

PUGET SOUND PASSENGER- ONLY FERRY STUDY

January 2021



Puget Sound Regional Council



Puget Sound Passenger-Only Ferry Study

January 2021

Funding for this document provided in part by member jurisdictions, grants from U.S. Department of Transportation, Federal Transit Administration, Federal Highway Administration, and Washington State Department of Transportation.

American with Disabilities Act (ADA) Information

Individuals requiring reasonable accommodations may request written materials in alternate formats, sign language interpreters, physical accessibility accommodations, or other reasonable accommodations by contacting the ADA Coordinator, **Thu Le**, at **206.464.6175**, with two weeks' advance notice. Persons who are deaf or hard of hearing may contact the ADA Coordinator, Thu Le, through **TTY Relay 711**.

Title VI Notice: PSRC fully complies with Title VI of the Civil Rights Act of 1964 and related statutes and regulations in all programs and activities. For more information, or to obtain a Title VI Complaint Form, see www.psrc.org/title-vi or call **206.587.4819**.

Additional copies of this document may be obtained by contacting:

Puget Sound Regional Council Information Center
1011 Western Avenue, Suite 500
Seattle, Washington 98104-1035
206.464.7532
info@psrc.org | www.psrc.org



CONTENTS

Introduction	3
Passenger-Only Ferries	6
Study Approach	16
Community Engagement	23
Analysis Results	30
Route Profiles	47
Greenhouse Gas Emissions and Electrification	78
Conclusions and Implementation	86

APPENDIX A - Initial Conditions and Trends Analysis

APPENDIX B - Candidate Route and Terminal Identification

APPENDIX C - Route and Terminal Assessment Methodology

APPENDIX D - Step 3 Analysis Scorecard and Findings

APPENDIX E - Stakeholder and Community Engagement

APPENDIX F - Confined Waterways Information

APPENDIX G - PSRC Regional POF Study Route Financial Analysis

APPENDIX H - Potential Ridership Demand for Puget Sound POF Study Route Profiles

All full-page section photos were provided by PSRC and the consultant team.



The project team would like to thank the many individuals and organizations who participated in the Puget Sound Passenger-Only Ferry Study by attending the public webinars, engaging with the study team via email, and/or responding to the public survey.

We would also like to give special thanks to the following organizations and partners who contributed to the study:

Regional Transportation Planning Organizations and Regional Partners

- Island Regional Transportation Planning Organization
- Peninsula Regional Transportation Planning Organization
- San Juan County
- Skagit Council of Governments
- Thurston Regional Planning Council
- Whatcom Council of Governments

Stakeholders Engaged in Development of Route Profiles

- City of Bellingham
- City of Everett
- City of Gig Harbor
- City of Kenmore
- City of Kirkland
- City of Langley
- City of Renton
- City of Seattle
- City of Tacoma
- Island County
- Legacy Development
- King County
- Kitsap County
- Kitsap Transit
- Metro Parks Tacoma
- Port of Bellingham
- Port of Everett
- Port of Seattle
- Port of South Whidbey
- San Juan County
- SECO Development
- The Suquamish Tribe
- Town of Ruston
- University of Washington
- Washington State Ferries
- Whatcom Transportation Authority

Project Team

Puget Sound Regional Council

- Monica Adkins, Administrative Assistant II
- Josh Brown, Executive Director
- Gil Cerise, Project Manager
- Stefan Coe, Principal Modeler
- Craig Helmann, Director of Data
- Michele Leslie, Sr. Communications and Public Involvement
- Kelly McGourty, Transportation Planning Director
- Kalon Thomas, Assistant Planner

Consultant Team



- Kristen Kissinger, AICP, Project Manager
- Mike Anderson, Director of Marine Transportation
- Cassandra Durkin, Associate/Planner
- Martha Hart, Planner/Project Assistant



- Kevin Ramsey, PhD, Associate Principal

Progressions
Sawyer & Associates Consulting

- Carla Sawyer, Owner



- John Reeves, PE, Director of Business Development

LUND + FAUCETT

- Kris Faucett, Founder/Partner



- Jessica Côté, Principal/Owner



INTRODUCTION

Passenger-Only Ferries

Study Approach

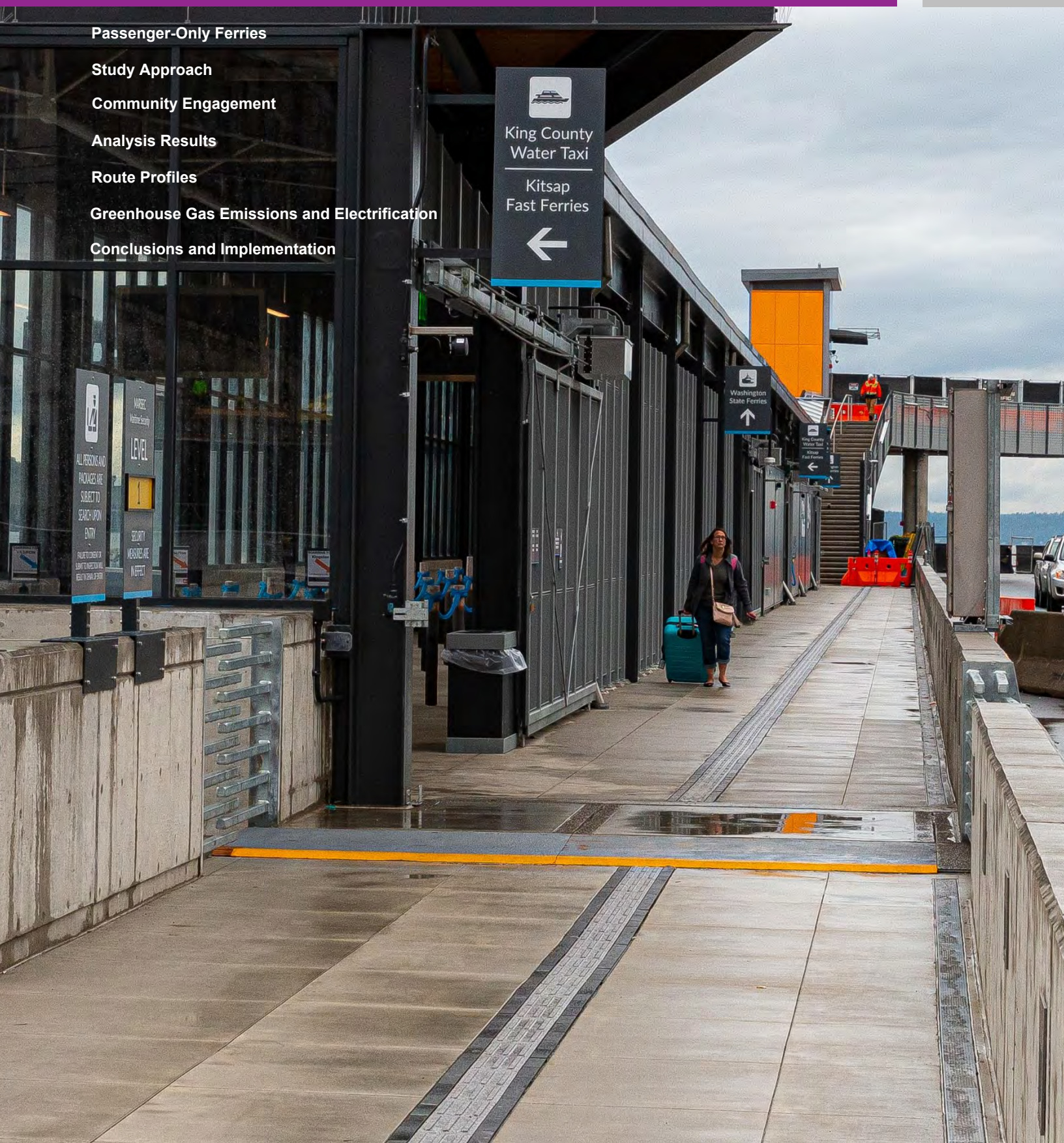
Community Engagement

Analysis Results

Route Profiles

Greenhouse Gas Emissions and Electrification

Conclusions and Implementation



INTRODUCTION

Origin of the Study

This study was commissioned by the Washington State Legislature in Substitute House Bill 1160 during the 2019 regular session to evaluate the potential demand for new passenger-only ferry (POF) service to connect communities throughout the Puget Sound area.

This report is a culmination of the analyses conducted throughout the study process, documenting the approach taken during the study and the key findings of analysis and engagement.

The Puget Sound Regional Council (PSRC) Executive Board directed the agency to conduct a POF study in 2008. That study focused on the central Puget Sound region and resulted in identification of near-, medium-, and long-term POF routes. All the near-term routes identified in the 2008 study will be in operation by the end of 2020. Because of PSRC's experience with the 2008 POF Study, the Legislature authorized PSRC to lead the study commissioned in 2019.

Scope of the Study

The Legislature's direction was for PSRC to study new passenger ferry service to better connect communities throughout the 12-county area surrounding Puget Sound.¹ The scope of this POF study includes potential services on Puget Sound, Lake Washington, and Lake Union, with a focus on identifying opportunities for POF services.

The study includes the evaluation of potential new routes and landing sites, potential demand, and estimated capital and operating costs. This study documents recommendations to further

Study Area



¹The 12 counties making up this area are Clallam, Island, Jefferson, King, Kitsap, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom.



electrification of POF in the study area and provides analysis of carbon emissions by mode given current technology.

This study was conducted at a conceptual planning level across a wide geographic area, limited to travel between the 12-counties that border Puget Sound. Community engagement was a priority of this study, with engagement activities beginning early and continuing throughout the entire study process.

This report represents the conclusion of the study and documents both the approach taken in the study process and the key findings found throughout the course of the study. Though key findings are presented for a number of potential POF services, further analysis would be needed prior to route implementation, which would include additional stakeholder and public outreach, environmental analysis and business planning.

HB 1160: “\$350,000 of the multimodal transportation account—state appropriation is provided solely for a study by the Puget Sound Regional Council of new passenger ferry service to better connect communities throughout the twelve county Puget Sound region. The study must assess potential new routes, identify future terminal locations, and provide recommendations to accelerate the electrification of the ferry fleet. The study must identify future passenger-only demand throughout Western Washington, analyze potential routes and terminal locations on Puget Sound, Lake Washington, and Lake Union with an emphasis on preserving waterfront opportunities in public ownership and opportunities for partnership. The study must determine whether and when the passenger ferry service achieves a net reduction in carbon emissions including an analysis of the emissions of modes that passengers would otherwise have used. The study must estimate capital and operating costs for routes and terminals. The study must include early and continuous outreach with all interested stakeholders and a report to the legislature and all interested parties by January 31, 2021”



Introduction

PASSENGER-ONLY FERRIES

Study Approach

Community Engagement

Analysis Results

Route Profiles

Greenhouse Gas Emissions and Electrification

Conclusions and Implementation



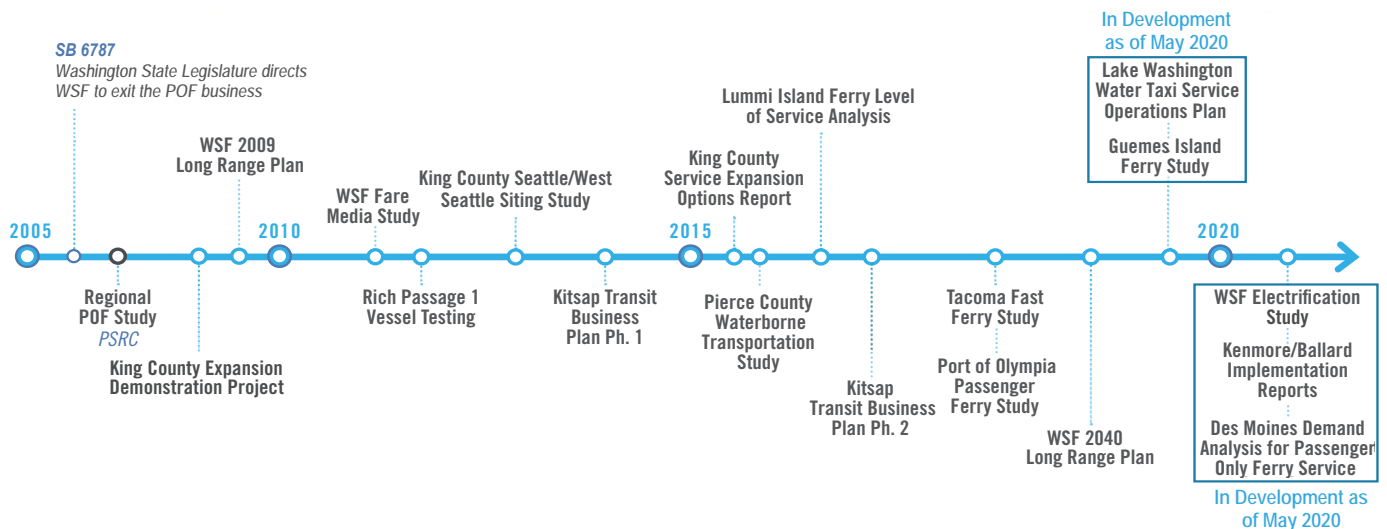
PASSENGER-ONLY FERRIES

Background

The long history of water travel on the Salish Sea began with Native Americans using water transportation to connect their communities. During the late 1800s and early 1900s, the waters of Puget Sound were bustling with the Mosquito Fleet, a multitude of steam-powered small craft connecting communities throughout Puget Sound. Expansion of the landside road and bridge network in the early 20th century increased demand for vehicle travel. Financial pressure in the Great Depression, combined with competing automobile infrastructure, forced the consolidation of ferry routes and the conversion from passenger ferries to vehicle ferries. Washington state took over the ferry system beginning in 1951. Washington State Ferries (WSF) reintroduced POF service in 1986. However, by 2006, the state Legislature identified POF as a public transit mode and directed WSF to exit the POF business. Legislative guidance as to funding resources has changed over time, providing more opportunities for regional and local jurisdictions. Both King County and Kitsap Transit have stepped in to continue and expand POF routes in the central Puget Sound region. Today, public POF routes are in operation connecting Vashon Island and West Seattle to Seattle, connecting Port Orchard and Annapolis to Bremerton, and also connecting Seattle and Kitsap County through Kingston, Bremerton, and Southworth (expected to be implemented in the first quarter of 2021). Additional smaller scale private passenger ferries and County-operated automobile ferries are also found throughout the study area. See Appendix A for additional information on existing POF trends in the Puget Sound study area.

Agencies throughout the study area have continued to plan and evaluate potential for water transit. This report reviewed studies completed since 2008, when PSRC produced its last POF study.

Timeline of Reviewed POF Studies



Existing Public POF Services

Two public POF operators, King County and Kitsap Transit, currently provide service in the Puget Sound study area.

King County’s POF service is the King County Water Taxi, while Kitsap Transit operates two POF services: Kitsap Transit Foot Ferry and Kitsap Transit Fast Ferry. Both operators have growing ridership and are each exploring opportunities to expand and implement new POF routes. Currently, all King County and Kitsap Transit Fast Ferry routes land in downtown Seattle at the recently renovated King County Pier 50 POF terminal. Completed in 2019, Pier 50 is owned by King County. Kitsap Transit contracts terminal staff operations from King County via an operating agreement. Four routes are currently served by the terminal, but this number could soon expand to five as Kitsap Transit begins a new service from Southworth. These routes are outlined below.

KING COUNTY WATER TAXI

West Seattle–Downtown Seattle

Weekday commute service year-round; mid-day and weekend service added in the spring and summer months

Vashon Island–Downtown Seattle

Weekday commute service year-round



KITSAP TRANSIT POF

Bremerton–Port Orchard

Weekday frequent commute service, midday service and early-evening service year-round; year-round Saturday service

Bremerton–Annapolis

Weekday frequent commute service, midday service and early-evening service year-round

Bremerton–Downtown Seattle

Weekday commute service year-round; Saturday service added in the spring and summer months

Kingston–Downtown Seattle

Weekday commute service year-round; Saturday service added in the spring and summer months

Southworth–Downtown Seattle

Weekday commute service year-round; scheduled service launch 1st quarter 2021



Supporting POF Service

For any mode of transit, service is supported by a variety of funding tools and strengthened through multimodal connections and infrastructure that bring riders to and from the service. Other mechanisms are also in play, such as regulatory requirements, community support, and any potential hindrances to service reliability—whether that be roadway congestion or, in the case of POF, marine conditions due to weather. While landside and water transit share many common fundamental elements to successful operations, POF service operates in the unique **marine environment**, with its own set of regulations, opportunities, and constraints.



Elements of POF Service

Sustainable funding

Transit service requires funding for two main categories of expenses: capital and operating. Capital funds are needed to purchase vessels and build terminals. Multiple state, federal, and local sources can be used to fund capital needs, including tax levies and grants from state and federal agencies, such as the Washington State Department of Transportation (WSDOT) and the Federal Transit Administration (FTA).

Operating funds typically present more of a challenge for transit service, and POF is no exception. Operating funds must be sustainable and continually acquired to support the ongoing operations of service and or service expansion. Operating funds typically include staff and crew wages, fuel, and maintenance activities for terminals and vessels. As most grant opportunities are specifically designated for capital project expenditures, there are fewer options available to provide enough funding to sustain POF operations. Revenue from fares and concessions is often used to help fund operations, though, in the case of all current POF operations and most public transit within Washington state, these revenues are insufficient to cover all operating costs. To supplement fare revenues, sources such as tax levies (sales or property) can be used.

Each of the potential POF services proposed in this study will need to develop adequate and sustainable funding plans. These plans will likely differ by route, due to the differing funding and governance structures in place in these areas.



Community support

Implementing a successful POF service requires support from the local community. Without this support, ridership is likely to be low and local funding partnerships may not be possible. Partnerships can take many forms, from tax base support to terminal infrastructure use. POF terminals are located on waterfront property; therefore, use of this space must comply with state Shoreline Master Program rules. In addition, POF use of these properties must be compatible with local comprehensive plans, land use regulations, and the various public uses including parks and recreation, as appropriate. Community and stakeholder outreach played a large role in this study. This is explained in more detail in the *Study Approach* and *Community Engagement* sections of this report.

Infrastructure

POF vessels themselves represent a large capital investment to support service. These vessels are high-capacity transit, with some of the smallest in-service vessels in the region supporting 118 passengers and the largest with capacity for over 250 passengers. Vessels are designed specifically for the routes they serve and are regulated in a different way than land-based transit.

In addition to vessels, landing site infrastructure is necessary to support POF service, much like a high-capacity transit station. Landing site infrastructure may include both over- and in-water components, which require permitting at the local, state, and federal levels.

Uplands infrastructure can vary. It ranges from typical bus stop-type amenities with communication and ticketing to full terminal facilities with weather-protected queuing, restrooms, and bike and pedestrian facilities.

Multimodal connections

Ensuring that a POF landing site is reachable for users is vital to ensuring service success. If a terminal is hard to access or does not connect to desired destinations, ridership can be negatively impacted. Multimodal connections to POF could be in the form of transit (via light rail, heavy rail, and/or bus), walking, biking or through a park-and-ride option (in areas where this is

Typical Infrastructure Over and in-water elements

- Dock or float space
- Cleats and fendering to secure the vessel
- Boarding ramp and transfer span for passenger loading and unloading
- Lighting, signage to illuminate and provide wayfinding

Potential uplands elements

- Ticketing
- Signage directing passengers, showing sailing times, and providing information about ticket costs
- Covered waiting area
- Public restrooms
- Bike racks
- Designated drop-off and pick-up zone
- Sidewalks and bike lanes



feasible and supported). High-capacity transit is most frequently found in the “spine” of a community, typically located inland, away from the shoreline where POF service would be provided. This simple geography and topography can provide obstacles to accessible service and is a consideration in terminal siting.

Service reliability

While many other modes of transportation run on roadways with relatively constant conditions, POF travels along bodies of water where wind and waves make for ever-changing conditions. While this can be more of an obstacle in some areas of the Puget Sound than others, the waterway also provides a relatively congestion-free travel way. Weather events such as fog and winds could result in the cancellation or delay of POF sailings, while bus or rail services may not be impacted. Conversely, and discussed in more detail in the resiliency section of the report, the waterway is not impacted by roadway closures due to hazardous weather events (rain or snow), traffic incidents, or other response events. The fleet composition of POF service can play a large role in service reliability, ensuring there are enough vessels to maintain service during disruptions due to vessel maintenance needs.

Marine Operating Environment

The marine operating environment presents unique planning elements for consideration and coordination—including tribal fishing rights, sensitive habitat, and marine mammal protection. In addition to more typical federal, state and local environmental and use regulators, the U.S. Coast Guard (USCG) is responsible for safe vessel operations in U.S. waters. Vessel and terminal facilities are subject to safety, security and pollution control standards

Expanding any type of POF vessel service in high-traffic marine operating environments could also pose additional safety risks, and marine traffic patterns should be evaluated to assess mitigation strategies and ensure safe operations for POF and all vessels.

Puget Sound, Lake Washington, and Lake Union are busy marine operating environments. POF routes may interact with nearby vessels including WSF auto ferries, shipping and cargo vessels, tugboats, and recreational uses and vessels.

Additionally, landing sites must be assessed for environmental and cultural considerations to protect tribal fishing rights and marine mammals. This will likely require early and continuous coordination.

Additional details are provided in the section below.



Environmental Conditions Impacting POF Service

Introduction

The marine environment also provides critical water and shoreline habitat for the protected plant and animal species of the Puget Sound. Environmental review will play an important role in the siting of landing facilities, along with the chosen travel routes. Marine mammal protection is an important issue in Puget Sound, as is protecting sensitive shorelines. Operating protocols are developed to ensure communication and vessel slowing when sighting marine mammals. High-speed vessels can be designed to minimize wake wash. However, narrow channels and certain shoreline types can increase the potential for shoreline erosion. These same operating protocols also identify other environmental protections, from the way vessels and landings are cleaned to navigating landings.

