

Mukilteo Multimodal Ferry Terminal



FINAL Travel Time Memorandum

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Executive Summary

Overview

To guide capital investment decisions relating to ferry service between the terminal at Clinton on Whidbey Island and a mainland destination, the Washington State Ferries (WSF) is evaluating alternative sites for the mainland ferry terminal. WSF is seeking to ensure that the site chosen would optimize travel efficiencies for its customers and maximize the benefit of their investment.

As part of the overall evaluation of alternative sites, WSF has developed this report to specifically evaluate travel time differentials. Although there are multiple potential sites still under evaluation, all geographically-proximate candidate locations have been aggregated into three general locations for the purpose of comparing regional travel times. The three (3) alternative ferry landing sites are:

1. Everett Ferry Terminal: South Terminal
2. Mukilteo Ferry Terminal: Existing
3. Edmonds Ferry Terminal: Existing

This Travel Time Memorandum will be part of a larger evaluation effort conducted as a staged screening process. The first stage of the process will be to evaluate all candidates and through iterative screening, narrow the number of candidates to those with the highest qualities. A more detailed evaluation will then be conducted on the remaining candidate sites.

The purpose of this memorandum is to quantify the amount of time necessary to travel from the various candidate sites to common destinations. For a more thorough examination of travel time comparisons, the trip data is segregated by mode for the different trip segments, and summarized by mode category.

The data presented shows the travel time required for a commuter to complete a trip commencing at the Clinton Ferry Terminal, passing through one of the three candidate ferry terminal locations (Everett, Mukilteo, or Edmonds) as the variable center point of the trip, and terminating at either (1) *The University of Washington*, or (2) *Downtown Seattle*. The termination point for the University of Washington by vehicle is Interstate 5, Exit 169: NE 45th Street and by bus is the bus stop at 15th Avenue NE and NE 41st Street. The termination point for Seattle by vehicle is Interstate 5, Exit 165B: Union Street and by bus is Stewart and 9th Avenue (closest stop to the Convention Place tunnel station). The termination point for Seattle by train is the King Street Station.

This analysis presents the data gathered and uses comparative analysis to compare travel times between the three alternative routes for the mainland ferry terminal.

Methodology

To provide a more detailed examination, the travel times between trip ends were segregated into four modes of travel:

- Single Occupancy Vehicle (SOV)
- High Occupancy Vehicle (HOV)

- 1 • Bus
- 2 • Train

3 A single occupant vehicle (SOV) is the most prevalent type of vehicle utilizing the
4 transportation system. A high occupancy vehicle (HOV) is any personal vehicle with an
5 occupancy of at least two. The bus mode is any public scheduled bus service. All
6 inferences to train refer to Sound Transit's scheduled Sounder Commuter Rail service.
7 The methodology employed in the development of this travel time analysis is
8 summarized as:

- 9 • Develop an algorithm incorporating the essential trip segment components for
10 each complete trip between origin and destination.
- 11 • Gather data germane to these components through existing sources
- 12 • Gather any data not available through existing sources (e.g. field measurement)
- 13 • Input the data to each element of the algorithm to derive the travel time for each
14 complete trip
- 15 • Present the trip time data to reveal comparative advantages

16 The algorithms used for this travel time study were comprised of several potential
17 elements that were combined as appropriate for each potential trip:

- 18 • Sailing time - applies to all pedestrians and commuters
- 19 • Disembarking time - applies to all pedestrians and commuters
- 20 • Local street access time to I-5 from the ferry terminals - applies to vehicular (non
21 bus/train) commuters
- 22 • I-5 commute time - applies to vehicular (non bus/train) commuters
- 23 • Walk time to bus stop or train depot - applies to pedestrians
- 24 • Wait time at bus stop or train depot - applies to pedestrians
- 25 • Bus or train route time - applies to pedestrians

26
27 Travel time was assigned to each of the above trip components and summed to arrive at
28 total trip time. The travel time assigned to each element of the algorithm was derived
29 from existing sources or measured using field observations and measurements. Vehicle
30 travel time in some segments was measured by directly measuring trip time while
31 flowing with the natural speed of traffic along the most efficient routes (floating car
32 technique).

33
34 Pedestrian travel times were measured by directly measuring the time of pedestrians on
35 existing trip segments, by walking and timing the anticipated pedestrian routes where
36 possible, and by calculating pedestrian travel time along anticipated future routes with an
37 assumed pedestrian walking speed of 4.5 feet/sec over the required distances. The
38 algorithm is stated and defined in Section 5 of the **Travel Time Study** and is presented
39 in its entirety in **Appendix B** with assigned travel times for each algorithm component.

40 **Findings**

- 41 • *Total Travel Time From Clinton to the University of Washington*

42
43
44 With the a sailing time of 15 minutes vs. Edmonds 50 minutes or Everett's 35 minutes,
45 total travel time for all modes from Clinton to the University of Washington favors the

1 existing Mukilteo alternative over the existing Edmonds and the proposed South
 2 Terminal at Everett. Transportation by train to the University of Washington is not
 3 available. Total travel time to the University of Washington from Clinton is summarized
 4 in Table 1.

5

6 **Table 1. Total Travel Time from Clinton to the University of Washington**
 7 **by Mode by Ferry Terminal**

To the University of Washington (mins)				
Terminal	Ferry/SOV	Ferry/HOV	Ferry/Bus	Ferry/Train
Everett	81.5	74.5	112.3	N/A
Mukilteo	54.6	50.7	92.1	N/A
Edmonds	75.7	73.4	120.5	N/A

8

9 • *Total Travel Time From Clinton To Downtown Seattle*

10 Again, due to sailing time, the total travel time from Clinton to downtown Seattle favors
 11 the existing Mukilteo alternative over the exiting Edmonds Ferry Terminal and South
 12 Terminal in Everett for SOV, HOV, bus, and train commuters. Travel time to downtown
 13 Seattle is summarized in Table 2.

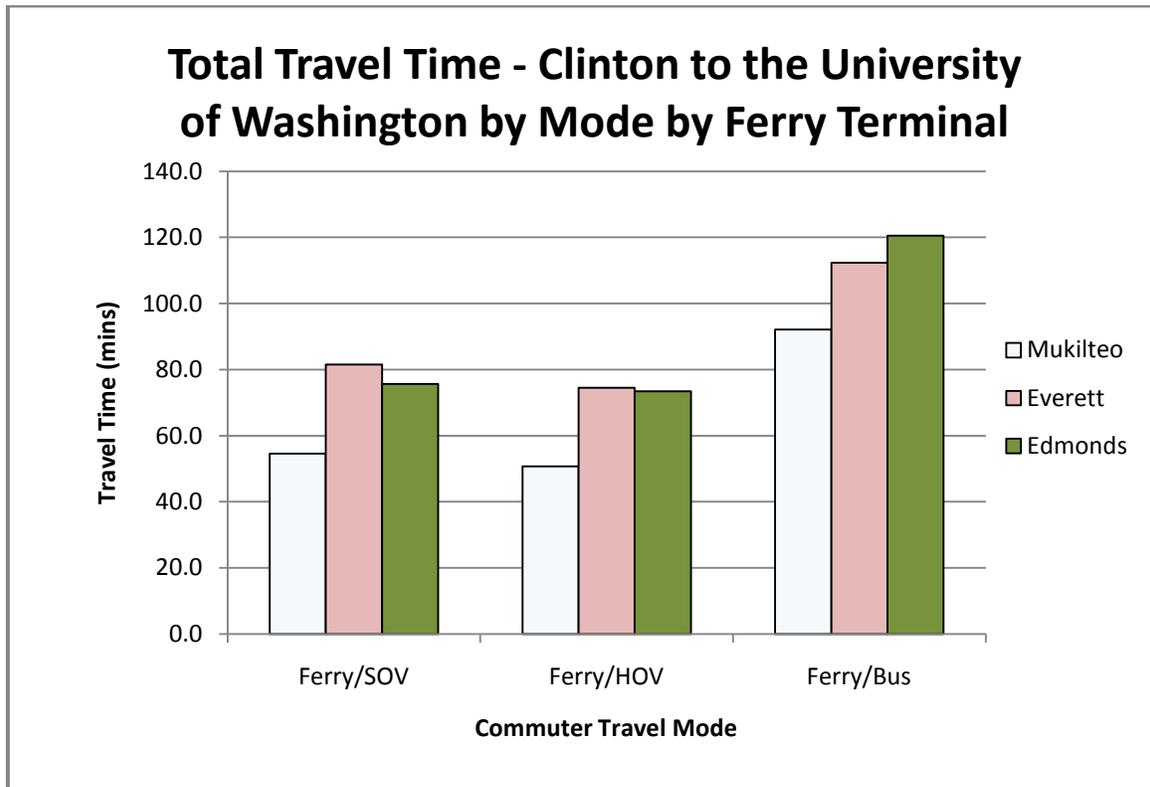
14 **Table 2. Total Travel Time from Clinton to Downtown Seattle by Mode by Ferry**
 15 **Terminal**

To Downtown Seattle (mins)				
	Ferry/SOV	Ferry/HOV	Ferry/Bus	Ferry/Train
Everett	87.0	78.9	96.3	104.3
Mukilteo	59.8	55.0	76.1	73.1
Edmonds	81.1	77.7	106.5	92.4

