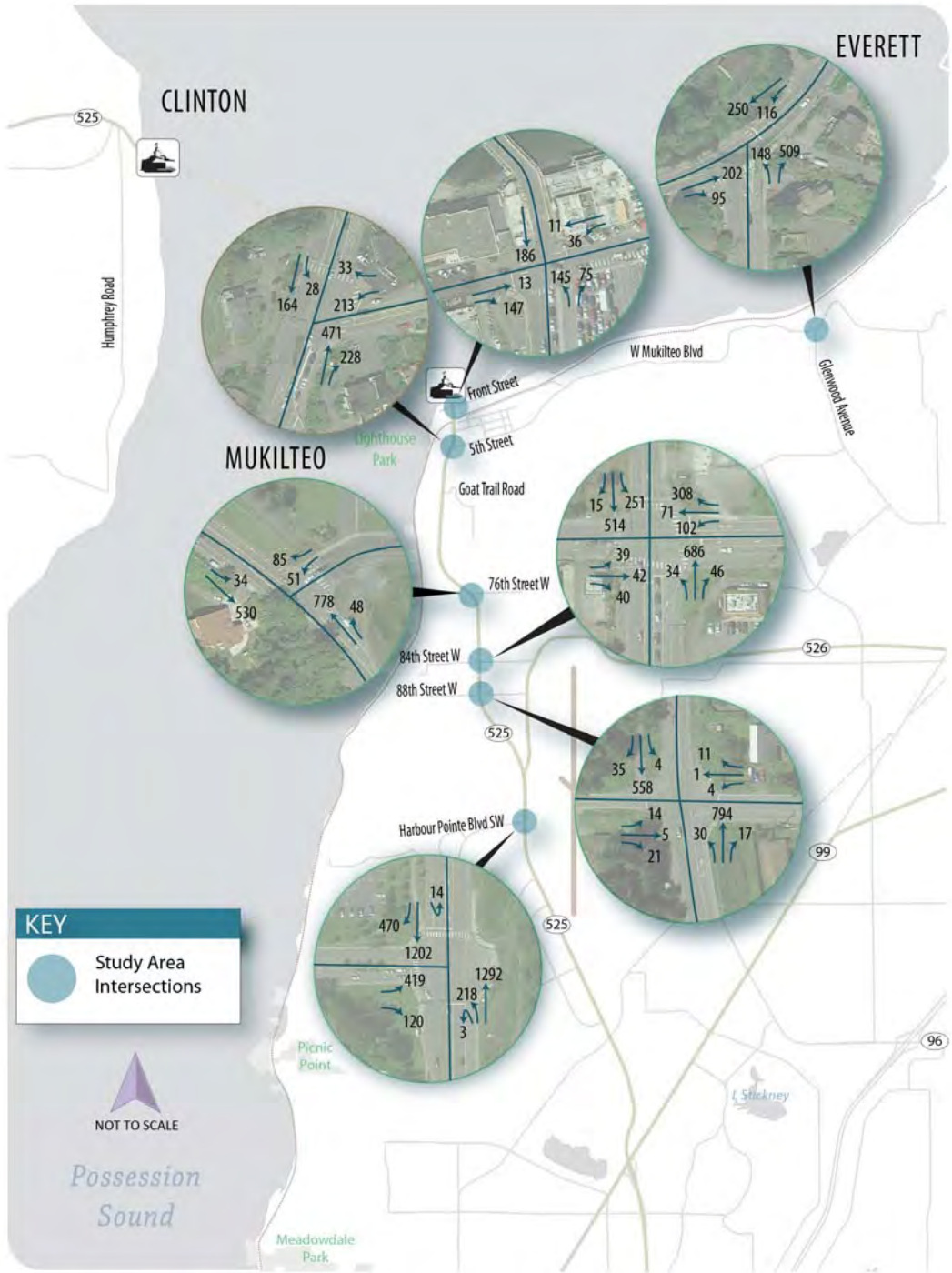
Because the WSF ferry ridership model was developed to estimate typical ridership (May is considered a typical month, see Section 2.1.3), the Washington State Department of Transportation (WSDOT) Assignment of Factors Report (WSDOT 2008) was used to adjust November and January traffic volumes to May. The WSDOT 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 and 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)

A 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 a WSF staff manual traffic controller. 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 LOS Summary

Intersection	Control Type	LOS Standard	AM Peak LOS	AM Peak Delay (sec/ vehicles)	PM Peak LOS	PM Peak Delay (sec/ vehicles)
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

2.2.4 Roadway Network Safety

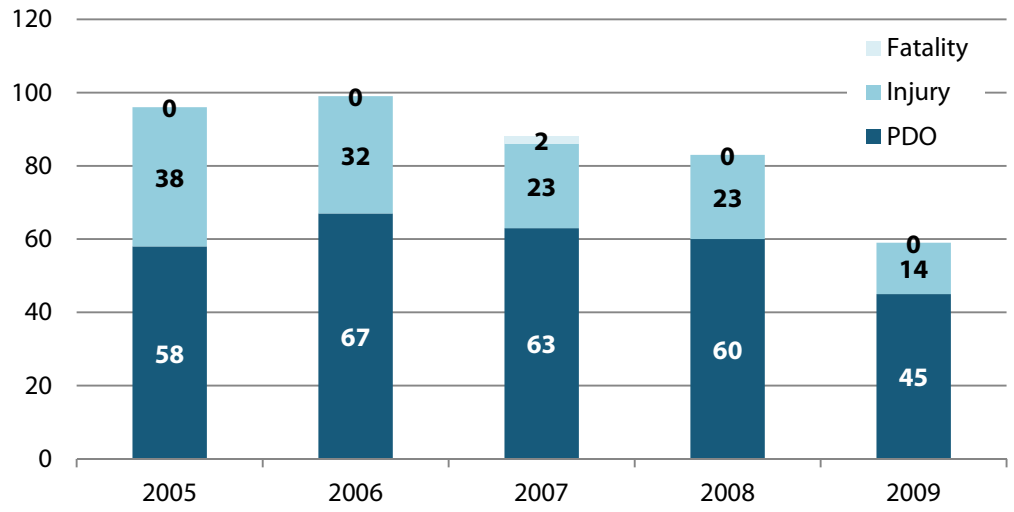
As described above, the roadway characteristics influence how drivers interact with the physical environment, traffic volumes influence how drivers interact with other drivers, and LOS is a means to describe and quantify the cumulative interactions with respect to how well, or poorly, the system operates.

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 travelled (coll/MVM), 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, and 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)

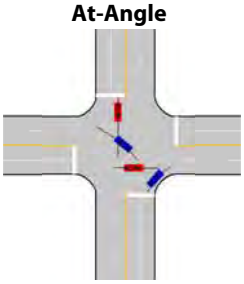
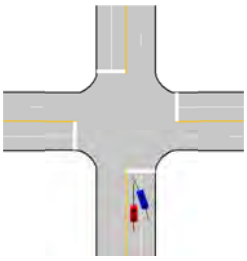
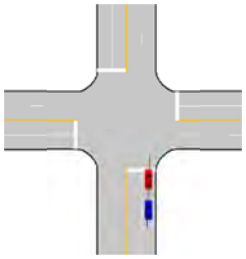
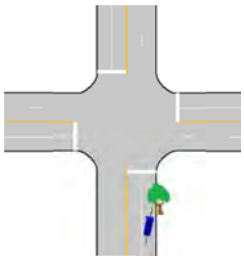
Intersection	SR 525/ Harbour Pointe Boulevard N	SR 525/ 88th Street SW	SR 525/84th Street SW	SR 525/ 76th Street SW	SR 525/ 5th Street	W Mukilteo Blvd /Glenwood Avenue	Subtotal
Property Damage Only	59	6	27	5	21	3	**121**
Injury	30	2	16	6	7	0	**61**
Fatality	0	0	0	0	0	0	**0**
Head On	0	0	2	0	1	0	**3**
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/ Bike	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 shows that the majority of collisions at these intersections result in property damage only. The most frequent collision types at these intersection 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, which meets some but not all ADA standards, and does not meet current WSDOT design standards for 4-foot sidewalks.

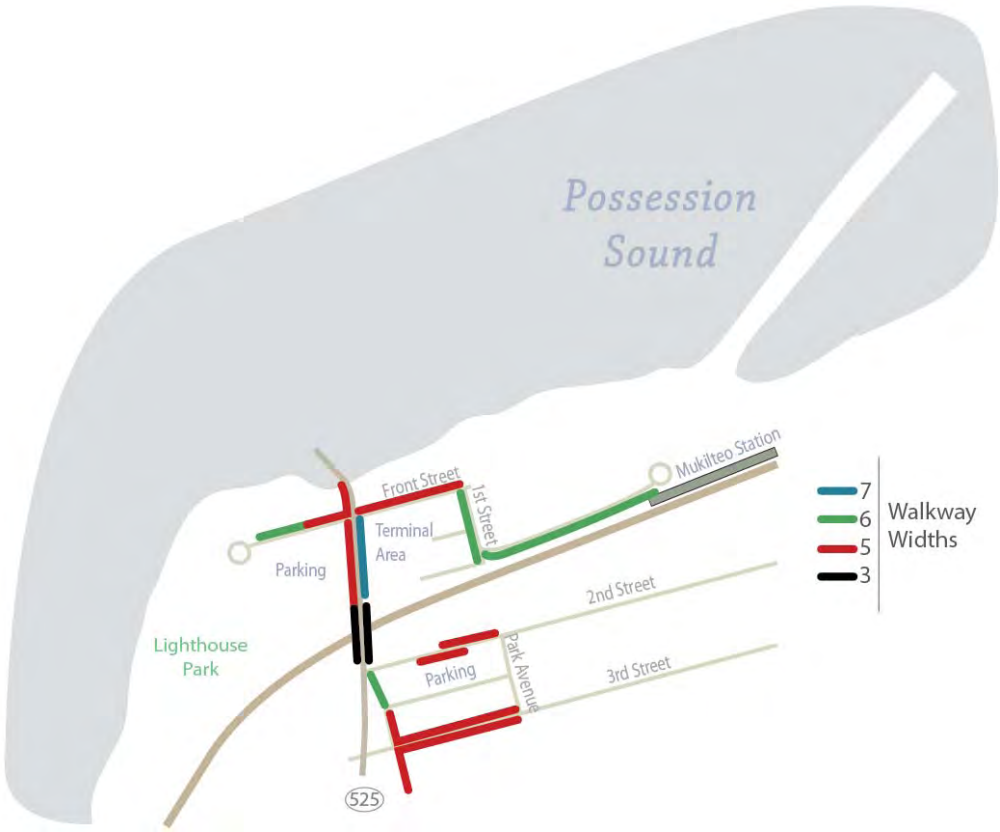
The terminal facility was built in the 1950s and includes a single sidewalk connection on the west side of the ferry ramp to Front Street from the passenger facilities building. Between Front Street and the BNSF bridge there is a 5-foot-wide sidewalk on the west side of SR 525 and a 7-foot-wide sidewalk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



During the ferry loading and unloading procedure, WSF personnel help to control traffic at the SR 525/Front Street intersection to intermittently assist pedestrian crossings and non-ferry traffic through the intersection.

Existing pedestrian facilities are not ideal for two primary reasons: pedestrians are exposed to motorized traffic at the SR 525/Front Street intersection during ferry loading, and they must navigate narrow sidewalks.