Marine mammals

The Governor's Southern Resident Orca Task Force's November 2019 report identified concerns related to potential whale-strike risks and underwater noise impacts to Southern Resident orca whales that could occur with increasing POF service in Puget Sound. The task force recommended an environmental review of these risks and collaborative identification of policies and technologies to mitigate them. Operating protocols have been put in place for all existing ferry operators. These protocols require observation of marine mammals and communication of their location so that other vessel traffic can avoid them. These or similar operating protocols would be needed on any of the Puget Sound routes explored by this study, though the details of these protocols would be established later in the route implementation process, as recommended protocols may be different in the future when routes begin operation.

Increased consideration is being given to the underwater noise impact of propulsion systems during the design of a vessel. Current technologies that can assist POF vessels in limiting underwater noise production include specially designed propellers and the use of water jet propulsion. The high-speed hydrofoil POF vessel is a cutting-edge technology that poses promise for mitigating sound impacts. The Washington Maritime Blue Joint Innovation Program is currently in the process of developing this vessel design to help decrease both greenhouse gas (GHG) emissions and underwater noise impacts on marine ecosystems. This vessel is planned to be zero-emission, with lightweight carbon fiber hull construction.



Sensitive shorelines/wake wash

Though carefully selecting route paths can minimize the impacts on shoreline soils and their stability, additional choices made by individual POF operators can further decrease impacts to shoreline environments. As POF vessels travel, they generate waves in their wake that can erode shorelines and disturb coastal habitats. To decrease the impacts of vessel wake, agencies can explore more efficient hull designs and foil assistance when designing and building vessels. Additionally, protocols can be used during operations that will minimize wake. Some examples include tailoring vessel travel speeds to minimize wake wash as water depth varies along the route travel path to avoid slowing down or maneuvering in the most sensitive areas.



Vashon Island Shoreline [PSRC]

Operating protocols can also mitigate impacts to sensitive shoreline vegetation species, such as bull kelp and eel grass. As these are floating vegetation species, monitoring and communicating changes in vegetation patterns will be useful in preventing impacts to these sensitive shoreline vegetation species.

Tribal Coordination

The Puget Sound and Salish Sea study area are home to over 20 federally recognized Native American tribes. Tribal fishing rights and culturally significant sites are a consideration for any new POF route which will use shoreline property as a landing site and traverse the Puget Sound waters. Tribal coordination is paramount to the development and implementation of new landing site infrastructure and vessel traffic.



Tribal Canoe Journey
[Jenn Squally Photography, Puyallup Tribe]



POF Resiliency

The resilience of a transportation system, as defined for this study, is the “capacity [of the system] to sustain a shock, recover, and continue to function.”² Simply speaking, the resilience of the system is its ability to cope with change.³

Due to climate change and the increasing likelihood of sea level rise and extreme weather events, resilience has become an increasingly important focus for transportation systems. PSRC’s VISION 2050 regional plan includes policies and actions for improving resilience throughout the PSRC region, and the Washington State Ferries (WSF) 2040 Long Range Plan designates “sustainability and resilience” as one of its four focus areas. Transportation systems often need to cope with many different types of shocks and changes, including extreme weather events, sea level rise, increased wildfire activity, collapsed bridges, seismic damage, etc. Increasing POF service throughout the study area increases the resilience of the Puget Sound transportation system by providing more transportation capacity during these types of extreme events. As an alternative mode, POF improves the flexibility and adaptability of the system by diversifying the transportation modes provided and by encouraging transit, walking, and biking for connecting trips. As a result, all POF routes in this study increase the resiliency of the Puget Sound transportation system. POF can further increase resiliency in three specific areas: emergency response, bridge/ferry dependency, and lifeline services.

Emergency response

When natural disasters or weather emergencies strike, POF vessels help maintain key transportation connections and can aid in evacuations by bypassing damaged roadways and bridges. By being able to navigate in relatively shallow water and maneuver in closer quarters than a large



Fremont Bridge [PSRC]

² <http://onlinepubs.trb.org/onlinepubs/circulars/ec226.pdf>, citing Walker, B., C. Holling, S. Carpenter, and A. Kinzig. Resilience, Adaptability and Transformability in Social–Ecological Systems. *Ecology and Society*, Vol. 9, No. 2, 2004. <https://doi.org/10.5751/ES00650-090205>.

³ *Ibid.*



automobile ferry vessel, POF vessels can make emergency landings at a variety of locations.

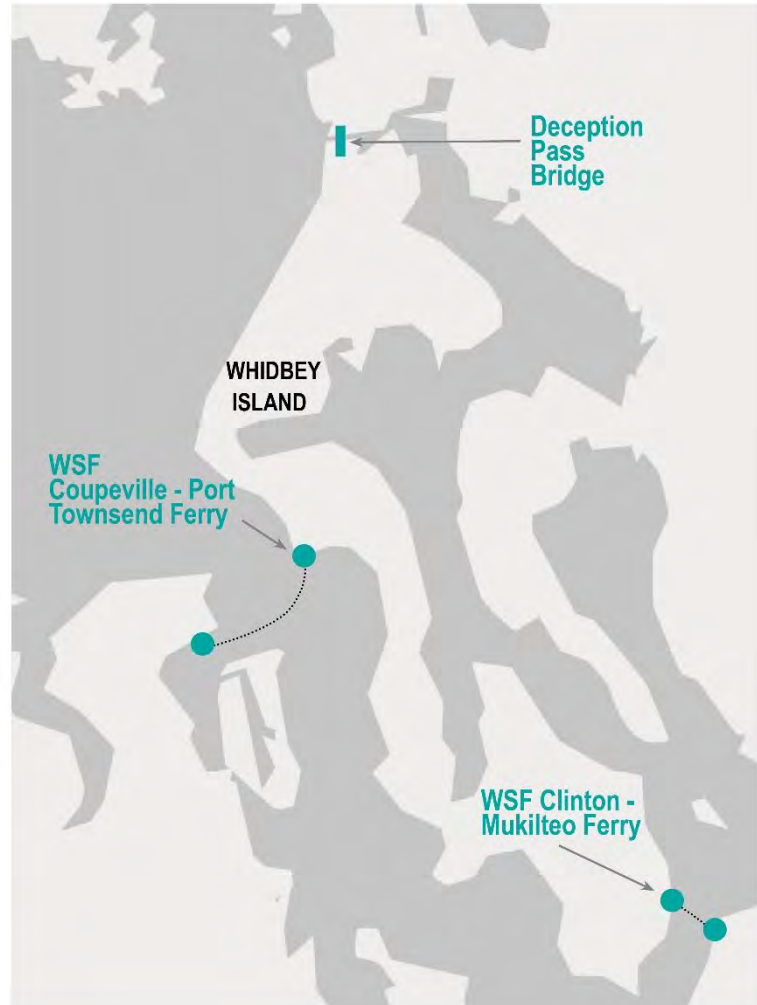
All the POF routes evaluated in this study would help improve transportation resiliency to emergency events.

Bridge/ferry dependency

Due to the geography of Puget Sound and its numerous islands, many areas are connected to one another only by bridges or WSF/county-operated automobile ferries. In these cases, if a bridge were to be closed for repairs or a ferry shut down for maintenance, a POF route would be able to maintain service for these areas. Moreover, bridges and WSF ferry routes often face heavy vehicle congestion. By providing a POF alternative, travelers could avoid some or all of this congestion to reach their destination.

Lifeline service

The distribution of key medical services is not consistent throughout the Puget Sound area, with many hospitals and medical campuses located in denser, more urbanized areas. Rural residents of the area still need access to these services, though they often need to travel far distances to do so. Some of the POF routes in this study increase access and connections to these essential services, particularly for island residents.



Access Points from Whidbey Island



Introduction

Passenger-Only Ferries

STUDY APPROACH

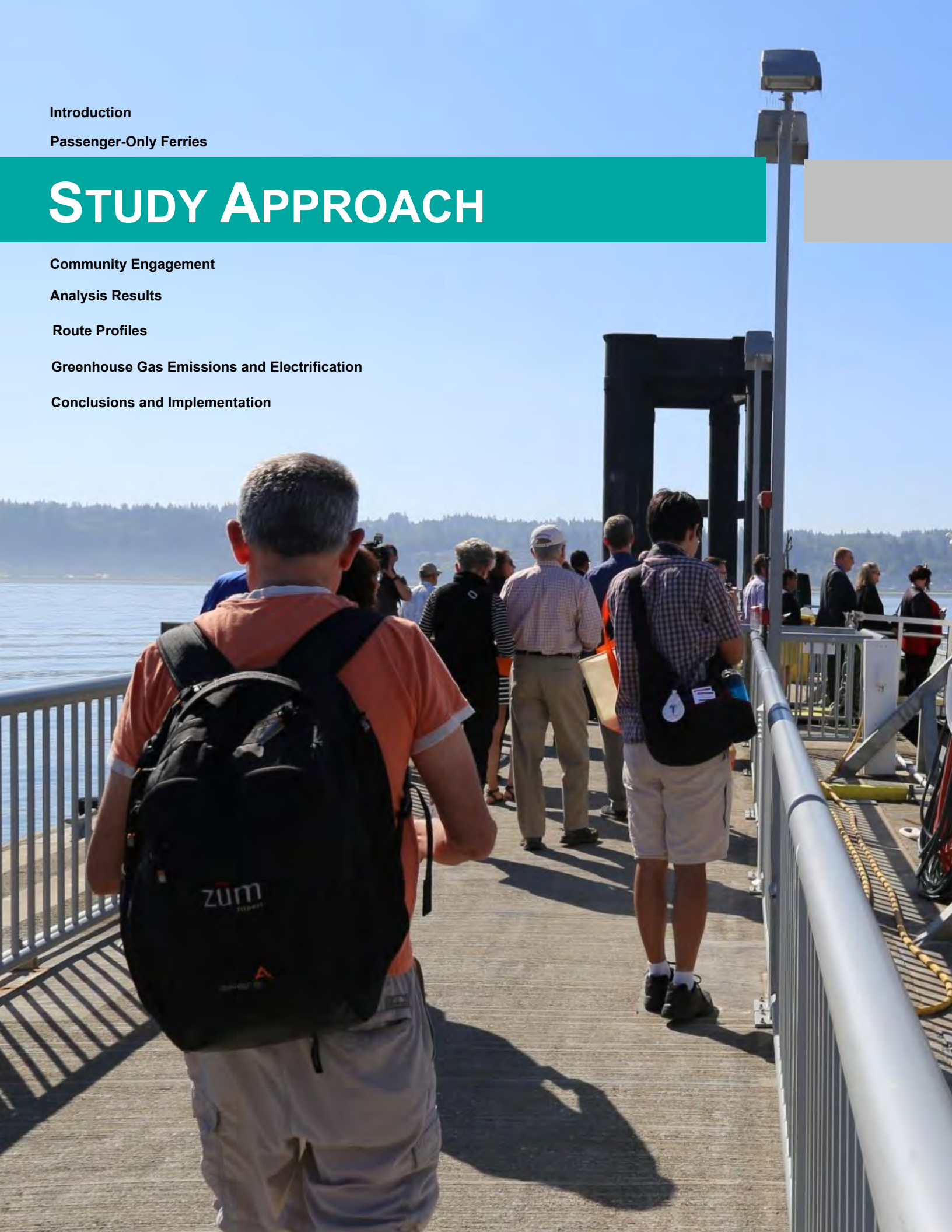
Community Engagement

Analysis Results

Route Profiles

Greenhouse Gas Emissions and Electrification

Conclusions and Implementation

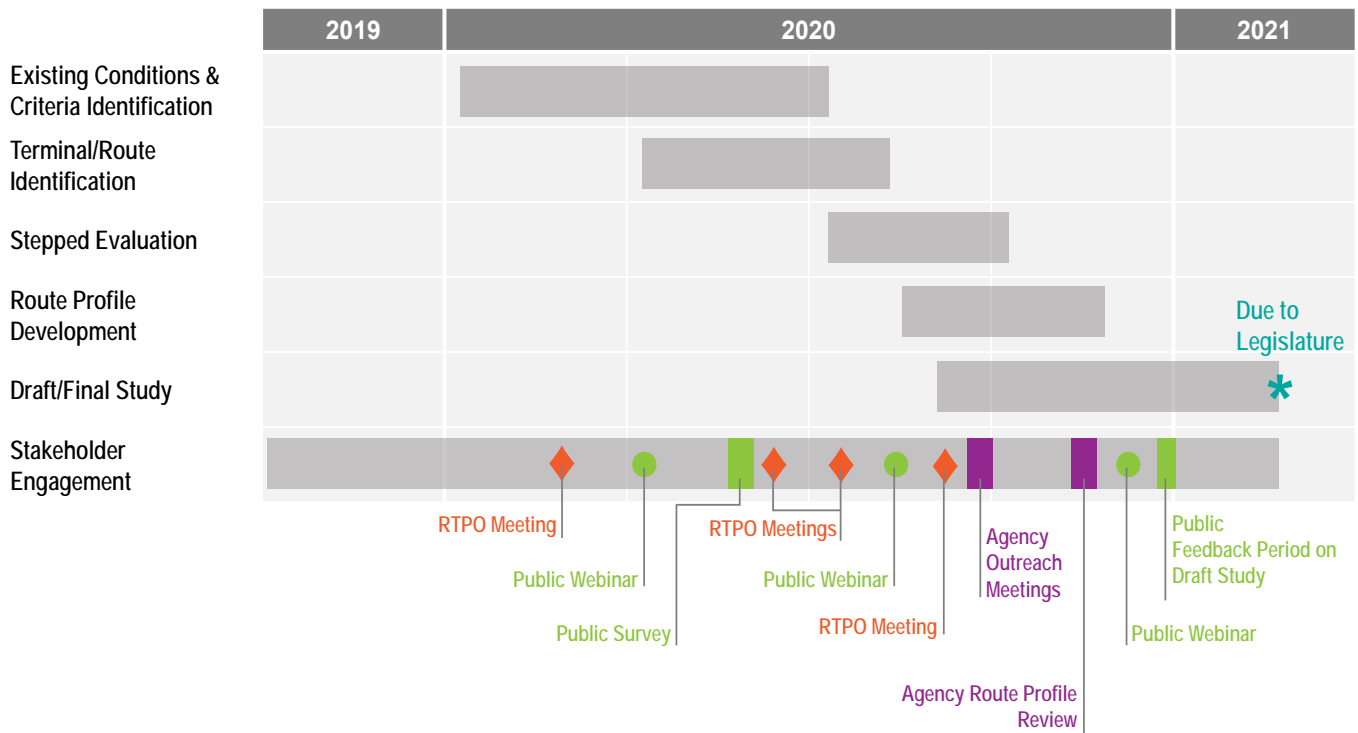


STUDY APPROACH

Overview

This POF study is a planning and feasibility-level study, which consisted of the exploration of existing information, development of criteria, and evaluation with continuous community and stakeholder engagement informing each stage. The study began by analyzing existing conditions in the Puget Sound study area that have impacted the current POF system. It identified key criteria to be used in analyzing future potential POF routes and landing sites. The study then focused on identifying the potential POF routes and landing sites. Multiple levels of analysis were conducted on the routes and sites in the stepped evaluation. The results were compiled in the draft study report. Engagement informed each step of the project.

Study Schedule



Operating Models

This study focused on a publicly operated service model as opposed to a privately operated one. Publicly operated services are often subsidized by taxes or other public funding mechanisms, while privately operated services generally need to make a profit in order to continue operating. Costs identified in this plan could be representative of either service model, public or private. Public/private partnerships are also a viable POF operations strategy that could be further explored by implementers, if desired. This model is one frequently used around the country. Policy decisions, and often capital investments, are made by the public entity, while



operations are conducted by a private service provider through contracting. Locally, Kitsap Transit and King County are both public operators that provide the infrastructure and operations.

Examples of public-private partnerships include the New York City Ferry (managed by New York City Economic Development Corporation and operated by Hornblower) and San Francisco Bay Ferries (managed by the Water Emergency Transportation Authority and operated by Blue and Gold Fleet).

Review Existing Conditions and Identify Criteria

This POF study analyzed an expansive geographic area of the 12 counties surrounding Puget Sound, including Lake Washington and Lake Union. Transportation plans and studies from applicable Regional Transportation Planning Organizations (RTPOs) and inter-county organizations (such as the North Sound Transportation Alliance) were analyzed to understand the regional context of POF demand and planning effort to-date. Throughout this stage, it became clear that conditions and priorities varied across the study area. As a result of this variation, the remainder of the study sought to evaluate each route based on the priorities of the region or regions it would serve.

Past POF feasibility studies were reviewed to inform potential routes and the development of route evaluation criteria. These common criteria and evaluation themes are listed below, along with how these themes informed this POF study methodology. Summaries of the RTPO plans and POF studies can be found in Appendix A.

Identified Theme	Key Findings	Application to Study
Travel Time Competitiveness	Previous studies indicated that riders would likely use services if the travel times were faster or the same as competing modes. It was also revealed that riders would use POF services that were slightly longer than competing modes due to the comfortable or scenic nature of the POF trip.	Previously identified travel time thresholds were taken into consideration when developing travel time savings criteria for this study.
Ridership	Most previous studies indicated that POF ridership will grow over time, with a mature POF service being reached approximately one to five years after operation begins. Ridership calculation methods varied based on best data available.	Ridership was calculated for the route profiles using the best data available.



Identified Theme	Key Findings	Application to Study
Access and Land Use Compatibility	Previous studies identified the importance of landing site access and supportive land use for POF and supporting multimodal connections.	Access, multimodal connections, and land use compatibility were criteria used in the route assessment.
Costs	Previous studies identified cost estimates for both start-up capital costs and ongoing operational costs.	Cost estimates from previous studies provided good baseline data for comparison of the route costs identified in this study.
Fares and Fare Structure	Past studies identified a variety of options available for fare prices and methods of fare payment. Determining these methods was deemed important in POF implementation.	Though detailed fare policy analysis is beyond the scope of this study, it is recommended for evaluation in follow-up implementation and detailed feasibility studies for potential routes.
Community and Stakeholder Support	Public surveys and meetings with key stakeholders were successful strategies used to gather information about community support in previous studies.	Previous engagement methods inspired some of the engagement activities conducted by this study, though additional activities were added.
Environmental Impact	Previous studies identified multiple environmental impacts that POF service could contribute to and need to be considerate of, including impacts to sensitive shorelines. Decreasing greenhouse gas emissions (GHGs) and the role of POF electrification were also explored in past studies.	Confined waterways were identified as a criterion for routes to minimize impacts to sensitive shorelines. Electrification potential of routes was identified in Step 4 of the route assessment. Further environmental considerations are noted for future implementation work.

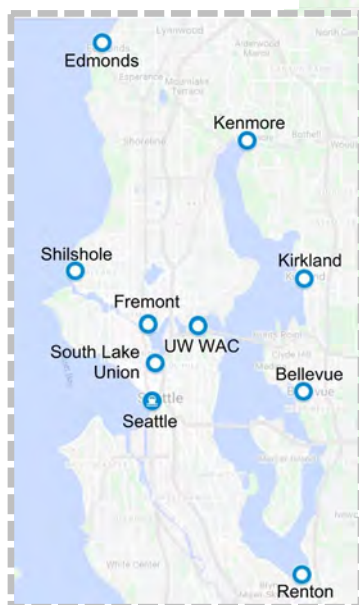
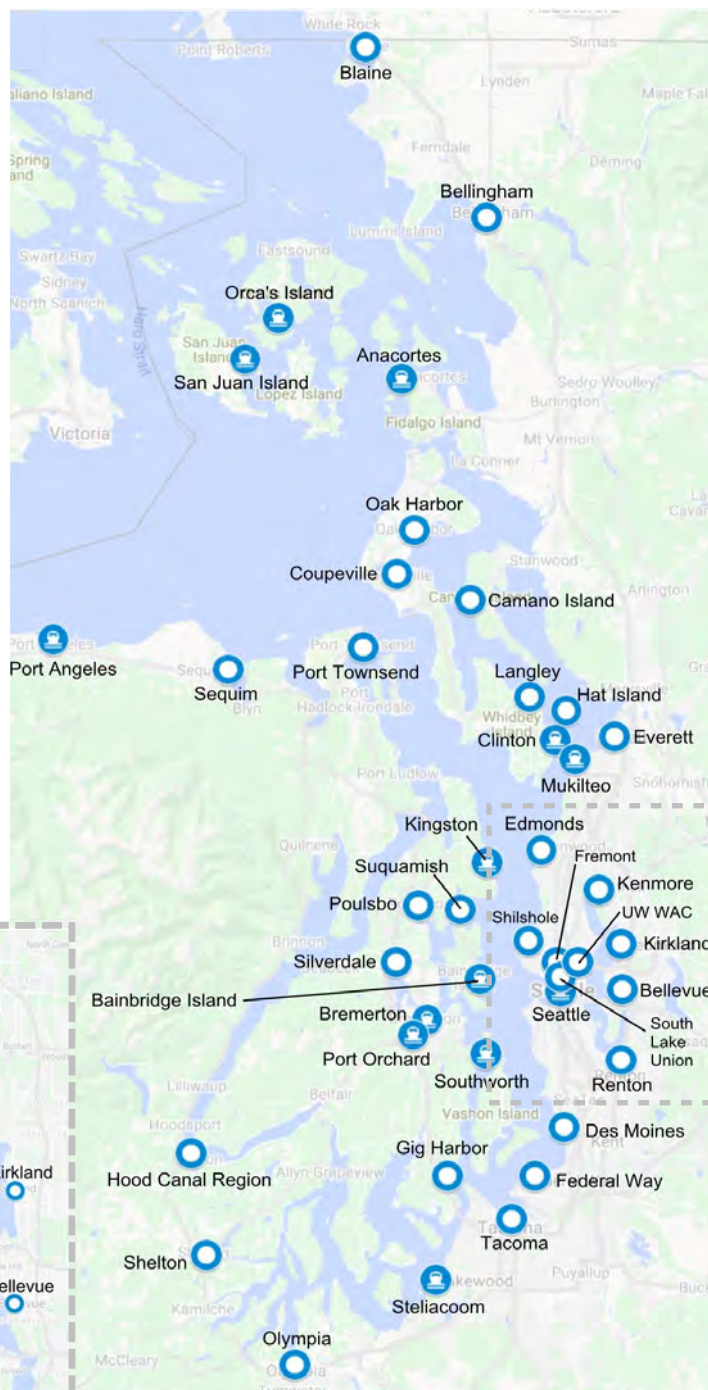


Identify Potential Landing Sites and Routes for Review

Route combinations were identified from previous studies and by evaluating jurisdictions with waterfront property that people could travel between via POF. The map to the right depicts all potential landings that were evaluated during the identification process. This process ultimately led to 45 route combinations, in all 12 counties bordering Puget Sound, moving forward to the route assessment. Of the 45 route combinations, 10 routes were identified from previous studies and five routes were identified and included for analysis based upon public survey results completed as part of the study engagement.