16

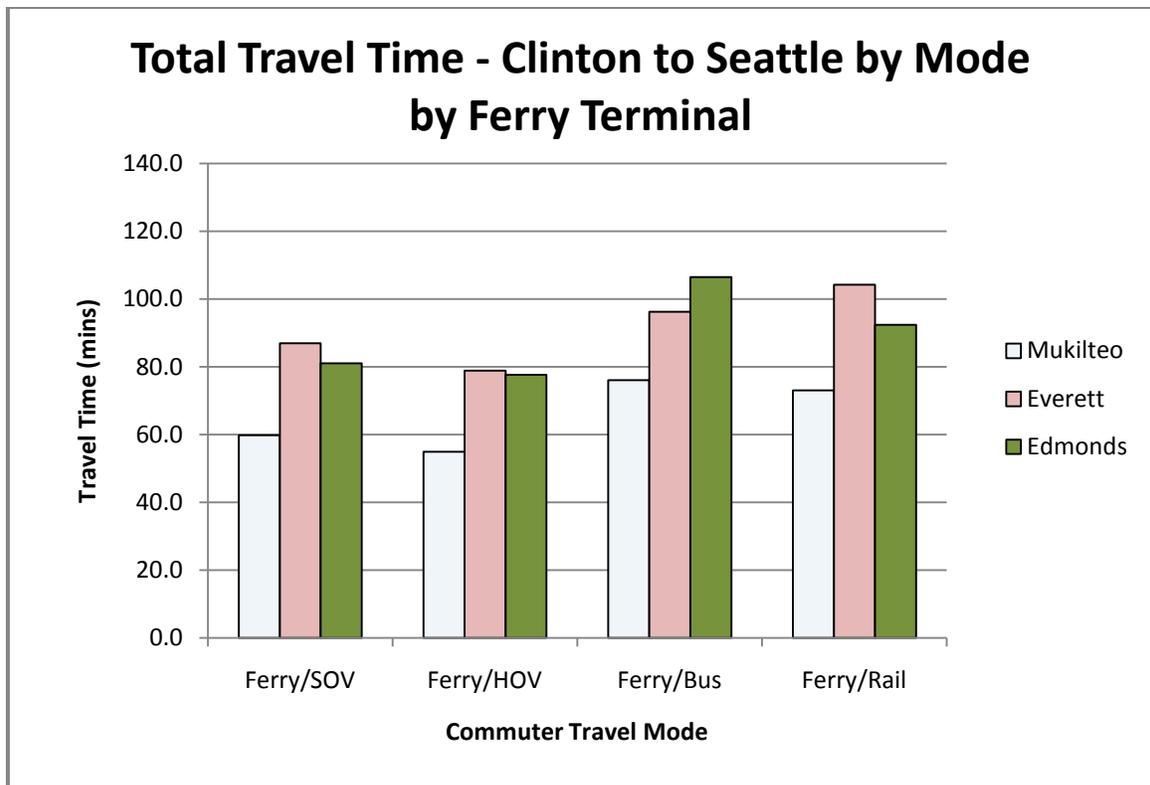
17 The results of the travel time study are shown graphically in Figures 1 and 2.

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Figure 1. Clinton to the University of Washington - Travel Time by Mode by Ferry Terminal



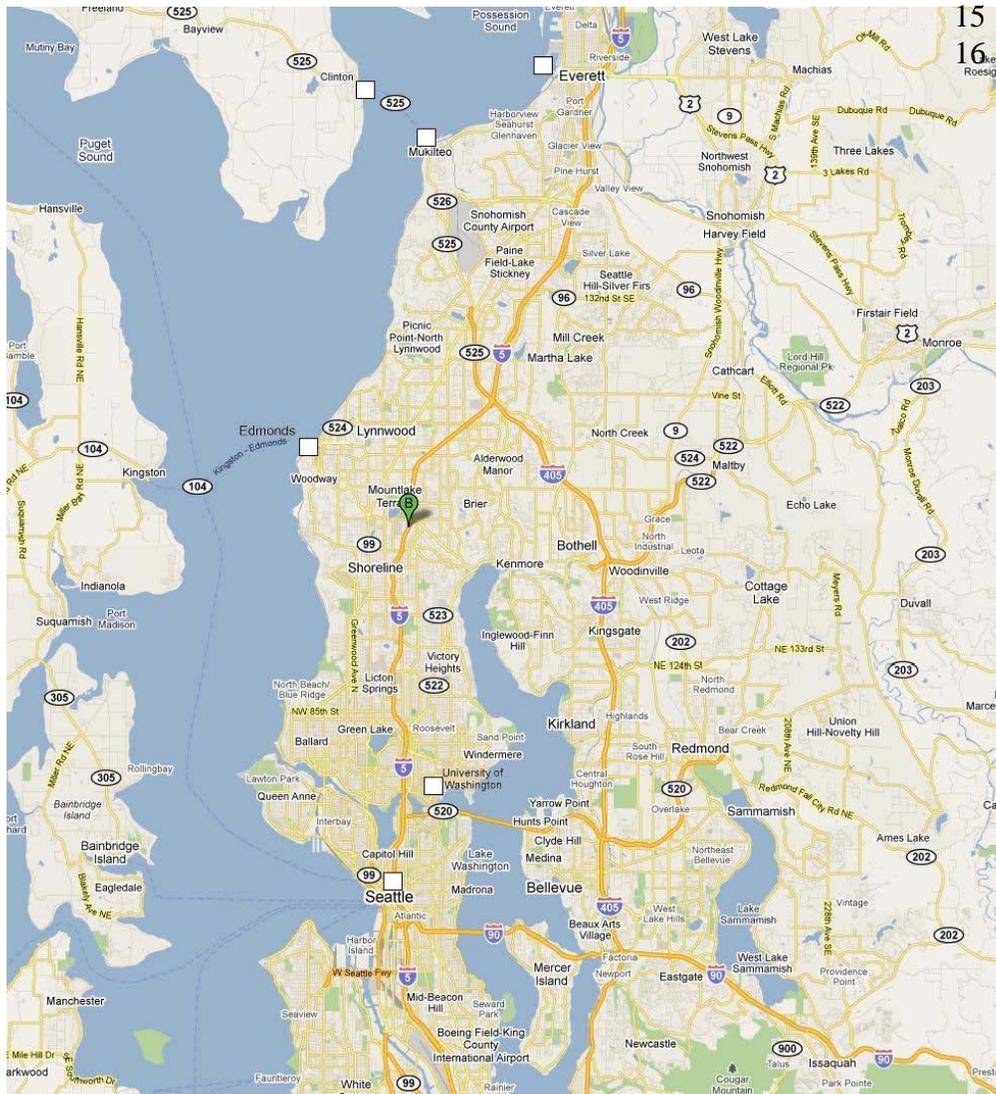
6
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Figure 2. Clinton to Downtown Seattle - Travel Time by Mode by Ferry Terminal

1 Mukilteo Multimodal Ferry Terminal Travel Time Memorandum

2 1. Purpose

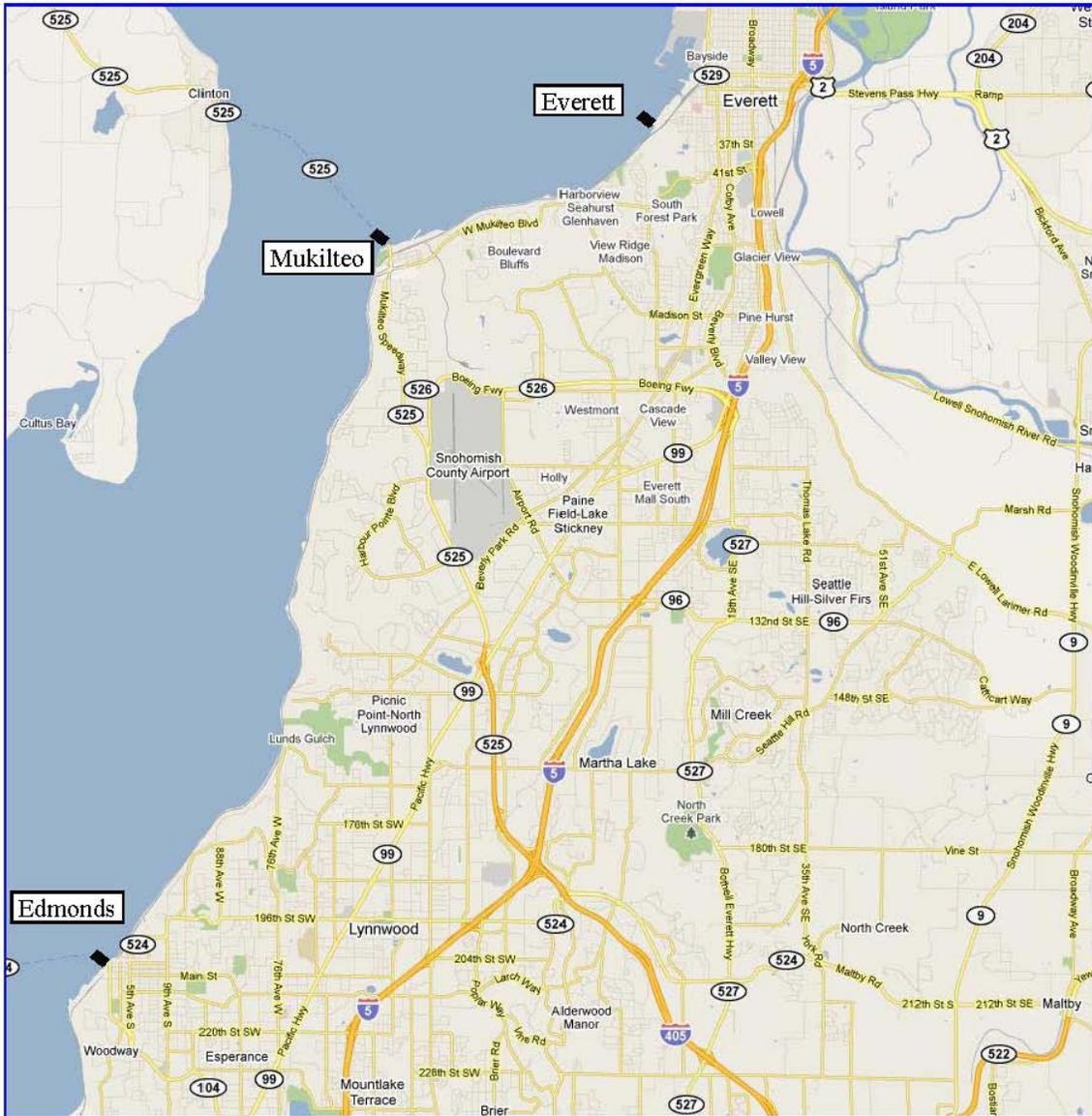
3 The purpose of this memorandum is to quantify the time required for a commuter to
4 complete a trip commencing at the Clinton Ferry Terminal and ending at either the
5 University of Washington or downtown Seattle destination as part of the overall
6 comparative evaluation of potential future alternative ferry terminal locations. The
7 Washington State Ferries seeks to quantify the amount of time necessary to complete
8 specific trip types between origin and destination with varying ferry terminal locations on
9 some representative trip routes which involve a ferry trip as one of the trip components.
10 The data will be used as part of the screening process seeking to evaluate potential site
11 locations. With this process, WSF hopes to reveal the strongest candidate locations for a
12 more focused analysis and further screening. Figure 3 is a vicinity map of the study area
13 including originating ferry terminal, mainland alternative ferry terminal sites, and study
14 destinations.