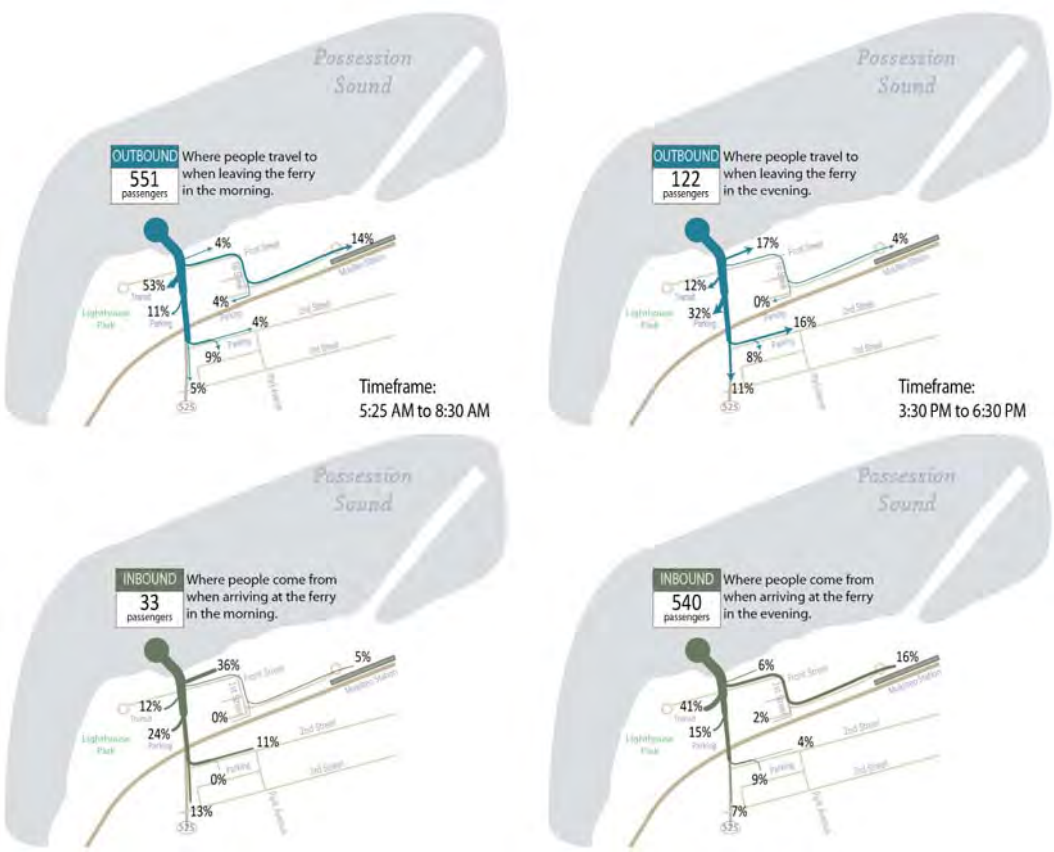
Pedestrians accessing the ferry terminal or areas west of the terminal from the east side of the terminal must either wait for all vehicles to load or find a safe gap in the loading of vehicles. Pedestrians who use the SR 525 bridge to access the terminal must walk on sidewalks that are 3 feet wide. 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 morning 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 evening 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

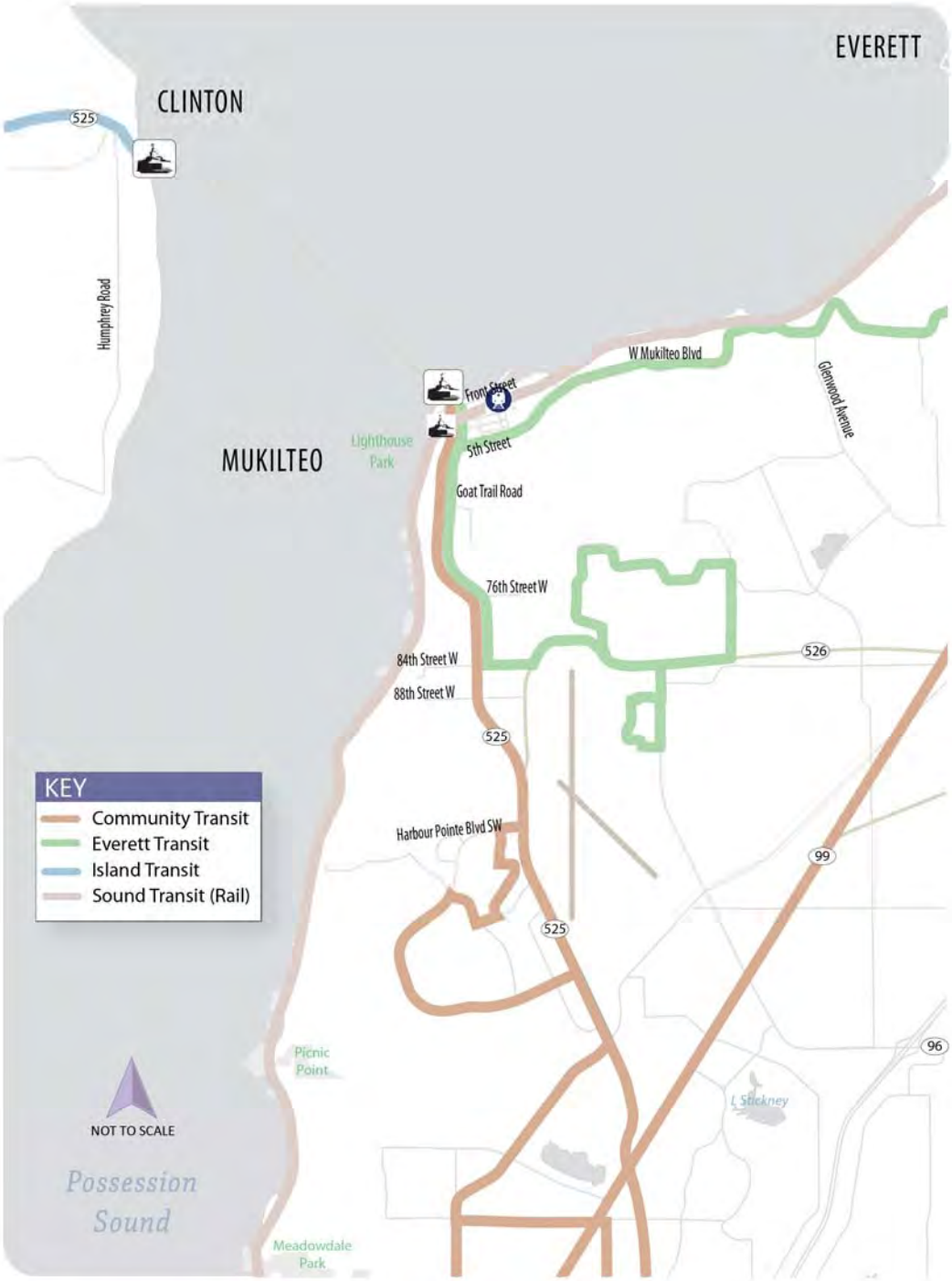
A total of eight collisions involving non-motorized traffic were reported from 2005 to 2009: four at SR 525/Harbour Pointe Boulevard North, two at SR 525/84th Street SW, one at a private driveway north of Goat Trail Road, and one at the SR 525/Sixth Street intersection (refer to Exhibit 2-23 in Section 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 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/West Mukilteo Boulevard, SR 526, and the BNSF Railway line.

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, 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 estimated transit ridership (boardings and alightings) 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 Lynwood Transit Center and bus service between the Mukilteo ferry terminal and Edmonds Community College during class times.

Vanpool service in Mukilteo is also provided by Community Transit; there are currently four vanpools serving 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 anticipates there will be a restructuring of service in February 2012, which could result in service reductions at the Mukilteo ferry terminal. Specific service reductions have not yet been identified.

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 Seattle Downtown
	113	20	20	20	Mukilteo Ferry Terminal, SR 525, Harbour Pointe Boulevard N, Beverley Park Road, Swamp Creek Park and Ride, Alderwood Mall, and Lynnwood Transit Center
	880/885	30–40	no service	30-40	Mukilteo Ferry Terminal, SR 525, Swamp Creek Park and Ride, Ash Way Park and Ride, Lynnwood Transit Center, and University District
	190	60	60	60	Mukilteo Ferry Terminal, SR 525, Beverley Park Road, Meadowdale, and Edmonds Community College Transit Center
Everett Transit	18	30	60	30	Mukilteo Ferry Terminal, W 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

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

Transit Agency	Route Number	Operating Hours	Annualized Ridership	Average Ridership		
				Weekday	Saturday	Sunday
Community Transit	417	5:48 AM–9 AM 3:18 PM–7:44 PM	90,000	353	no service	no service
	113	5:03 AM–11 PM	418,100	1,352	859	no service
	880/885	5:35 AM–9:16 AM 3:05 PM–6:43 PM	102,050	398	no service	no service
	190	6:37 AM–7:12 PM	50,510	197	no service	no service
Everett Transit	18	5:24 AM–6:55 PM	no data	150	35	no service
	70	4:55 AM–7:38 AM 2:26 PM–5:25 PM	no data	210	no service	no service
Sound Transit	Sounder	5:45 AM–8:14 AM 4:05 PM–6:34 PM	no data	1,070	no service	no service

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

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 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 provides peak-period Sounder commuter rail service (see Exhibits 2-28 and 2-29) at Mukilteo Station, which connects Everett, Mukilteo, and Edmonds to 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 service passes through Mukilteo, it does not stop at 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 alightings) 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 the 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 Navy, and Microsoft. Vanpool participants are responsible for keeping vehicles at their residence and no vanpool parking is provided at the Mukilteo ferry terminal.

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

Bus Stop Location	Route Number	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	20–30	Clinton Ferry Terminal, Bayview, Greenbank, Coupeville Park and Ride, and Oak Harbor
Clinton Ferry Terminal, Humphrey Road, Deer Lake Road	7	25–60	60	30	Clinton Ferry Terminal, Langley, Bayview, and Freeland
Clinton Ferry Terminal, Deer Lake Road	8	60	120	60	Clinton Ferry Terminal, Satchet Head, Maxwelton, Langley, and Bayview

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

Transit Agency	Route Number	Operating Hours	Annualized Ridership	Average Ridership		
				Weekday	Saturday	Sunday
Island Transit	1	4:30 AM–7:50 PM	183,520	680	185	no service
	7	5:45 AM–7:15 PM	64,640	250	no service	no service
	8	6:30 AM–6:07 PM	9,940	40	no service	no service

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 is a corridor centered on the scheduled route and extending 0.75 mile on either side of the route. Currently, Island Transit will serve Americans with Disabilities Act (ADA) eligible patrons living outside the corridor structure.

2.4.3 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. Exhibit 2-32 summarizes how Community Transit and Everett Transit service schedule times align with scheduled ferry arrival at the Mukilteo ferry terminal. Some buses are scheduled to leave at the same time or within minutes of ferry arrival time (bus schedule time is shown for buses scheduled to depart after ferry arrival). Because it takes a couple of minutes for walk-on passengers to walk off the ferry and walk to the bus stop, sometimes buses will 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.

Exhibit 2-33 summarizes how Community Transit and Everett Transit service schedule times align with scheduled ferry departure at the Mukilteo ferry terminal (bus schedule time is shown for buses scheduled to arrive prior to ferry departure). During the evening peak periods, buses are scheduled to arrive at Mukilteo approximately 11 minutes before a ferry departs to Clinton.

