



Drive or sail: comparing cost, time, and greenhouse gas emissions

Differences in travel modes for the six busiest weekday, commute routes around the Puget Sound

Comparing six routes

The Washington State Ferries (WSF) evaluated travel times, direct costs, and GHG emissions for the six example ferry routes used for weekday commuting across Puget Sound. WSF then compared the ferry travel to driving a single-occupancy vehicle between the same locations.

Reason for making the comparison

WSF has received questions from the public and policy makers about the costs and benefits of the Washington State Ferry System. This comparison addresses some of the costs and benefits of particular interest to commuters using or considering using WSF vessels. WSF recognizes that individual circumstances and personal preferences contribute to travel decisions in addition to the items compared here.

This analysis is the first comparison of time, cost and greenhouse gas emissions (GHG) between the ferry system and driving around Puget Sound.

Results

For the six busiest commuter routes across Puget Sound with road drive around possibilities:

- It costs less money to ride the ferry compared to driving around.
- Ferry travel contributes to fewer GHG emissions compared to driving around.
- It is faster to ride the ferry compared to driving around.

The results assumed no highway congestion and didn't consider reliability or consistency of travel times. Ferries left the dock within 10 minutes of the published times 96% of the time in the first 9 months of 2012.



Comparing Routes

Six different routes for commuters across Puget Sound were selected from WSF's 2011 Annual Ridership Statistics and include more than 16.1 million passenger trips, about 72% of all WSF ferry service trips. More than 5.3 million of these are commute trips.

Time, cost and GHG emissions were estimated between the two points described. Drive-only routes were south over the Tacoma Narrows Bridge to Seattle and north over Deception Pass and then south on I-5 to Everett. Ferry travel assumes a combination of travel modes as described. The circled number on the adjacent map corresponds to the routes below.

1. Bainbridge Town Center to Seattle Westlake

Walk 0.5 mile from Bainbridge Town Center to Bainbridge ferry terminal > ferry to Seattle terminal on foot > walk 0.9 mile to Seattle Westlake Center.

2. Bremerton Downtown to Seattle Westlake

Drive 1.9 miles from the Bremerton Town Center to Bremerton Terminal > ferry to Seattle terminal on foot > walk 0.9 mile to Seattle Westlake Center.

3. Poulsbo Town Center to Seattle Westlake

Drive 12 miles from the Poulsbo town center to Bainbridge Terminal > ferry to Seattle terminal on foot > walk 0.9 mile to Seattle Westlake Center.

4. Port Townsend to Seattle Westlake

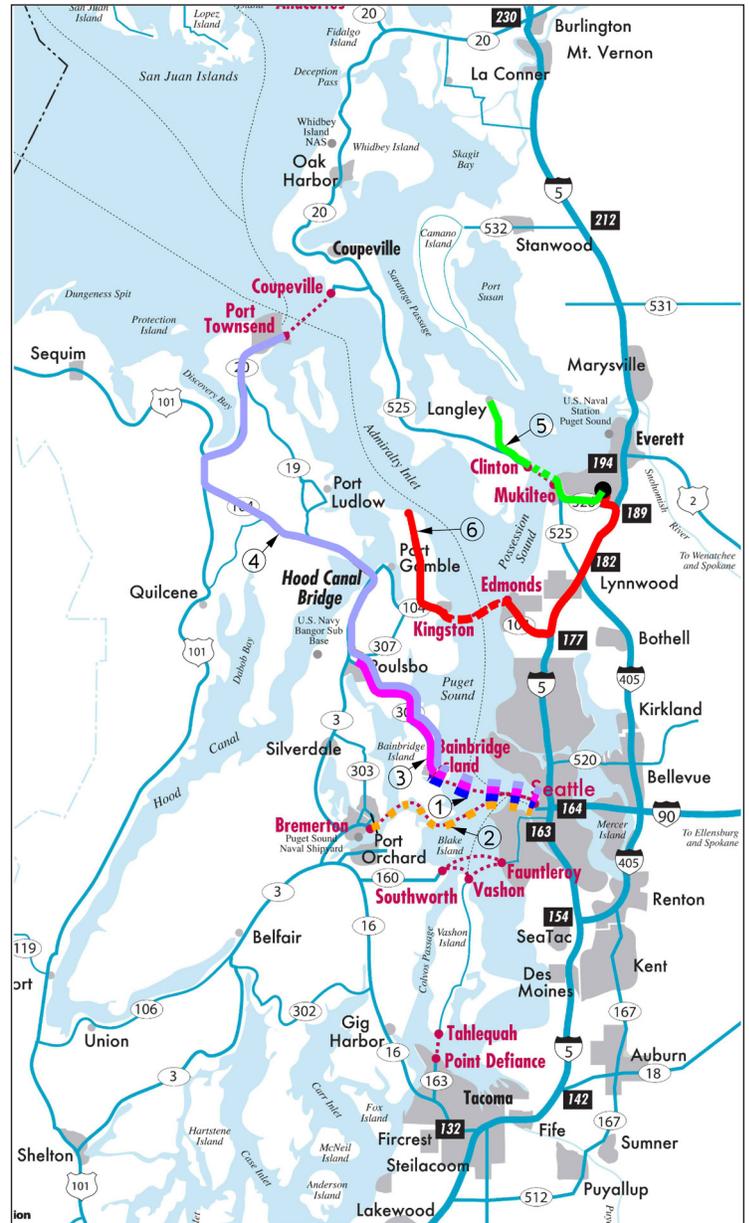
Drive 47 miles from Port Townsend town center to Bainbridge Terminal > ferry to Seattle terminal on foot > walk 0.9 mile to Seattle Westlake Center.