17 **Figure 3. Project Vicinity Map**

1 Although there are multiple potential specific sites still under evaluation, all
2 geographically-proximate candidate locations have been aggregated into three
3 generalized locations for the purpose of comparing regional travel times. The three (3)
4 alternative ferry landing sites are:

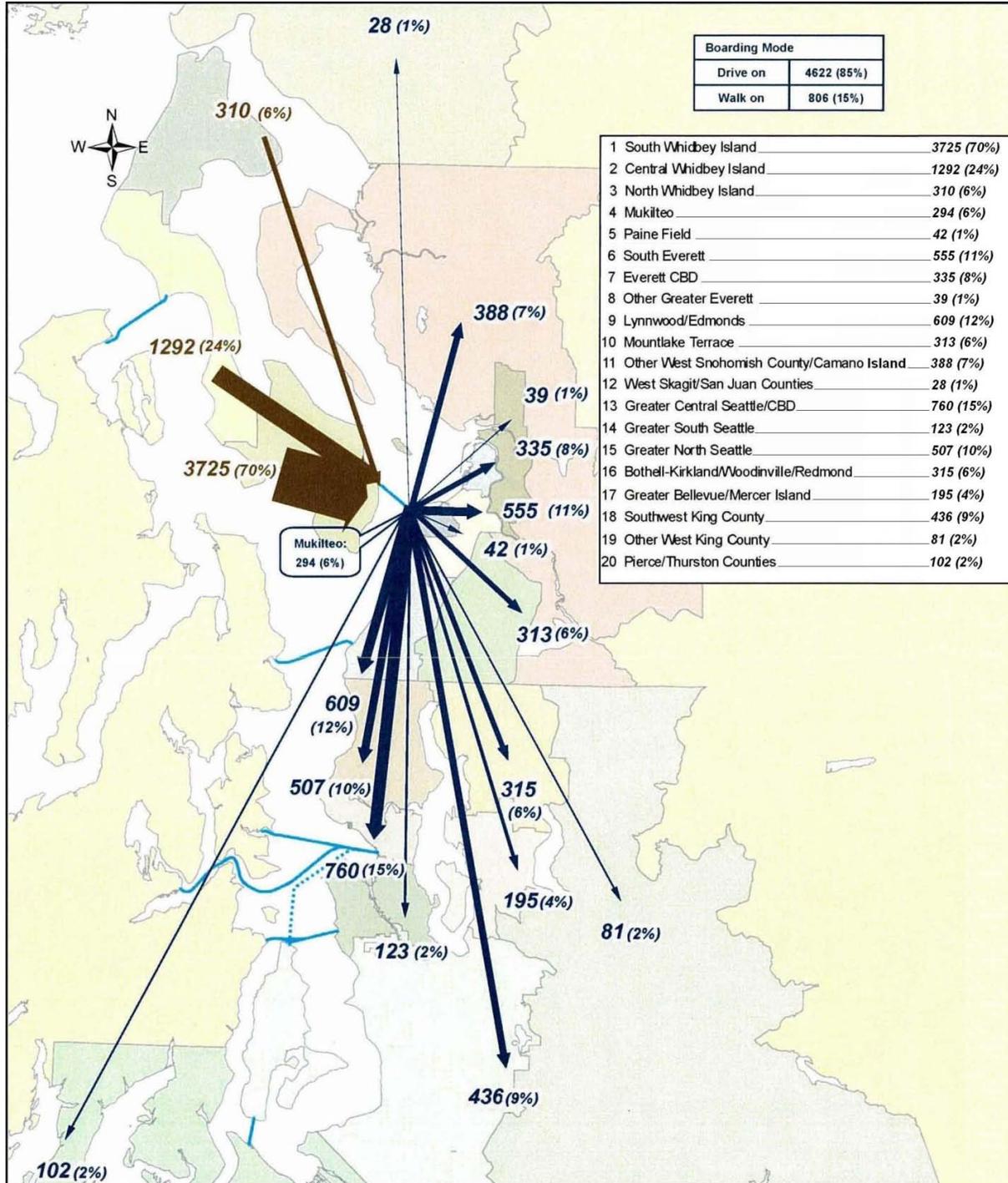
- 5 1. Everett Ferry Terminal: South Terminal
- 6 2. Mukilteo Ferry Terminal: Existing
- 7 3. Edmonds Ferry Terminal: Existing



8
9 **Figure 4. Multimodal Project Alternatives Site Map**

10

1 The WSF conducted an Origin and Destination study in 2006. Based on the survey,
 2 approximately 27% of all trips from Clinton went to the Seattle area. Results of the O&D
 3 study are shown in Figure 5. The data of the O&D study does not have a direct impact
 4 upon the travel time analysis, but is presented as supplementary reference information
 5 only.



6Figure 5. WSF O&D Study 2006 Results

7

1 **2. Study Assumptions**

2 Assumptions for the travel time study include:

- 3 • The morning commute peak period was considered to be 7AM to 9AM. The peak
- 4 hour for I-5 traffic was 7 AM to 8 AM.
- 5 • The provision of a dedicated shuttle bus to transport passengers to Everett Station.
- 6 • To simplify comparisons, all vehicles would use the same local street access route
- 7 to I-5 from the ferry terminals (See Appendix A for routes).
- 8 • A pedestrian walking speed of 4.5 ft./sec. was utilized to calculate pedestrian
- 9 travel time for proposed future pedestrian trip segments which could not be
- 10 measured.
- 11 • A fixed Clinton departure time (consistent among all eastside terminals)
- 12 • Existing bus routes
- 13 • Existing bus schedules
- 14 • Existing Sound Transit Commuter Rail schedule

15 Information for this study was either provided or field gathered and included:

- 16 • WSF’s *Origin and Destination Study* (2006)
- 17 • WSF’s *Long Range Plan*
- 18 • WSF rider statistics
- 19 • WSDOT and PSRC information regarding travel times on interstate freeways for
- 20 SOV, HOV and bus
- 21 • Floating car technique (field measurement of travel time from an observation
- 22 vehicle floating in the travel stream)
- 23 • King County Metro’s Trip Planner
- 24 • Sound Transit – Train Schedule/ Bus Schedule
- 25 • Community Transit – Bus Schedule

27 **3. Travel Time Study - Destinations**

28 In order to compare travel times, it was necessary to assign destinations common to each
29 mode of travel. Doing this allowed meaningful comparisons to be made, since origins
30 and destinations were the same. Trip termination points are shown in Table 3.

31 **Table 3. Trip Termination Points by Destination**

Destination	Travel Mode	Trip Termination Point
University of Washington	SOV - HOV	Exit 169 (I-5 and NE 45 th Street)
	Bus	15th Avenue NE & NE 41st Street
	Train	N/A
Downtown Seattle	SOV-HOV	Exit 165B (I-5 and Union St)
	Bus	Stewart and 9th (Convention Place Station)
	Train	King Street Station

33

1 **4. Data Sources**

2 Each of the trip components required data that was either provided by an outside source
 3 or gathered by INCA. Data sources are shown in Table 4.

4
 5 **Table 4. Data Sources**

Algorithm Element	Data Methodology
Sailing Times	
Sailing transit times from Clinton to Mukilteo	Collected from WSDOT’s Ferry schedule
Sailing transit time to proposed Everett and Edmonds Ferry Terminals	Provided by WSDOT’s Ferry staff
Disembarking/Walking/Waiting Times	
Vehicle and passenger disembarking times	Timed on-site during a field visit to Mukilteo and Edmonds Ferry Terminals. <i>(For South Terminal, times were calculated with an assumed pedestrian walking speed of 4.5 ft/sec and a vehicle speed of 30 mph using the proposed concept drawing for distances)</i>
Passenger walking times to bus stops and train depots	Timed by walking route. <i>(For South Terminal, walking times were calculated with an assumed pedestrian walking speed of 4.5 ft/sec)</i>
Passenger waiting times for bus and train	From field data and current schedules <i>(Wait times and transfer are estimated)</i>
Local Street Access to I-5	
Travel time from the proposed Everett Ferry Terminal to Everett Station via shuttle bus	Timed by floating vehicle. <i>(Field measurement of travel time from an observation vehicle floating in the travel stream)</i>
Travel times from the proposed Everett Ferry Terminal to I-5 SB via Pacific Ave	Timed by floating vehicle.
Travel time from the Edmonds Ferry Terminal to I-5 SB via SR-104	Timed by floating vehicle.
Travel time from the Mukilteo Ferry Terminal to I-5 SB via SR-525	Timed by floating vehicle.
I-5 Travel Times	
I-5 commute times from Everett, Mukilteo, and Edmonds to the University of Washington and downtown Seattle	Collected from the WSDOT’s <i>Seattle Area Travel Times</i> website
Bus/Train Travel Times	
Bus travel times	Collected using Metro’s <i>Trip Planner</i>
Train travel times	Collected using Sound Transit’s <i>Commuter Rail Schedule</i>

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5. Travel Time Algorithms Defined

For this analysis, all trips are defined as A.M. Peak hour inbound (Southbound) trips. This definition was chosen because it offers a common time for trip origin and reflects the period of highest travel demand. Each trip routing involves multiple components with varying modes of travel and periods of delay as modes are shifted during the trip. Each of the trip components have been broken out so that the time associated with each could be developed. Once broken out and a time value for each of the individual components assigned, the components of each trip were aggregated into a total trip time. The following section details these components for the trip types and modes.

Algorithms

- Vehicular Travel (SOV and HOV) Time = Sailing Time + Disembarking Time + Local Street Access Time + I-5 Travel Time to the destination
- Bus Travel Time = Sailing Time + Disembarking Time + Walking Time + Waiting Time + Route Time to the destination
- Train Travel Time = Sailing Time + Disembarking Time + Walking Time + Waiting Time + Route Time to the destination

The algorithm for bus and train travel time for Everett includes a shuttle bus to Everett Station:

- Bus Travel Time = Sailing Time + Disembarking Time + Walking Time + Shuttle Bus Time + Waiting Time + Route Time to the destination
- Train Travel Time = Sailing Time + Disembarking Time + Walking Time + Shuttle Bus Time + Waiting Time + Route Time to the destination

Algorithm Elements Defined

- **Sailing time** is the time required for the ferry to travel from the terminal at Clinton to one of the 3 alternative ferry landing terminals.
- **Disembarking time** is the time for passengers to exit the ferry and reach the beginning of the local street access (Mukilteo), ticket office exit door (Edmonds), or passenger building (Everett). Disembarking time for vehicles is the time for the last vehicle to exit the ferry and to reach the local access street. See Appendix C for passenger, vehicle and shuttle bus disembarking routes.
- **Local street access travel time** is the time required for vehicular traffic to reach I-5 from the ferry terminals using the local roadway network. See Appendix A for routes.
- **Walking times:**
 - Edmonds – Walked and timed from exit door to the bus stop or train depot (See Appendix D for routes)
 - Mukilteo - Walked and timed from Front Street to the bus stop or train depot (See Appendix D for routes)
 - Everett – Walk time was the estimated time required for passengers to walk from the passenger building to the bus stop at a walking speed of 4.5 feet/sec.
- **Waiting time** is the estimated time spent by passengers at the bus stop or train depot prior to boarding.