Exhibit 2-32. Mukilteo Ferry Arrival and Transit Service Departure Schedule Times

Mukilteo Ferry Scheduled Arrival Time	Bus Routes Leaving Mukilteo					
	417	113	880	190	18	70
	Downtown Seattle	Lynnwood	University District	Edmonds	Everett Station	Boeing
4:55 AM		5:03				
5:25 AM	5:48	5:30	5:46		5:35	
5:50 AM	6:18	5:52			6:00	5:51
		6:08				
6:20 AM	6:48	6:27	6:20	6:37	6:30	6:38
6:50 AM	7:18	6:51	6:50		7:00	
		7:09				
7:20 AM	7:48	7:27	7:20	7:38	7:30	7:38
7:50 AM		7:53			8:00	
		8:18				
8:20 AM		8:39		8:38	8:30	
8:50 AM		9:01				
9:20 AM		9:21		9:31	9:30	
		9:41				
2:20 PM		2:37			2:35	
2:50 PM		2:56			3:00	
		3:16				
3:20 PM		3:36			3:30	
3:50 PM		3:57			4:00	
		4:16				
4:20 PM		4:35			4:30	
4:50 PM		4:55			5:00	
5:20 PM		5:23			5:30	
5:50 PM		5:55			6:00	
6:20 PM		6:27			6:30	
6:50 PM					7:00	
7:25 PM		7:27				

Exhibit 2-33. Mukilteo Ferry Departure and Transit Service Arrival Schedule Times

Mukilteo Ferry Scheduled Departure Time	Bus Routes Arriving in Mukilteo					
	417	113	880	190	18	70
	Downtown Seattle	Lynnwood	University District	Edmonds	Everett Station	Boeing
5:05 AM	4:17		4:47			
5:35 AM	5:17		5:18			
6:00 AM	5:44		5:48		5:48	
6:30 AM	6:14	6:13	6:15			
7:00 AM	6:45	6:38	6:43		6:50	
		6:56				
7:30 AM	7:19	7:16			7:20	
8:00 AM	7:44	7:33				
		7:55			7:55	
8:30 AM		8:19			8:25	
9:00 AM		8:42				
9:30 AM		9:01			9:25	
		9:21				
10:00 AM		9:42				
2:30 PM		2:08		2:14		
3:00 PM		2:31			2:33	2:51
		2:53			2:55	
3:30 PM		3:15		3:14	3:23	
4:00 PM		3:35			3:53	3:37
		3:53				
4:30 PM		4:16		4:14	4:23	4:23
5:00 PM		4:40			4:53	
		5:00				
5:30 PM		5:20		5:14	5:23	5:25
6:00 PM		5:38			5:55	
		5:59				
6:30 PM		6:17		6:13	6:25	
7:00 PM		6:33			6:55	
		6:50				

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 safe maximum 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 of buses divided by the safe maximum number of passengers. 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 2-34 summarizes the average passenger boardings and alightings for buses serving the Mukilteo and Clinton ferry terminals. Because these routes originate and terminate their service at the ferry terminals, an average passenger load can be calculated from the observed boardings and alightings. A larger sample size was not available because Community Transit, Everett Transit, and Island Transit do not regularly collect substantial passenger boarding and alighting data for every stop. Exhibit 2-35 summarizes the load factors for all observed bus transit routes.

Mukilteo Ferry Terminal

None of the buses serving the Mukilteo ferry terminal was overloaded. 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 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 morning peak period, which had an average of 29 boardings per bus. All other buses for both the morning peak period and evening peak period had observed load factors of less than 0.20.

Exhibit 2-34. Average Boardings and Alightings 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*	26.4*	2.5
	7	2.5	15.9	8.2	1.8
	8		7.7	9.0	

* Observed buses with loads exceeding 40 passengers
Source: Transit Agencies

Exhibit 2-35. Average Load Factors

		Morning Load Factors		Evening Load Factors	
Transit Agency	Route Number	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: Transit Agencies

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 safe maximum number of passengers of 60. Route 7 and Route 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 evening was approximately 26 passengers. Route 7 and Route 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 indicated that transit buses regularly encounter bus zone capacity deficiencies.

The primary bus zone (turn-around on southbound SR 525) is spaced to accommodate only two transit vehicles at a time. Because six routes terminate at the Mukilteo ferry terminal and fare payment causes long dwell 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, and when future phases of the park are completed, Mukilteo has indicated that transit buses will 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 and 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 preclude buses from entering into 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 ferry vehicles being unloaded.

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 of criminal activity while waiting.

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

As 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 an array of uses is provided at three 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 2-36 and 2-37 show the number and type of parking spaces in the Mukilteo ferry terminal vicinity.

Exhibit 2-36. Designated Parking Areas near the Mukilteo Ferry Terminal

A sample of parking lot utilization was conducted on December 15, 2010 near the Mukilteo ferry terminal and 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.

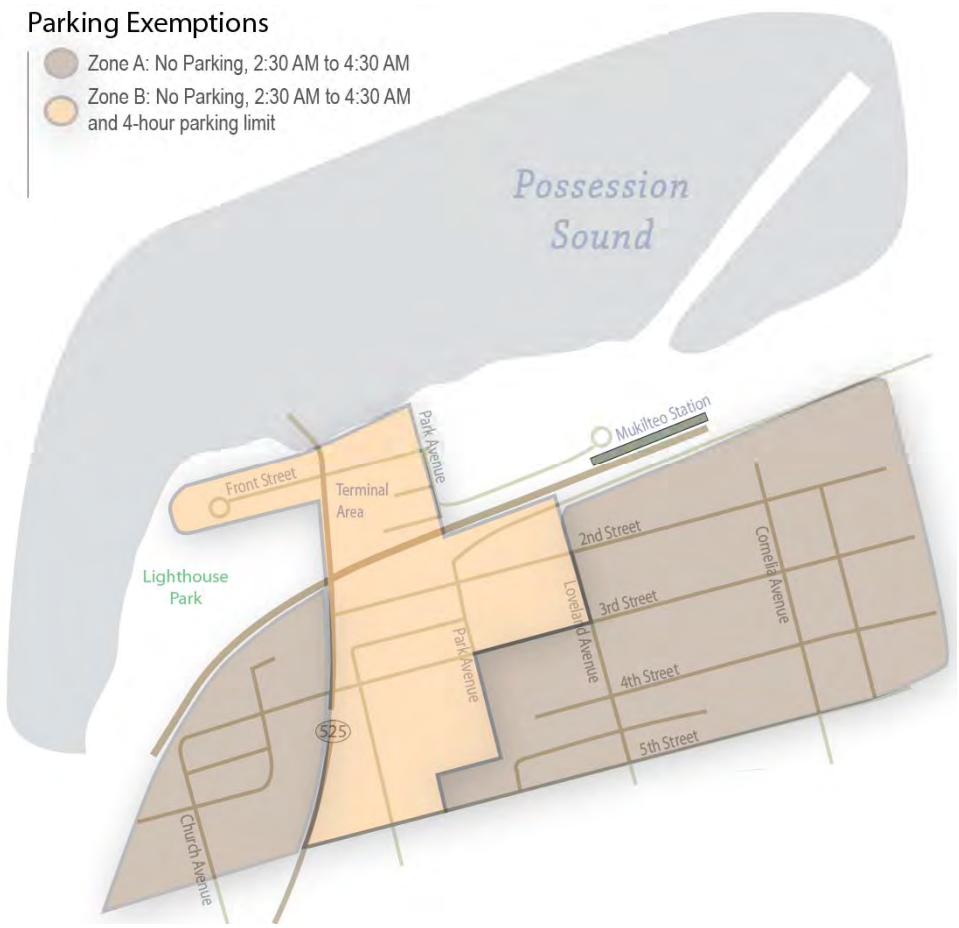
On-street parking near the Mukilteo ferry terminal is regulated by two residential parking zones as illustrated in Exhibit 2-38; parking permits are available to residents of Mukilteo and not available to ferry commuters. Resident Zone A permit holders are exempt from the no parking from 2:30 AM to 4:30 AM and Resident Zone B permit holders are exempt from the no parking from 2:30 AM to 4:30 AM and the 4-hour parking restrictions. 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/First Street intersection (Lot C) is reserved for Ivar's Mukilteo Landing patrons. On-street parking on First Street east of Park Avenue (Lot E) is restricted to Mukilteo Station patrons.

Exhibit 2-37. 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
K	New Lot at Terminal	--	Off-Street public lot
	Subtotal	231	
ON-STREET			
F	First Street between SR 525 and Park Avenue	25	On-street / time restrictions
G	Park Avenue between Front Street and First Street	18	On-street / time restrictions
H	Front Street between SR 525 and Park Avenue	26	On-street / time restrictions
	Subtotal	69	
	Total Parking Lot and On-Street Parking Spaces	**300**	
WSF PARKING			
I	WSF employee parking (west of SR 525)	20	WSF employees only
J	WSF employee parking (at Mukilteo ferry terminal)	23	WSF employees only
	Subtotal	43	

Exhibit 2-38. 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 (see Exhibit 2-39). 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 2-39. 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 have not historically been a concern and any collision data for these

roadways would be difficult to separately identify between ferry-related and non-ferry-related collisions.

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 Section 2.4 for non-freight vehicles. However, freight vehicles have one additional potential issue not shared by non-freight vehicles—turning radii. Freight vehicles 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 and into the ferry). This potential safety issue, however, is mitigated by the position and sequencing of boarding, 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. As the larger-sized vehicle maneuvers the right turn onto SR 525, 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 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.
- 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.
- Elliot Point 2, which would relocate the terminal and multimodal center in the western portion of the Mukilteo Tank Farm 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. This chapter summarizes the analysis year (2040) traffic volumes and ferry ridership and includes an assessment of 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 is 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

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

3.1.2 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 3-2.

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's existing fishing pier and seasonal day moorage would be relocated. Options for relocating the pier include placing it to the west or to the east of the new trestle.

The existing vehicle holding area would remain at the same general location and would still store the equivalent of one-and-one-half 144-vehicle vessels (approximately 216 vehicles). 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.

N

0 150 300

FEET

Existing Site Improvements

Ferry

To be Removed

Ferry Traffic Control Light

Exhibit 3-2. **Existing Site Improvements Alternative**

3.1.3 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 3-3.

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. An overhead passenger loading ramp would connect to a second story of the new passenger building.

The Tank Farm Pier, including approximately 3,000 piles, would be removed up to its existing bulkhead and a channel 400 feet wide that provides a navigation depth of 26 feet would be dredged through part of the area currently occupied by the pier. Near the pier, current depths range from 14 to 17 feet, and other areas are deeper.

WSDOT would remove the existing ferry terminal, including buildings and marine structures, but the Port of Everett's fishing pier at the current terminal site would remain. The current vehicle holding area would be vacated.

The Elliot Point 1 Alternative would also provide parking for commuter rail, the Mount Baker Terminal shoreline access area, and ferry employees. The alternative includes toll booths, 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. This 35-foot-high structure would be oriented north-south.

First Street would be realigned and extended as a four-lane roadway from SR 525 to the Port of Everett's Mount Baker Terminal, also providing sidewalks and bike 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.

Exhibit 3-3. **Elliot Point 1 Alternative**

Mukilteo Multimodal Project

3.1.4 Elliot Point 2 Alternative

The Elliot Point 2 Alternative would develop the project on the western portion of the Mukilteo Tank Farm. It would have a more compact footprint than the Elliot Point 1 Alternative due to the deeper water near the shore where the ferry would berth. Its key features are shown on Exhibit 3-4.

Elliot Point 2 would have the same types of marine facilities as Elliot Point 1, but because there is no beach and the water is deeper at this location, the ferry slip would be nearer to the shore than Elliot Point 1, with a shorter trestle. The Tank Farm Pier would be removed and a channel 500 feet wide that provides a navigation depth of 26 feet would be dredged through part of the area currently occupied by the pier.

The existing ferry facility, including buildings and marine structures, would be removed, but the Port of Everett's fishing pier would remain. A ferry employee parking area would be located on the east side of SR 525, occupying part of the area currently used for vehicle holding, but the remainder of the existing holding area would be vacated.

A new passenger building and a maintenance building would be located immediately upland of the ferry dock. An overhead passenger loading ramp would connect to a second story of the new passenger building.

The vehicle holding area would have the holding capacity for approximately 216 vehicles. The terminal supervisor's building would be west of the vehicle holding area, near four new toll booths.