Appendix B provides more detail on the landing locations and routes identified.

Appendix E provides more detail on stakeholder engagement and survey results, also discussed in more detail in the next section of the report.



Map of Reviewed Landing Sites
[Base Map from Google Maps]



Route classification

Routes and landing sites were classified at the onset of analysis based on ridership type and on population density. This classification was needed due to the diverse geography, demographics, and ways in which users access transportation options. These classifications were based on the primary type of ridership and urban or non-urban landing site. This information provided a consistent methodology for review of very diverse geographies and users.



A Beach on the Shoreline of Puget Sound [PSRC]

Ridership type

COMMUTE routes are anticipated to bring commuters to and from work. These POF routes will focus primarily on providing service during the morning and evening peak travel periods. More limited mid-day POF service may also be provided to support trips outside peak commute periods.

As all existing public POF routes are commute-focused, more information is generally available regarding what makes a commute POF route successful as well as how to estimate ridership for commute services.

RECREATIONAL/DISCRETIONARY routes focus on providing POF service during mid-day, evenings, and weekends for essential trips, including access to services such as medical appointments or the airport, and recreational trips, which are primarily for leisure travel.

No exclusively recreational/discretionary POF routes are currently publicly operated in the Puget Sound study area. As a result, less information is available about how to analyze and estimate ridership for these routes.

Comparable mode

URBAN POF routes were identified as routes connecting populous urban areas and having a directly comparable mode of transit for the same trip.

NON-URBAN POF routes were identified as those connecting either urban or rural areas and having only single-occupant vehicles as a directly comparable time-competitive mode.



Route Analysis and Assessment

A stepped approach was developed for route and landing site assessment in order to most efficiently apply study resources to the large list of potential routes. Each of the three steps included progressively more detailed stages of analysis. The goal was to provide jurisdictions, elected officials, and interested parties with useful information about a particular route no matter where it was reviewed in the analysis.

The analyses in Steps 1 through 3 were conducted in order, with potential routes and landings moving forward for further analysis based on the findings of each step. Steps 1 and 2 analyzed routes based on the selected criteria, with some key implementation challenges identified for routes in these steps. Step 3 revisited and refined some criteria and evaluated additional criterion elements. Ultimately, a weighted ranking of the routes based on geographic priorities was developed to identify seven routes that would receive additional analysis. The stepped approach is outlined in the figure below, including the main evaluation criteria used within each of the three steps. Greater detail is provided in the following section of this report.



Stakeholder and community engagement was a central element throughout the assessment, starting with early engagement and continuing throughout the project. The engagement approach and findings can be found in the next section of this report and within the route-specific profiles.

A summary of the routes analyzed in each step is included in the *Analysis Results* section of this report.



Introduction

Passenger-Only Ferries

Study Approach

COMMUNITY ENGAGEMENT

Analysis Results

Route Profiles

Greenhouse Gas Emissions and Electrification

Conclusions and Implementation



STAKEHOLDER AND COMMUNITY ENGAGEMENT

Overview

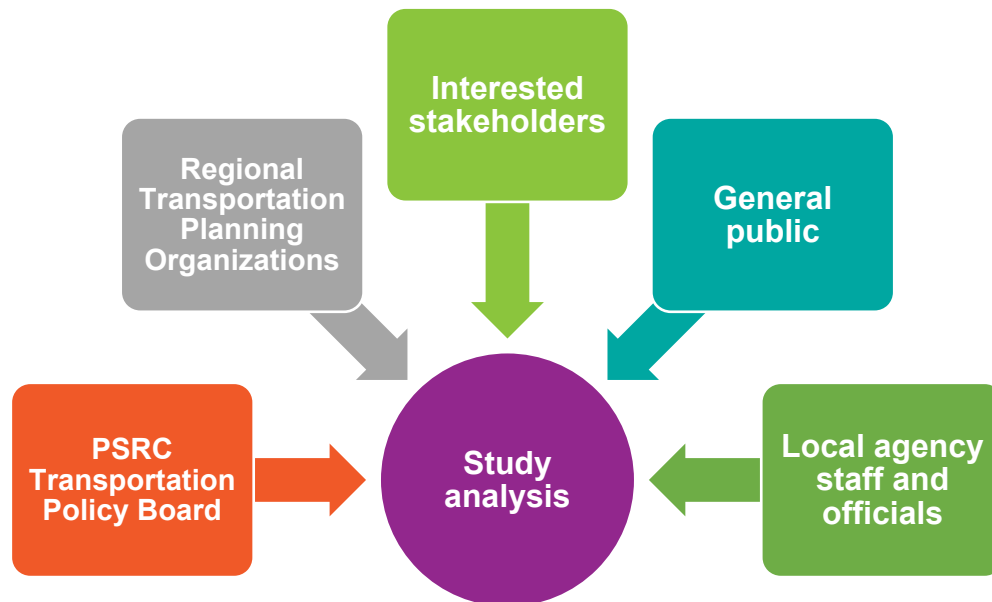
The Legislature called for this study, in part, because of the growing enthusiasm for POF service. As King County and Kitsap Transit have planned and implemented services in the central Puget Sound region, an increasing number of people have called for more service and service connecting new destinations. This enthusiasm for POF service was noted throughout the stakeholder and community engagement process.

To engage the 12-county study area during the COVID-19 pandemic, this study used online tools to distribute information and gain feedback, including public webinars, an online survey, website materials, e-newsletters, and social media platforms. In addition, the team solicited feedback from Regional Transportation Planning Organization (RTPO) partners on the study approach and community representatives for site-specific feedback. PSRC established and regularly updated a Passenger-Only Ferry Study website to house project information and provided a project-specific email where people could sign up to receive project updates. Due to the COVID-19 pandemic, community engagement activities were held virtually from March 2020 through December 2020.

Engagement Tools

Social media	Project website
Direct emails	Public webinars
Public meeting briefings	Stakeholder meetings
Mailing lists	FAQs

Feedback Provided to the Study



For more information on this project's community outreach and engagement efforts, please see Appendix E.

Webinars

PSRC conducted three webinars throughout the study to inform and gain feedback. Each webinar was promoted via PSRC social media platforms and project email lists and published on the Passenger-Only Ferry Study website. Prior to each webinar, the study team met with RTPO partners to gather feedback before presentation to the general public.

April: Introduced study and study approach, outlined ways to stay informed and provide input.

August: Provided online survey results and gathered feedback on preliminary study findings.

December: Presented route profiles and gathered feedback on the draft report.

During the webinars, comments were received via chat and answered during the event. Feedback informed the "Frequently Asked Questions" included on the project webpage.

Reoccurring study scope questions received in webinars:

- *Governance*
- *Funding*
- *Marine Mammal Protection*
- *Equity*

When the issues of governance and funding were raised, the study team communicated to webinar participants that these items were out of the scope of this study. Issues such as marine mammal protection and equity are addressed in this study as elements for implementation where topics and tools such as operating protocols, fare structure, and terminal siting evaluation can be used. Governance and funding are also important topics that will need to be addressed by an implementer during more detailed route planning. Please see the *Conclusion and Implementation* section of this report for more information.



Recreational Boating on Lake Union [PSRC]



Survey Summary

PSRC conducted an online survey in spring 2020 to further understand and review geographical priorities and destinations of interest. The survey was promoted on PSRC social media platforms, the study website, and local news outlets. Over 10,500 individuals responded. Due to the strong response from the North Sound regions—over half of the 10,500 survey responses were from Whatcom County—data normalization measures were taken to ensure geographic equity in the survey analysis.

Across all 12 counties, survey responses indicated that travel time savings was a top priority for POF service. As a result, travel time savings was incorporated as a criterion in the Step 2 evaluation, as well as the Step 3 weighted ranking of POF routes. Travel time competitiveness is often a high priority and consideration for transit customers.

Recreational potential for POF routes was identified as more important in the North Sound and Peninsula RTPO regions. Prioritizing recreational opportunities contributed to more routes in these regions being designated as discretionary/recreational routes, and the relative recreation potential of each route was included as a criterion in the study analysis.

The table below highlights the top criteria identified by each RTPO region via the survey results.

RTPO REGION	TOP CRITERIA
Peninsula RTPO (Clallam, Jefferson, Mason)	Travel Time, Resiliency, Recreation, Quick Implementation
North Sound Regions (Whatcom, Skagit, Island, San Juan)	Recreation, Quick Implementation, Travel Time
PSRC (King, Kitsap, Pierce, Snohomish)	Travel Time, Ridership, Quick Implementation
Thurston County	Travel Time, Ridership, Multimodal Connections



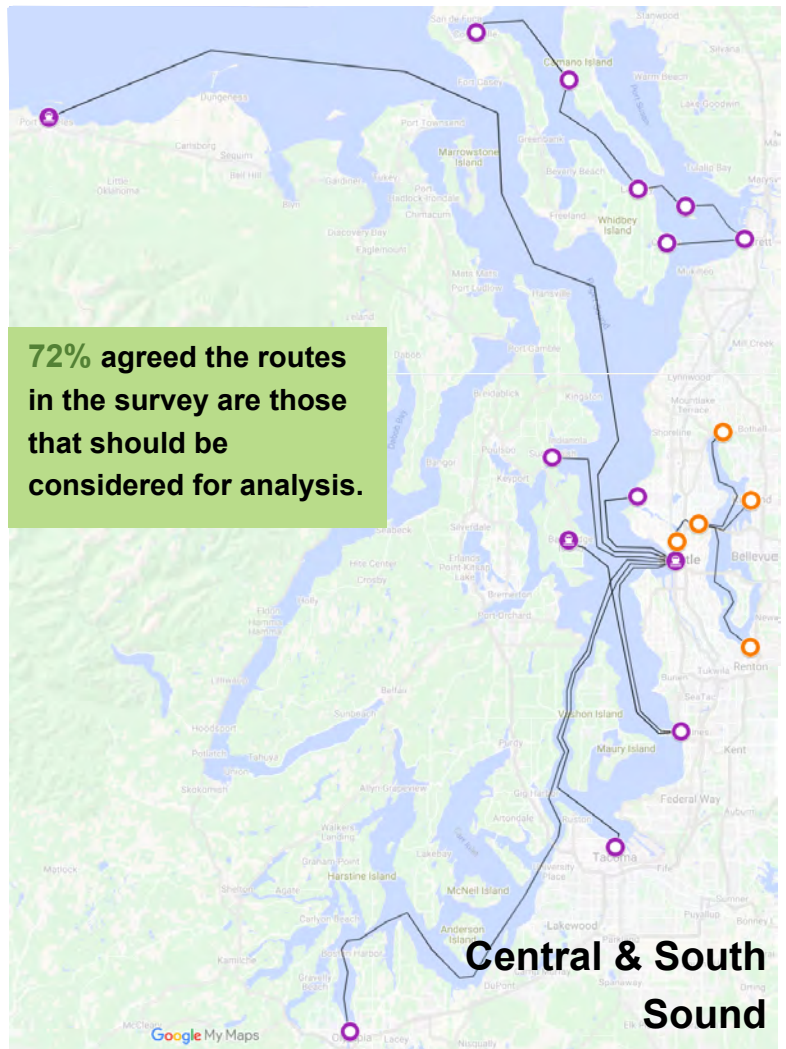
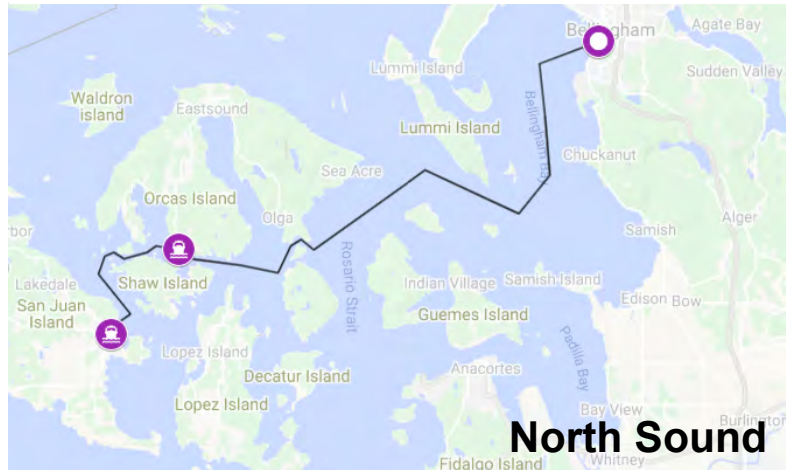
Apart from identifying key analysis criteria, the survey also provided respondents the opportunity to recommend routes for consideration. A selection of routes was included on the survey based upon previous studies, representing only a subsection of all of the routes analyzed. Of survey respondents, 72% agreed the routes shown in the survey were those that should be considered for analysis. For those who believed additional routes should be evaluated, an opportunity to write-in up to three route options was provided.

The following route combinations were “write-in” routes that were supported by at least 10% of one county’s survey respondents and were therefore added for assessment:

- Port Townsend–Downtown Seattle
- Port Townsend–Bellingham
- Orcas Island–Bellingham
- Camano Island–Everett
- Tacoma–Olympia

Ultimately, most of these routes did not meet the analysis criteria metrics to be analyzed in Step 3 or beyond of the route assessment. Additional information can be found in Appendix E.

Routes Included in the Survey
[Base Maps from Google Maps]



Finally, the survey provided an opportunity for respondents to provide additional information through open-ended comments. Most of the open-ended responses received were positive towards the prospect of POF service as a form of transportation. Many used this opportunity to further advocate for implementation of specific route selections made in the route options portion of the survey. Additionally, respondents shared additional factors they felt were important for POF service. These factors and more information can be found in Appendix E.

Site-Specific Outreach

After the routes and landing sites were analyzed through the three-step process, sites were identified for further analysis. PSRC conducted site-specific outreach with local agency representatives to understand potential challenges or opportunities of POF service. This included identifying potential terminals within their jurisdiction, work underway on the waterfront or surrounding areas, and general interest in being included in the study.

A summary of findings from these discussions can be found in the route-specific profiles within this report. While nine routes were originally identified as candidates for final analysis, based on this site-specific outreach it was concluded that the Gig Harbor-Seattle and the Suquamish-Seattle routes would be removed from further analysis. More information on this feedback can be found in Appendix E. Potential landing sites in the City of Seattle also raise challenges and concerns from stakeholders including both the City and the University of Washington. Their feedback led to identification of landing site options where additional study will be needed prior to implementation.

In addition to the feedback noted above, several key themes arose from the site-specific outreach, including:

- Funding needs for POF
- Relationship of POF to other waterfront uses
- Multimodal connections to landing sites

More information on these themes can be found in Appendix E.





University of Washington [PSRC]

Feedback on Draft Study

PSRC sought feedback on the draft study that was presented at the December 15, 2020 webinar. Similar to previous phases of engagement, general enthusiasm for POF service was expressed. However, specific feedback included questions or concerns in the following topic areas:

- Cost and ridership estimates
- Speed and travel time calculations
- Environmental and recreation impacts and mitigation
- Accessibility and capacity associated with potential terminal locations

More information on specific issues contained in these areas can be found in Appendix E. However, most of the feedback received would be associated with tasks an implementer would need to address when studying a particular route.



Introduction

Study Approach

Passenger-Only Ferries

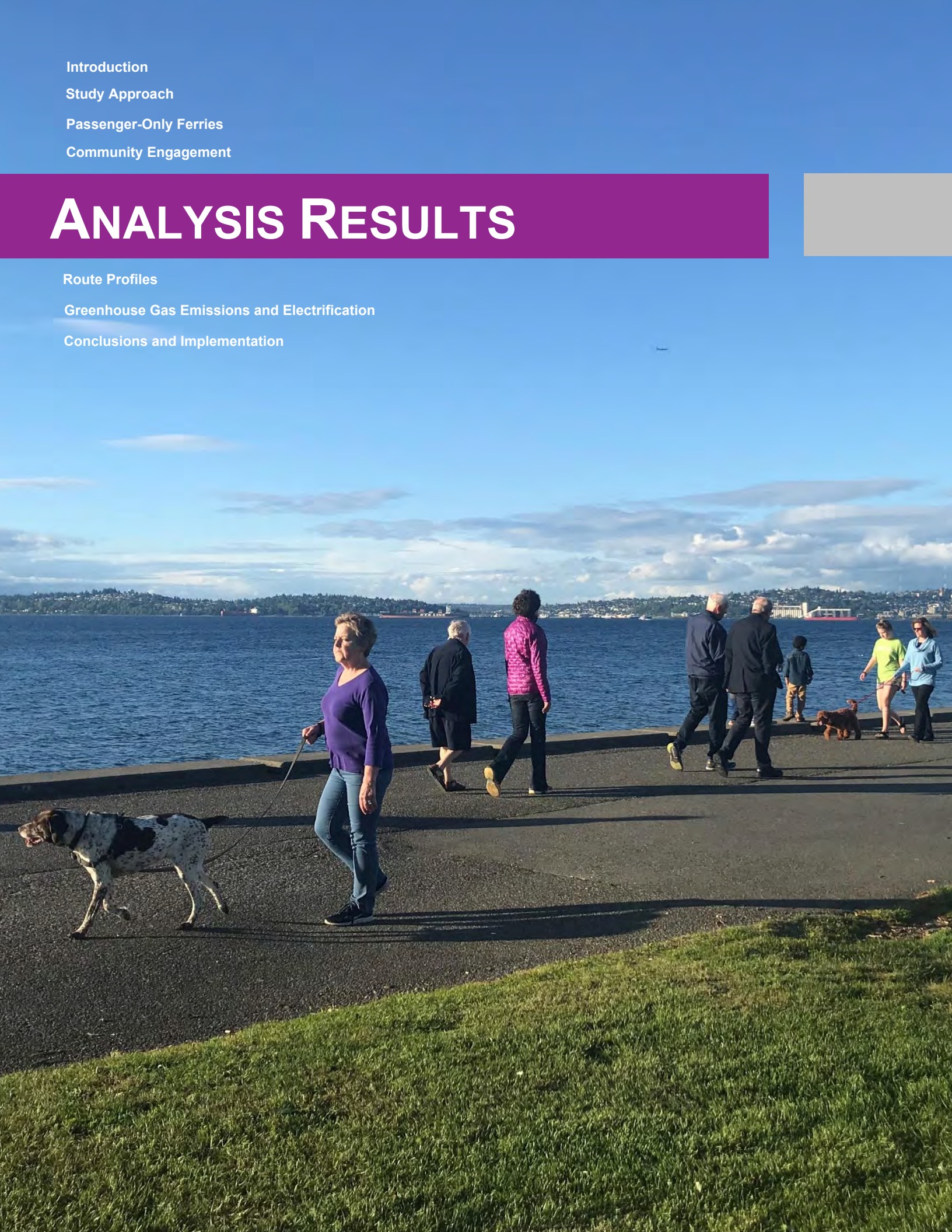
Community Engagement

ANALYSIS RESULTS

Route Profiles

Greenhouse Gas Emissions and Electrification

Conclusions and Implementation



ANALYSIS RESULTS

Existing Conditions Assessment

The existing conditions assessment identified a few key factors to keep in mind throughout the route assessments. They are detailed below.

Seattle landing capacity

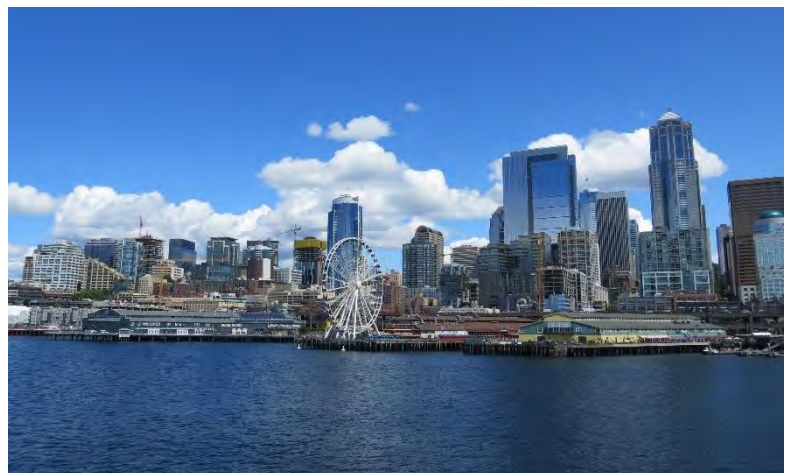
Seattle is the largest employment center in the Puget Sound area, and there is growing interest in offering additional POF connections to downtown Seattle. In addition to the eight routes connecting to downtown Seattle that progressed through Step 3 of the analysis, several other feasibility studies have been recently completed for POF routes landing in Seattle. For all of this interest, there is currently only one POF landing facility in downtown Seattle. It serves four routes and five vessels from two operating slips. An additional Kitsap Transit route from Southworth to Seattle is expected to come online in the first quarter of 2021, adding to the current operating challenges. Though new routes landing at this existing facility may be advantageous due to potential cost savings and easy passenger transfers, docking availability for additional routes or more trips on current routes at this facility is extremely limited. Additional POF slips and landing facilities, whether at multiple new landing sites, at a new larger regional facility, or at an expanded existing facility, will be needed to accommodate additional routes to downtown Seattle.