- **I-5 travel time** is the time required for SOV and HOV vehicles to reach the final destination.
- **Route time** is the time required for bus and trains to reach the final destination.
- **Shuttle bus time** is the time required for a shuttle bus to take passengers from the Everett ferry terminal to Everett Station. See Appendix A for route.

Travel Times

The travel time for each of the elements making up the travel time algorithm are shown in the following tables:

1. Sailing times as shown in Table 5.
2. Disembarking times as shown in Table 6 and 7.
3. Walk times to bus stop or train depot as shown in Table 8.
4. Wait times at bus stop or train depot as shown in Tables 9 and 10.
5. Bus or train route times as shown in Tables 11 and 12.
6. Bus or train total travel times as shown in Tables 13 and 14.
7. Local street access times to I-5 from ferry terminals as shown in Table 15.
8. I-5 travel times as shown in Table 16.

Table 5. Sailing Times

Sailing Times From Clinton (mins)		
To Edmonds	To Mukilteo	To Everett
50	15	35

WSF operations staff provided an exhibit showing approximate sailing times that were used for the Clinton to Everett and Clinton to existing Edmonds runs. The sailing time for Clinton to existing Mukilteo was gathered from the ferry system’s sailing schedule.

Table 6. Disembarking Times for Vehicles and Shuttle Bus

Mukilteo				
Vehicle Capacity	Actual # of Vehicles	First Vehicle Off	Last Vehicle Off	Disembarking Time (mins)
124	120	6:53:00	6:58:32	5.53
Edmonds				
Vehicle Capacity	Actual # of Vehicles	First Vehicle Off	Last Vehicle Off	Disembarking Time (mins)
202	120	11:22:20	11:27:49	5.86
Everett				
Vehicle Capacity	Actual # of Vehicles	First Vehicle Off	Last Vehicle Off	Disembarking Time (mins)
---	---	---	---	6.97
Shuttle Bus to Local Access Street				1.41

1 The disembarking time represents the time for the last vehicle to disembark the ferry and
 2 reach the local access street. It was assumed that the vehicular disembarking time at
 3 Mukilteo would be representative of the times for either Edmonds or Everett, as the serving
 4 ferry would be the same in either case. Although outside the window for the morning peak
 5 hour/period, the disembarking time for Edmonds was included as it correlated very closely
 6 with the disembarking time at Mukilteo. One hundred twenty vehicles disembarked at each
 7 facility. The slightly longer Edmond time is partially due to the disembarking distance: 700'
 8 vs. 300' at Mukilteo. The Everett time was assumed to be the same as Mukilteo plus the
 9 distance to the starting point of the local access street.

10 **Table 7. Disembarking Times (Passengers)**

Mukilteo		
First Passenger Off	Last Passenger Off	Disembarking Time (mins)
6:51:20	6:52:58	1.60
Edmonds		
First Passenger Off	Last Passenger Off	Disembarking Time (mins)
10:37:50	10:39:59	2.15
Everett		
First Passenger Off	Last Passenger Off	Disembarking Time (mins)
		1.1

11 The passenger disembarking time is the time for passengers to exit the ferry and reach the
 12 beginning of the local street access in the case of Mukilteo; the exit door of the ticket office
 13 in the case of Edmonds; or the passenger building in the case of Everett. As with the vehicle
 14 disembarking time, the passenger disembarking time represents the last passenger off. The
 15 passenger disembarking time for Everett was estimated from the Mukilteo time. As the
 16 disembarking route distance for the Everett Ferry Terminal was estimated to be 200' and that
 17 of Mukilteo 300', the time assigned to the Everett terminal was 2/3 that of Mukilteo or 1.1
 18 minutes.

19 **Table 8. Pedestrian Walking Times**

Walking Time		
	To Bus (mins)	To Train (mins)
Edmonds	1.3	3.2
Mukilteo	0.5	4.5
Everett	1.7	1.7

20 Recorded pedestrian walking times for the existing Mukilteo Ferry Terminal commenced at
 21 the intersection of Front Street and SR 525 and ended at the bus stop or the train depot.
 22 Walking times for the existing Edmonds Ferry Terminal commenced from the exit door of
 23 the passenger gangway inside the terminal's ticketing office and ended at the bus stop or the
 24 train depot. For the Everett Ferry Terminal, the walking time is from the passenger building
 25 to the bus bay(s) where the shuttle bus to Everett Station would depart. As it is not possible
 26 to provide an actual field time for the Everett Ferry Terminal, it was estimated from the
 27 proposed concept drawing using a walking speed of 4.5 ft/sec.

1 **Table 9. Bus Wait Times**

Bus to the University of Washington (15th Avenue NE & NE 41st Street)				
Everett - Ferry Arrives at 7:05	Bus Route ST 532 Everett Station to Ash Way P&R and Bay 3			Total Wait Time (mins)
Arrive at Everett Station 7:15	Wait Time (mins)	Departs	Arrives	
	2.0*	---	---	
	Transfer to Bus Route CT 880 Ash Way P&R to 15th Ave NE & NE 41st St			Total Wait Time (mins)
	Wait Time (mins)	Departs	Arrives	
	6.0	7:52	8:31	8.0*
Mukilteo - Ferry Arrives at 6:45	Bus Route CT 880 Hwy 525 & Front St to 15th Ave NE & NE 41st St			Total Wait Time (mins)
Arrive at Bus Stop at 6:48	Wait Time (mins)	Departs	Arrives	
	2.0	6:50	8:03	2.0
Edmonds - Ferry Arrives at 7:25	Bus Route CT 110 Railroad Ave & Main St to Lynnwood Transit Center			Total Wait Time (mins)
Arrive at Bus Stop at 7:29	Wait Time (mins)	Departs	Arrives	
	2.0*	---	---	
	Transfer to Bus Route CT 855 Lynnwood Transit Center to 15th Ave NE & NE 41st St			Total Wait Time (mins)
	Wait Time (mins)	Departs	Arrives	
	11.0	8:15	8:45	13.0*
Bus to Downtown Seattle (Convention Place Station)				
Everett - Ferry Arrives at 7:05	Bus Route ST 510 Everett Station to Stewart & 9th			Total Wait Time (mins)
Arrive at Everett Station 7:15	Wait Time (mins)	Departs	Arrives	
	0.0*	---	---	0.0*
Mukilteo - Ferry Arrives at 6:45	Bus Route CT 417 Ferry Terminal to Stewart & 9th			Total Wait Time (mins)
Arrive at Bus Stop at 6:48	Wait Time (mins)	Departs	Arrives	
	0.0	6:48	7:47	0.0*
Edmonds - Ferry Arrives at 7:25	Bus Route CT 404 Ferry Terminal to Stewart & 9th			Total Wait Time (mins)
Arrive at Bus Stop at 7:29	Wait Time (mins)	Departs	Arrives	
	0.0*	---	---	0.0*

*Wait Times have been revised and do not reflect actual wait times caused by existing bus service. See text below for explanation.

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3
4

1 This study chose to use the ferry departing Clinton at 6:30 AM to place vehicular ferry traffic
2 (SOV and HOV) onto the roadway network during the morning peak hour of traffic on I-5 (7
3 AM to 8 AM). The bus schedule was optimized for the early morning ferry arrivals at
4 Mukilteo, thereby reducing pedestrian wait times at the bus stop. However, this is not the
5 case for either Edmonds or Everett. Here, the ferries are arriving at “odd” times and the
6 existing bus schedules (at Edmonds and Everett Station) have not been optimized for these
7 arrivals. This creates an unfair condition in favor of Mukilteo: 4 minutes of wait time vs.
8 11.0 minutes each for Edmonds and Everett to the University of Washington destination and
9 0 minutes of wait time vs. 15.0 minutes (Everett Station) and 12.0 minutes (Edmonds) to the
10 Seattle destination. It was assumed that bus schedules could be aligned to better coincide
11 with the arriving ferries at Edmonds or Everett. Therefore, in the interests of fairness, the
12 wait times at the Edmonds and Everett ferry terminals have been equated with those of
13 Mukilteo. Trips to the University of Washington require a transfer for the Edmonds and
14 Everett Ferry sites, while Mukilteo has direct service to the UW. The wait times at the
15 transfer locations was left unchanged.

16
17 This study assumed that bus schedules could be revised at Edmonds and Everett to
18 accommodate morning ferry arrivals. In speaking with Community Transit and Everett
19 Transit staff, it was deemed possible to alter schedules and routes to accommodate the ferry
20 arrival times at either Everett or Edmonds. However, doing so is not as easy as it would
21 seem. A number of topics/issues were raised by the agencies:

- 22 • Community Transit (CT) would not provide service from the Everett Ferry terminal
23 to Everett Station. Service could be provided by Everett Transit, although a number
24 of key issues would have to be addressed.
- 25 • Everett Transit service levels to the ferry terminal could be similar to service levels
26 they now provide to Mukilteo.
- 27 • Capacity at Everett Station looms as a large concern as well as dedicated storage at
28 either terminus.
- 29 • Service for the transit agencies is not necessarily determined by the ferry schedule but
30 is incorporated within the routes that include other trip generators.
- 31 • Bus schedules are more often than not driven by transfer connections at facilities such
32 as transit centers.
- 33 • CT routes serving Edmonds already provide frequent (~30 minute headway) service.
- 34 • A CT study revealed that few walk-on passengers utilize CT route 416 from Edmonds
35 to Seattle. CT route 417 from Mukilteo to Seattle has more transfers than Edmonds.

36
37 Bus routes and times were collected using Metro’s and Community Transit’s *Trip Planner*.
38 At the Everett Ferry terminal location, the total bus wait time is the time from arrival at
39 Everett Station to the departure of the bus, plus any wait time at transfer locations. For the
40 existing Mukilteo Ferry, the total bus wait time is the time from arrival at the bus stop,
41 located at SR 525 and Front Street, to the departure of the bus. For the existing Edmonds
42 Ferry, the total bus wait time is the time from arrival at the bus stop, located on Railroad
43 Avenue approximately 250’ south of Main Street, to the departure of the bus plus any wait
44 time at transfer locations.