5. Langley to Everett Boeing Plant

Drives 6 miles from Langley town center to Clinton terminal > ferry to Mukilteo terminal > drive 3 miles to Boeing Plant.

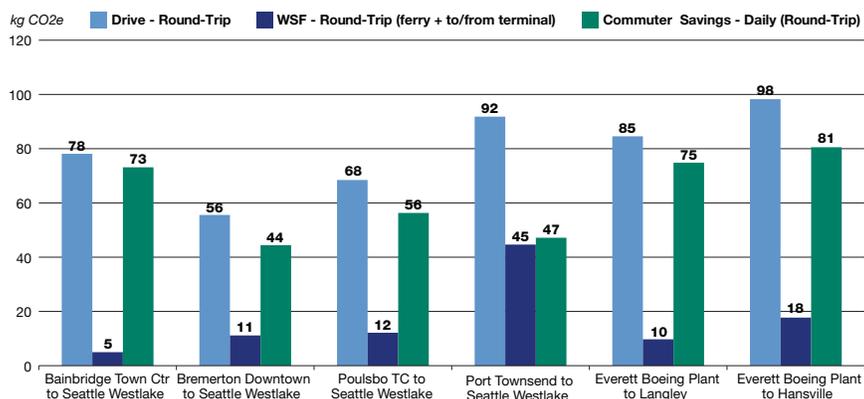
6. Hansville to Everett Boeing Plant

Drive 12 miles from the Hansville town center to Kingston Terminal > ferry to Edmonds Terminal > drive 10 miles to Everett Boeing Plant.

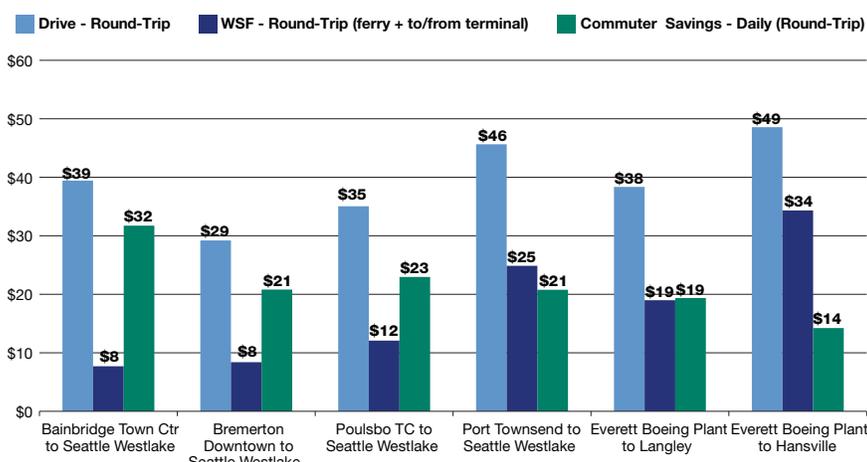


Highest Volume Commute Routes	Daily Round Trip Savings Ferry vs. Drive Around			Annual RT Savings (228 days) Ferry vs. Drive Around		
	Min	Cost	GHG (Kg CO2e)	Hours	Cost	GHG (Kg CO2e)
Bainbridge to Seattle	119	\$32	74	452	\$7,235	16,821
Bremerton to Seattle	39	\$21	45	148	\$4,745	10,238
Poulsbo to Seattle	87	\$23	57	331	\$5,236	12,947
Port Townsend to Seattle	75	\$21	48	285	\$4,737	10,859
Langley to Everett	219	\$19	75	832	\$4,416	17,203
Hansville to Everett	194	\$14	81	737	\$3,244	18,504