Seattle Fast-Ferry Terminal Siting Study

To address the limited landing site capacity at the existing Pier 50 POF facility, Kitsap Transit launched the Seattle Fast-Ferry Terminal Siting Study in September 2020 to evaluate options for an alternative downtown Seattle landing site. The study, anticipated to continue through 2021, will identify and comprehensively evaluate alternatives for a long-term downtown Seattle POF landing site by following this process:

- Developing criteria for site evaluation based on Kitsap Transit's long-term service needs and goals
- Evaluating site alternatives (minimum of six)
- Narrowing the list to two sites for further analysis, including environmental assessment
- Identifying a preferred alternative to move forward in National Environmental Policy Act (NEPA) scoping and planning
- Engaging communities, tribal governments and affected stakeholders throughout the process

(Source: <https://www.kitsaptransit.com/seattle-fast-ferry-terminal-siting-study>)



Downtown Seattle Waterfront [PSRC]



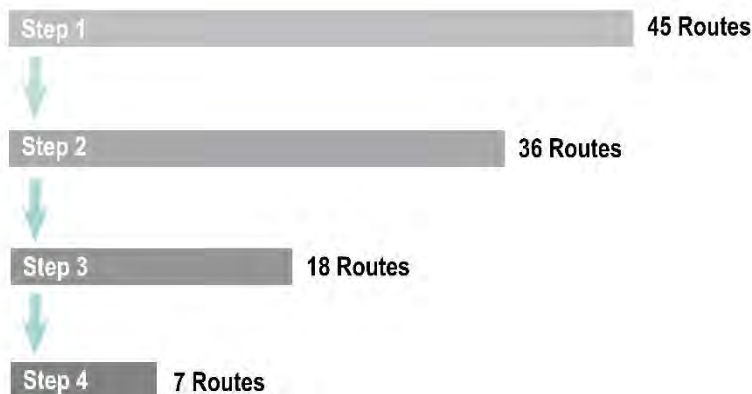
Reducing greenhouse gas emissions

Lowering the emissions of ferry service through alternative fuels and vessel propulsion systems has increased in prominence throughout the ferry industry for both POF vessels and vehicle ferries. Locally, WSF is developing a system-wide electrification plan using plug-in diesel-electric hybrid vehicle ferries. Kitsap Transit is operating a new, hybrid passenger ferry from Bremerton to Port Orchard. Please see the *Greenhouse Gas Emissions and Electrification* section of this report for additional information regarding the current and future emissions of POF.

Routes for Assessment

A wide variety of route types and geographical regions served led to the identification of 45 routes at the beginning of the analysis. Ultimately, 18 routes advanced to Step 3 and received a thorough review for a variety of feasibility analysis metrics. From this analysis, seven routes were identified for more detailed review, which included local jurisdictional outreach, detailed ridership demand analysis, route profile review, and financial assessment. For more detail on the metrics and criteria for each step, please see Appendix C.

Number of Routes Evaluated in Each Step



List of Routes Assessed

ROUTE

- Anacortes – Des Moines
- Bellingham – Everett
- Bellingham – Friday Harbor
- Bellingham – Port Angeles
- Bellingham – Seattle
- Blaine – Friday Harbor
- Camano Island – Everett
- Clinton – Tacoma
- Coupeville – Camano Island
- Coupeville – Clinton
- Langley – Camano Island
- Oak Harbor – Everett
- Oak Harbor – Seattle
- Orcas Island – Bellingham
- Whidbey (Clinton/Langley) – Everett
- Whidbey (Clinton/Langley) – Kingston
- Whidbey (Clinton/Langley) – Seattle
- Bainbridge Island – Des Moines
- Everett – Seattle
- Fremont – Seattle (South Lake Union)
- Gig Harbor – Seattle
- Gig Harbor – Tacoma
- Kenmore – Seattle (University of WA)
- Kirkland – Seattle (University of WA)
- Port Orchard – Seattle
- Poulsbo – Seattle
- Renton – Seattle (University of WA)
- Renton – Seattle (South Lake Union)
- Seattle – Des Moines
- Seattle (Shilshole) – Seattle
- Silverdale – Bremerton
- Silverdale – Seattle
- Southworth – Des Moines
- Steilacoom – Tacoma
- Suquamish – Seattle
- Tacoma – Seattle
- Tacoma – Olympia
- Hoodsport – Port Angeles
- Hoodsport – Port Townsend
- Hoodsport – Seattle
- Port Angeles – Seattle
- Port Townsend – Bellingham
- Port Townsend – Seattle
- Shelton – Seattle
- Olympia – Seattle

North Sound
(Whatcom, Skagit, Island, San Juan)

PSRC
(King, Kitsap, Pierce, Snohomish)

Peninsula RTPO
(Clallam, Jefferson, Mason)

Thurston County



Route Analysis and Assessment— Step 1

The first step of analysis involved evaluating route combinations for the two factors: confined waterways and land use compatibility.

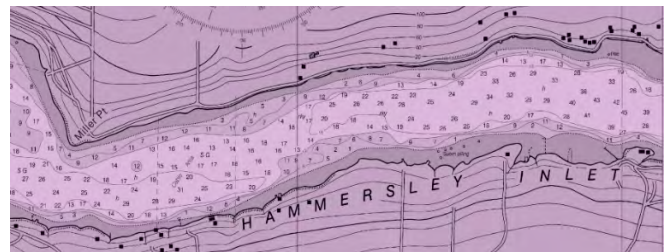
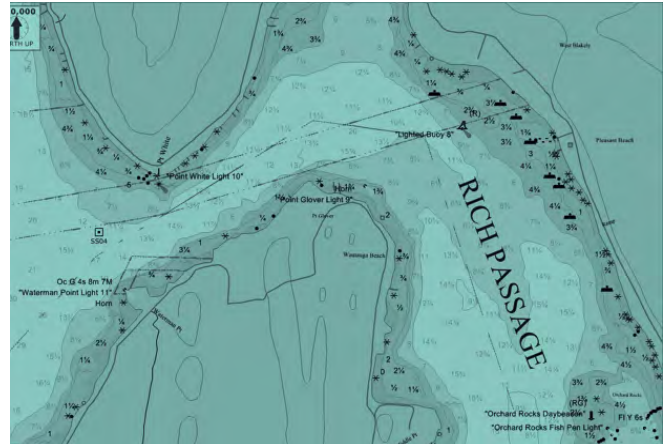
Presence of confined waterways along the route path

Confined waterways are sensitive to vessel wakes and require either many years of environmental monitoring or POF vessels that are restricted to very slow speeds to avoid impacting the shores of the waterway. Some routes in this study, such as those traversing Rich Passage and Hammersley Inlet, were not analyzed further due to confined waterway constraints. However, some routes traveling through confined waterways, such as the routes from Olympia that travel through Dana Passage, were analyzed in Step 2 using the assumption that the vessel would travel at slow speeds through the confined waterways along the route path. For information about confined waterways, please see Appendix F.

Land use compatibility

Property and zoning information for landing sites at both sides of the route was reviewed to determine if POF was an allowed use. Areas that were deemed incompatible with POF use included rural/agricultural and single-family residential uses. Public parks, mixed-use zones, and commercial uses were deemed POF-compatible. However, in some jurisdictions, such as Bellevue and Seattle, public parks are zoned as residential, despite their public use. For these jurisdictions, property ownership was also reviewed to identify public parks that could support POF route landings.

Confined Waterways – NOAA Navigation Charts



Routes identified in Step 1 with confined waterways and/or incompatible land use:

- Port Orchard–Seattle
- Poulsbo–Seattle
- Silverdale–Bremerton
- Silverdale–Seattle
- Shelton–Seattle
- Camano Island–Everett
- Coupeville–Camano Island
- Coupeville–Clinton



Route Analysis and Assessment—Step 3

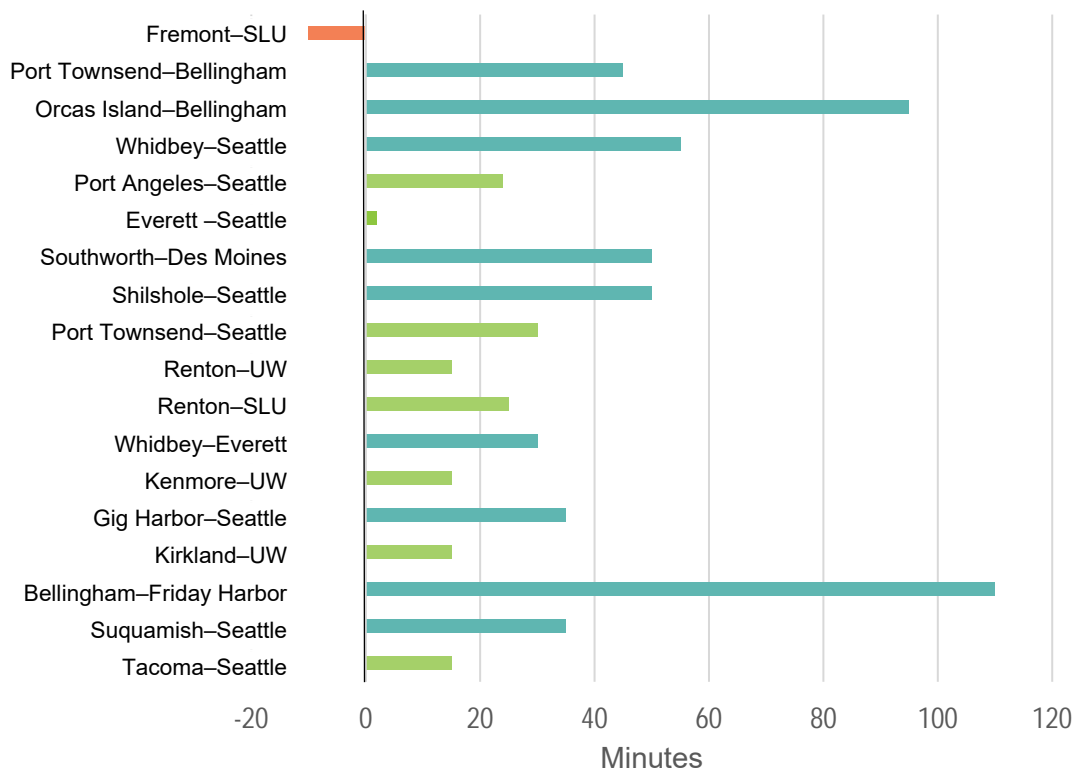
Step 3 includes a weighted ranking of the potential routes that moved forward following Steps 1 and 2. The ranking compared routes according to key regional priorities. Recreational/ discretionary trips were a higher focus in some areas, while commute ridership was more important in others.

Seven key criteria were used in this weighted ranking and were analyzed using 10 metrics. These criteria are summarized in the following section. For additional detail on the criteria please see Appendix D.

Travel time savings

Though evaluated in Step 2, travel time savings was reevaluated in Step 3, due to both the importance placed on time savings and the wide range of savings between routes. Some routes had savings of 90 minutes or more, while others were within only 10 minutes of the competitive mode travel time.

POF Travel Time Savings vs. Other Modes



Ridership potential

Ridership potential was evaluated using U.S. Census data and focused on the existing and potential commute ridership of each route. Again, wide ranges were observed between routes, with high performers being at least 10 times higher than the lowest performing routes. Ridership was identified as a particularly important criteria for the PSRC region and for the Thurston County region.

Discretionary trip opportunities

For discretionary/recreational routes in areas with high interest in recreational opportunities, the recreational potential of routes relative to one another was evaluated qualitatively by analyzing a variety of data sources, such as the number of hotels at destinations and WSF walk-on passenger ridership data. Low, moderate, and high recreational potentials were identified, with most routes having moderate potential.

Multimodal connections

For most of the POF routes studied, both origin and destination landing sites were within a 15-minute walk of some modal connection, either a transit stop (if the route was urban) or some form of parking (if the route was non-urban). Many routes could provide additional mode options for connections; only a few had no connections within a 15-minute walk of one or more route landings. Insufficient multimodal connections can be overcome through additional investment.



Example Walking Distance Calculation [Google Maps]

Community interest

Community interest in a route was indicated by how much support the route received in the public survey and whether a route was included in some form of planning document, such as a feasibility study or a long-range plan. Looking at these two facets of community support was important to get an idea of the general public's support and to see whether this support aligns with local transportation policy regarding POF.



Resiliency contribution

Many of the evaluated POF routes contributed to resiliency by providing options for bridge- or ferry-dependent travel, though only a few standout routes were deemed to improve access to essential medical services.

Operational considerations

One of the prime factors impacting POF operations is the general state of the seas and currents a vessel will encounter while traversing the length of the route. Routes travelling through rougher waters may need larger vessels to ensure that passengers will experience a comfortable and on-time trip.

Of the 18 routes analyzed in Step 3, six can be expected to reliably meet a 95% on-time schedule with a smaller 150-passenger vessel, given wind and wave conditions. The remaining routes face rougher wind and wave conditions and would require a larger vessel to meet 95% on-time service. Additional consideration was needed for routes crossing the eastern end of the Strait of Juan de Fuca and Admiralty Inlet, as these routes are affected by sea swell from the west.

Route ranking

Please refer to the route scorecard on the following page for information on how the routes analyzed in Step 3 performed in the analysis. Routes bolded and marked with asterisks were profiled in Step 4 of the analysis.



Step 3 Score Card

	Highest priority elements					Secondary priority elements				RANK
	Travel Time Savings	Existing Commute Demand	Potential Commute Demand	Support Criteria	Modal Connections Quality	Relative Recreational Potential	Modal Connection Distance	Resiliency	Seaworthiness	
*Tacoma – Seattle	●	●	●	●	●	-	●	○	-	1
Suquamish – Seattle	●	●	●	○	●	-	●	●	-	2
*Bellingham – Friday Harbor	●	○	○	●	●	●	●	●	-	3
*Kirkland – UW	○	●	●	●	●	-	●	○	-	4
Gig Harbor – Seattle	●	●	●	○	●	-	●	●	-	4
*Kenmore – UW	●	●	●	●	●	-	●	○	-	6
*Whidbey – Everett	●	○	○	●	●	-	●	●	-	7
*Renton – SLU	●	●	●	●	●	-	●	○	-	8
*Renton – UW	●	●	●	●	●	-	●	○	-	9
Shilshole – Seattle	●	●	●	●	○	-	○	○	-	10
Port Townsend – Seattle	●	○	○	○	●	●	○	●	▼	10
Southworth – Des Moines	●	○	○	○	●	-	●	●	-	12
Everett – Seattle	○	●	●	○	●	-	○	○	-	13
Port Angeles – Seattle	●	○	○	●	●	-	●	●	▼	14
Whidbey – Seattle	●	○	○	○	●	-	●	●	-	15
Orcas Island – Bellingham	●	○	○	○	○	○	●	●	-	16
Port Townsend – Bellingham	●	○	○	○	●	○	○	●	▼	17
Fremont – SLU	▼	●	●	○	○	-	○	●	-	18

● : High score
 ● : Middling score
 ○ : Low score
 ▼ : POF travel time is longer than competitive mode
 ▼ : Less 0.5 points
 ▼ : Less 1 point



Routes to be profiled

Following the Step 3 weighted ranking, outreach began with local agencies along the highest-ranked routes. This outreach informed site- and route-specific concerns in the route profiles. In some cases, jurisdictions indicated that they were not interested in a POF route in their community and that the planned route was incompatible with the community's existing uses. In these cases, the given route was not profiled regardless of its rank.

Routes Progressing to Step 4:

- *Tacoma–Seattle*
- *Bellingham–Friday Harbor*
- *South Whidbey–Everett*
- *Kenmore–Seattle (University of WA)*
- *Kirkland–Seattle (University of WA)*
- *Renton–Seattle (University of WA)*
- *Renton–Seattle (South Lake Union)*

For more information on the results of the Step 3 analysis, please see Appendix D.

Steps 1-3 Route Analysis Summary

The next page shows all routes evaluated and summarizes the analysis steps for each route. Ultimately, seven routes were identified for more detailed analysis and are profiled in this report. These routes are color coded in the graphic shown on the next page.



All routes that are highlighted in color in the table below have been profiled in detail, and these profiles can be found in the *Key Findings* section of the POF Study Report. For more information on the routes that were analyzed in Step 3, but were not profiled in detail, please see Appendix D.

Summary of Stepped Analyses

ROUTE	STEP 1	STEP 2			STEP 3	
	Initial Review	Mode	Time Savings	Community Support	Additional Consideration	Rank
Anacortes – Des Moines	●	Car	15	○	○	
Bellingham – Everett	●	Car	-90			
Bellingham – Friday Harbor	●	Car	110	●	N/A	3
Bellingham – Port Angeles	●	Car	90	○	○	
Bellingham – Seattle	●	Car	-20	○	○	
Blaine – Friday Harbor	●	Car	105	○	○	
Camano Island – Everett	LU					
Clinton – Tacoma	●	Car	65	○	○	
Coupeville – Camano Island	LU					
Coupeville – Clinton	LU					
Langley – Camano Island	LU					
Oak Harbor – Everett	●	Car	30	○	○	
Oak Harbor – Seattle	●	Car	70	○	○	
Orcas Island – Bellingham	●	Car	95	●	●	16
Whidbey (Clinton/Langley) – Everett	●	Car	30	○	Resiliency	7
Whidbey (Clinton/Langley) – Kingston	●	Car	85	○	○	
Whidbey (Clinton/Langley) – Seattle	●	Car	55	●	N/A	15
Bainbridge Island – Des Moines	●	Car	55	○		
Everett – Seattle	●	Car	0	○	Ridership	13
Fremont – Seattle (South Lake Union)	●	Bus	-10	○	Ridership	18
Gig Harbor – Seattle	●	Car	35	●	N/A	4
Gig Harbor – Tacoma	●	Car	-15			
Kenmore – Seattle (University of WA)	●	Bus	15	●	N/A	6
Kirkland – Seattle (University of WA)	●	Bus	15	●	N/A	4
Port Orchard – Seattle	CW					
Poulsbo – Seattle	CW					
Renton – Seattle (University of WA)	●	Bus	15	○	Ridership	9
Renton – Seattle (South Lake Union)	●	Bus	25	●	N/A	8
Seattle – Des Moines	●	Light Rail	-25			
Seattle (Shilshole) – Seattle	●	Bus	30	●	N/A	10
Silverdale – Bremerton	CW					
Silverdale – Seattle	CW					
Southworth – Des Moines	●	Car	50	●	N/A	12
Steilacoom – Tacoma	●	Car	-5	○	○	
Suquamish – Seattle	●	Car	35	●	N/A	2
Tacoma – Seattle	●	Bus	15	●	N/A	1
Tacoma – Olympia	●	Car	-45			
Hoodsport – Port Angeles	●	Car	-60			
Hoodsport – Port Townsend	●	Car	-40			
Hoodsport – Seattle	●	Car	15	○	○	
Port Angeles – Seattle	●	Car	25	●	N/A	14
Port Townsend – Bellingham	●	Car	45	●	N/A	17
Port Townsend – Seattle	●	Car	50	●	N/A	10
Shelton – Seattle	CW					
Olympia – Seattle	●	Car	-15			

KEY

- LU: Land use is prohibitive.
- CW: Confined waterway is prohibitive.
- Mode: Travel mode used to compare POF travel times.
- : This route met the analysis metric.
- : This route did not meet the metric for further analysis.



Further Route Analysis and Assessment—Step 4

This level of assessment focused on the development of a detailed route profile to provide a better understanding of route feasibility—including costs to operate service, expected ridership demand, fleet composition and operating profile.

Travel time savings

Travel times for POF are for the trip measured dock-to-dock and refined for profiled routes based upon agency feedback on preferred landings and more granular measurements of maneuvering zones. All POF travel times, regardless of water body, accounted for necessary vessel maneuvering and slowdown distances.

Times for comparative travel modes, transit or car, were also determined. When a car trip was the comparative mode, trips were measured point-to-point from central city locations. Transit trip times were measured from the nearest transit stops to each POF landing.

Costs⁴

Feasibility analysis typically evaluates the costs of acquiring required capital assets, the costs of operating the service, revenue from the planned service, and other sources of revenue available to support capital acquisition and ongoing operations. Once a proposed service plan is defined, projecting capital start-up and annual operating costs is relatively straightforward. Certain assumptions have to be made about wage rates, fuel prices, and overhead costs but, particularly in the Puget Sound area, there are currently operating services to inform these assumptions. Projecting potential revenue relies upon ridership forecasts and is more difficult to assess. This study has developed preliminary ridership estimates to evaluate and rank routes for further assessment. However, these are very preliminary estimates and may not be reliable as a basis for forecasting fare revenue. Current Puget Sound POF operators report system revenue recovery above 25%. However, this is not the case for all transit modes or particular routes that may perform higher or lower than this average. A privately operated service would have



A KT Fast Ferry Rider's Ticket from the Day of Service Launch [PSRC]

⁴ All costs estimated in this report are in 2020 dollars.



to cover the full cost of operations, capital investment, and demonstrate a profit or rate of return on owner investment.

Costs assumed stand-alone operation of each route. If a route is implemented by an existing operator, cost efficiencies might be possible. These may include decreased capital costs when back-up vessels can serve more than one route. Or they may be lower operating costs when management, support staff and overhead costs can be shared. Such efficiencies were not addressed in this study but should be explored in further analyses or follow-up route implementation studies.

Capital costs

Landing sites

There is a range in the level of infrastructure provided at current landing sites in Puget Sound. Some landing sites, such as the landing at Seacrest Park in West Seattle, are minimal, providing space for only one vessel to land at a time with access ramps and railings but no other passenger amenities. However, other landing facilities provide more extensive passenger amenities, such as the Pier 50 POF terminal that provides covered passenger queuing and docking infrastructure to support two vessels landing simultaneously. For this study, the minimum level of work required for docking infrastructure to support the landing for one POF vessel was identified for each landing site, placing sites into one of two categories, which are defined below. Both categories assume some form of ticketing, signage, and uplands improvements will be needed. Though not assumed in this study, a potential service operator could choose to provide more extensive improvements for docking capacity and passenger amenities.

	<i>Category Description</i>	<i>ROM Capital Cost</i>
Retrofit	Existing dock is available and is serviceable with minor changes	\$1M - \$5M
Replacement or New Build	<i>Either</i> 1) docking infrastructure currently exists but would need replacing to support service <i>or</i> 2) no docking infrastructure currently exists and all new docking infrastructures would need to be constructed	\$5M - \$35 M ⁵

⁵As a reference point, the recently constructed (2018) King County Multimodal Passenger-Only Terminal at Pier 50, had an approximate total terminal costs of \$34 million dollars. This facility serves two POF providers with only two slips. Facility size, location, ownership, mitigation and other factors can vary terminal construction costs greatly.