45

1 **Table 10. Train Wait Times**

Train to Downtown Seattle (King Street Station)				
Everett - Ferry Arrives at 7:05	Everett Station to King Street Station			Total Wait Time (mins)
Arrive at Everett Station 7:15	Wait Time (mins)	Departs	Arrives	
	0.0	7:15	8:14	0.0
Mukilteo - Ferry Arrives at 6:45	Mukilteo Train Depot to King Street Station			Total Wait Time (mins)
Arrive at Train Depot at 6:52	Wait Time (mins)	Departs	Arrives	
	4.0	6:56	7:44	4.0
Edmonds - Ferry Arrives at 7:25	Edmonds Train Depot to King Street Station			Total Wait Time (mins)
Arrive at Train Depot at 7:30	Wait Time (mins)	Departs	Arrives	
	4.0*	---	---	4.0*

2 *Wait Times have been revised and do not reflect actual wait times caused by existing train service. See text below for
 3 explanation.

4
 5 Train routes and times were collected using Sound Transit’s *Souder Commuter Rail*
 6 *Schedule*. For Everett and Edmonds, Souder train #1707 was used. For Mukilteo, Souder
 7 train #1705 was used. For the Everett Ferry terminal location, the total train wait time is the
 8 time from the arrival at Everett Station (by dedicated shuttle) to the departure of the train.
 9 For the existing Mukilteo and Edmonds Ferries, the total train wait time is the time from the
 10 arrival at the train depot to the departure of the train. As was the case with buses, in the
 11 interests of fairness, the wait times at the Edmonds ferry terminal has been equated with that
 12 of Mukilteo. There is no train route from the University of Washington to Downtown Seattle
 13 or from any of the ferry landing sites to the University.

14
 15 This study assumed that train schedules, like bus schedules, could be revised at Edmonds or
 16 Everett to better accommodate morning ferry arrivals. In speaking with Souder staff, it was
 17 deemed not impossible to alter schedules to accommodate the ferry arrival times at either
 18 Everett or Edmonds. Again, doing so is not as easy as it would seem. A number of
 19 topics/issues were raised by the agency:

- 20 • Limited access to tracks.
- 21 • Coordination issues with Amtrak’s Cascade train service, as well as regularly
- 22 scheduled freight train service.
- 23 • Coordination issues (headways, etc.) with transit agencies that provide service to the
- 24 existing train depots.
- 25 • Easement leasing fees.

1

Table 11. Bus Route Times

Bus to the University of Washington (15th Avenue NE & NE 41st Street)				
Everett - Ferry Arrives at 7:05	Bus Route ST 532 Everett Station to Ash Way P&R and Bay 3			Total Route Time (mins)
Arrive at Everett Station 7:15	Departs	Arrives	Travel Time (mins)	
	7:26	7:46	20.0	
	Transfer to Bus Route CT 880 Ash Way P&R to 15th Ave NE & NE 41st St			Total Route Time (mins)
	Departs	Arrives	Travel Time (mins)	
	7:52	8:31	39.0	59.0
Mukilteo - Ferry Arrives at 6:45	Bus Route CT 880 Hwy 525 & Front St to 15th Ave NE & NE 41st St			Total Route Time (mins)
Arrive at Bus Stop at 6:48	Departs	Arrives	Travel Time (mins)	
	6:50	8:03	73.0	73.0
Edmonds - Ferry Arrives at 7:25	Bus Route CT 110 Railroad Ave & Main St to Lynnwood Transit Center			Total Route Time (mins)
Arrive at Bus Stop at 7:29	Departs	Arrives	Travel Time (mins)	
	7:40	8:04	24.0	
	Transfer to Bus Route CT 855 Lynnwood Transit Center to 15th Ave NE & NE 41st St			Total Route Time (mins)
	Departs	Arrives	Travel Time (mins)	
	8:15	8:45	30.0	54.0
Bus to Downtown Seattle (Convention Place Station)				
Everett - Ferry Arrives at 7:05	Bus Route ST 510 Everett Station to Stewart & 9th			Total Route Time (mins)
Arrive at Everett Station 7:15	Departs	Arrives	Travel Time (mins)	
	7:30	8:21	51.0	51.0
Mukilteo - Ferry Arrives at 6:45	Bus Route CT 417 Hwy 525 & Front St to Stewart & 9th			Total Route Time (mins)
Arrive at Bus Stop at 6:48	Departs	Arrives	Travel Time (mins)	
	6:48	7:47	59.0	59.0
Edmonds - Ferry Arrives at 7:25	Bus Route CT 404 Railroad Ave & Main St to Stewart & 9th			Total Route Time (mins)
Arrive at Bus Stop at 7:29	Departs	Arrives	Travel Time (mins)	
	7:41	8:34	53.0	53.0

2

1 The total bus route time is the time from bus departure to arrival at the final location,
 2 including transfer route times. From the Everett Ferry Terminal to the University of
 3 Washington, the total bus route time is the time from bus departure at Everett Station on
 4 route ST 532 to arrival at Ash Way P&R and Bay 3 plus the time from bus departure at Ash
 5 Way P&R and Bay 3 on route CT 880 to arrival at 15th Avenue NE and NE 41st Street.

6
 7 From the existing Mukilteo Ferry Terminal to the University of Washington, the total bus
 8 route time is the time from bus departure at the bus stop on SR 525 and Front Street on route
 9 CT 880 to arrival at 15th Avenue NE and NE 41st Street.

10
 11 From the existing Edmonds Ferry Terminal to the University of Washington, the total bus
 12 route time is the time from bus departure at the bus stop on Railroad Avenue and Main Street
 13 on route CT 110 to arrival at Lynwood Transit Center plus the time from bus departure at
 14 Lynwood Transit Center on route CT 855 to arrival at 15th Avenue NE and NE 41st Street.

15
 16 From the Everett Ferry Terminal to Convention Place Station (Bus stop is at Stewart and 9th
 17 Avenue) in downtown Seattle, the total bus route time is the time from bus departure at
 18 Everett Station on route ST 510 to arrival at Stewart and 9th Avenue.

19
 20 From the existing Mukilteo Ferry Terminal to Convention Place Station (Bus stop is at
 21 Stewart and 9th Avenue) in downtown Seattle, the total bus route time is the time from bus
 22 departure at the bus stop on SR 525 and Front Street on route CT 417 to arrival at Stewart
 23 and 9th Avenue.

24
 25 From the existing Edmonds Ferry Terminal to Convention Place Station (Bus stop is at
 26 Stewart and 9th Avenue) in downtown Seattle, the total bus route time is the time from bus
 27 departure at the bus stop on Railroad Avenue and Main Street on route CT 404 to arrival at
 28 Stewart and 9th Avenue.

29
 30 **Table 12. Train Route Times**

Train to Seattle (King Street Station)			
Everett - Ferry Arrives at 7:05	Everett Station to King Street Station		Total Route Time (mins)
Arrive at Everett Station 7:15	Departs 7:15	Arrives 8:14	
			59.0
Mukilteo - Ferry Arrives at 6:45	Mukilteo Train Depot to King Street Station		Total Route Time (mins)
Arrive at Train Depot at 6:52	Departs 6:56	Arrives 7:44	
			48.0
Edmonds - Ferry Arrives at 7:25	Edmonds Train Depot to King Street Station		Total Route Time (mins)
Arrive at Train Depot at 7:30	Departs 7:41	Arrives 8:14	
			33.0

1 The total train route time is the time from departure at the either Everett Station, the Mukilteo
 2 train depot, or the Edmonds train depot to the arrival at King Street Station.

3 **Table 13. Bus Total Travel Times**

Origin	To the University of Washington (15th Avenue NE & NE 41st Street)	To Seattle (Convention Place Station)
	Total Travel Time (mins)	Total Travel Time (mins)
From Everett	67.0	51.0
From Mukilteo	75.0	59.0
From Edmonds	67.0	53.0

4
 5 Bus total travel times include wait time at Everett Station or the bus stops located near the
 6 existing Mukilteo and Edmonds ferry terminals and the actual route travel time to the
 7 University of Washington or to Seattle, including any transfer wait and route times. The bus
 8 routes and times were collected from Metro’s *Trip Planner*. These times do not account for
 9 timetables being subjected to future adjustments or rescheduling of intermodal connectivities.

10 **Table 14. Train Total Travel Times**

Origin	To the University of Washington	To Seattle (King Street Station)
	Total Travel Time (mins)	Total Travel Time (mins)
From Everett	N/A	59.0
From Mukilteo	N/A	52.0
From Edmonds	N/A	37.0

11
 12 Train total travel times include wait time at Everett Station and the train depots near the
 13 existing Mukilteo and Edmonds ferry terminals and the actual route travel time to King Street
 14 Station in Downtown Seattle. There is no train route available to the University of
 15 Washington.

16 **Table 15. Local Street Access Times to I-5 and Shuttle Bus Time**
 17 **to Everett Station**

Route	Distance (miles)	Travel Time (mins)
Edmonds to I-5 SB		
Via SR 104	4.7	8.3
Mukilteo to I-5 SB		
Via SR 525	8.9	15.7
Everett Ferry Terminal to I-5 SB (I-5 at NE 41st St)		
Via Pacific Ave	2.3	5.6
Shuttle Bus – Local Access Street to Everett Station		
Via Hewitt Ave	1.4	6.1

18

1 A floating vehicle technique was utilized for this part of the study. The term for this
 2 methodology refers to the technique of timing the trip segment while “floating” in a vehicle
 3 along the most reasonable route at a pace conforming with the resident traffic flow.
 4 Typically, several runs along the route are measured by the floating vehicle with average
 5 travel time calculated. The floating vehicle technique is useful in obtaining average travel
 6 time for the run. In this exercise, two runs were made for each route and averaged. The local
 7 access street routes are shown in Appendix A.

8

Table 16. I-5 Travel Times

Terminal	Destination	Originating Mile Post #	Destination Mile Post #	Travel Distance (mi)	Distance as a % of the Everett to Seattle Distance	UW Distance as a % of the Terminal to Seattle Distance	Mode	Travel Time (mins)
Everett	Seattle	192.8 (I-5 at NE 41 st St.)	165.7	27.1	---	---	SOV	39.4
							HOV	31.3
	The University of Washington		169.5	23.3	---	86.0%	SOV	33.9
							HOV	26.9
Mukilteo	Seattle	182.2 (I-5 at SR 525)	165.7	16.5	60.9%	---	SOV	23.6
							HOV	18.8
	The University of Washington		169.5	12.7	---	77.0%	SOV	18.2
							HOV	14.5
Edmonds	Seattle	177.5 (I-5 at SR 104)	165.7	11.8	43.5%	---	SOV	16.9
							HOV	13.5
	The University of Washington		169.5	8.0	---	67.8%	SOV	11.5
							HOV	9.2

10

11 The travel time shown for Everett to Seattle was gathered using the WSDOT’s *Travel Time*
 12 website. Distances were derived using mile post numbers found on the WSDOT’s state route
 13 website. As there are no I-5 travel times reported from Mukilteo (SR 525) to downtown
 14 Seattle or from Edmonds (SR 104) to downtown Seattle, estimates were made. The times
 15 assigned to those trips were in portion to their length relative to the website’s full length
 16 Everett to Seattle distance, which starts at NE 41st Street and I-5 in Everett. These
 17 percentages were applied to WSDOT’s reported travel time from Everett to downtown
 18 Seattle via I-5 to yield the SOV and HOV times for Mukilteo and Edmonds.