First Street would be realigned and extended as a four-lane roadway from SR 525 to a signalized entrance to the new ferry terminal. First Street would continue as a two lane road to a new bus transit and paratransit center and a relocated parking area for Mukilteo Station.

A new transit center with six new bus bays and a transit passenger area would be on the eastern part of the site.

The First Street improvements would include a new signalized intersection with SR 525 and a reconstructed intersection with Park Avenue. The extended roadway would generally be along the southern portion of the Mukilteo Tank Farm. The First Street extension would occupy areas currently used by Sound Transit for the Mukilteo Station parking and pick-up/drop-off functions.

First Street would feature sidewalks and bicycle lanes. At the driveway for the ferry terminal, a 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.

As with the Elliot Point 1 Alternative, this alternative would include new security fences and gates surrounding the holding area and terminal.

N

0 150 300
FEET

- Elliot Point 2 Alternative
- Ferry
- To be Removed
- Area Vacated by WSF
- Dredging Locations under Pier
- City Boundary

Exhibit 3-4. **Elliot Point 2 Alternative**

Mukilteo Multimodal Project

3.2 DEVELOPMENT OF THE TRAVEL FORECASTS

Travel forecasts are an estimation of how many people will travel in a future year and how those people will choose to travel. These forecasts provide insight into how travel demand grows or changes given future land use assumptions, transportation investments, and capacity constraints for the roadway and public transportation systems.

To develop travel forecasts for a roadway and ferry network, two demand models were used:

1. WSF's Long-Range Plan 2030 model, which was used to determine ferry ridership and distribution of ferry passengers.
2. Puget Sound Regional Council (PSRC) 2040 Regional model, which was used to determine traffic forecasts for the state and regional roadway network.

It was necessary to use both models and compile their results into a single forecast because each model is better for forecasting the use (ferry system or roadway system) for which it was designed. A more detailed description of the travel forecasting methodology and process can be found in the *Transportation Methods and Assumptions Technical Memorandum* (see Appendix B).

3.2.1 Travel Demand Model Overview

Travel demand models estimate the number of trips, origin and destinations of trips, mode of travel and routing people make on a day-to-day basis based on land use, trip behavior, and the transportation network. The travel demand models used to develop the forecasts follow a standard four-step process:

1. **Trip generation** is based upon land use and socio-economic travel behavior. This step determines the demand for travel that can be expected from a variety of land use types, such as housing, shopping, or employment.
2. **Trip distribution** matches trip origins with trip destinations, determining the proportion of trips made from one area to another.
3. **Mode choice model** determines the probability that previously generated and distributed trips are made by one mode versus another. The models take into account many trip factors such as travel time and cost and are built upon travel surveys.

4. **Route assignment** takes the mode choice probabilities generated in Step 3 and routes the trips via the transportation network from their origin to their destination.

For the four-step process, Steps 2 through 4 are repeated multiple times to balance the trips over the transportation network. Models are generally intended to reflect these patterns during a normal peak period (the WSF model reflects a 4-hour period from 3 PM to 7 PM).

3.2.2 Forecast Methodology

Two travel models were used to develop the travel forecasts for the transportation assessment. Because the 2030 WSF Long-Range Plan and PSRC Transportation 2040 models were each created for a specific purpose, both models were required to estimate future travel patterns. The WSF model includes a large geographic area, which captures travel outside the geographic limits of the PSRC model. Additionally, the WSF model has a more detailed and refined travel behavior and tolling model for each ferry crossing throughout Western Washington and is consistent with the WSF Long-Range Plan. The PSRC model includes the land use and transportation investments assumed in *Vision 2040* and *Transportation 2040,* and the model is specifically calibrated for the state highway system and regional roadway network. Applying both of these models to the forecasting process helps to maintain consistency with PSRCs *Vision 2040* and *Transportation 2040* and the WSF Long-Range Plan.

One set of future travel demand volumes was developed for all 2040 alternatives because the change in the multimodal connections for each alternative is not anticipated to change the total number of people traveling and how they choose to travel.

The base year for this analysis is 2010 with a horizon year of 2040. Model inputs for 2010 are based on seasonally adjusted traffic counts and WSF fare box receipts, as well as transit, park-and-ride, pedestrian, and bicycle traffic counts conducted at the Mukilteo ferry terminal. Turning movement counts at study intersections were provided by WSDOT. To accurately reflect vehicle queuing behavior, data were collected on a per-sailing basis.

The focus of the WSF model was to develop ferry ridership volumes for the 4-hour weekday PM peak period (3 PM to 7 PM) in both the southbound and northbound directions. The base model month was May, which is used by WSF as an average travel month, and is consistent with the WSF Long-Range Plan. When evaluating seasonal variation throughout the year, January is considered the lowest travel month

and August is the highest travel month. Daily ridership volumes were based on conversion factors created by evaluating the three seasonal time periods.

3.2.3 Transportation Forecasting Assumptions

The transportation forecasting process for this project assumed additional transportation services and infrastructure would be in place by 2040. These anticipated investments identified in *Transportation 2040* can be separated into two groups:

1. Investments affecting ferry ridership.
2. Investments affecting transit and roadway facilities.

These two groups correspond with the different models used to develop the travel forecasts. Exhibit 3-5 and Exhibit 3-6 summarize the investments within the study area by the type of project and whether or not the project was included as a model assumption.

The replacement of the two existing 124-vehicle ferries providing service on the Mukilteo-Clinton route with two 144-vehicle ferries was an important assumption in the travel forecasting process. The new ferries would carry approximately 20 more vehicles per sailing. The WSF Long-Range Plan identifies the first replacement ferry to enter service in the 2013-2025 timeframe with the second ferry entering service in the 2025-2031 timeframe. With sailings every 30 minutes, cross-Sound vehicle capacity on ferries is increased by approximately 40 vehicles per hour per direction.

Exhibit 3-5 summarizes the transit investments that were assumed in the model and could affect ferry ridership. The investments consist of improved bus service, higher capacity Sound Transit Sounder commuter rail service as well as the extension of Link light rail from the Northgate Transit Center to the Lynwood Transit Center.

Exhibit 3-6 summarizes investments affecting transit and roadway facilities, including widening projects on state routes and local arterial roadways. Several projects within the Mukilteo ferry terminal area were not included as part of the assumptions because they have uncertain funding sources, have unknown environmental impacts, or are not possible or necessary with all alternatives. For example, two projects not included in the forecasting assumptions are a new three-lane connection between SR 525 and the ferry terminal and signal and traffic improvements to reduce impact of queuing vehicles on SR 525 because they are represented in the Build alternatives. Also, a proposed 130-stall parking garage at Mukilteo Station was not included and is addressed in *Chapter 6 Cumulative Impacts*.

Exhibit 3-5. Transportation Investments Potentially Affecting Ferry Ridership

Project Title	Project Location	Limits	Description	Lead Agency	Included in Forecasting Assumptions
Bicycle and Pedestrian Investments					
Mukilteo Lane Waterfront Access	Mukilteo Lane	Park Avenue to Mt. Baker Crossing	Construct parking lot and pedestrian access bridge connection to the ferry terminal.	City of Mukilteo	No
Transit Service and Ferry-Related Investments					
Enhanced Sounder Service	BNSF Railway Corridor	Seattle to Everett	Passenger capacity on the Sounder was unconstrained, reflecting ability to add additional cars to existing train departures if necessary	Sound Transit	Yes
Mukilteo-Clinton Vessel Replacement Program	Mukilteo-Clinton crossing	Mukilteo-Clinton	Replacement of both 124-vehicle ferries with 144-vehicle ferries	WSF	Yes
Core or Swift BRT	Airport Road, 128th, 132nd, Cathcart Way	SR 526 to SR 9	Core Service or Swift Bus Rapid Transit (BRT). Requires speed and reliability improvements and accessible transit stops.	Agency Not Identified	Yes
Core or BRT	Mukilteo Speedway (SR 525)	Mukilteo Ferry to I-405	Core Service or BRT. Requires speed and reliability improvements and accessible transit stops.	Agency Not Identified	Yes
Core or BRT	SR 525	I-5 to SR 526	Core Service or BRT. Requires speed and reliability improvements and accessible transit stops.	Agency Not Identified	Yes
Parking Garage at Mukilteo Station	First Street east of SR 525	n/a	Sound Transit to provide funding to construct up to 130 additional structured parking stalls for a joint-use parking garage.	Sound Transit	No
Link Light Rail Extension from Northgate Transit Center to Lynwood Transit Center	I-5	Link Northgate Station to Lynwood Transit Center	Extension of Link light rail with stations at 145th, 185th, and 236th	Sound Transit	Yes

Source: Transportation 2040, Appendix M: Itemized Investment List (PSRC 2010); 2009 WSF Long-Range Plan, Appendix N: Proposed Vessel Assignments

Exhibit 3-6. Transportation Investments Affecting Transit and Roadways Facilities

Project Title	Project Location	Limits	Description	Lead Agency	Included in Forecasting Assumptions
Transit Facilities & Ferry-Related Investments					
Transit Priority Infrastructure for Core or Swift BRT	Airport Road, 128th, 132nd, Cathcart Way	SR 526 to SR 9	Transit priority infrastructure for Core or Swift BRT. May include BAT lanes, signal priority, stations, queue-jumps, etc.	Agency Not Identified	Yes
Transit Priority Infrastructure for Core or BRT	Mukilteo Speedway (SR 525)	Mukilteo Ferry to I-405	Transit priority infrastructure for Core or BRT. May include BAT lanes, signal priority, stations, queue-jumps, etc.	Agency Not Identified	Yes
Transit Priority Infrastructure for Core or BRT	SR 525	I-5 to SR 526	Transit priority infrastructure for Core or BRT. May include BAT lanes, signal priority, stations, queue-jumps, etc.	Agency Not Identified	Yes
State Route Roadway-Related Investments					
SR 99/Evergreen Way	SR 99/Evergreen Way	115th Street to Airport Road	Widen Evergreen Way from five to seven lanes, with curb, gutters, and sidewalks and drainage improvements.	City of Everett	Yes
SR 99/ Evergreen Way Transit HOV Treatments	SR 99/Evergreen Way	148th Street SW to 46th Street	Construct BAT lanes on Evergreen Way/ Hwy 99.	City of Everett	Yes
SR 525	SR 525	SR 526 to Mukilteo Multimodal Terminal	Develop a new three-lane roadway on new alignment that would access the relocated Mukilteo ferry terminal.	WSDOT	No
Arterial Roadway-Related Investments					
112th Street – Beverly Park Road Corridor	112th Street	SR 527 to SR 525	Widen from two or three lanes to five lanes with sidewalks and bicycle lanes on both sides in six phases.	City of Everett	Yes
112th Street SW/ Beverly Edmonds Road	Beverly Park Road	Airport Road to SR 525	Improve to five lanes with bicycle lanes	Snohomish County	Yes
Ferry Holding Lanes	Mukilteo Ferry Terminal	n/a	Mitigation measure for traffic congestion associated with ferry traffic backup on SR 525. Options include off-street storage, traffic warning measures, signals at Fifth Street, Goat Trail Road, 76th Street SW, 84th Street SW.	City of Mukilteo	No

Source: Transportation 2040, Appendix M: Itemized Investment List (PSRC, October 2010)

3.3 MUKILTEO FERRY TERMINAL

The following section compares the elements related to the operation of the Mukilteo ferry terminal for the No-Build and Build alternatives. WSF plans to continue operating ferry service connecting Mukilteo to Clinton as part of the SR 525 corridor, as opposed to another location such as Edmonds or Everett. Overhead loading is anticipated to be needed after 2030 and is assumed to be provided for all Build alternatives.