Due to the variability of costs that could result from different design solutions or infrastructure investments, a range of landing costs was developed for each of the two landing site categories, estimated at a rough order of magnitude (ROM) planning level using the best available information from recent reports. No costs were estimated for purchasing or leasing land for terminals or maintenance facilities, or for improving current operator maintenance facilities to meet any expanded POF needs.

Fleet and vessels

To maintain service reliability, each route is assumed to have one back-up vessel. In most cases, that means a total fleet of two. For longer travel routes, two vessels may be required for regular operation, making the fleet size three.

Three possible vessel classes were identified. Larger vessels (Subchapter K—more than 150 passengers) were assumed for most open sea Puget Sound routes to increase rider comfort. These vessels would be capable of operating speeds up to 35 knots. Smaller vessels (Subchapter T—150 passengers or less) were identified for all other routes, with operating speeds from 28 to 35 knots. To handle the greater power required for higher speed, a vessel must be larger to accommodate more engines, even though the passenger capacity remains the same. Power can be mitigated with lighter materials or additional features such as foils, but they may also increase vessel costs.

All routes have been evaluated qualitatively for current electrification potential, based on route length and current known battery capacities. This will change as technology evolves.

	<i>Max Passenger Capacity</i>	<i>Speed</i>	<i>Capital Cost per Vessel</i>	<i>Routes</i>
Vessel Profile 1	150 (Subchapter T)	28 knots	\$6.4M	Lake Washington & Lake Union Routes
Vessel Profile 2	150 (Subchapter T)	35 knots	\$9.5M	South Whidbey–Everett
Vessel Profile 3	250 (Subchapter K)	35 knots	\$14.8M	Tacoma–Seattle Bellingham–Friday Harbor

Operating costs

Annual operating costs were projected based on the unique operating characteristics of each route. These characteristics include vessel type, fleet size, service and vessel operating hours, daily trips, vessel crewing, terminal staffing requirements, and fuel consumption rates. Annual operating costs include the direct costs associated with operations and maintenance, such as



labor, fuels, and materials, as well as fixed costs such as insurance, management, support, and overhead.

Labor

All of the routes are expected to have the same vessel crewing requirements, and all of the commute routes are expected to operate similar service hours. However, the Tacoma–Seattle and Renton–South Lake Union routes are assumed to operate two vessels to provide the same service level and will require nearly twice as many labor hours for the second crew needed to operate two vessels.

Fuel

Fuel as a percent of total annual costs varies greatly across the routes. The variation is a function of vessel speed, travel times, and number of vessels operating. The Tacoma–Seattle route has the highest fuel costs, with fuel representing almost 20% of annual costs. The Kirkland–UW route, with short trip times and slower vessel speeds, has fuel costs of less than 5%. Fuel prices have fluctuated greatly in recent years. The Tacoma–Seattle route is projected to spend about \$800,000 a year on fuel at today's prices. At 2019 fuel prices, that would be almost \$1.3M.

Maintenance, management, and support

There are economies of scale possible in both maintenance and management and support. Management and support costs enable the operations and maintenance of the service. They include program and financial management, and administrative staff salaries and benefits, payroll and financial system costs and other overhead such as office space, office supplies and equipment and professional services. The practices and expenditures of the two current POF operators informed the calculation of these costs for the seven routes. However, each route is treated as a stand-alone service bearing the full weight of these costs. If an operator were to operate more than one route, there would be incremental cost savings associated with additional routes reducing the cost to each route.

For more information regarding costs and financial assumptions, please see Appendix G.

Ridership

Calculating POF ridership is a notoriously difficult endeavor, made only more complicated by the changing travel conditions during the COVID-19 pandemic.

While previous ridership potential was estimated using U.S. Census data, the ridership estimates conducted at this stage were more refined and made use of PSRC's regional travel demand model wherever possible. This model, called SoundCast, estimates expected travel patterns and volumes between over 3,700 origin and destination zones within the region. The model's baseline reflects conditions during an average weekday in 2018.



For routes outside the PSRC region, the SoundCast model could not be used and the other best available data sources, such as WSF passenger ridership, were used. Though there are differences in data availability, the approach for estimating ridership was the same for all routes and is outlined below.

1. Determine how competitive the POF route would likely be compared to other travel options.
2. Estimate the current demand for travel between the destinations served by the proposed route.
3. Estimate the percentage of travelers who would potentially select the new POF service.

PSRC Region Routes <i>Commuter</i>	Bellingham–Friday Harbor <i>Discretionary</i>	Clinton–Everett <i>Commuter</i>
<p>Step 1 Determine time competitiveness using estimated POF trip times.</p> <p>Step 2 Estimate travel demand using the SoundCast model to:</p> <ol style="list-style-type: none"> 1. Define destination market areas. 2. Compare travel time competitiveness. 3. Define origin areas. <p>Step 3 Estimate the market capture rate using the SoundCast model.</p>	<p>Step 1 Determine time competitiveness using estimated POF trip times.</p> <p>Step 2 Estimate travel demand using the 2018 San Juan Island Visitor Survey and average daily foot-passenger ridership on the WSF ferry from Anacortes to Friday Harbor.</p> <p>Step 3 Estimate the market capture rate by accessing the relative accessibility of each terminal, frequency of service, and length of boat trip.</p>	<p>Step 1 Determine time competitiveness using estimated POF trip times.</p> <p>Step 2 Estimate travel demand using Everett Transit boarding data for northbound riders at the landing site nearest route, information on upcoming waterfront developments, and ridership on the WSF ferry from Clinton to Mukilteo.</p> <p>Step 3 Estimate the market capture rate by accessing the relative accessibility of each terminal, frequency of service, and length of boat trip.</p>

The table above highlights where differences in data availability between routes resulted in differences in the second step of ridership demand analysis.



It is important to note that this analysis focused on determining the share of current travel demand that might be captured by proposed POF services. While SoundCast does simulate household travel behavior, there are forms of induced travel demand that the model is not able to anticipate. For example, tourists or locals may decide to take POF trips purely for the recreational appeal rather than as a replacement for a trip they would otherwise make by another mode. Also, because the analysis was performed using the 2018 base year, the longer-term impacts of new ferry service, which could include land use and household location changes and their subsequent impacts on trip making, were not evaluated.

Additionally, some of the proposed routes include opportunities for new residential and commercial growth within the landing watershed—or have already experienced growth since 2018. These changes could have significant impacts on potential travel demand, particularly if new residents or businesses make location choices based on the anticipated availability of POF service.

For more information on ridership modelling and calculations, please see Appendix H.



Introduction

Study Approach

Passenger-Only Ferries

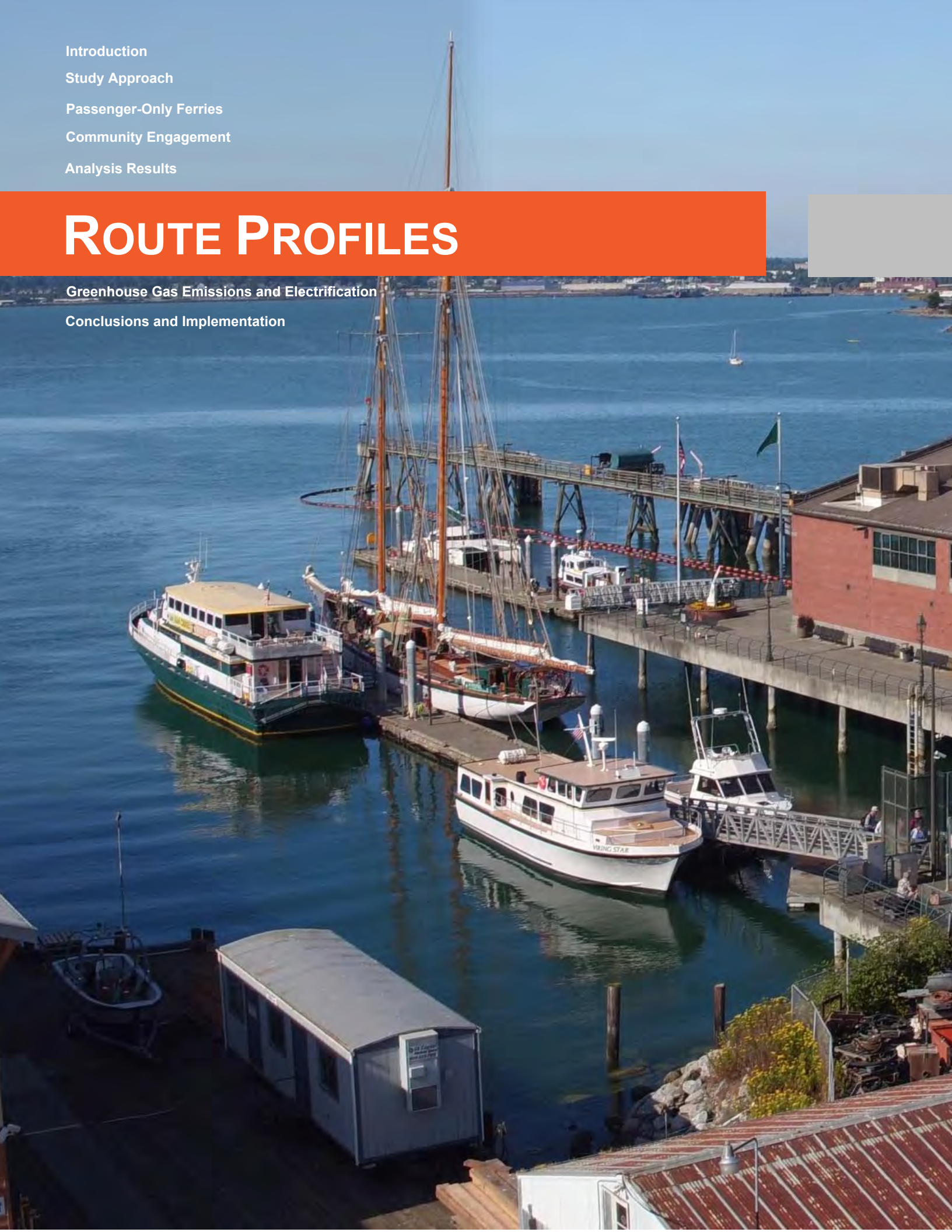
Community Engagement

Analysis Results

ROUTE PROFILES

Greenhouse Gas Emissions and Electrification

Conclusions and Implementation



ROUTE PROFILES

The route profiles on the following pages represent the culmination of analysis for the study and were the seven routes analyzed in the greatest level of detail. These profiles are based on high-level assumptions to provide a feasibility-level analysis. The fleet requirements, ridership, and costs shown are based on the programmed service schedule and operating profile and are estimates only. If an alternative service schedule was chosen, these estimates would not be applicable.

COMPARATIVE EXISTING SERVICES

To put the route profiles in context, the table below provides information about current public POF route operations. It summarizes key statistics for the current King County and Kitsap Fast Ferry POF routes.

	<i>Route Length</i>	<i>Vessel Capacity</i>	<i>Vessel Service Speed</i>	<i>Level of Service</i>	<i>2019 Annual Ridership</i>	<i>Farebox Recovery</i>
King County Water Taxi Routes						
Vashon Island –Downtown Seattle	10 miles	278 passengers	28 knots	M-F commute service, year-round	257,685	55.6%
West Seattle – Downtown Seattle	2 miles	149 to 278 passengers	28 knots	M-F commute service, year round Apr – Oct: M-F expanded service; Sat & Sun service	443,993	30.9%
Kitsap Fast Ferry Routes⁶						
Bremerton-Seattle	17 miles	118 passengers	27-38 knots	M-F commute service, year round May- Sept: M-F expanded service, Sat. service	301,531	26% for all Fast Ferry Routes (2019)
Kingston-Seattle	17.5 miles	350 passengers	27-38 knots	M-F commute service, year round May- Sept: M-F expanded service, Sat. service	175,397	

⁶ Kitsap Foot Ferry comparative statistics can be found in Appendix A, Attachment I. The speed and distance of travel on these routes is not comparable to the routes profiled in the following pages.



Route Profile Structure

Each route profile was designed to be a stand-alone document that has all the information relative to the jurisdictions in which each route lies. As a result, some information is repeated across profiles, when applicable for multiple routes. Each route profile is bookended by photos of the proposed landing sites, while the body of each profile has three main parts. An example with each of the three parts is shown below.

Part 1: Route Overview

Part 1 of the profile contains the following components:

1. ROUTE SUMMARY
2. ROUTE MAP
 - Each route profile includes a route map that shows the approximate route path and the representative terminal locations used. The number of vessels in the fleet is represented on each map by a vessel icon.
3. OPERATING PROFILE
 - This section includes the route service schedule and other key operating information, including route electrification potential. Electrification potential was categorized as low, medium, or high for each route. These categorizations are represented by battery icons, as are seen in the key below.

Electrification potential key

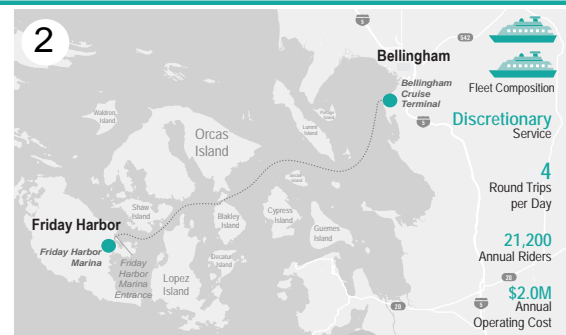


4. APPROXIMATE TRAVEL TIMES

- Travel times for both POF and comparative mode are included.

Part 1 Route Overview

Bellingham - Friday Harbor



1 ROUTE SUMMARY
Traversing the scenic waters of north Puget Sound, this route connects mainland Washington to the San Juan Islands and provides a major time savings compared to current travel options. Tourists from Washington and Canada can travel to the Bellingham terminal by a variety of modes. San Juan Islanders can also use the route to connect to essential medical services and business travel.

Due to sea states and low commuter ridership potential, this operating profile identifies seasonal service, April through September. A larger vessel was selected to improve passenger comfort on the rougher North Sound waters.

Though originally envisioned as a primarily recreational/discretionary POF route, feedback from the San Juan Islands community has indicated that this route, if implemented, would also help support commuters traveling from the San Juan Islands to mainland Washington.

2

3 OPERATING PROFILE
Service Type
Recreational/discretionary, seasonal (6 months: April through September), 7 days a week

Departure Schedule
• Periodic
• 4 round trips per day

Slowdown Zones
Friday Harbor Marina entrance

Top Service Speed
35 knots

Electrification Potential

4 APPROXIMATE TRAVEL TIMES

	Car & WSF	POF	Time Saved
Bellingham Cruise Terminal - Friday Harbor Marina	160 minutes	50 minutes	110 minutes



Part 2: Landing Sites Overview

Part 2 of the profile contains the following components:

1. SITE MAPS

The landings for each POF route are mapped within the profiles. Where no specific landing has yet been agreed upon, potential landing options have been mapped instead with all landing locations within a half-mile radius of a multimodal transit hub near the desired route origin/destination. The capital cost category of necessary terminal improvements is also shown on each map.

Landing site map key

- Parking is in teal.
- Transit is in orange [LTR= light rail; all routes are approximate].
- Pedestrian/Bicycle infrastructure is in green.
- Landing location is in purple.

2. For each site, the following sections are also provided:

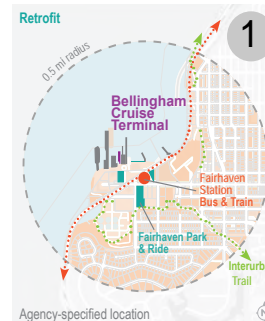
- MULTIMODAL CONNECTIONS - an overview of site accessibility by other transportation modes
- INFRASTRUCTURE - an overview of existing and needed infrastructures to support POF service
- REGULATORY REQUIREMENTS - an overview of key regulatory concerns

Part 2 Landing Sites Overview

Bellingham - Friday Harbor: Landing Sites

BELLINGHAM CRUISE TERMINAL

Port of Bellingham



Access / Multimodal Connections

- **Parking:** Some parking is on site, and numerous parking lots are within a half-mile of the landing, including the Fairhaven Park & Ride.
- **Transit:** The landing is a 0.2-mile walk from Fairhaven Station, where riders can connect to Greyhound, Amtrak, or local WTA bus services and onward to the Bellingham Airport.
- **Bicycle:** No dedicated bike lanes are nearby.
- **Pedestrian:** Sidewalks connect to Fairhaven Station, which is a 0.2-mile walk away. A trails network is accessible by a 0.3-mile walk.

Infrastructure

The cruise terminal currently has in-water facilities that can support the landing of a 250 passenger POF vessel. Ticketing, signage, and minor uplands work would be needed to fully support service.

Regulatory Requirements

Minor upland improvements would require local approvals.

FRIDAY HARBOR MARINA

Port of Friday Harbor

Access / Multimodal Connections

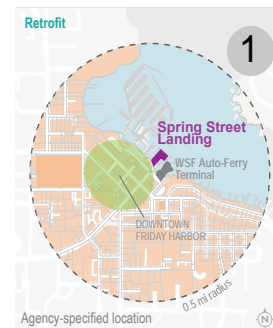
- **Parking:** Parking lots with capacity to support service are currently adjacent to the potential landing.
- **Transit:** The landing is adjacent to the existing WSF terminal, which provides connections to Anacortes, Sidney B.C., and other islands.
- **Bicycle:** Though in a bikeable area, no designated bike lanes are adjacent to the site.
- **Pedestrian:** Located in walkable downtown Friday Harbor, multiple attractions are connected to the landing via sidewalks.

Infrastructure

The marina currently has in-water facilities that can support the landing of a 250-passenger POF vessel. Ticketing, signage, and minor uplands work would be needed to fully support service.

Regulatory Requirements

Minor upland improvements would require local approvals.



2

2



Part 3: Route Considerations

Part 3 contains the following components:

1. FLEET
 - Number and type of vessels required to support service
2. RIDERSHIP
 - Estimated daily and annual riders based on the specified operating profile
3. COST SUMMARY
 - Estimated capital costs
4. RESILIENCY
 - Contribution to the resiliency of the study area’s transportation system
5. ENVIRONMENTAL
 - Overview of environmental concerns and analyses needed
6. ELECTRIFICATION
 - Potential for the route to be electrified given current technology
7. COMMUNITY OUTREACH
 - Summary of the route’s performance on the public survey and of the findings of stakeholder outreach
8. IMPLEMENTATION OUTLOOK
 - Summary of the hurdles to and opportunities for implementation of the route

Part 3 Route Considerations

Bellingham - Friday Harbor: Route Considerations

1 FLEET

Fleet Size
2 vessels

Fleet Composition
1 service vessel
1 back-up vessel

Maximum Passengers per Vessel
Between 150 and 250

2 RIDERSHIP

Ridership estimates were based on the total POF trip time and an assumed fare level that was based upon comparable existing passenger transit modes. Induced demand was not included in ridership estimates.

Estimated Ridership

Estimated Daily Riders	120
Projected Annual Ridership	21,200


3 COST SUMMARY¹

All operating cost estimates were calculated based on the established operating profile using the best available data.

Annual Operating Costs (in thousands)	\$2,035
Operating Labor	\$535
Energy / Fuel	\$400
Maintenance (Labor, Materials, & Contracts)	\$410
Insurance & Other	\$335
Management, Support, & Overhead	\$355

4 ADDITIONAL STOPS

About 15% of all North Sound survey respondents were interested in an Orcas Island to Bellingham route. As a result, a potential stop at Orcas Island along this route could be explored, serving tourists and increasing inter-island connections. Additional stops would increase the route trip time which can decrease ridership.



5 RESILIENCY

Though recreationally-focused for Whatcom County residents, this route provides transportation resiliency for residents of the ferry-dependent San Juan Islands. By providing an additional mode and transportation option, this route better connects island residents with key mainland services such as St. Joseph’s Medical Center and provides an additional option in case of mechanical difficulties or crowding on the WSP automobile ferry system.

6 ENVIRONMENTAL

By using existing facilities and limiting over-water work, this route is not anticipated to affect protected habitat. The confined waterway between Blakely Island and Obstruction Island should be considered for potential wake impacts.

7 ELECTRIFICATION

With current technology, this route is not a good candidate for electrification. The long length of the route combined with the fast travel speed and short dwell times for charging require a large amount of power to support service. Electric battery technology cannot currently store the amount of needed power without making the vessel larger and/or excessively heavy.

As vessel and battery technology evolves, electrification could become more viable.

¹Estimated capital costs needed for route start-up reference the Analysis Results section of this report.

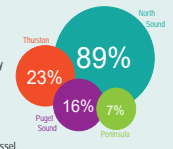
Bellingham - Friday Harbor: Route Considerations

7 COMMUNITY OUTREACH²

This route had extensive community support with interest from almost 90% of the more than 6,000 North Sound survey respondents. Interest from other regions was more minimal. Additional community outreach would be needed prior to route implementation.

Jurisdictional outreach for this route provided the following observations:

- This POF would provide commute service for San Juan Islands.
- It will be important to identify a governing body.
- Financial feasibility is an important factor.
- Anticipated users will want a reliable, consistent service schedule.
- A big challenge is identifying funding and creating a ferry district.
- San Juan Islands would like the opportunity to provide priority boarding to residents.
- Other POF routes to the San Juan Islands should be considered (i.e. Orcas Island to Bellingham).
- An important factor is to include bicycle space on the vessel.



8 IMPLEMENTATION OUTLOOK

The first step toward implementation is identifying a lead agency that will plan, fund, implement and manage the POF route. Following this identification, the selected agency will need to complete the actions required for start-up of any POF service, which are listed in the Implementation section of the report. Additional hurdles and/or opportunities for this route, beyond those shown below, may present themselves later in the route implementation process.

HURDLES

- Sea states. The sea states along this route necessitate a larger, more expensive vessel than ridership demand may necessitate.
- Low projected ridership. Seasonal service is supported by the low projected ridership.

OPPORTUNITIES

- + Economic opportunity from domestic and Canadian tourism.
- + High community interest and robust survey response.
- + Contribution to transportation resilience.
- + Opportunity to align with the 2022 Bellingham Regional Planning Update.
- + Potential for private service. As both landing sites currently support the landing of vessels, this route is well poised for a pilot POF service with no major infrastructure improvements needed.
- + Potential for year-round service with additional costs.
- + Opportunity for a connection at Orcas Island.

