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.

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

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.

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” white 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.

Contact the following people for more information:
Tim Sexton
WSDOT Air Quality, Noise, Energy Policy Manager
SextonT@wsdot.wa.gov
206-440-4549
Ray Deardorf
WSF Planning Director
Deardorf@wsdot.wa.gov
206-515-3491
Sheila Helgath
WSF Environmental Program Manager
helgats@wsdot.wa.gov
206-515-3911

October 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.

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

<table>
<thead>
<tr>
<th>Route</th>
<th>Hours</th>
<th>Cost ($)</th>
<th>GHG (Kg CO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bainbridge to Seattle</td>
<td>452</td>
<td>$21</td>
<td>74</td>
</tr>
<tr>
<td>Bremerton to Seattle</td>
<td>148</td>
<td>$23</td>
<td>57</td>
</tr>
<tr>
<td>Poulsbo to Seattle</td>
<td>331</td>
<td>$23</td>
<td>57</td>
</tr>
<tr>
<td>Port Townsend to Seattle</td>
<td>285</td>
<td>$21</td>
<td>48</td>
</tr>
<tr>
<td>Langley to Everett</td>
<td>832</td>
<td>$19</td>
<td>75</td>
</tr>
<tr>
<td>Hansville to Everett</td>
<td>737</td>
<td>$14</td>
<td>81</td>
</tr>
</tbody>
</table>

**Travel Time (Hours): Daily Round-Trip Savings**

- **Drive**:
  - Bainbridge to Seattle: 0.9 miles
  - Bremerton to Seattle: 1.9 miles
  - Poulsbo to Seattle: 12 miles
  - Port Townsend to Seattle: 47 miles
  - Langley to Everett: 6 miles
  - Hansville to Everett: 12 miles

- **Ferry**:
  - Bainbridge to Seattle: 0.5 miles
  - Bremerton to Seattle: 1.9 miles
  - Poulsbo to Seattle: 12 miles
  - Port Townsend to Seattle: 47 miles
  - Langley to Everett: 6 miles
  - Hansville to Everett: 12 miles

**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 and 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).

**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 walk 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