3.3.1 Sailings and Scheduling

For all alternatives, daily ferry service would continue, and sailing time between Mukilteo and Clinton would remain approximately 15 minutes each way. Relocating the ferry terminal for the Elliot Point 1 and Elliot Point 2 alternatives would not impact ferry scheduling for the Mukilteo-Clinton route. The service would be provided by two ferries, which would accommodate more vehicles than the existing ferries serving this route.

3.3.2 Ferry Ridership Forecasts

This section summarizes the forecasted vehicular, transit (bus and train) and non-motorized volumes expected by 2040. As regional population and employment grows, the demand for travel will also grow. Comparisons between the 2010 base year and 2040 forecast year are included, illustrating how volumes, trends and mode choice change or do not change over the next 30 years (see Exhibit 3-7 through Exhibit 3-12). One set of future travel demand volumes was developed for all 2040 alternatives because none of the alternatives is likely to change the total number of people traveling or how they choose to travel.

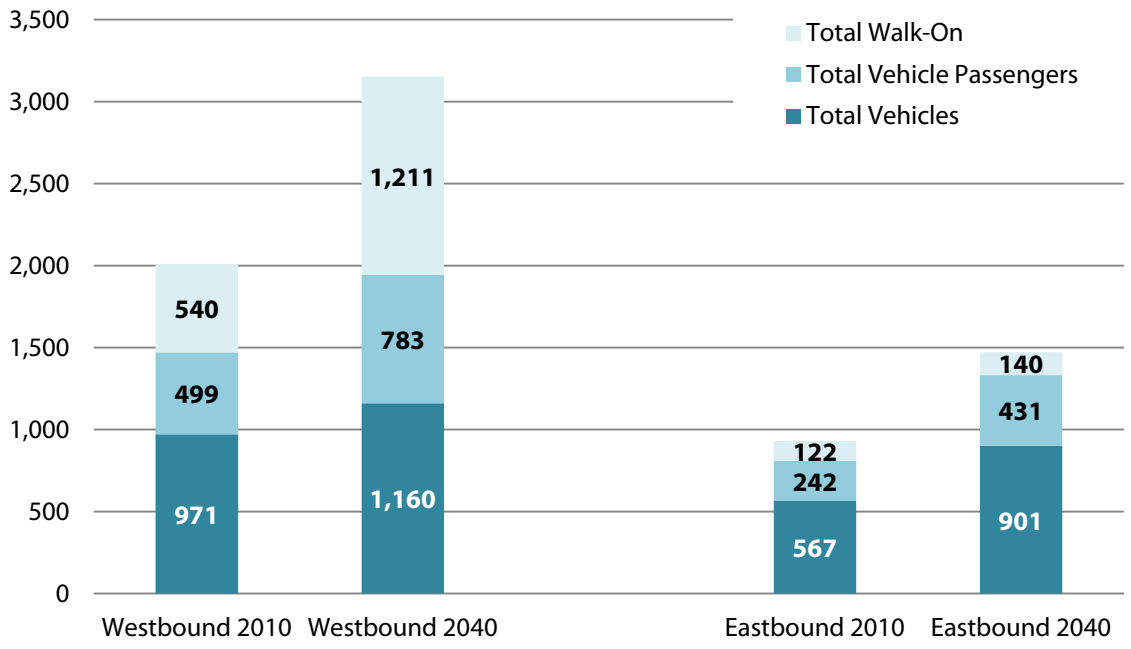
The LOS for the Mukilteo-Clinton ferry route, based on the percent of total sailings operating at full capacity, is also analyzed in this section. Data from 2010 and 2040 forecasts were compared to performance thresholds set by the WSF Long-Range Plan. These performance thresholds are used to identify when additional demand management or additional capacity is required.

Ferry passengers are separated into three categories: vehicle drivers, vehicle passengers, and walk-on passengers. Vehicle drivers represent one driver in each vehicle. Vehicle passengers can be one or more additional passengers per vehicle, such as vanpool users. Walk-on passengers are those passengers who are not associated with a ferry vehicle. Walk-on passengers may park their car near the terminal, ride

rail or bus transit, be picked up or dropped off by someone else, or bike or walk to or from the terminal. All of these access modes are grouped into the walk-on passenger category.

Exhibit 3-7 summarizes the 2010 and 2040 volumes for the three types of ferry passengers for the southbound and northbound travel directions. Between 2010 and 2040, PM peak period ridership totals are expected to increase by approximately 60 percent for travel in both directions.

Exhibit 3-7. 2040 Ferry Ridership Volumes by Type (PM Peak Period)



Source: WSF Fare Box Receipts, WSF Model, PM Peak Period (3PM to 7PM)

Northbound travel volumes during the PM peak period are more than double the southbound travel volumes, which reflects typical regional travel patterns where people travel towards Seattle in the morning and away from Seattle in the evening. Travel volumes and mode share are impacted or constrained by vehicle capacity limits of the ferry. In the northbound direction, vehicle capacity limits would cause a majority of passenger growth to come from walk-on passengers. In the southbound direction, vehicle capacity is not reached during the PM peak period, resulting in a majority of the passenger growth coming from vehicles.

3.3.3 PM Peak Vehicle Forecasts at the Terminal

Exhibit 3-8 summarizes the 2010 and 2040 vehicle and vehicle passenger volumes for the Mukilteo ferry terminal by direction and the percent increase over the 30-year period. Total volumes for both vehicle and vehicle passengers remain higher in the northbound direction compared to the southbound direction, which is similar to existing conditions.

During the PM peak period, vehicle demand in the northbound direction exceeds capacity; people who want to take their vehicle on the ferry are not likely to make the next sailing during the peak period. By 2040, two new ferries with the capacity for an additional 20 vehicles each are planned to be in operation on the Mukilteo-Clinton ferry route. The 144-vehicle ferries increase the 4-hour PM peak period capacity by 160 vehicles per direction. The added cross-Sound vehicle capacity results in most of the northbound vehicle volume increase from 2010 to 2040.

Exhibit 3-8. PM Peak Period Vehicles and Vehicle Passenger Volumes

Type, Direction	2010 Volumes	2040 Volumes	Percent Increase
Vehicles, Southbound (Unloading)	567	901	59%
Vehicles, Northbound (Loading)	971	1,160	19%
Vehicle Passengers, Southbound (Unloading)	242	431	79%
Vehicle Passengers, Northbound (Loading)	499	783	57%

Source: WSF Fare Box Receipts, WSF Model, PM Peak Period (3PM to 7PM)

3.3.4 PM Peak Walk-On Passenger Forecasts

The number of existing (2010) and future (2040) passengers who walk on and walk off the ferry during the PM peak period are summarized in Exhibit 3-9 and Exhibit 3-10.

As shown in Exhibit 3-9, northbound walk-on ridership more than doubles from 2010 to 2040, with bus-to-ferry transfer still the most popular mode of access. (Almost 50 percent of people walking onto the ferry in the PM peak period arrive by bus.) The number of people transferring from Mukilteo Station to the ferry increases by more than 400 percent over the same time period. Modest growth is projected for park-and-ride, passenger drop-off, and bicycling.

Exhibit 3-9. Northbound PM Peak Period Walk-On Passenger Volume by Access Mode

Mode of Access	2010 Volumes	2040 Volumes	Volume Increase	Percent Increase
Park-and-Ride	144	206	62	43%
Pick-Up/Drop-Off	28	41	13	46%
Transit – Bus	241	539	298	124%
Transit – Train	70	355	285	407%
Bike	3	7	4	133%
Walk	55	63	8	14%
Total	541	1,211	670	124%

Source: November 2010 Field Counts, WSF Forecast Model, PM Peak Period (3PM to 7PM)

As shown in Exhibit 3-10, the total number of walk-off passengers coming from Clinton to Mukilteo in the PM peak period increases by approximately 16 passengers. The most common destination for people walking off the ferry at Mukilteo is to park-and-ride lots. The number of people connecting to bus or the train is low compared to vehicle-based connections.

Exhibit 3-10. Southbound PM Peak Period Walk-Off Passenger Volume by Access Mode

Mode of Access	2010 Volumes	2040 Volumes	Volume Increase	Percent Increase
Park and Ride	56	59	3	5%
Pick-Up/Drop-Off	21	24	3	14%
Transit – Bus	13	19	6	46%
Transit – Train	5	9	4	80%
Bike	3	3	0	0%
Walk	24	26	2	8%
Total	122	140	18	15%

Source: November 2010 Field Counts, WSF Forecast Model, PM Peak Period (3PM to 7PM)

Exhibit 3-11 summarizes the percent of total people who walk onto the ferry for the northbound PM peak period direction. From 2010 to 2040, the total share of people walking from the transit center (bus) or Mukilteo Station (train) to the ferry increases from 58 percent (45 percent bus and 13 percent train) to 74 percent (45 percent bus and 29 percent train).

Exhibit 3-11. Northbound PM Peak Period Walk-On Passenger Mode of Access at Mukilteo Ferry Terminal

Source: November 2010 Field Counts, WSF Forecast Model, PM Peak Period (3PM - 7PM)

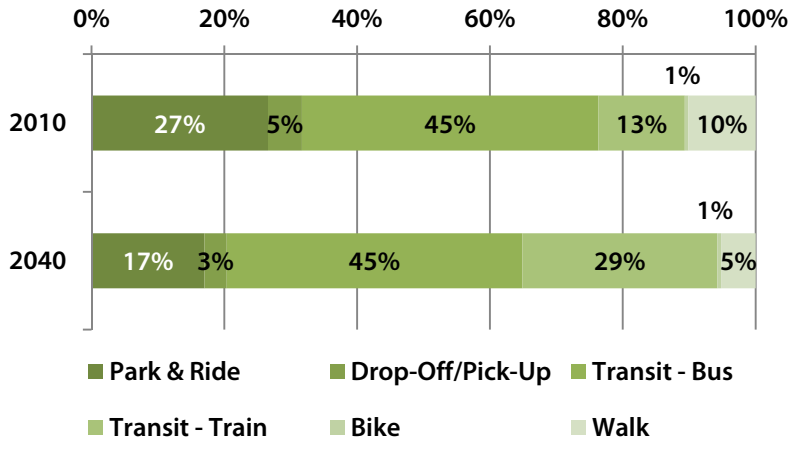
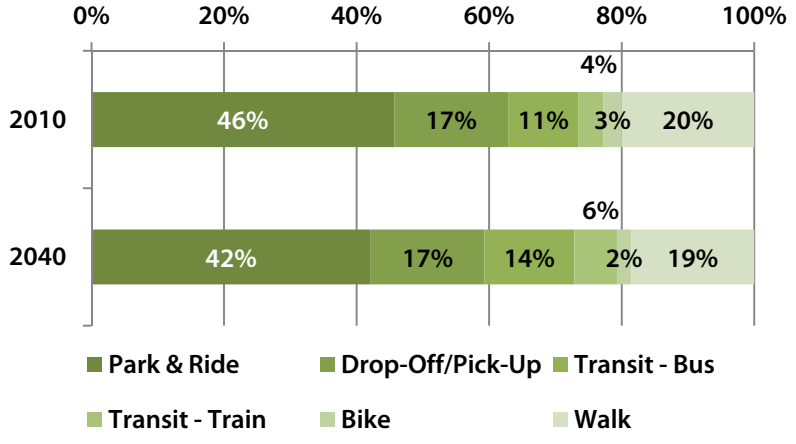


Exhibit 3-12 summarizes the percent of total people traveling southbound (from Clinton to Mukilteo) who walk off the ferry in the PM peak period. People walking off the ferry in Mukilteo mostly transfer to park-and-rides, get picked up, or walk. The lower number of people transferring to bus or rail transit could be a reflection of greater vehicle capacity in the southbound direction during the PM peak period.