²These percentages are the percent of survey respondents from each region that either selected or wrote in this route for study.





Downtown Seattle Waterfront
[PSRC]

Tacoma - Seattle

ROUTE SUMMARY

Studied previously in 2018, a Tacoma to Seattle POF route has continued to remain popular in the discussion of Puget Sound POF expansion. The route connects two key regional job centers and provides a travel option that avoids the congested I-5 corridor.

Primarily serving commuters, this route would land in downtown Seattle, where POF docking space is currently limited. Though not assumed in this analysis, this route could be expanded to provide weekend or evening service if desired to meet the increase in POF demand that typically occurs in the summer. Additional service would increase operating costs. A larger vessel type was selected for seakeeping and passenger comfort.

OPERATING PROFILE

Service Type

Commute focused, year-round, 5 days a week

Departure Schedule

- 3 hourly AM peak departures
- 3 hourly PM peak departures

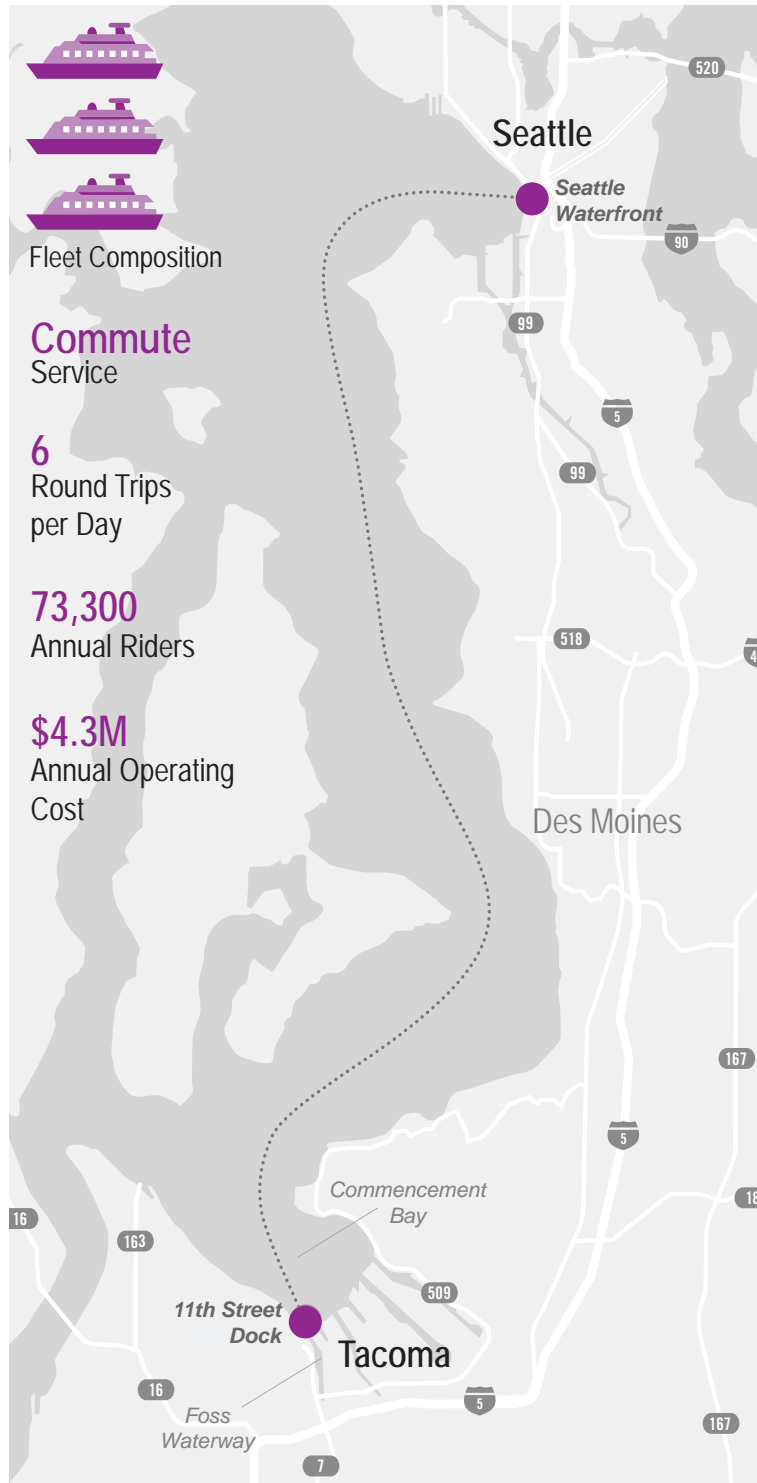
Slowdown Zones

Foss Waterway (4.3 knots), Commencement Bay (12 knots)

Top Service Speed

 35 knots

Electrification Potential



Fleet Composition

Commuter Service

6 Round Trips per Day

73,300 Annual Riders

\$4.3M Annual Operating Cost

APPROXIMATE TRAVEL TIMES

	Bus	Sounder	POF	Time Saved
11th Street Dock - Downtown Seattle Waterfront	70 minutes	60 minutes	55 minutes	5 to 15 minutes

POF travel time is from dock to dock and includes maneuvering time and slowdown zones. Transit times are from transit stop to transit stop.



Tacoma - Seattle: Landing Sites

TACOMA 11TH STREET DOCK

City of Tacoma



Access / Multimodal Connections

- **Parking:** A lot is adjacent to the landing, with additional street parking also available nearby.
- **Transit:** The landing has good transit access and is within a 0.3-mile walk of a bus stop and the Commerce Street Tacoma Link station. Stairs or elevator must be used to reach either.
- **Bicycle:** No designated bike lanes are immediately adjacent to the landing.
- **Pedestrian:** A waterfront trail is nearby, and downtown Tacoma is accessible via the stairs and elevator to the 11th St. Bridge.

Infrastructure

Overwater improvements required to support POF service would include fendering, a boarding ramp, and a transfer span. Ticketing, signage, and minor uplands work would be needed to support service.

Regulatory Requirements

Overwater improvements would require federal, state, and local approvals.

SEATTLE WATERFRONT

Various owners

Access / Multimodal Connections

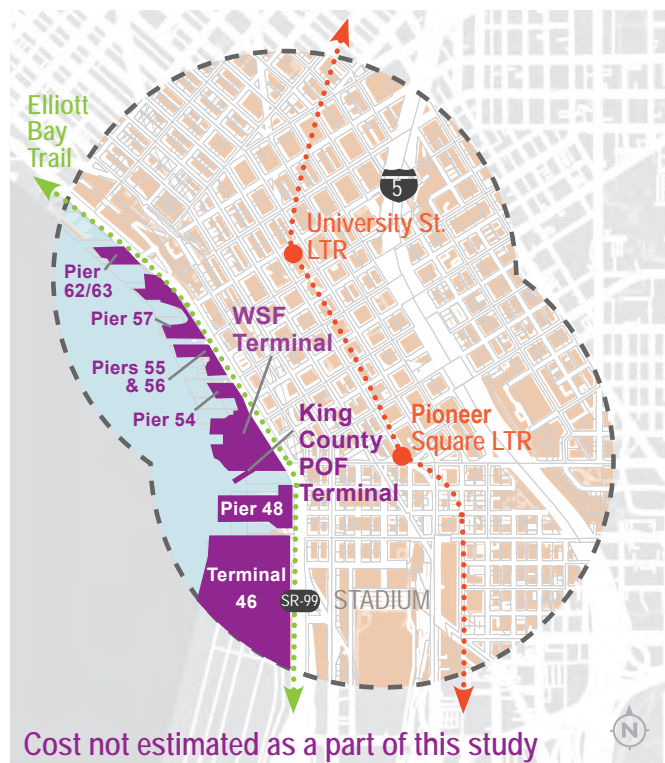
The Seattle waterfront has bicycle and pedestrian facilities but generally has limited parking. Transit access would depend upon the landing selected as some options are closer to light rail stations and bus stops than others.

Infrastructure

Multiple docks and piers are present along the waterfront, including the recently renovated Pier 50 which currently serves as a POF landing for the King County Water Taxi and the Kitsap Fast Ferries. Additional docking capacity will need to be identified to accommodate this or other potential POF service. The Seattle Terminal Siting Study is currently underway, sponsored by Kitsap Transit.

Regulatory Requirements

Construction of new ferry slips is anticipated to require federal, state, and local approvals.



Cost not estimated as a part of this study

*Not all piers were evaluated for docking options.



Tacoma - Seattle: Route Considerations

FLEET

Fleet- 3 vessels

2 service vessels

1 back-up vessel



Maximum Passengers per Vessel

between 150 and 250

RIDERSHIP

Ridership estimates were based on the established route profile and the total POF trip time and an assumed fare level that was based upon comparable existing passenger transit modes. Induced demand was not included in ridership estimates.

Estimated Ridership

Estimated Daily Riders	290
Projected Annual Ridership	73,300

COST SUMMARY¹

All operating cost were calculated using the best available data and were based on the established operating profile.

Annual Operating Costs (in thousands)	\$4,280
Operating Labor	\$1,160
Energy / Fuel	\$800
Maintenance (Labor, Materials, & Contracts)	\$1,065
Insurance & Other	\$545
Management, Support, & Overhead	\$710

ADDITIONAL STOPS

The City of Des Moines recently completed a POF demand study that evaluated travel demand to and from the City of Des Moines, including potential POF demand to Seattle and Tacoma. Adding a stop in Des Moines along this proposed Tacoma to Seattle route is a potential service option that could be analyzed further in collaboration with the City of Des Moines. However, the addition of any stops would increase the route trip time which is often less desirable for riders.

RESILIENCY

This route could increase the resiliency of the regional transportation system by providing an additional travel option that avoids the congested I-5 and adds redundancy to the system. The route does not connect ferry or bridge dependent communities and does not substantially increase access to essential services.

ENVIRONMENTAL

The overwater work needed for this route will require an evaluation of habitat impacts during the environmental permitting process. To mitigate potential wake impacts to the shoreline, operating protocols could be established prior to route implementation.

ELECTRIFICATION

With current technology, this route is not a good candidate for electrification. The long length of the route combined with the fast travel speed and short dwell times for charging require a large amount of power to support service. Electric battery technology cannot currently store the amount of needed power without making the vessel larger and/or excessively heavy.

As vessel and battery technology evolves, electrification could become more viable.

¹Estimated capital costs (in 2020 dollars) that are needed for route start-up reference the *Analysis Results* section of this report.



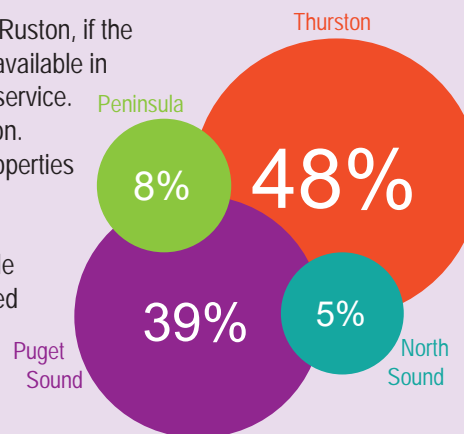
Tacoma - Seattle: Route Considerations

COMMUNITY OUTREACH²

This route had wide-ranging community support from multiple regional geographies, with particular interest from the PSRC region survey respondents (with 39% identifying it as a top three route choice) and from Thurston County respondents. Additional community outreach would be needed prior to route implementation.

Jurisdictional outreach for this route provided the following observations:

- POF service could provide opportunities to connect to Prairie Line Trail, the Museum and Brewery Districts and the Schoester Parkway multi-use trail connections in Tacoma.
- There is opportunity to provide connections to and from the City of Ruston, if the landing was located at a Ruston landing location. While parking is available in Ruston, there is no existing in-water infrastructure to support POF service.
- There is competing interest for transit dollars with light rail expansion.
- Consider potential docking availability at multiple Port of Seattle properties in Seattle.
- Landing opportunities are concentrated along the northern portion (near the new Expedia Campus) and the southern end of the Seattle waterfront (pictured in the Seattle landing site map) with more limited opportunities along the central waterfront.
- Seattle waterfront park sites that have been improved are not a compatible use with POF.



IMPLEMENTATION OUTLOOK

The first step toward implementation is identifying a lead agency that will plan, fund, implement and manage the POF route. Following this identification, the selected agency will need to complete the actions required for start-up of any POF service, which are listed in the *Implementation and Conclusions* section of the report. Additional hurdles and/or opportunities for this route, beyond those shown below, may present themselves later in the route implementation process.

HURDLES

- Existing Pier 50 POF landing site has inadequate capacity to serve additional routes. There is a need to identify a Seattle landing location with facilities and capacity to accommodate the route.
- Low potential for electrification with current technology.
- This route has long travel time but needs to operate with frequent service to meet commuter needs. As a result, the vessel fleet will require two service vessels, as well as a spare vessel, which significantly increases upfront capital investment.

OPPORTUNITIES

- + High community interest and robust survey response.
- + Previous feasibility study. A collaboration between the Port of Tacoma, the City of Tacoma, and Pierce Transit, the study indicates interest from multiple agencies and jurisdictions in the Tacoma area.
- + Kitsap Transit is leading the Seattle Terminal Siting Study which may identify additional POF landing capacity.
- + The City of Des Moines has expressed interest in and conducted a study on POF service which could fit in with the Tacoma-Seattle POF route.

²These percentages are the percent of survey respondents from each region that either selected or wrote in this route for study.





ANTHEM

m&p

OPEN

Tacoma
[PSRC]



Bellingham Cruise Terminal
[Port of Bellingham]

Bellingham - Friday Harbor



ROUTE SUMMARY

Traversing the scenic waters of north Puget Sound, this route connects mainland Washington to the San Juan Islands and provides a major time savings compared to current travel options. Tourists from Washington and Canada can travel to the Bellingham terminal by a variety of modes. San Juan Islanders can also use the route to connect to essential medical services and business travel.

Due to sea states and low commuter ridership potential, this operating profile identifies seasonal service, April through September. A larger vessel was selected to improve passenger comfort on the rougher North Sound waters.

Though originally envisioned as a primarily recreational/discretionary POF route, feedback from the San Juan Islands community has indicated that this route, if implemented, would also help support commuters traveling from the San Juan Islands to mainland Washington.

OPERATING PROFILE

Service Type

Recreational/discretionary, seasonal (6 months: April through September), 7 days a week

Departure Schedule

- Periodic
- 4 round trips per day

Slowdown Zones (7 knots speed)

Friday Harbor Marina entrance

Top Service Speed

 35 knots

Electrification Potential



APPROXIMATE TRAVEL TIMES

	Car & WSF	POF	Time Saved
Bellingham Cruise Terminal - Friday Harbor Marina	160 minutes	50 minutes	110 minutes

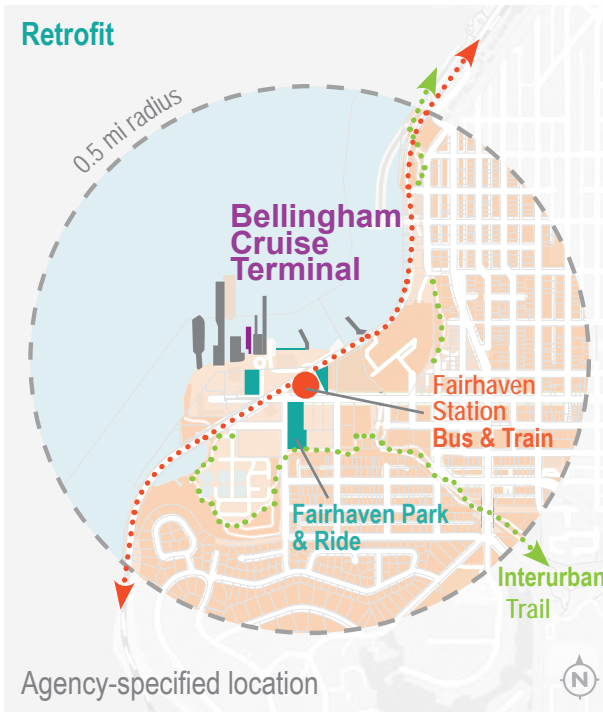
POF travel time is from dock to dock and includes maneuvering time and slowdown zones. Car travel time is the time traveled between representative city locations.



Bellingham - Friday Harbor: Landing Sites

BELLINGHAM CRUISE TERMINAL

Port of Bellingham



Access / Multimodal Connections

- **Parking:** Some parking is on site, and numerous parking lots are within a half-mile of the landing, including the Fairhaven Park & Ride.
- **Transit:** The landing is a 0.2-mile walk from Fairhaven Station, where riders can connect to Greyhound, Amtrak, or local WTA bus services and onward to the Bellingham Airport.
- **Bicycle:** No dedicated bike lanes are on Harris Ave, though connecting lanes and bike friendly streets adjoin the site.
- **Pedestrian:** Sidewalks connect to Fairhaven Station, which is a 0.2-mile walk away. A trails network is accessible by a 0.3-mile walk.

Infrastructure

The cruise terminal currently has in-water facilities that can support the landing of a 250 passenger POF vessel. Ticketing, signage, and minor uplands work would be needed to fully support service.

Regulatory Requirements

Minor upland improvements would require local approvals.

FRIDAY HARBOR MARINA

Port of Friday Harbor

Access / Multimodal Connections

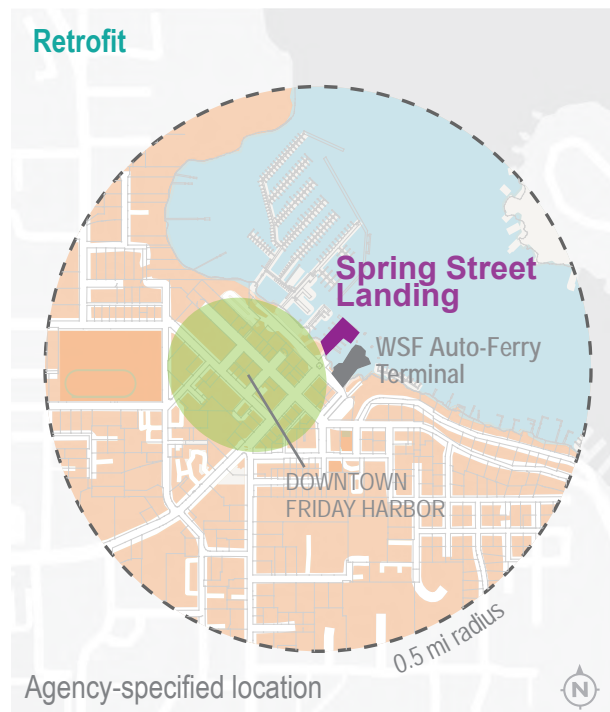
- **Parking:** Parking lots with capacity to support service are currently adjacent to the potential landing.
- **Transit:** The landing is adjacent to the existing WSF terminal, which provides connections to Anacortes, Sidney B.C., and other islands.
- **Bicycle:** Though in a bikeable area, no designated bike lanes are adjacent to the site.
- **Pedestrian:** Located in walkable downtown Friday Harbor, multiple attractions are accessible via sidewalks.

Infrastructure

The marina currently has in-water facilities that can support the landing of a 250-passenger POF vessel. Ticketing, signage, and minor uplands work would be needed to fully support service.

Regulatory Requirements

Minor upland improvements would require local approvals.



Bellingham - Friday Harbor: Route Considerations

FLEET

Fleet- 2 vessels

1 service vessel

1 back-up vessel



Maximum Passengers per Vessel

between 150 and 250

RIDERSHIP

Ridership estimates were based on the total POF trip time and an assumed fare level that was based upon comparable existing passenger transit modes. Induced demand was not included in ridership estimates.

Estimated Ridership

Estimated Daily Riders 120

Projected Annual Ridership 21,200

COST SUMMARY¹

All operating cost estimates were calculated based on the established operating profile using the best available data.

Annual Operating Costs (in thousands)	\$2,010
Operating Labor	\$535
Energy / Fuel	\$400
Maintenance (Labor, Materials, & Contracts)	\$410
Insurance & Other	\$330
Management, Support, & Overhead	\$335

ADDITIONAL STOPS

About 15% of all North Sound survey respondents were interested in an Orcas Island to Bellingham route. As a result, a potential stop at Orcas Island along this route could be explored, serving tourists and increasing inter-island connections. Additional stops would increase the route trip time which can decrease ridership.



RESILIENCY

Though recreationally-focused for Whatcom County residents, this route provides transportation resiliency for residents of the ferry-dependent San Juan Islands. By providing an additional mode and transportation option, this route better connects island residents with key mainland services such as St. Joseph's Medical Center and provides an additional option in case of mechanical difficulties or crowding on the WSF automobile ferry system.

ENVIRONMENTAL

By using existing facilities and limiting over-water work, this route is not anticipated to affect protected habitat. The confined waterway between Blakely Island and Obstruction Island should be considered for potential wake impacts.

ELECTRIFICATION

With current technology, this route is not a good candidate for electrification. The long length of the route combined with the fast travel speed and short dwell times for charging require a large amount of power to support service. Electric battery technology cannot currently store the amount of needed power without making the vessel larger and/or excessively heavy.

As vessel and battery technology evolves, electrification could become more viable.

¹Estimated capital costs (in 2020 dollars) that are needed for route start-up reference the *Analysis Results* section of this report.



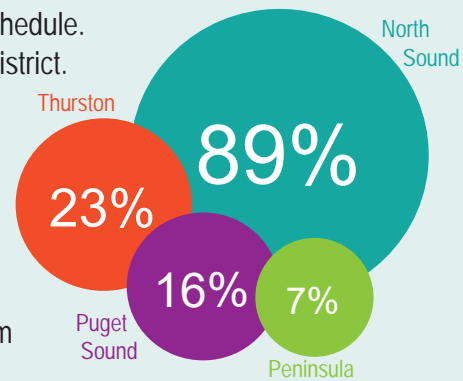
Bellingham - Friday Harbor: Route Considerations

COMMUNITY OUTREACH²

This route had extensive community support with interest from almost 90% of the more than 6,000 North Sound survey respondents. Interest from other regions was more minimal. Additional community outreach would be needed prior to route implementation.