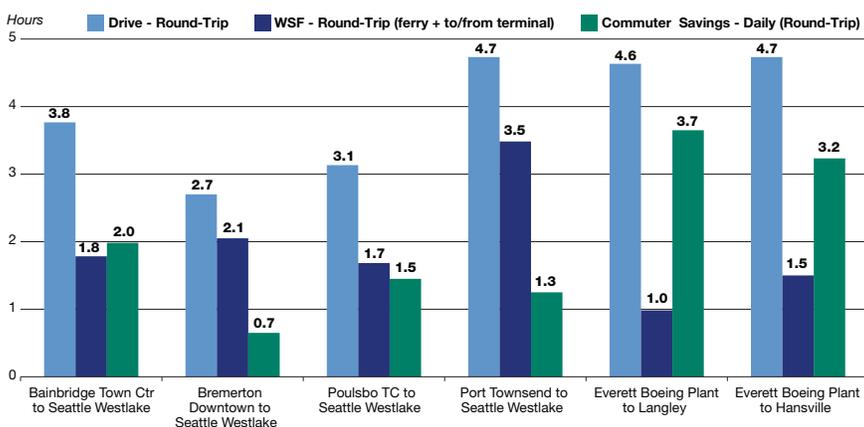
Daily GHG Emissions: Ferry vs. Drive Around - Round-Trip



Cost (\$): Daily Round-Trip Savings



Travel Time (Hours): Daily Round-Trip Savings



Modeling Assumptions

Ferry-passenger fuel use

The total number of trips per route divided by total number of passengers for each route.

Ferry cost

Fares were for non-peak travel published in the May 1, 2012, schedule.

- Walk-on passengers traveling to Seattle (\$7.70)
- Round-trip, single-occupant vehicle fares for other destinations (\$15.70-\$26.30)

Private-vehicle fuel use

Average light-duty vehicle fuel consumption was based on the model year 2000 average of 20.3 mpg.

Drive time and mileage

Google Maps was used to determine drive times and mileage for the most direct route with travel at posted speeds. Drive time under-estimates average peak-hour travel time between Seattle and Tacoma.

Drive cost

Driving costs include gas (\$4.00 per gallon) and toll charges on the Tacoma Narrows Bridge (\$4.00 with Good to Go pass). Parking and vehicle maintenance costs were not included.

Travel to/from ferry terminal and wait time

Travelers were assumed to drive distances greater than one mile and walk distances less than one mile. No wait time was assumed at terminals since arrival times vary by commuter and long waits are generally on weekends and holidays, which don't affect weekday commutes.

GHG emissions

The following emission factors were applied to fuel consumptions (2011 US EPA Office of Transportation and Air Quality):

- Driving: 8.82 kg of carbon dioxide equivalent (CO2e) per gallon of gasoline
- Ferries: 10.25 kg CO2e per gallon of diesel

What do these results mean?

This analysis suggests that using a ferry to cross Puget Sound is faster, cheaper and emits less GHG emissions than driving between the identified locations, or locations nearby.

Car or vanpooling, driving an electric or hybrid vehicle, using other forms of transit, and/or biking were not included in the analysis but may reduce the cost and/or GHG emissions of those reported. Carpool and transit lanes may also improve travel times compared to those reported here.

WSF efforts to reduce fuel use and GHG emissions

WSF efforts to reduce air pollution and GHG Emissions focus on reducing fuel use, obtaining more efficient engines, and using alternative fuels.

Currently Doing

- Use ultralow sulfur diesel (USLD) fuel to reduce sulfur emissions by as much as 98%.
- Retrofit engines to save nearly 50% the lube oil and lower diesel particulate emissions.
- Slow vessels down to reduce emissions and fuel use saving 6-8% on one route.

Currently Evaluating

- Retrofit ferries to use cleaner burning Liquefied Natural Gas (LNG) instead of diesel.
- Profile routes to identify optimum speeds and save fuel.
- Use positive restraint systems to eliminate “pushing the dock” while loading/unloading.
- Reduce the number of engines operating on certain vessel classes.
- Reduce on-board fuel storage to minimize weight load.
- Install heat-recovery systems to eliminate diesel powered boiler heating.

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**Washington State
Department of Transportation**

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