19

20 The WSDOT website does not include travel times from any of the origins to the University
 21 of Washington, therefore, these times were estimated. The I-5 travel time assigned to
 22 Edmonds and Mukilteo to the University of Washington were in proportion to their
 23 individual I-5 length to downtown Seattle. As seen from Table 16, the distance from Everett
 24 to University of Washington via I-5 was determined to be 23.3 miles or 86.0% of the distance
 25 from Everett to Seattle. The distances to the University of Washington via I-5 corresponded
 26 to 77.0% and 67%.8 of their I-5 distances from Mukilteo and Edmonds respectively.

27

1 **6. Travel Time Summary**

2 The summarized travel times reported in Tables 17, 18 and 19 are the result of compiling the
3 data as defined in the above tables and entering it into the travel algorithm defined in **Section**
4 **5**. All of travel times shown in these Tables are for the trip commencing at Clinton.
5

6 As shown in the Tables, the Mukilteo location for a ferry terminal provides the lowest travel
7 times to both of the trip-end destinations.
8
9

10 **Table 17. Travel Time Using the Everett Ferry Terminal**

Total Travel Time from Clinton via Everett (minutes)		
	To the University of Washington	To Downtown Seattle
Ferry/SOV	81.5	87.0
Ferry/HOV	74.5	78.9
Ferry/Bus	112.3	96.3
Ferry/Train	N/A	104.3

11
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Table 18. Travel Time Using the Mukilteo Ferry Terminal

Total Travel Time from Clinton via Mukilteo (mins)		
	To the University of Washington	To Downtown Seattle
Ferry/SOV	54.6	59.8
Ferry/HOV	50.7	55.0
Ferry/Bus	92.1	76.1
Ferry/Train	N/A	73.1

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16

Table 19. Travel Time Using the Edmonds Ferry Terminal

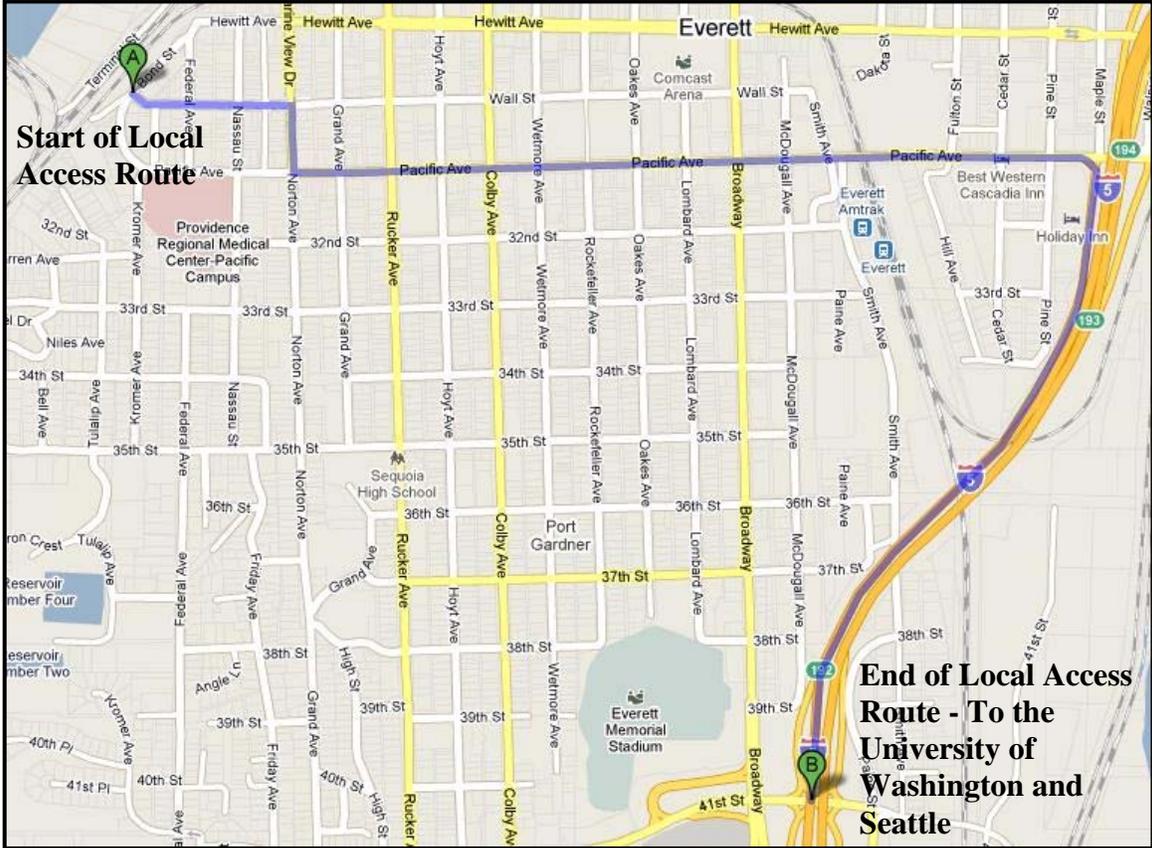
Total Travel Time from Clinton via Edmonds (mins)		
	To the University of Washington	To Downtown Seattle
Ferry/SOV	75.7	81.1
Ferry/HOV	73.4	77.7
Ferry/Bus	120.5	106.5
Ferry/Train	N/A	92.4

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APPENDIX A
Local Street Access Routes