Jurisdictional outreach for this route provided the following observations:

- This POF would provide commute service for San Juan Islands with local community belief that day trips may also provide ridership if the service is provided.
- It will be important to identify a governing body.
- Financial feasibility is an important factor.
- Anticipated users will want a reliable, consistent service schedule.
- A big challenge is identifying funding and creating a ferry district.
- San Juan Islands would like the opportunity to provide priority boarding to residents.
- Consider additional San Juan Island stops (i.e. Orcas Island).
- An important factor is to include bicycle space on the vessel. Bicycle connections to the Bellingham Cruise Terminal are required with redevelopment in the Bellingham Bike Master Plan.



IMPLEMENTATION OUTLOOK

The first step toward implementation is identifying a lead agency that will plan, fund, implement and manage the POF route. Following this identification, the selected agency will need to complete the actions required for start-up of any POF service, which are listed in the *Implementation and Conclusions* section of the report. Additional hurdles and/or opportunities for this route, beyond those shown below, may present themselves later in the route implementation process.

HURDLES

- Sea states. The sea states along this route necessitate a larger, more expensive vessel than ridership demand may require.
- Low projected ridership. Seasonal service is supported by the low projected ridership.

OPPORTUNITIES

- + Economic development opportunity from domestic and Canadian tourism.
- + High community interest and robust survey response.
- + Contribution to transportation resilience.
- + Opportunity to align with the 2022 Bellingham Regional Planning Update.
- + Potential for private service. As both landing sites currently support the landing of vessels, this route is well poised for a demonstration POF service with no major infrastructure improvements needed.
- + Potential for year-round service with additional costs.
- + Opportunity for a connection at Orcas Island.

²These percentages are the percent of survey respondents from each region that either selected or wrote in this route for study.





Friday Harbor
[San Juan County]



WSF Clinton Terminal
[Port of South Whidbey]

Whidbey - Everett



ROUTE SUMMARY

Connecting Island and Snohomish counties, this route would connect Whidbey Island residents to mainland Washington for work, appointments, and essential services. Augmenting the WSF Clinton-Mukilteo passenger and auto ferry service, this route would improve the resiliency of the Whidbey Island transportation system.

A commute-focused route, this service would run year-round and is a likely candidate for electrification, due to the short transit time.

Though not assumed in this analysis, this route could be expanded to provide weekend or evening service if desired, to meet the increase in POF demand that typically occurs in the summer. Additional service would incur additional operating costs.

OPERATING PROFILE

Service Type

Commuter focused, year-round, 5 days a week

Departure Schedule

- 3 hourly AM peak departures
- 3 hourly PM peak departures

Slowdown Zones (7 knots speed)

Jetty Island Slowdown

Top Service Speed

 35 knots

Electrification Potential



APPROXIMATE TRAVEL TIMES

	Car	POF	Time Saved
Clinton Terminal - Port of Everett Guest Dock 1	50 minutes	20 minutes	30 minutes

POF travel time is from dock to dock and includes maneuvering time and slowdown zones. Car travel time is the time traveled between representative city locations.



Whidbey - Everett: Landing Sites

CLINTON FERRY TERMINAL

Port of South Whidbey

Replacement / New Build



Access / Multimodal Connections

- **Parking:** A small parking lot is adjacent to the landing while a larger parking lot is located within a 0.3-mile walk of the landing, across the street and up a set of stairs. This parking area is services by a shuttle to the terminal. Additionally, a new kiss-and-ride drop-off zone has been added to the terminal.
- **Transit:** Island Transit provides service right at the WSF ferry terminal.
- **Bicycle:** No bike lanes are immediately adjacent to the landing.
- **Pedestrian:** Sidewalks are available near the terminal but not on both sides of the street.

Infrastructure

The landing currently supports a WSF auto ferry terminal. The site's current POF dock and float are damaged and need replacement. Signage and minimal upland improvements would be needed.

Regulatory Requirements

Dock replacement that requires in-water and overwater work would require federal, state and local approvals.

GUEST DOCK 1

Port of Everett

Access / Multimodal Connections

- **Parking:** Multiple large parking lots are nearby with many stalls reserved for other uses. Availability for ferry-only parking is limited.
- **Transit:** A transit stop is located on W. Marine View Dr. near the pedestrian bridge.
- **Bicycle:** The Mill Town Trail is a dedicated bike/pedestrian path along SR 529. Bicycle access to the north Everett neighborhoods is available via the nearby pedestrian bridge with a bike-sized elevator.
- **Pedestrian:** Sidewalks are available, and the landing is within a 0.6-mile walk of the Puget Sound Naval Complex.

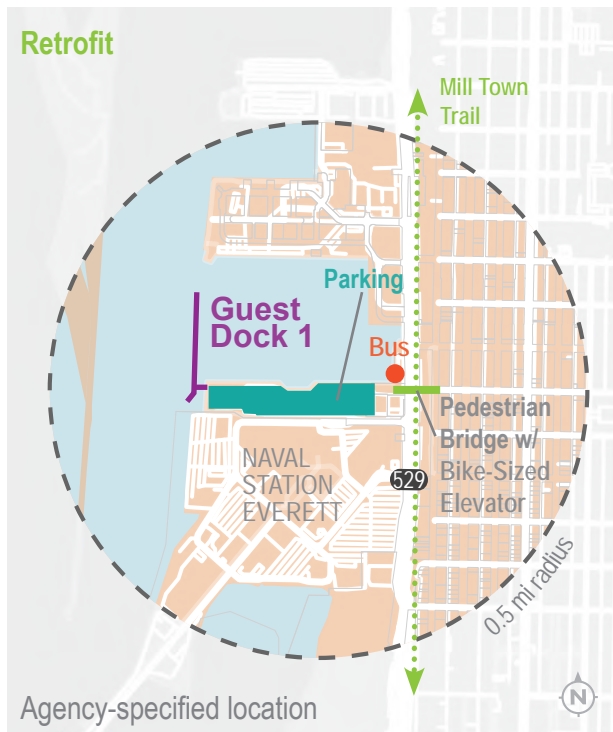
Infrastructure

Guest Dock 1 has in-water facilities that can support the landing of a POF vessel and currently serves the Hat Island Ferry. Ticketing, signage, and minor uplands work would be needed to support service.

Regulatory Requirements

Minor upland improvements would likely require local approvals.

Retrofit



Whidbey - Everett: Route Considerations

RESILIENCY

Whidbey Island experiences highway congestion, and island residents are dependent upon a bridge and two ferry routes. These ferry routes experience tidal constraints that impact service. By providing an additional option, this route provides resiliency to the transportation system. The route also increases transportation resiliency for the Whidbey Island population by increasing access to jobs and essential services on the mainland. The small rural hospital 30 miles from the ferry dock has limited capacity, and this route increases access to necessary medical services in the Everett area.



FLEET

Fleet- 2 vessels

1 service vessel

1 back-up vessel



Maximum Passengers per Vessel

up to 150

RIDERSHIP

Ridership estimates were also based on the total POF trip time and an assumed fare level that was based upon comparable existing passenger transit modes. Induced demand was not included in ridership estimates.

Estimated Ridership

Estimated Daily Riders 60

Projected Annual Ridership 14,500

COST SUMMARY¹

All operating cost estimates were calculated based on the established operating profile using the best available data.

Annual Operating Costs (in thousands)	\$1,750
Operating Labor	\$625
Energy / Fuel	\$120
Maintenance (Labor, Materials, & Contracts)	\$445
Insurance & Other	\$270
Management, Support, & Overhead	\$290

ENVIRONMENTAL

The overwater work needed for landing site improvements will require an evaluation of habitat impacts during the environmental permitting process.

ELECTRIFICATION

With current technology, this route is a promising candidate for electrification. The shorter route distance and short transit time require much less power to support service than other routes. Current electric battery and vessel technologies could store all needed power on the vessel.

Power to support an electric route is also likely to be readily available at both the Everett and Clinton landings which provides great opportunities for charging an electric vessel and will likely require minimal utility improvements.

¹Estimated capital costs (in 2020 dollars) that are needed for route start-up reference the *Analysis Results* section of this report.



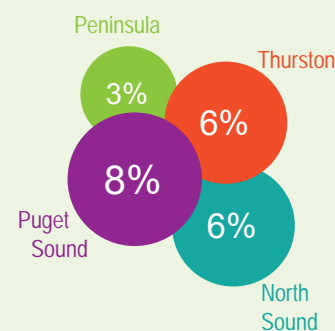
Whidbey - Everett: Route Considerations

COMMUNITY OUTREACH²

Of all the route options, this route did not have as much widespread regional support, with no more than 8% of any region's respondents selecting this route as one of their top three routes. However, this route did have noticeable support from Island County survey respondents and for Snohomish County respondents.

Jurisdictional outreach for this route provided the following observations:

- This service would provide more connections to the mainland.
- Transit connections would need to be improved on the Everett side.
- WSF has recently added load/unload zones for ride-share to the Clinton ferry terminal.
- Limited parking is available on both sides of the route.
- It is unclear who the governing body would be.
- Opportunity to serve Navy and USCG facility near the Everett side.



IMPLEMENTATION OUTLOOK

The first step toward implementation is identifying a lead agency that will plan, fund, implement and manage the POF route. Following this identification, the selected agency will need to complete the actions required for start-up of any POF service, which are listed in the *Implementation and Conclusions* section of the report. Additional hurdles and/or opportunities for this route, beyond those shown below, may present themselves later in the route implementation process.

HURDLES

- The Everett landing has limited existing transit connections, and transit infrastructure would need to be implemented in Everett to best support this route.
- Low projected ridership compared to other routes.

OPPORTUNITIES

- + High potential for electrification with current technology.
- + Contribution to transportation resilience.
- + Potential to align existing Clinton dock redevelopment plans with POF service.
- + Possibility of partnership with private operators to decrease up-front capital investments.
- + Proximity to Naval Station Everett.
- + Potential partnership opportunity with the Hat Island Ferry.

²These percentages are the percent of survey respondents from each region that either selected or wrote in this route for study.





Port of Everett
[PSRC]



Lake Washington/Lake Union Routes

ROUTE SUMMARY

POF service across Lake Washington has been extensively studied over the past ten years but has not yet been implemented. The proposed service profile seeks to connect commuters and students to downtown Seattle, the University of Washington and eastside communities with job centers. A variety of jurisdictions have expressed interest in such a service.

Environmental and wake studies, as well as the identification of a Seattle landing location, are needed prior to implementation within this Lake environment.

OPERATING PROFILE

Type of Service

Commute focused, year-round, 5 days a week

Departure Schedule

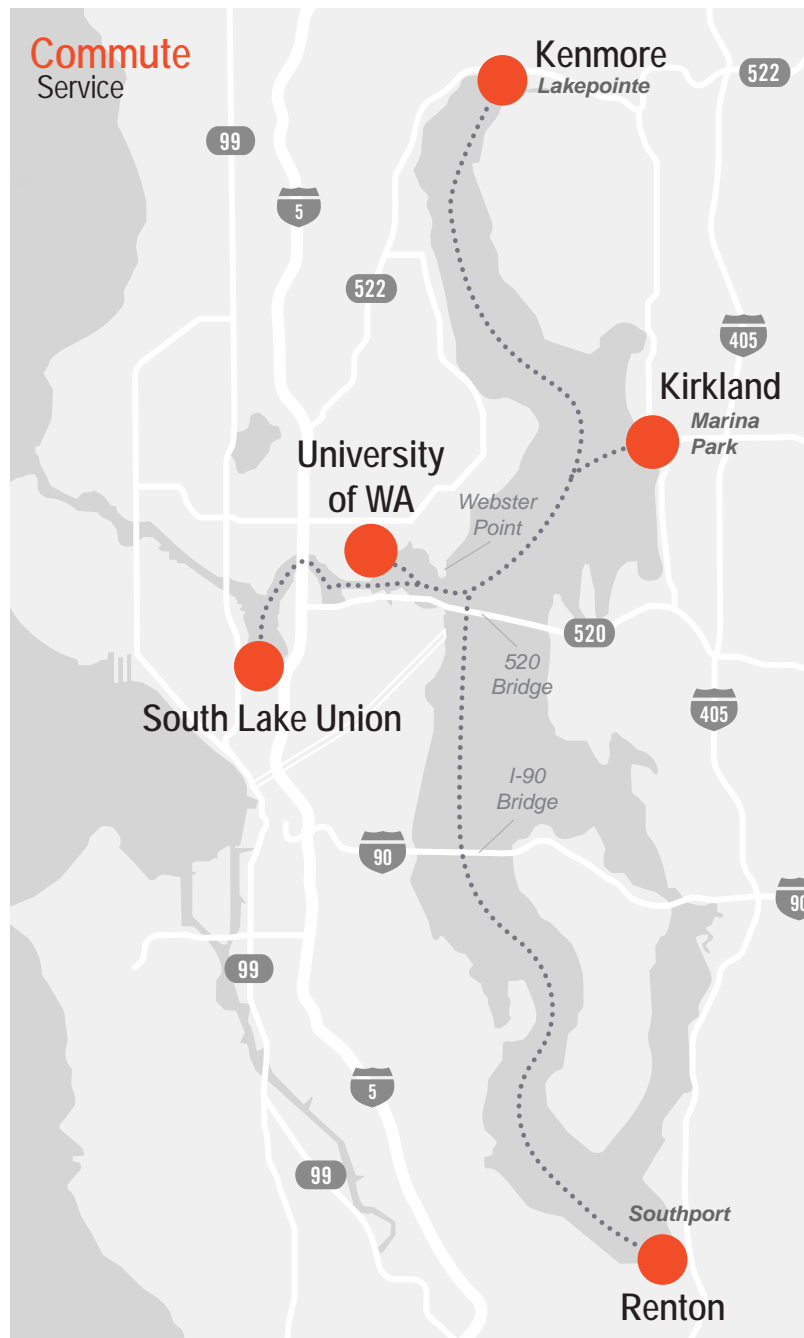
- 3 hourly AM peak departures
- 3 hourly PM peak departures

Top Service Speed

 28 knots

Slowdown Zones (7 knots speed)

From Webster Point to South Lake Union, 520 Bridge, I90 Bridge



APPROXIMATE TRAVEL TIMES

	Bus	POF	Time Saved
Kenmore - UW	45 minutes	30 minutes	15 minutes
Kirkland - UW	35 minutes	20 minutes	15 minutes
Renton - UW	60 minutes	35 minutes	25 minutes
Renton - SLU	75 minutes	60 minutes	15 minutes

POF travel times are from dock to dock and include maneuvering time and slowdown zones. Transit times are from transit stop to transit stop.



Seattle-side Landing Sites

UNIVERSITY OF WASHINGTON (UW)

University owned

The UW is a destination for students and employees and can help commuters connect to downtown Seattle via the light rail. The University has expressed concern and attention needed to retain compatibility to crew team and recreational boating use of the facilities and waterways.

Waterfront Activities Center (WAC)

Selected as the representative landing for all routes to the UW area, the WAC has been identified as the most desirable UW landing in multiple previous studies. An approximately 0.3-mile walk to UW station, this landing provides excellent access to transit, though walkway improvements would be needed to meet ADA standards. This landing is the only UW option that lies outside of the Montlake Cut slowdown area. The existing dock would need replacing to support service.

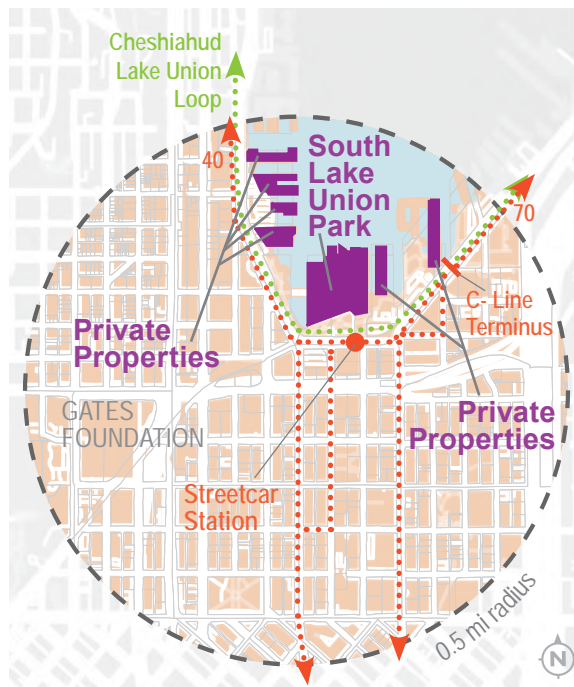
The former UW Oceanography Building was a potential landing option in the 2016 King County Water Taxi Expansion Options report. Though revisited in the early analysis stages of this report, the landing was not carried forward for more detailed analysis following Step 3 outreach.



Route shown represents light rail only.

SOUTH LAKE UNION (SLU)

Ownership varies



Cost not estimated as a part of this study

Routes shown include only C-Line, Seattle Streetcar, KC Metro 40 & KC Metro 70.

The South Lake Union area of downtown Seattle has grown rapidly and become a hub for high tech jobs. Multiple landing options are available in this area. A potential utility property could be studied for POF service though it is not within 0.5-mile of the transit stop used in this profile.

South Lake Union Park

Selected as the representative landing for all routes to the SLU area, South Lake Union park cannot currently support a POF landing without new in-water and overwater infrastructure. The City of Seattle has expressed concern and attention needed to the compatibility of a landing site with park uses and the grant funding that supports those uses.

Private Properties

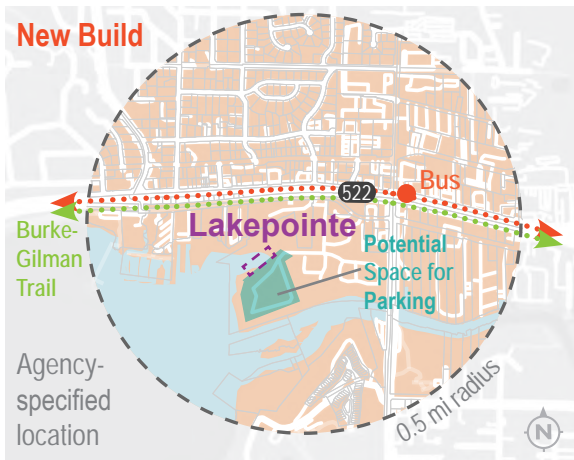
Multiple private properties lie within a half mile of the Westlake Ave N & Mercer St. Station that serves both the Seattle Streetcar and the King County Metro C-Line, identified on the map to the left. These sites could be used as POF landings with varying levels of investment, and would require a landing site agreement with the property owner.



Lake Washington Community Landing Sites

KENMORE: LAKEPOINTE

Private Owner



Access / Multimodal Connections

The site is large with the opportunity to construct on site parking. It is close to the Burke-Gilman trail and is slated to be near Sound Transit's new bus rapid transit to the Shoreline Link Station. Prior to redevelopment, there are pedestrian access challenges due to the industrial nature of the site and its surrounding properties.

Infrastructure

Construction of a landing float and gangway, grading, uplands site work, and the construction of ticketing and signage would be needed as a part of site redevelopment.

Regulatory Requirements

In-water and overwater construction would require federal, state and local approvals.

KIRKLAND: MARINA PARK

City of Kirkland



Access / Multimodal Connections

The dock is within a 0.3-mile walk of downtown Kirkland and the Kirkland Transit Center, which is a hub for multiple bus routes. Sidewalks connect the area, but no dedicated bike lanes are adjacent.

Infrastructure

The marina currently has in-water facilities that can support the landing of a 150 passenger POF vessel. Ticketing, signage, and minor uplands work would be needed to support service. The City of Kirkland is exploring a redevelopment of the dock, and aligning with this redevelopment could facilitate future service.

Regulatory Requirements

Any minor upland improvements could require local approvals.

RENTON: SOUTHPORT

SECO Development, Inc.



Access / Multimodal Connections

The site is within a 0.4-mile walk of a bus stop with routes connecting to multiple locations. An extension of nearby Park Avenue into the Southport development will enhance direct access. Parking is available on site, and walking paths are available in the nearby park with additional trail connections planned to connect the park to the Eastrail, Lake-to-Sound Trail, and Cedar River Trail.

Infrastructure

The landing site currently has in-water facilities that can support the landing of a 150 passenger POF vessel. Ticketing, signage, and minor uplands work would be needed to fully support service.

Regulatory Requirements

Any minor upland improvements could require local approvals.



Lake Washington/Lake Union Route Comparisons

FLEET

KENMORE - UW



Fleet- 2 vessels

1 service vessel

1 back-up vessel



Maximum Passengers per Vessel

up to 150

KIRKLAND - UW



Fleet- 2 vessels

1 service vessel

1 back-up vessel



Maximum Passengers per Vessel

up to 150

RENTON - UW



Fleet- 2 vessels

1 service vessel

1 back-up vessel



Maximum Passengers per Vessel

up to 150

RENTON - SLU



Fleet- 3 vessels

2 service vessels

1 back-up vessel



Maximum Passengers per Vessel

up to 150

RESILIENCY

These potential routes could increase the resiliency of the regional transportation system by providing additional travel options that avoid the I-90 and 520 bridges.

ENVIRONMENTAL

Any over-water work needed for any of these routes will require an evaluation of habitat impacts during the environmental permitting process. To mitigate potential wake impacts to the shoreline of Lake Washington, emerging low wake vessel technologies such as carbon fiber foil ferries could be used in future.

Regardless of vessel technology, operating protocols could also be established prior to route implementation. One such protocol could be related to traveling in the middle Lake Washington wherever possible to minimize wake impacts. Slowdown zones, such as the zone around Webster Point, also help protect sensitive shorelines.

ELECTRIFICATION

With current technology, these routes have moderate potential for electrification. The relatively short route distances require less power to support service than other routes. Current electric battery and vessel technologies could likely store all needed power on the vessel.

However, the electricity needed to support an electric route may not be readily available at all of the potential landing locations. Utility improvements to acquire needed electric power could be expensive, due to the urban areas in which landing sites are located.



Lake Washington/Lake Union Route Comparisons

RIDERSHIP

Ridership estimates were also based on the total POF trip time and an assumed fare level that was based upon comparable existing passenger transit modes. Induced demand was not included in ridership estimates.