Exhibit 3-12. Southbound PM Peak Period Walk-Off Passenger Mode of Egress at Mukilteo Ferry Terminal



Source: November 2010 Field Counts, WSF Forecast Model, PM Peak Period (3PM to 7PM)

3.3.5 Ridership Variation

Ridership variation describes the changes in how many people use the ferry and the mode (bus, train, walk, bike, drive) people choose to make their trip. Ridership variation is important because travel forecasts assume similar ridership trends will continue in the future, except in cases where capacity constraints force behavioral changes, such as peak spreading or mode share shift from drive-on to walk-on.

WSF describes the underlying nature of these trends in its Long-Range Plan and previous travel surveys by categorizing trip types into three categories: maintenance, recreational discretionary trips, and non-recreational discretionary trips. Each trip type has a different travel demand implication.

- **Maintenance** trips are those related to day-to-day needs, such as work, school, medical appointments, or personal business.
- **Recreational discretionary** trips are related to sightseeing, special events, or social activities.
- **Non-recreational discretionary** trips consist of shopping trips as well as some social activity trips.

These three trip types and when they occur, are responsible for much of the variation of travel throughout the week and year.

Maintenance trips are expected to be consistent among weekdays, with lower volumes on the weekend. This trend is observed with transit ridership, which disproportionately captures this trip type.

Recreational discretionary trips are typically observed on weekends during the summer as well as holidays. Throughout the year, this type of trip occurs frequently on Friday and Saturday in the northbound direction and Sunday in the southbound direction. Good weather and holidays increase demand for this trip type.

Non-recreational discretionary trips occur with more frequency late in the week, with weekdays having the highest occurrence. Average daily ferry volumes grow as the week progresses, likely reflecting this trend.

The factors affecting travel demand associated with each trip type indicate that no significant changes in demand variation should be expected. This is consistent with the travel demand forecast assumptions used in both models and supports the soundness of these assumptions.

3.3.6 Ferry Crossing Levels of Service

Exhibit 3-13 summarizes the percentage of sailings that were full in 2010 and are estimated to be full in 2040. Forecasts were based on 2010 data and projected to 2040. By 2040, the travel forecasts indicate that capacity in all 3 analysis months would exceed the Level 1 Standard, but not the Level 2 Standard. The impacts of this are longer travel time for passengers, longer peak periods, and longer queues on adjoining roadways. The Levels 1 and 2 Standards are higher for August due to increased late week, weekend, and summer travel demand that does not necessarily overlap with typical weekday capacity-constrained PM peak periods in January or May.

Exhibit 3-13. Mukilteo-Clinton Ferry Route Level of Service

Month	Level 1 Standard	Level 2 Standard	2010 Data	2040 Forecast
January	25%	65%	8%	32%
May	25%	65%	20%	48%
August	30%	75%	35%	58%

Source: 2010 WSF Fare Box Data, WSF Model Forecast; Values are percent of total northbound sailings that are full

This indicates that WSDOT should consider methods to address peak period travel demand and relieve congestion experienced on this route. Because performance in 2040 is not anticipated to exceed the Level 2 Standard, the route does not warrant additional capacity investments above the already planned replacement of the current 124-vehicle ferries with new 144-vehicle ferries. Measures to manage demand to the Level 1 Standard are described in *Chapter 6 Cumulative Impacts*.

3.3.7 Terminal Operations

Access Lanes and Vehicle Holding Area

All alternatives include a holding area that can accommodate approximately one-and-a-half of the vehicle holding capacity of the new ferries, which is approximately 216 vehicles. The No-Build and Existing Site Improvements alternatives provide increased flexibility when managing the separation of vehicles in the holding area, because more lanes are provided compared to the Elliot Point 1 and Elliot Point 2 alternatives. The vehicle holding area does not directly change the length of the SR 525 shoulder queue, because vehicles typically do not clear the tollbooths fast enough to fill the holding area before loading of the next ferry begins. If it was faster

to purchase tickets at the tollbooths (faster processing time and time to answer customer questions), the vehicle queue waiting to enter the Mukilteo terminal holding area would be shortened.

All Build alternatives would permit registered HOVs to bypass some or all the ferry shoulder queuing to access the tollbooths. The current design for the Elliot Point 1 Alternative would merge HOVs into the general queue before they reach the tollbooth.

No-Build Alternative

The currently leased holding area would continue to be used for ferry holding. The terminal supervisor's building, passenger building, and toll booths would be replaced at their current locations. The No-Build Alternative provides more holding lanes for managing vehicles; there are approximately 24 lanes. The existing site and its adjacent uses do not allow the terminal facility to include security features for complying with the U.S. Department of Homeland Security regulations and allowing the facility to respond to heightened marine security directives from the U.S. Coast Guard (see *Section 2.1.9*).

Existing Site Improvements Alternative

The Existing Site Improvements Alternative would provide a fourth tollbooth and relocate the supervisor's building to provide additional employee parking in the holding area (in addition to the parking provided at the proposed transit center). The space to queue vehicles between the proposed SR 525/First Street intersection and the tollbooths would hold two to four vehicles per tollbooth lane. If this intersection reduces the number of vehicles able to access the tollbooths, the queue of vehicles on SR 525 would increase. As modeled, the three tollbooths and surrounding street operations would permit enough vehicles into the holding area to fill the PM peak period vessels.

Elliot Point 1 and Elliot Point 2 Alternatives

Because the Elliot Point 1 and Elliot Point 2 alternatives have approximately seven long holding area lanes and a motorcycle bypass lane, HOVs and trucks may be mixed with other ferry traffic to maximize holding space during peak periods. In compliance with post 9/11 U.S. Department of Homeland Security regulations, security fences and gates would be constructed to allow WSF to secure the holding area during periods of higher security, as required by the U.S. Coast Guard.

Overhead Passenger Loading

All Build alternatives include overhead passenger loading, which allows pedestrian and vehicle loading to occur simultaneously by separating vehicles and pedestrians. The No-Build Alternative does not include overhead passenger loading. Overhead passenger loading would be provided by a structure connecting the upper ferry deck to an on-land passenger area and would maintain safe ADA grades during low and high tides, unlike the existing condition. It would also improve pedestrian safety by reducing conflicts with pedestrians and vehicles on the transfer span and where the transfer span meets the nearest roadway. Overhead passenger loading reduces unloading and loading times, which improves ferry schedule reliability (see *Ferry Loading and Unloading Times* for the impact to loading and unloading times).

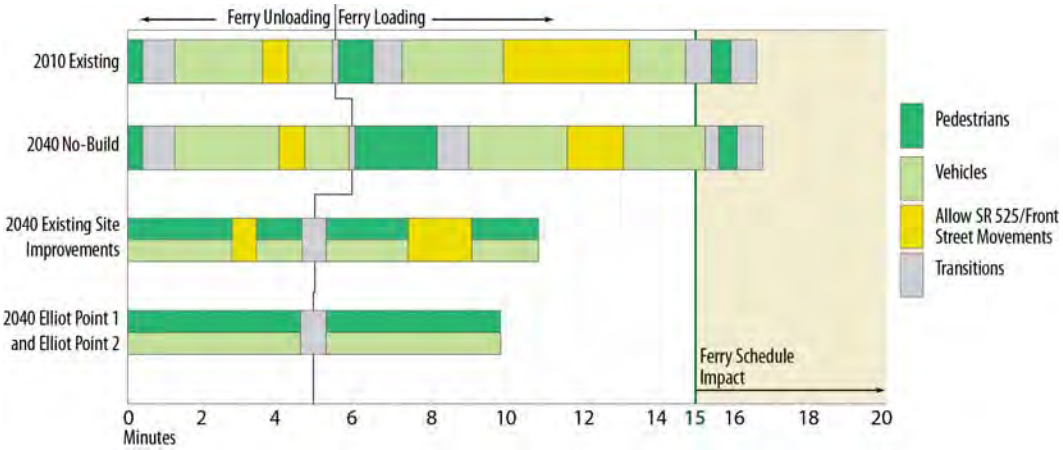
Ferry Loading and Unloading Times

The location of the ferry terminal in relation to the local street system and the presence of overhead passenger loading affect ferry turnaround time; to maintain 30-minute headways between Mukilteo and Clinton, there is approximately 15 minutes to unload and load passengers at either terminal. When the turnaround time exceeds 15 minutes, ferry vessels fall behind schedule, causing two operating challenges:

1. **Reduced connection reliability**: passengers can miss connections to bus and rail services and have increased wait times between connections.
2. **Reduced cross-sound capacity**: when a ferry falls behind schedule a sailing could be missed or cancelled to return the ferry to the regular scheduled sailing time. Canceling a sailing during the peak period means that approximately 124 (today) and 144 (future) vehicles are delayed until the next sailing, which increases vehicle passenger travel time and the length of queuing vehicles waiting to enter the ferry terminal.

As illustrated in Exhibit 3-14, field observations found existing ferry terminal unloading and loading times exceeded 15 minutes in the PM peak period. The observation occurred in Winter 2010.

Exhibit 3-14. Mukilteo Ferry Terminal Unloading and Loading Times (Observed Winter 2010)



No-Build Alternative

Under the No-Build Alternative, increased ferry ridership means that it takes longer to load and unload passengers. In 2040, it is estimated that the No-Build Alternative terminal configuration would take PM peak period ferries almost 17 minutes to unload and load passengers before leaving for Clinton (see Exhibit 3-14). This would impact the overall ferry schedule during the PM peak period. The addition of the northbound right-turn lane to the SR 525/Front Street intersection would reduce the amount of time required to clear the intersection during the ferry loading and unloading.

Existing Site Improvements Alternative

As illustrated in Exhibit 3-14, the addition of overhead passenger loading for the Existing Site Improvements Alternative would reduce the time to load and unload each ferry to 11 minutes, almost 6 minutes faster than the No-Build Alternative, and would enable the ferries to maintain their schedules.

Elliot Point 1 and Elliot Point 2 Alternatives

The Elliot Point 1 and Elliot Point 2 alternatives eliminate the time required to stop ferry traffic at the SR 525/Front Street intersection to allow local traffic to clear. Providing a continuous off-loading process helps meet the objectives of reliability and efficiency. A break in off-loading traffic could be provided off the dock without impacting the ferry off-loading time. The Elliot Point 1 Alternative would begin stopping off-loading vehicles at the west driveway/transit center once enough vehicles

have passed so the vehicle queue does not extend back to block the loading process. The Elliot Point 2 Alternative would have an on-site ferry exit lane that would be used to store off-loading vehicles and avoid blocking the loading process. Because these alternatives do not have to cross a local street from the holding lane to the ferry (such as Front Street in existing conditions) there is no requirement for a break in the loading. The average load and unload time is almost 7 minutes faster than the No-Build Alternative and would enable the ferries to maintain their schedules.