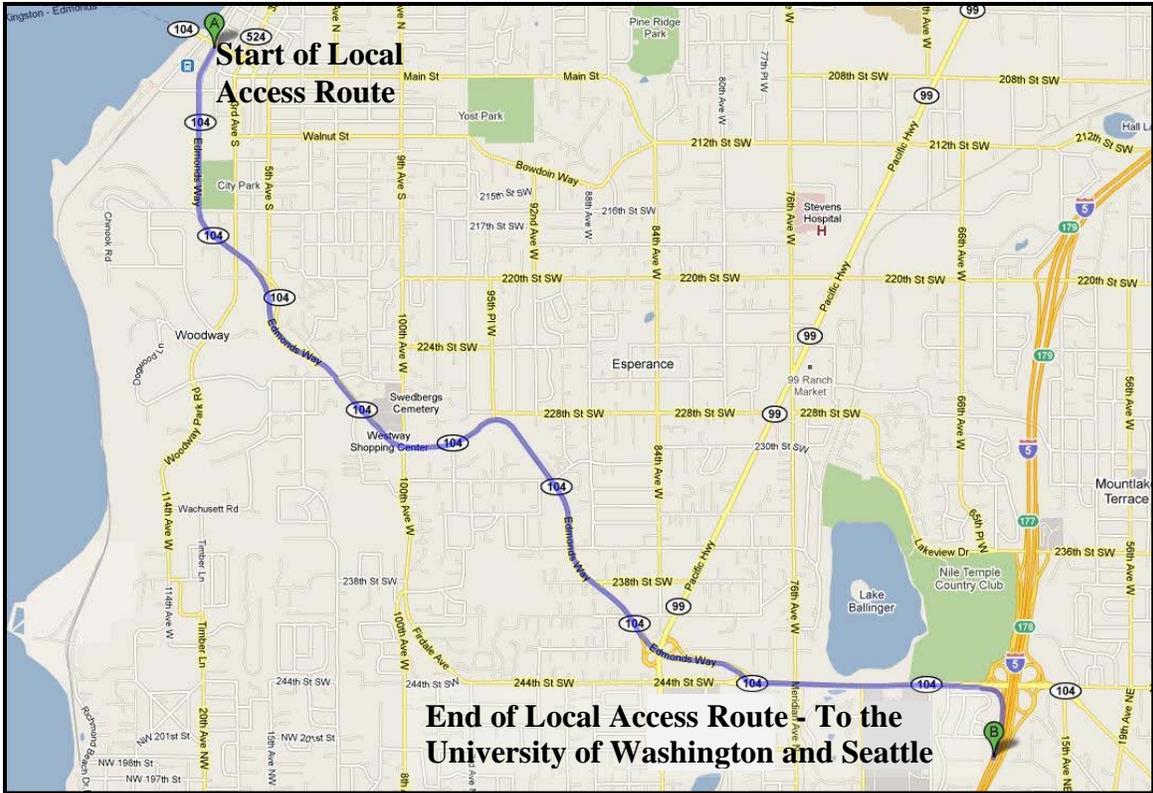


1 Local Street Access – Everett Ferry Terminal to Everett Station

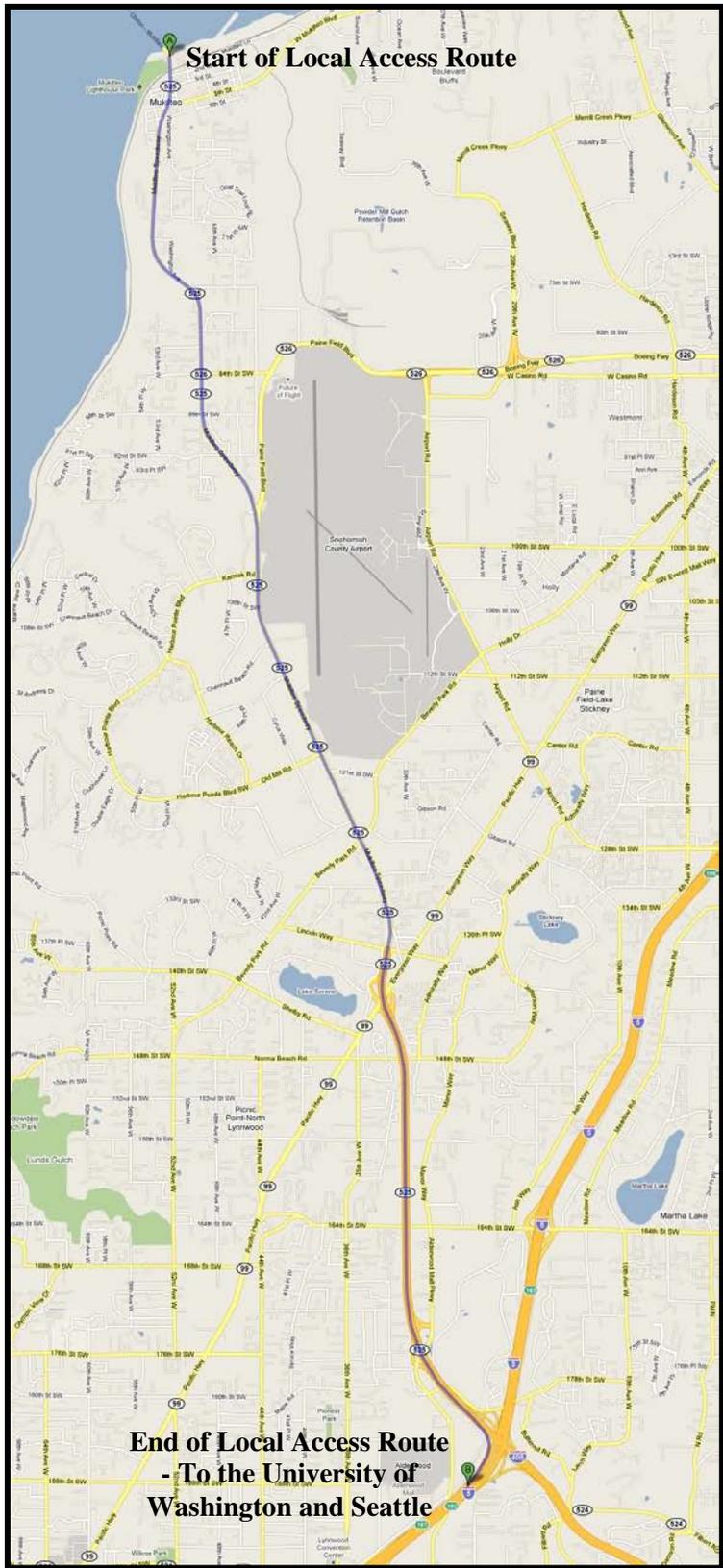


2 Local Street Access – Everett Ferry Terminal to I-5 Southbound

3



- 1
- 2 Local Street Access – Edmonds Ferry Terminal to I-5 Southbound
- 3



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2

Local Street Access – Mukilteo Ferry Terminal to I-5 Southbound

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APPENDIX B
Complete Algorithm Table

Complete Algorithm Table

EVERETT										
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +	Local Access Time (mins) +				I-5 Time (mins)	TOTAL (mins)
Vehicular	To University of Washington	SOV	35.0	6.97	5.6				33.9	81.5
		HOV	35.0	6.97	5.6				26.9	74.5
	To Seattle	SOV	35.0	6.97	5.6				39.4	87.0
		HOV	35.0	6.97	5.6				31.3	78.9
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +		Walk Time (mins) +	Shuttle Time (mins) +	Wait Time (mins) +	Route Time (mins)	TOTAL (mins)
Bus	To University of Washington		35.0	1.10		1.7	7.5*	8.0	59.0	112.3
	To Seattle		35.0	1.10		1.7	7.5*	0.0	51.0	96.3
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +		Walk Time (mins) +	Shuttle Time (mins) +	Wait Time (mins) +	Route Time (mins)	TOTAL (mins)
Train	To Seattle		35.0	1.10		1.7	7.5*	0.0	59.0	104.3
MUKILTEO										
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +	Local Access Time (mins) +				I-5 Time (mins)	TOTAL (mins)
Vehicular	To University of Washington	SOV	15.0	5.53	15.7				18.2	54.6
		HOV	15.0	5.53	15.7				14.5	50.7
	To Seattle	SOV	15.0	5.53	15.7				23.6	59.8
		HOV	15.0	5.53	15.7				18.8	55.0
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +		Walk Time (mins) +		Wait Time (mins) +	Route Time (mins)	TOTAL (mins)
Bus	To University of Washington		15.0	1.60		0.5		2.0	73.0	92.1
	To Seattle		15.0	1.60		0.5		0.0	59.0	76.1
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +		Walk Time (mins) +		Wait Time (mins) +	Route Time (mins)	TOTAL (mins)
Train	To Seattle		15.0	1.60		4.5		4.0	48.0	73.1
EDMONDS										
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +	Local Access Time (mins) +				I-5 Time (mins)	TOTAL (mins)
Vehicular	To University of Washington	SOV	50.0	5.86	8.3				11.5	75.7
		HOV	50.0	5.86	8.3				9.2	73.4
	To Seattle	SOV	50.0	5.86	8.3				16.9	81.1
		HOV	50.0	5.86	8.3				13.5	77.7
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +		Walk Time (mins) +		Wait Time (mins) +	Route Time (mins)	TOTAL (mins)
Bus	To University of Washington		50.0	2.15		1.3		13.0	54.0	120.5
	To Seattle		50.0	2.15		1.3		0.0	53.0	106.5
Travel Time =			Sailing Time (mins) +	Disembarking Time (mins) +		Walk Time (mins) +		Wait Time (mins) +	Route Time (mins)	TOTAL (mins)
Train	To Seattle		50.0	2.15		3.2		4.0	33.0	92.4

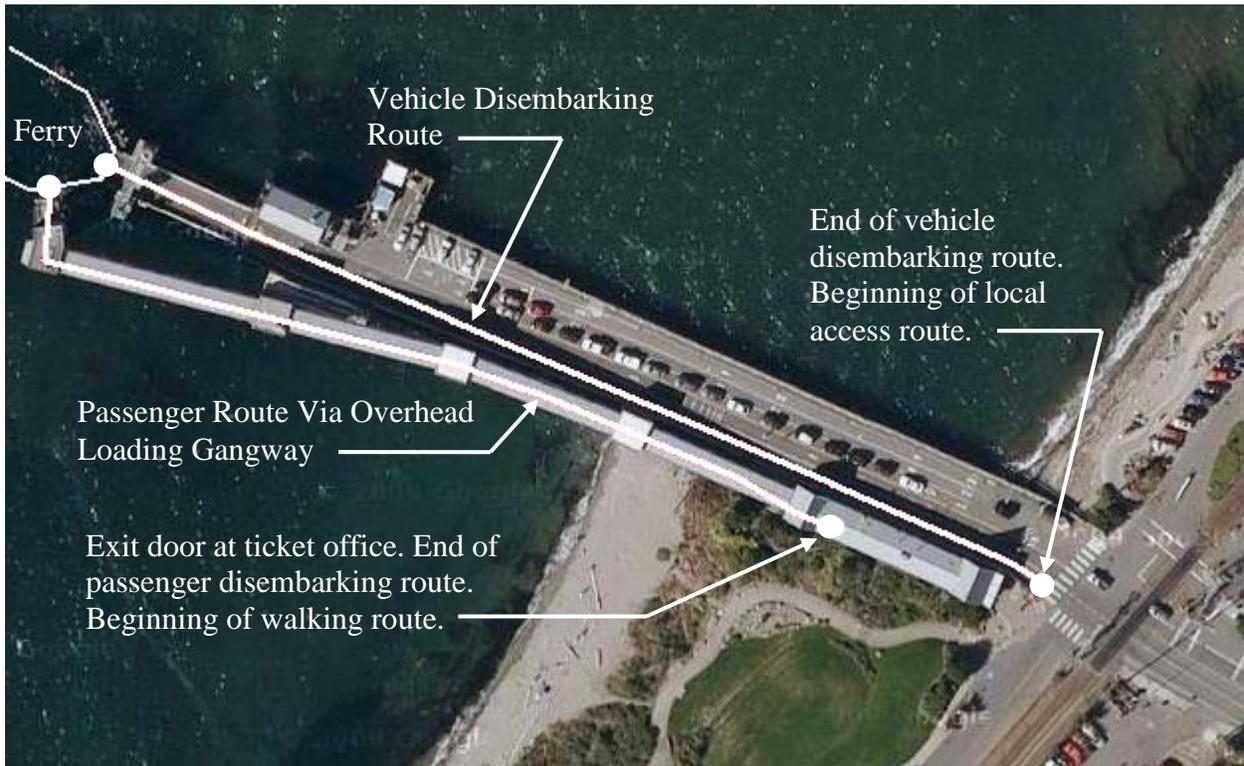
1 *This is the sum of 1.4 minutes from shuttle bus bay to the local access route + 6.1 minutes of the local access route to Everett Station.

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APPENDIX C
Disembarking Routes Defined