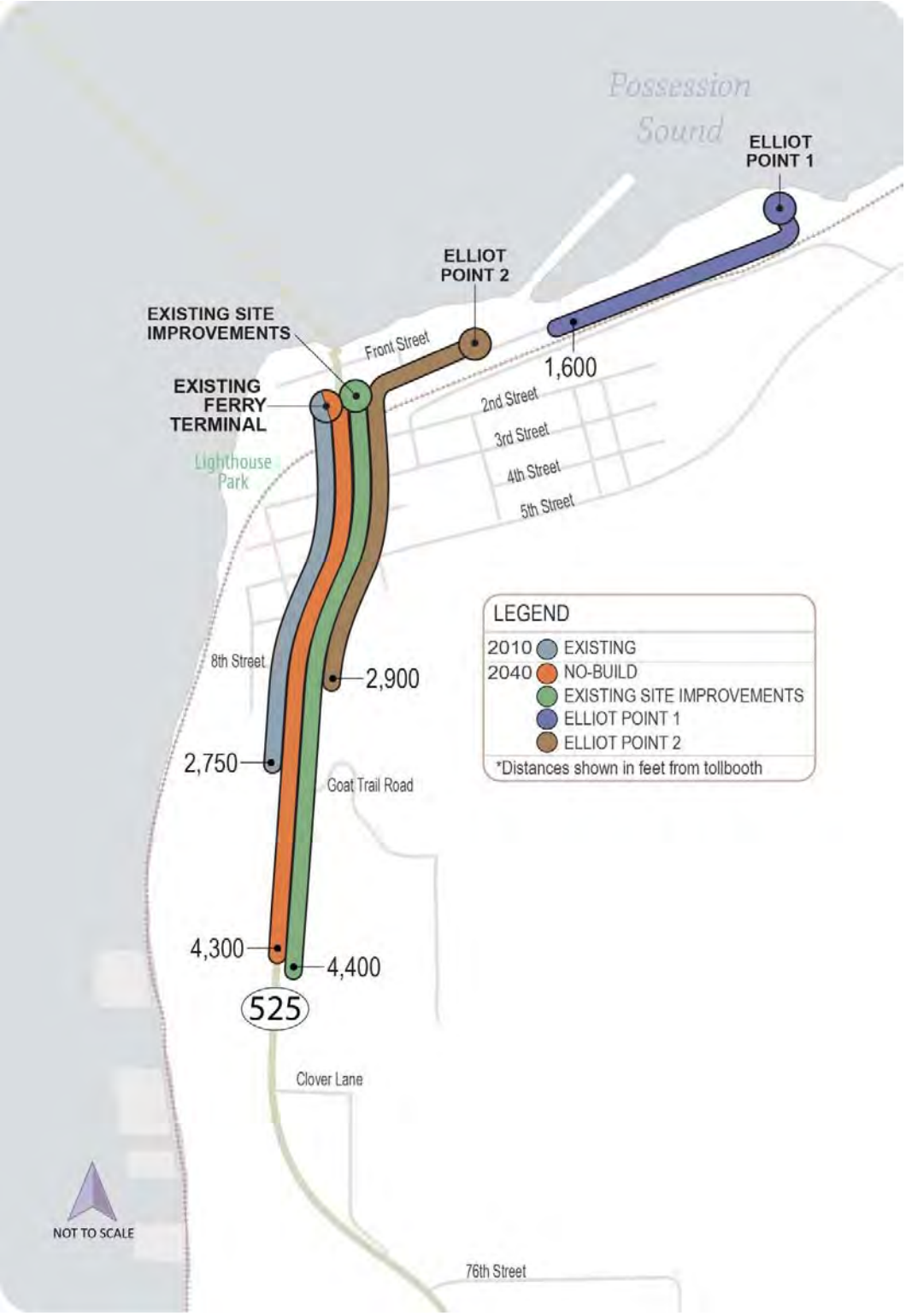
Ferry Shoulder Queuing

Ferry shoulder queuing was evaluated at the Mukilteo ferry terminal using the micro-simulation tool VISSIM Version 5.2. The typical weekday PM peak period ferry shoulder queues are projected to increase for 2040 No-Build, Existing Site Improvements, and Elliot Point 2 alternatives compared to 2010 conditions. The Elliot Point 1 Alternative is the only alternative where vehicle queues from the tollbooth would not extend to SR 525 during the PM peak period on a daily basis. Under all alternatives, higher weekend and seasonal travel would continue to create longer queues.

The queue lengths illustrated in Exhibit 3-15 are measured from the tollbooths to the end of the queue and includes intersection and driveway areas where vehicles are restricted from blocking access. The differences in queue lengths shown in Exhibit 3-15 are impacted by the following:

- The amount of vehicle queue space behind each tollbooth in the holding area (not on First Street or SR 525) to avoid larger vehicles blocking access to the tollbooths. The No-Build and Existing Site Improvements alternatives both have limited vehicle maneuvering space behind the tollbooths off of SR 525.
- The areas where vehicles are not able to queue for driveways and intersections. Alternatives with longer queues on SR 525 (No-Build and Existing Site Improvements) are impacted the most, followed by Elliot Point 2.
- The efficiency of traffic signal operations at the SR 525/Fifth Street and SR 525/First Street intersections. Alternatives with longer queues on SR 525 (No-Build and Existing Site Improvements) are impacted the most, followed by Elliot Point 2. For Elliot Point 1, ferry and non-ferry traffic are able to travel through the SR 525/Fifth Street intersection on the same signal phase, which improves efficiency and minimizes the overall queue length.

Exhibit 3-15. Typical Weekday Peak Hour Ferry Shoulder Queue Length in Mukilteo



3.3.8 Navigable Waterways

The effects on navigation for ferries crossing the shipping lane would be similar to existing conditions and would not vary significantly among alternatives. Other effects on navigable waterways would also be similar to existing conditions.

3.3.9 Mukilteo Terminal Facility Safety and Security

No-Build Alternative

The existing vehicle holding area would remain at the same location where it currently exists. Because the No-Build Alternative preserves the existing facility, the safety issues discussed in *Section 2.1.9* are unchanged. Moving the transfer span signal to the SR 525/Front Street intersection provides increased visibility between vehicles and pedestrians, which reduces the chance for collisions.

Existing Site Improvements Alternative

Overhead passenger loading (see *Section 3.3.7*), which separates vehicles and pedestrians during ferry loading and unloading, reduces the risk of collisions. Also, the passenger building would be relocated to the northeast corner of the SR 525/Front Street intersection and passengers would be able to walk to the transit center and Mukilteo Station without crossing ferry loading and unloading traffic. The proposed transit center would provide space for six separate bus bays and would eliminate buses blocking roadways such as Front Street. Properly sized bus zones would ensure that bus passengers wait for, load, and unload in designated areas.

Elliot Point 1 Alternative

Overhead passenger loading, which separates vehicles and pedestrians during ferry loading and unloading, reduces the risk of collisions. Passengers could travel between the ferry and the transit center without crossing a roadway, which eliminates any conflict with vehicle traffic. People traveling between the ferry terminal and Mukilteo Station would cross at the signalized east driveway/First Street intersection (see Exhibit 3-3). This alternative would include security fences and gates to allow the holding area to be secured during periods of higher security.

Elliot Point 2 Alternative

The Elliot Point 2 Alternative would have the same safety characteristics as the Elliot Point 1 Alternative, except people traveling between the transit center and Mukilteo

Station would cross First Street at the unsignalized west driveway/First Street intersection (see Exhibit 3-4). This crossing location would avoid pedestrians having to cross traffic arriving at or leaving the ferry terminal.

3.4 ROADWAY NETWORK

3.4.1 Roadway Modifications

This section describes the roadway modification occurring as part of the No-Build and the Build alternatives (see Exhibits 3-1 through 3-4 for illustrations of each alternative). All Build alternatives would incorporate the improvements included in No-Build Alternative. There are no proposed changes for the other intersections along SR 525 or the Glenwood Avenue/Mukilteo Boulevard intersection.

No-Build Alternative

Roadway improvements occurring prior to 2040 that are included in No-Build Alternative are a northbound right-turn lane, which would be constructed at the stop-controlled SR 525/Front Street intersection; this northbound right-turn lane would reduce the vehicle delay at this intersection by permitting both right-turning and left-turning vehicles to turn at the same time. Also, vehicles would be permitted to turn right during ferry unloading. During ferry unloading and peak periods, vehicles queuing to turn left towards Mukilteo Lighthouse Park and businesses could temporarily block the northbound right-turn lane.

Also, prior to 2040 as part of a separate project improvement, the existing signal on the Mukilteo ferry terminal transfer span would be relocated south towards the SR 525/Front Street intersection. Moving this signal would not impact the SR 525/Front Street intersection operation because it would continue to operate as a three-way stop-controlled intersection when ferry traffic was not loading or unloading. The purpose of moving the transfer span signal is to increase safety by stopping vehicles at the intersection, which gives drivers and pedestrians increased visibility and awareness of each other's movements.

Existing Site Improvements Alternative

To reduce the impact of ferry loading and unloading operations on local traffic, First Street would be extended westward to a new signalized intersection with SR 525. The SR 525/First Street intersection would operate similar to the SR 525/Fifth Street intersection, where shoulder ferry queuing would enter the holding area controlled

by a separate signal phase. The extension of First Street would provide an outlet for vehicles circulating from the waterfront area on a one-way eastbound Front Street and a one-way southbound Park Avenue. First Street would provide a direct route for vehicles, bicycles, and pedestrians to the Mukilteo Station. The Mount Baker Terminal would be accessed via Front Street and through the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service Mukilteo Research Station property similar to existing conditions.

Elliot Point 1 Alternative

The Elliot Point 1 Alternative holding area is located at the eastern edge of the Mukilteo Tank Farm; access to the holding area would be provided by the realignment and extension of First Street from SR 525 to the western edge of the Mukilteo ferry terminal site. First Street would be a four-lane roadway with sidewalks, bicycle lanes, and ferry queuing on the eastbound (south side) curb lane. New signals would be provided on First Street at its intersection with SR 525, the western transit center driveway, and the eastern transit center driveway/Mount Baker railroad crossing. All signals along First Street would incorporate transit signal priority, which allows buses to receive a green light upon arrival at an intersection. The Mount Baker railroad crossing would be open to pedestrians and emergency vehicles only. The Mount Baker Terminal would be accessed via First Street and through the NOAA Fisheries Service Mukilteo Research Station, similar to existing conditions.

The Park Avenue/First Street intersection would be reconstructed with stop-control for the southbound and northbound (exit from Mukilteo Station parking lot) movements. First Street would be realigned to provide access to a reconfigured parking area for the commuter rail station.

Elliot Point 2 Alternative

First Street would be realigned and reconstructed as a four-lane roadway from SR 525 to the western edge of the proposed Mukilteo ferry terminal, across from the existing Mount Baker railroad crossing. The realignment of First Street would remove the existing parking and passenger pick-up/drop-off for Mukilteo Station, which would be relocated east of the proposed Mukilteo ferry terminal location. First Street would provide ferry queuing in the eastbound (south side) curb lane, bicycle lanes between SR 525 and the ferry holding area entrance, and sidewalks the length

of the roadway. Access to the Mount Baker Terminal would require construction of a new roadway access from First Street east of the Mount Baker crossing.

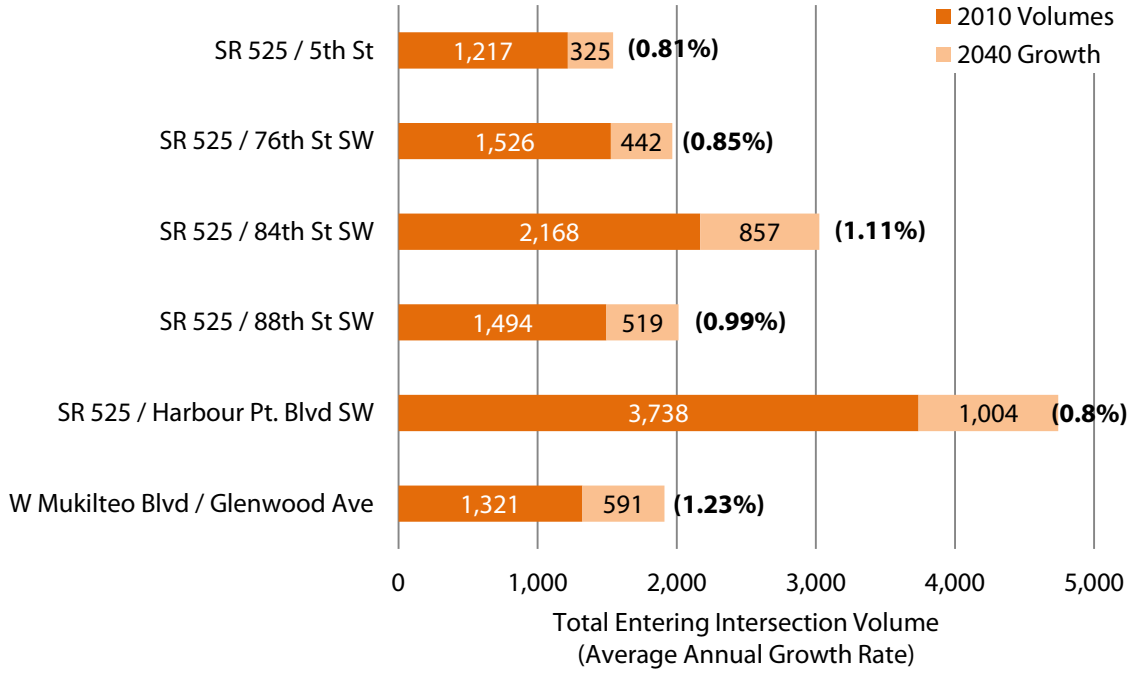
New signals would be provided on First Street at its intersection with SR 525 and the ferry holding area entrance. All signals along First Street would incorporate transit signal priority, which allows buses to receive a green light upon arrival at an intersection. The Park Avenue/First Street intersection would be southbound stop-controlled. The south block face of Front Street between SR 525 and Park Avenue would be redeveloped as part of a future undefined project.