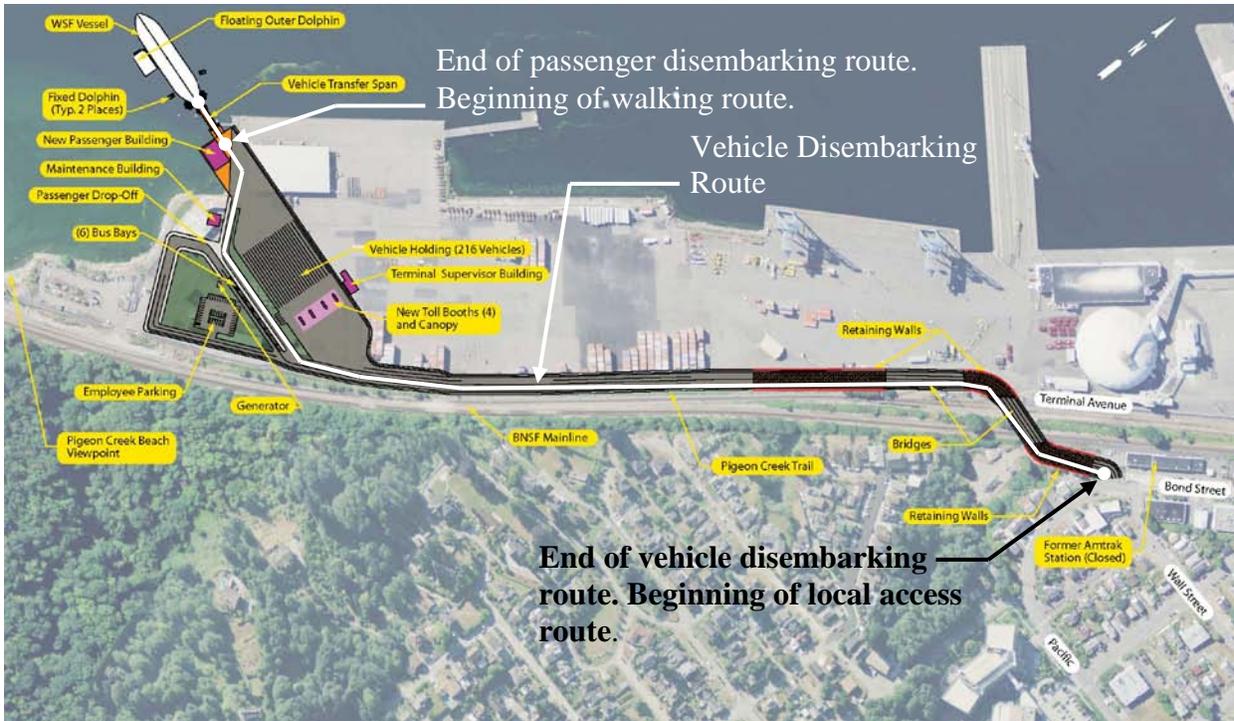


1 Passenger and Vehicular Disembarking Route – Mukilteo Ferry Terminal

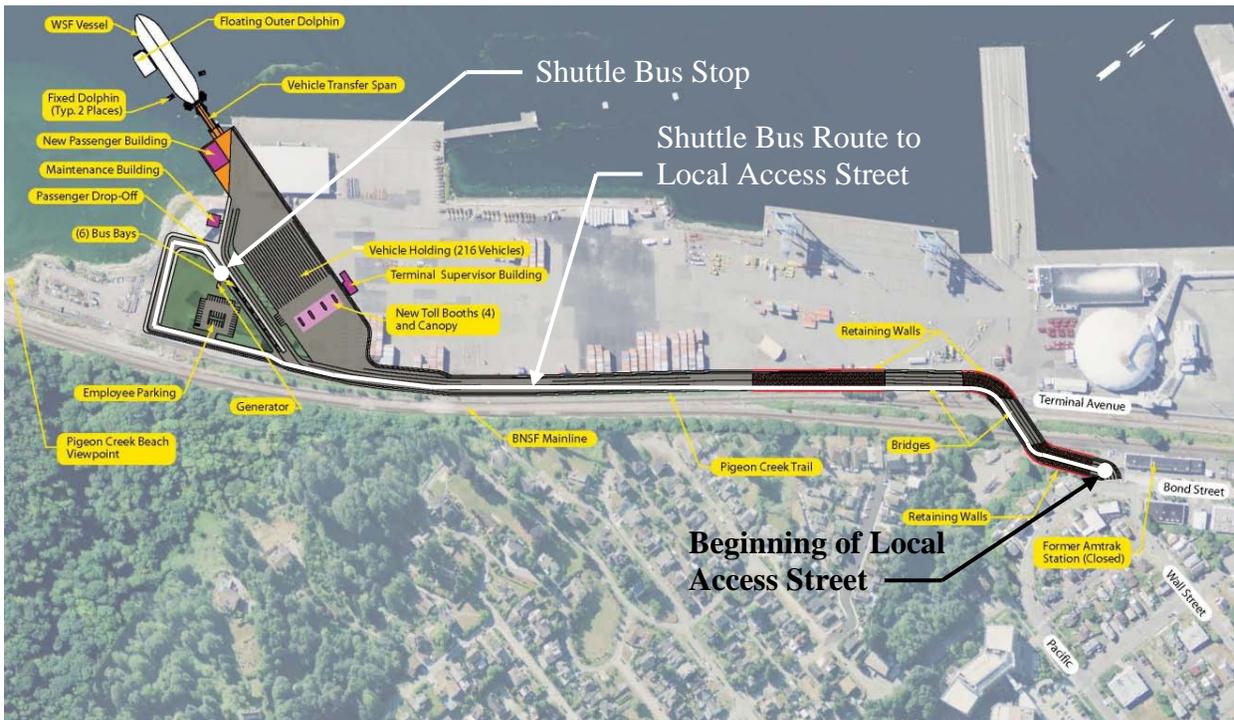


2 Passenger and Vehicular Disembarking Route – Edmonds Ferry Terminal

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1
2 Passenger and Vehicular Disembarking Route – Everett Ferry Terminal
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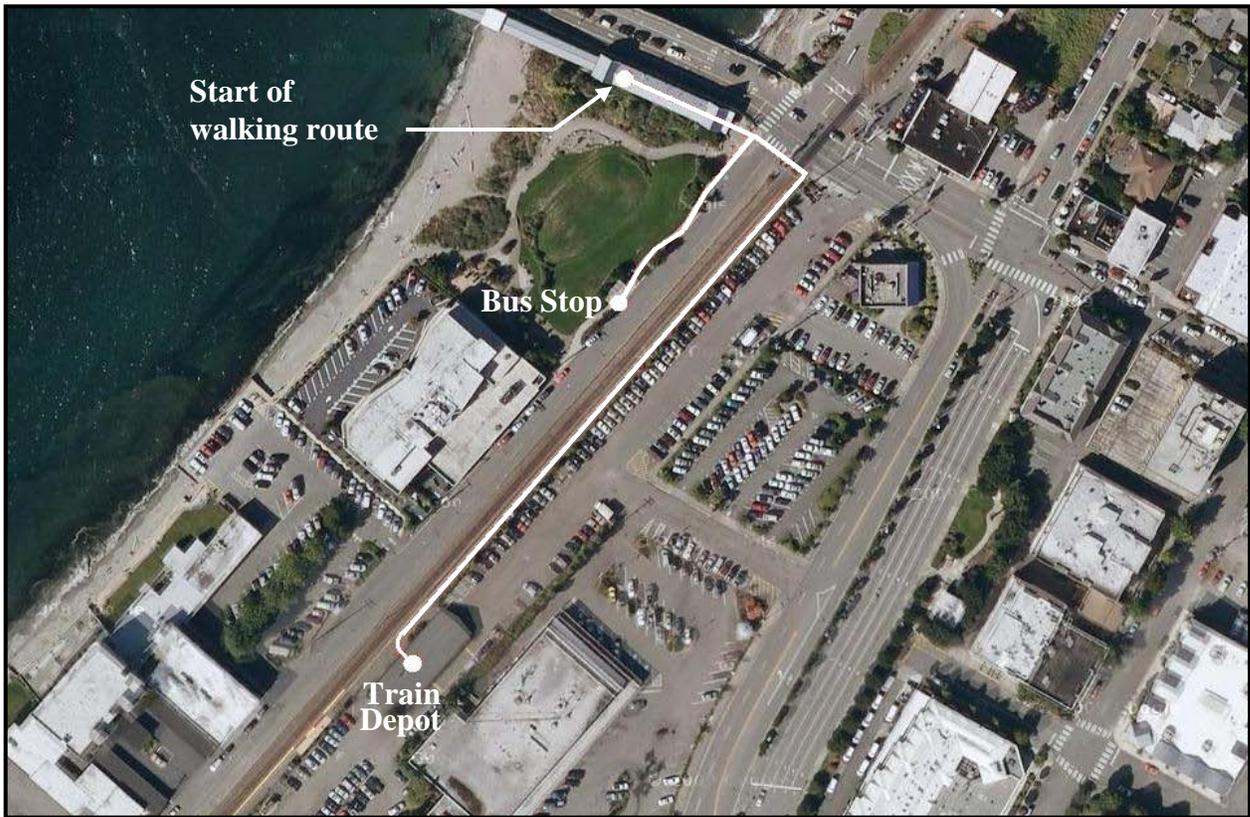
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5 Shuttle Bus Route to Local Access Street

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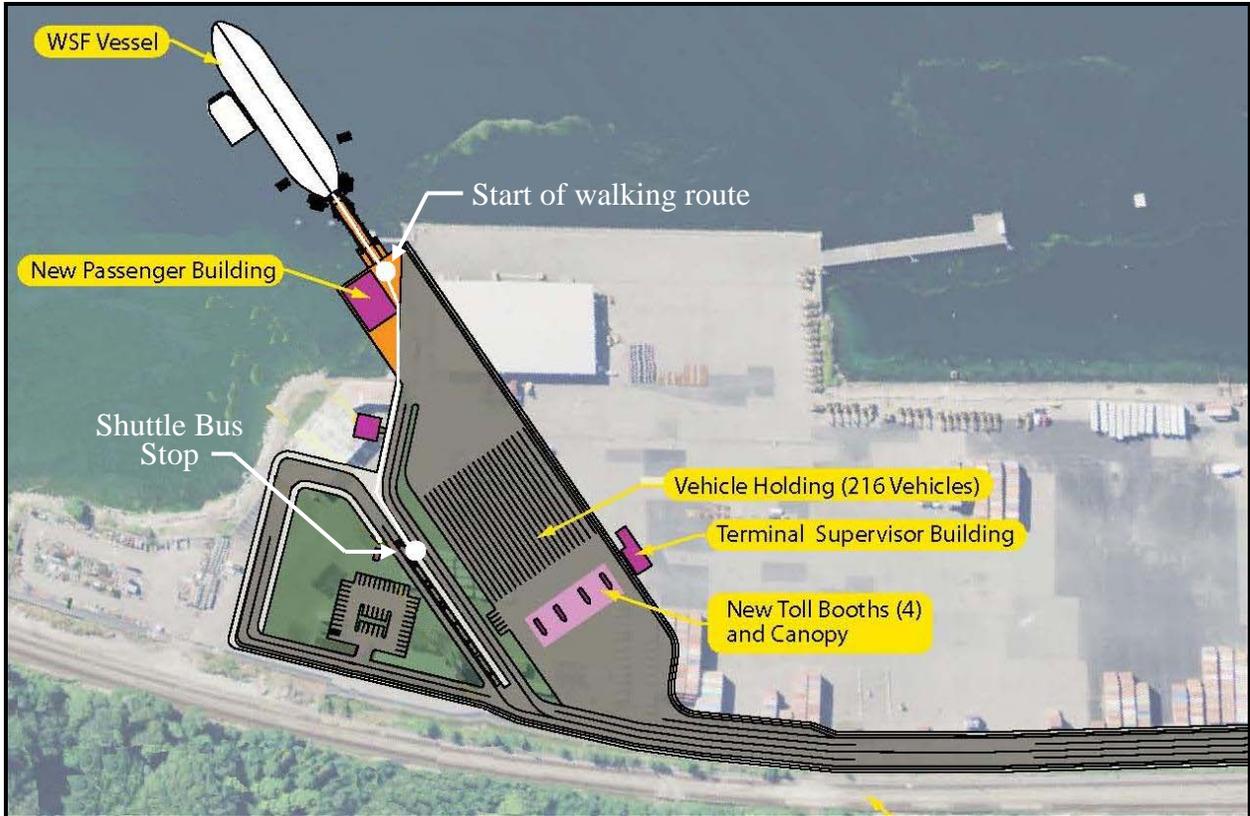
APPENDIX D
Walking Routes Defined



1
2 Passenger Walking Route – Mukilteo Ferry Terminal



3
4 Passenger Walking Route – Edmonds Ferry Terminal



1
2 Passenger Walking Route – Everett Ferry Terminal