3.4.2 Traffic Volumes

Ferry ridership demand was constant for all 2040 alternatives because the change in the multimodal connections for each alternative is not anticipated to affect how people choose to travel. Therefore, volumes south of the SR 525 bridge over the BNSF tracks do not vary by alternative.

Exhibit 3-16 summarizes the change in total PM peak hour entering volumes for study area intersections from 2010 to 2040, as well as the average annual growth rate over the 30-year forecast horizon. The SR 525/Fifth Street intersection serves the lowest amount of traffic among the study intersections and is forecasted to have the least amount of growth, with 325 additional vehicles by 2040. The SR 525/Harbour Pointe Boulevard SW intersection serves the highest number of vehicles among the study intersections, serving an additional 1,004 vehicles by 2040.

Exhibit 3-16. PM Peak Hour Total Entering Intersection Volumes for 2010 and 2040 Growth

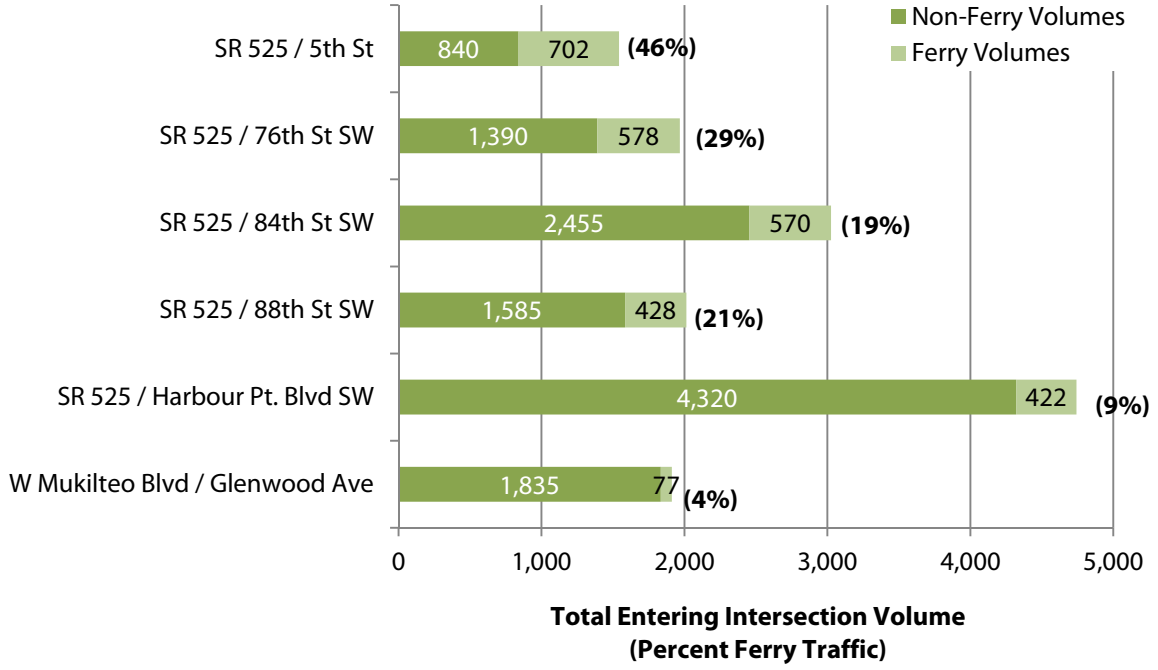


Source: 2010 WSDOT Intersection Counts, PSRC Model; PM peak hour volumes are maximum PM peak volumes over a 1-hour span.

Because the 2010 to 2040 increase in vehicles accessing the Mukilteo ferry terminal in the PM peak period (see Exhibit 3-8) is relatively low, the majority of the increase in future volumes (see Exhibit 3-16) is from background traffic growth. This is important because most of the increase in intersection delay summarized in Exhibit 3-30 (below) is from background traffic growth.

Exhibit 3-17 summarizes the 2040 PM peak hour ferry and non-ferry total entering intersection vehicle volumes and the percent of total entering vehicles that ferry traffic represents. As shown in Exhibit 3-17, the percent of traffic at the intersection that is ferry-related traffic increases towards the Mukilteo ferry terminal.

Exhibit 3-17. Total Entering Vehicle Volume by Ferry and Non-Ferry-Related Traffic (2040 PM Peak Hour)



Source: 2010 WSDOT Intersection Counts, PSRC Model, PM peak hour volumes are maximum volumes over a 1-hour span.

3.4.3 PM Peak Hour Ferry Vehicle Volumes and Circulation

The way vehicles circulate on roadways north of Second Street in the vicinity of the Mukilteo ferry terminal varies by alternative. The exhibits below illustrate the circulation of ferry-related vehicles in the terminal area and include drive-on vehicles, park-and-ride vehicles, pick-up/drop-off vehicles, and buses. In all alternatives, the majority of ferry-related vehicles arriving or departing the terminal area are either loading or unloading from the ferry.

No-Build Alternative

Vehicle circulation patterns for this alternative are the same as existing conditions, but with 2040 traffic volumes. Northbound vehicles boarding the ferry enter the holding area after crossing the SR 525 bridge over the BNSF tracks (see Exhibit 3-18). Southbound vehicles unloading from the ferry travel southbound on SR 525 (see Exhibit 3-19). Park-and-ride users are expected to continue to disperse around the terminal area depending on the availability of parking. Transit vehicles continue to use the two bus bays located in the southwest corner of SR 525 and Front Street and

pick-ups and drop-offs occur near the terminal. Exhibit 3-20 illustrates projected 2040 PM peak hour turning movement volumes for SR 525 and Mukilteo Boulevard.

Exhibit 3-18. 2040 PM Peak Hour Inbound Vehicle Volume Flows – No-Build Alternative

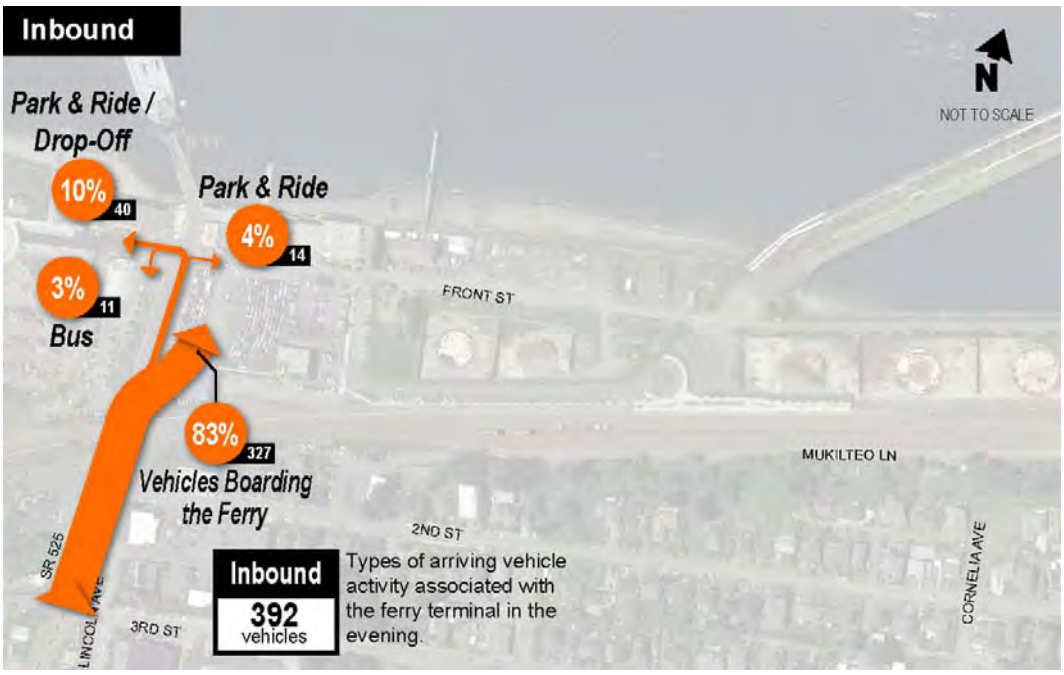
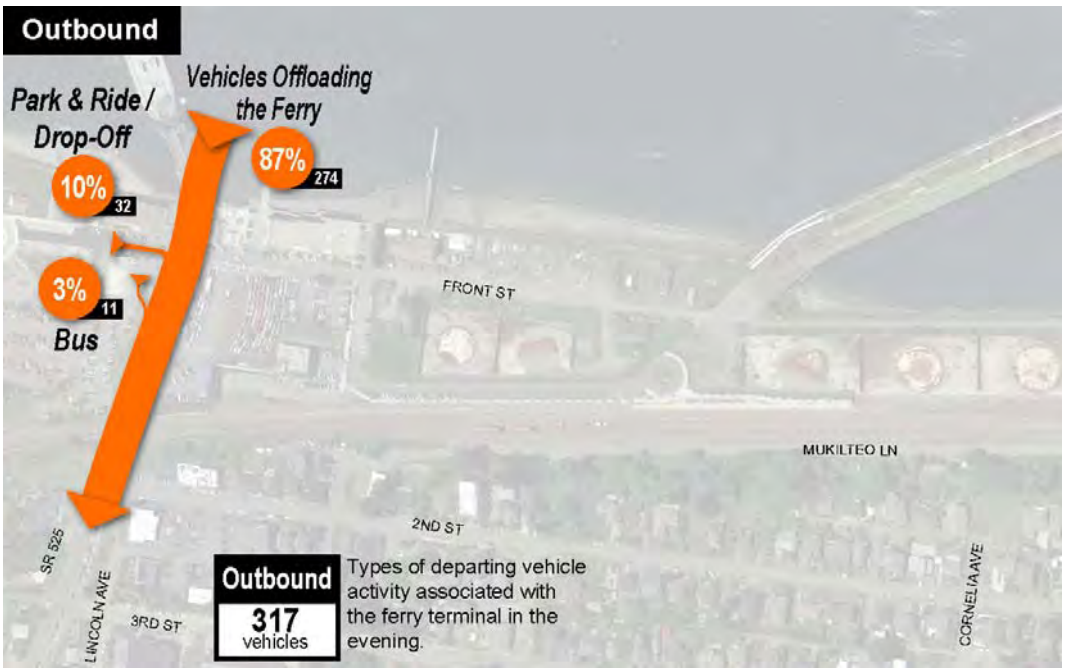



Exhibit 3-19. 2040 PM Peak Hour Outbound Vehicle Volume Flows – No-Build Alternative