	KENMORE - UW	KIRKLAND - UW	RENTON - UW	RENTON - SLU
Estimated Ridership				
Daily	510	580	160	190
Annual	129,700	147,700	39,600	47,600

COST SUMMARY¹

All operating cost estimates were calculated based on the established operating profile using the best available data. To find the estimated capital costs needed for route start-up, please see the Capital Costs in the *Analysis Results* section of this report.

	KENMORE - UW	KIRKLAND - UW	RENTON - UW	RENTON - SLU
Annual Operating Costs (in thousands)	\$2,015	\$1,805	\$2,095	\$3,335
Operating Labor	\$680	\$625	\$680	\$1,160
Fuel	\$160	\$80	\$190	\$225
Maintenance (Labor, Materials, & Contracts)	\$520	\$480	\$530	\$875
Insurance & Other	\$320	\$320	\$345	\$520
Management, Support, & Overhead	\$335	\$300	\$350	\$555

¹Estimated capital costs (in 2020 dollars) that are needed for route start-up reference the *Analysis Results* section of this report.



Lake Washington/Lake Union Route Comparisons

COMMUNITY OUTREACH

Jurisdictional outreach for this route provided the following observations:

Seattle-side

- POF service could result in potential operational conflicts with UW crew team practice routes near a UW landing with current practice times within some AM and PM proposed service hours.
- Pedestrian connections between a UW landing and UW station would need to be upgraded to meet ADA standards.
- POF service at UW would require coordination and negotiation with current ORCA payments/U-PASS program.
- There is a prevalence of small recreational craft on Lake Washington and Lake Union.
- City of Seattle docks at SLU are inhibited with parks and recreation use grant restrictions.
- There is potential conflict between outdoor recreational space and transportation facility use.
- POF service could provide the potential for recreational service outside of commute service window.

Lake Washington Communities

- There is competing interest for transit dollars in Kirkland.
- Kenmore site development challenges have been identified. However, there are opportunities for integrated development.
- Renton waterfront infrastructure can currently support POF service. First and last mile connections continue to be improved through site development and introduction of nearby transit improvements.




Lake Washington/Lake Union Route Comparisons

IMPLEMENTATION OUTLOOK

The first step toward implementation is identifying a managing agency that will plan, fund, implement and manage the POF route. King County has invested in feasibility studies in the past, either exclusively or in partnership with a private entity. Following this identification, the selected agency will need to complete the actions required for start-up of any POF service, which are listed in the *Implementation and Conclusions* section of the report. Additional hurdles and/or opportunities for this route, beyond those shown below, may present themselves later in the route implementation process.

	Hurdles	Opportunities
KENMORE - UW	<ul style="list-style-type: none"> - High capital costs and high level of infrastructure improvements needed. - Kenmore site development challenges. - Accessibility improvements needed at UW. - Sensitivity to motorized and non-motorized recreational vessel traffic at UW may require more extensive coordination. 	<ul style="list-style-type: none"> + Higher estimated ridership. + An implementation study was recently conducted, showing interest in this route and providing more detailed next steps. + Long standing City and community support. + Integrated infrastructure potential with future Lakepointe development. + Recent local funded bond measure to improve pedestrian access to waterways.
KIRKLAND - UW	<ul style="list-style-type: none"> - Accessibility improvements needed at UW - Sensitivity to motorized and non-motorized recreational vessel traffic at UW may require more extensive coordination. 	<ul style="list-style-type: none"> + Highest estimated ridership. + Possibility for alignment with City of Kirkland Marina Park redevelopment plans.
RENTON - UW	<ul style="list-style-type: none"> - Lower estimated ridership. - Accessibility improvements needed at UW. - Sensitivity to motorized and non-motorized recreational vessel traffic at UW may require more extensive coordination. 	<ul style="list-style-type: none"> + Higher travel time savings. + Recent dock improvements in Renton.
RENTON - SLU	<ul style="list-style-type: none"> - Lower estimated ridership. - High operating costs compared to other Lake routes. - This route needs an additional vessel to meet services levels, which increases upfront capital investment. - There is need for additional coordination to identify an adequate landing site in South Lake Union. 	<ul style="list-style-type: none"> + An implementation study was recently conducted, showing interest in this route and providing more detailed next steps. + Recent dock improvements in Renton.





Introduction

Study Approach

Passenger-Only Ferries

Community Engagement

Analysis Results

Route Profiles

GREENHOUSE GAS EMISSIONS AND ELECTRIFICATION

Conclusions and Implementation

GREENHOUSE GAS EMISSIONS AND ELECTRIFICATION

The transportation sector is a prominent source of greenhouse gas emissions (GHGs) in Washington state. Monitoring and reducing emissions is a prime concern for all transportation modes, including POF. This section provides a high-level modal comparison of GHG emissions and discusses the current and future outlook for low- and zero-emissions POF service.

Emissions by Mode

Emissions generated from transportation are influenced by a variety of factors, including the type of mode, or “vehicle”—broadly defined for these purposes to include all modes such as POF, bus or passenger car—as well as the length of the trip, operating characteristics of the vehicle, and number of passengers carried. These factors can vary significantly depending on how each system is designed and implemented for any given route, as well as on individual behaviors and choices for any trip.

As such, a direct comparison of emissions from a potential POF route to a comparable mode such as transit bus or private passenger vehicle is challenging. The factors contributing to these challenges include different beginning and end points for trips across modes, different hours of operation and service provided throughout the course of a day, and varying numbers of passengers moved by each vehicle for any given trip.

Given these important distinctions and understanding that specific operational details will impact the level of emissions produced, for the purposes of this study a high-level comparison among the modal vehicles is provided. The vehicles selected for comparison are based on the current and expected modes along many of the routes included in this study.

Different modes have various potential emissions profiles and passenger-carrying capacities at both the individual “vehicle” scale and the total operational level. It was deemed best to look at emissions per passenger per mode for this study. Upon implementation, the specific operational characteristics of each route will provide a better indication of estimated emissions and their comparison to other modes, taking into account type and size of vessel, total passengers served, route distance, speeds, idling, and other factors.



Comparisons

As previously described, the POF vessels referred to in this study can accommodate between 150-250 passengers. The emissions estimations are based on the comparative capacity of landside transportation modes, which include single-occupant passenger cars and transit buses. For the purposes of this study, the most prevalent comparable operating transit bus is the 60' hybrid diesel electric bus. It is also assumed that most passenger cars are single-occupant, although there are certainly carpools in the system.

To develop an emissions comparison by passenger across these three modes, it was first determined how many vehicles from each mode would be needed to transport the same number of passengers. For example, assuming full capacity of a POF vehicle:

- One 150-capacity POF = three 60' transit buses or 150 single-occupancy passenger cars
- One 250-capacity POF = five 60' transit buses or 250 single-occupancy passenger cars

Alternatively, should full capacity not be reached, 85% capacity is assumed, based on information on currently operating POF routes:

- 85% of one 150-capacity POF = 100 POF passengers, two 60' transit buses, or 100 single occupancy passenger cars
- 85% of one 250-capacity POF = 212 POF passengers, four 60' transit buses, or 212 single occupancy passenger cars

It is important to note that not every bus may be at full capacity for every trip, but for the purposes of this estimation, the comparison is to the passenger levels of the POF vehicle.

Emission factors for carbon dioxide equivalents were derived from established sources for each mode, including operating characteristics of the PSRC regional vehicle fleet using the U.S. Environmental Protection Agency's Motor Vehicle Emissions Software, data from the New Flyer hybrid diesel electric transit bus, calculations by propulsion power and generator load for representative POF vessels, and information from the U.S. Energy Information Administration.

In addition to the assumptions above, a 40-mile trip scenario was used for these analyses.



Mode	Emissions per passenger (kg)		Emissions for a 40-mile trip (kg)	
	POF at full capacity	POF at 85% capacity	POF at full capacity	POF at 85% capacity
150-seat POF	9.87	14.80	1,480.00	1,480.00
60' hybrid-electric transit buses	2.08	2.08	312.24	208.16
Single occupancy passenger vehicles	14.13	14.13	2,119.50	1,413.00

Mode	Emissions per passenger (kg)		Emissions for a 40-mile trip (kg)	
	POF at full capacity	POF at 85% capacity	POF at full capacity	POF at 85% capacity
250-seat POF	13.12	15.47	3,280.00	3,280.00
60' hybrid-electric transit buses	2.08	1.96	520.40	416.32
Single occupancy passenger vehicles	14.13	14.13	3,532.50	2,995.56

As the tables above illustrate, at full capacity, estimated emissions are lowest with the hybrid-electric transit bus, and highest with the single-occupant passenger vehicles. If the POF is not at full capacity, however, there is less emissions benefit under these broad scenarios. As noted earlier, as individual routes are implemented there will be more detailed operational information determined that will impact emissions, beyond this high-level estimation that is based on assumed capacities, average running speeds and vehicle types.

Current Emissions Outlook of POF

As indicated above, POF emissions are not the lowest of available transit vehicles, and lowering the emissions of ferry service has increased in prominence throughout the ferry industry as a whole.

A variety of methods have been explored that reduce, but do not eliminate, ferry emissions. Cleaner-burning fuels have been explored, including low-sulfur diesel, ultra-low-sulfur diesel, biodiesel fuel mixtures, methanol, and liquified natural gas (LNG). Diesel-electric hybrid ferries have also been explored to reduce emissions while still maintaining the high reliability of diesel generators. Most current diesel-electric hybrid ferries reduce emissions by using batteries to limit the peak demand on the diesel generators, allowing them to operate at their “sweet spot”



for efficiency. When docked, some hybrid ferries can also plug into electric power to charge their batteries, further reducing the need to burn diesel fuel while still maintaining the reliability and operating flexibility offered by diesel engines.

To eliminate GHG emissions of ferry service, plug-in electric battery-powered ferries have been designed and are now in operation. Full electrification using plug-in electric ferries eliminates all direct emissions from the ferry and is an approach being used on several passenger-only and vehicle ferry routes in Europe. However, these ferries are much slower than what is proposed in this study. Though at this time electrification is the most discussed method of creating a zero-emissions POF service, the smaller, higher-speed vessels used for POF services often face significant hurdles to electrification. This is due, in part, by the weight of current battery technology. Currently, high speeds require high power, and therefore more and heavier batteries, which itself increases the power requirement. Reducing power requirements and increasing power density are both the subject of active research, but the right combination for small, high-speed POF vessels is not currently commercially available.

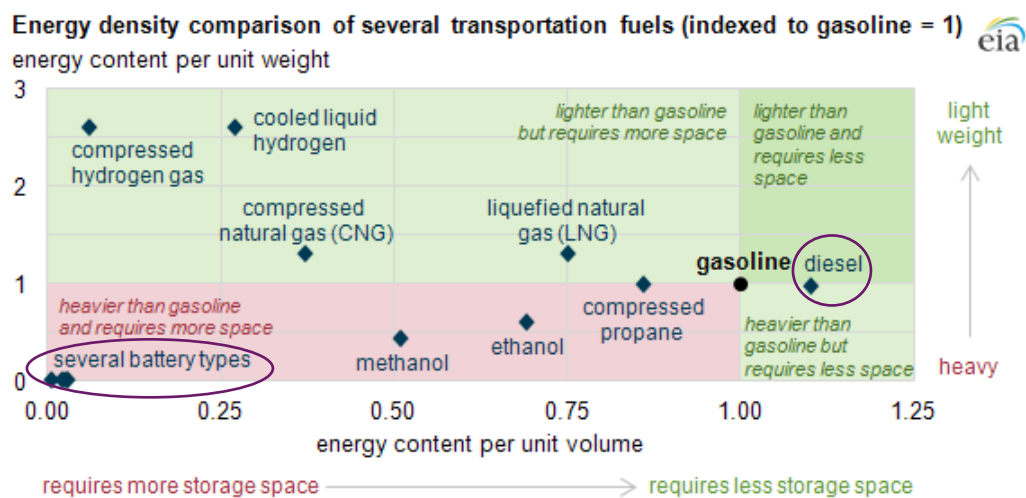


Passengers Disembarking from a KT Fast Ferry [PSRC]

Current outlook for small vessel electrification

Traditional ferry vessels are powered by liquid diesel fuel that is kept onboard, with the vessel normally refueling no more than once per day. Widely explored today as one of the methods for reducing the GHG emissions of ferries, plug-in electric ferries rely on batteries that store electricity on the vessel and are then re-charged when the vessel is docked at a landing site. While electrification is often discussed for larger ferries, electrifying high-speed, passenger-only routes, like those evaluated in this study, is not always viable and, with current technology, is limited by the following:

- Energy density⁷ of existing battery technology.** Batteries are less energy-dense than liquid diesel fuel. This means that to store enough power to operate at high speeds, batteries using current technology weigh too much to be viable. The extra weight of the batteries can be offset by reduction in passenger capacity, or a larger vessel can be built, at increased cost, that carries the same passenger count. As the graphic conveys below, the energy density of batteries is significantly lower than diesel and gasoline.⁸



Energy Density Comparison Chart [U.S. Energy Information Administration, based on the National Defense University]

- High-speed power demands.** The power needed for a ferry increases with the cube of its speed, so high-speed ferries need much more power than low- and medium-speed ferries. As a result, reducing the speed of the service route increases the opportunity for electrification by reducing the power required to operate the vessel.
- Battery and propulsion system cost.** Batteries and electric propulsion system components are more expensive than traditional diesel propulsion systems.

⁷ Energy density is the amount of energy a power source provides per a given unit of weight or volume.

⁸ Source: U.S. Energy Information Administration, based on the National Defense University



- **Cost of terminal infrastructure.** For battery-powered ferries to be viable, they need to be rapidly charged within the scheduled dwell time. This creates a large peak demand on the electric grid and requires significant infrastructure improvements at each charging terminal. Reducing the power required by a vessel and increasing the time allowed for charging can help reduce the cost of the necessary shoreside charging infrastructure. However, power availability is site-specific and, generally speaking, the closer main power distribution lines are to the terminal, the easier and cheaper it will be to get power to the vessel. Also, the more urbanized an area is, the more expensive the improvements to provide the final feeder lines to the charging location.
- **Limited charging time.** For a typical commuter vessel, the charging time between sailings can be extremely short, and therefore the storage capacity on the vessel must be able to support multiple transits. This problem can be reduced by increasing vessel dwell time between transits, which could come at the expense of commuter schedule efficiency (limiting the number of trips that can be made within the typical, highest-demand commuter timeframes).

When these factors make electrification infeasible, a hybrid of diesel and electric is frequently mentioned as a proposed solution for ferries. However, while hybrid vessels represent an opportunity to move toward electrification, they are not a viable high-speed, small-vessel ferry solution as the added weight of current hybrid technologies more than offsets any fuel efficiency gains.

Despite these costs and hindrances, electrification--or other zero-emission propulsion alternatives--also have intrinsic social and environmental benefits which are harder to quantify but still important to consider in overall cost-benefit discussions and can have different value by different stakeholders.

Supporting the Advancement of Electrification

While technology continues to advance, the Puget Sound area can conduct a variety of other activities to advance electrification where feasible.

Terminals standardization

Standardizing the terminal charging system used by all electric POF could reduce overall capital and design costs. However, the varying power needs between routes could reduce cost savings opportunities unless systems are scalable to meet power needs. Standardization can encourage multiple users at a facility. This has happened in the collaboration on boarding system configurations at Pier 50 that allows King County and multiple Kitsap Transit ferry classes to share the facility. Standardizing charging systems will also enable distribution of capital costs across ferry operating agencies and/or private operators.



System interface on vessels

The charging system interface on the vessels is closely related to the terminal standardization. The vessel's charging system components must be integrated and compatible with the charging components found uplands. Standard terminals will require standardized vessel equipment, which will allow vessels the flexibility to operate at multiple terminals.

Harmonization of utility rates for mass transportation

By working with utility companies and other transit agencies, it may be possible to negotiate the same rates for electricity service for all modes. The keys to the most favorable rates are maximizing overall demand, reducing peak demands, and increasing demand during off-peak hours.

Beyond Electrification: Cutting Edge Technologies

Cutting edge technologies are being developed that may improve the viability of electrifying or decreasing the emissions of high-speed POF routes.

In the near term is the development of hydrofoils, working to reduce the power required for high-speed ferries. By lifting the hull out of the water, hydrofoils allow higher speeds with less power than conventional catamaran ferries. The primary challenges associated with hydrofoil ferries are getting the power from the hull into the water and ensuring the safety of the passengers and crew in the event of a collision with large floating debris, such as logs. A local hydrofoil development project has recently received grant funding to advance the design with the goal of launching a demonstration ferry in the next few years.

Hydrogen fuel cells are an alternative to electric batteries that also eliminate direct emissions. Hydrogen fuel cell technology is advancing quickly, and a demonstration project is under construction in the San Francisco Bay area. As this technology matures, it will provide more flexibility and operating range than battery-powered ferries while requiring less maintenance than traditional diesel ferries. While both battery and fuel cell ferries produce zero emissions locally, the production of electricity or hydrogen off-site may use fossil fuels.

Between the hydrogen fuel cell ferry under construction in the San Francisco Bay area, the local efforts to develop new hydrofoil ferries, and other advances in battery technology, the viability of some of the longer routes assessed in this report may be significantly improved.

However, POF technology is not the only transportation technology that is rapidly evolving to decrease emissions. Bus and car electric technologies have also made significant strides over the last five years, while advances in battery technology will likely be applicable across transportation modes.



Introduction

Study Approach

Passenger-Only Ferries

Community Engagement

Analysis Results

Route Profiles

Greenhouse Gas Emissions and Electrification

CONCLUSIONS AND IMPLEMENTATION



CONCLUSIONS AND IMPLEMENTATION

POF service provides an additional transit mode option as part of the multimodal transportation system in the study area. In some instances, POF can provide more direct service to destinations, provide faster service than other modes and can help alleviate the pressure on current bridge, highway and WSF automobile ferry infrastructure—contributing to the resiliency of the Puget Sound transportation system. However, this study shows a variety of obstacles exist to implementation of POF, and it may not be a mode that best fits the interest and priorities in every community. Despite these challenges, there is considerable community interest in POF service throughout the study area. This study was strengthened by the extensive coordination and partnership with project stakeholders. Additional feasibility, business planning and implementation studies will be needed to move any new route to implementation.

Through the analysis of this study, many routes were reviewed and evaluated using a set of criteria. The routes that met the criteria best proceeded to a more detailed level of evaluation, and, in some cases, development of a route profile. It is the intent of this study that the route profiles provide additional information to potential implementers or serve as potential case studies for other routes with similar characteristics.

Summary of Findings

Overall POF study findings

This study conducted a thorough evaluation of existing regional conditions and many potential routes to identify key considerations for a POF service. Successful POF service planning requires understanding what attracts users to a given service, as well as how POF is unique in its route characteristics and operating environment within the transit landscape. This study's findings related to POF planning include:

- **Time-competitive travel:** This is an important consideration for all regions analyzed in this study, regardless of service type—commute or recreational/discretionary. For routes currently not considered time-competitive with other travel options, the development and use of emerging higher-speed vessel technologies such as carbon fiber foil ferries could lessen travel time and increase overall route feasibility.
- **Route characteristics:** A number of factors contribute to the quality of the customer experience and feasibility of the route: vessel speed, confined waterways, currents and wind action by season are water-specific elements. On land, connections to transit, biking, walking, and parking are key to attracting ridership.
- **Unique marine environment:** The marine operating environment presents unique planning elements for consideration and coordination, including tribal fishing rights, sensitive habitat and marine mammal protection. Expanding any type of vessel service in highly trafficked marine operating environments could also pose additional safety



risks. Marine traffic patterns should be evaluated to assess mitigation strategies and ensure safe operations for POF and all vessels.

- **Resiliency:** Added marine transportation alternatives within the Puget Sound strengthen the transportation resiliency of the region for both scheduled travel and response/recovery in an emergency event.
- **Electrification potential:** The feasibility of electric propulsion for passenger ferries will continue to improve over time, with leaps being made in low and zero emissions technologies every year. In addition to electrification, other propulsion types (for example, hydrogen), as well as other vessel materials and designs (such as composites and foils) continue to evolve and present opportunities for emissions reduction on routes where current technology is not viable.

Cross-regional findings

Many routes cross transit district and regional boundaries, meaning that potential implementers must coordinate to a greater extent on several issues, including funding, terminal location and access and other needs. While review of governance, management or operational structure was not within the scope of this study, there are several regionally focused findings that may require further coordination and study prior to any route implementation. These findings are described in greater detail below but include:

- **Landing site identification:** For all routes with a terminus in Seattle, further siting identification and analysis is required to determine suitable landing site locations. This is true in downtown Seattle, Lake Washington, and Lake Union.
- **Environmental considerations:** There are common marine environmental considerations for many of the routes that may require further evaluation, such as wake impacts, protected species, sensitive shoreline vegetation, in- and above-water noise and air quality impacts.
- **Tribal coordination:** There are over 20 federally recognized Native American tribes within the study area of Puget Sound and the Salish Sea. Early and frequent communication with tribal governments will be important with regard to tribal fishing rights and recognition of culturally significant waterfront property when considering landing site locations.
- **Prioritize equity:** Examination of equity in each stage of POF planning and implementation will play an important role in furthering equity goals of each region. Equity review can come in many forms, from engagement in the planning process to analysis of potential positive and negative impacts.



Landing site identification

Each route with a terminus in the City of Seattle (downtown, South Lake Union and University of Washington) has challenges to overcome securing a landing site location. The current POF facility in downtown Seattle is at capacity and expanded or new landing facilities will be required to accommodate currently planned and new routes.

Interest has been expressed in adding POF landing capacity to the Seattle waterfront. Additional POF slips and landing facilities, whether at multiple separate facilities, a new larger regional facility, or at an expanded existing facility, will be needed to accommodate additional routes. There is an opportunity for multi-jurisdictional coordination to address downtown Seattle POF capacity, which will involve numerous stakeholders.

Kitsap Transit is currently in the process of conducting a Seattle Fast-Ferry Terminal Siting Study to identify a suitable location to accommodate their current service, as well as to provide additional POF landing capacity for expansion. Kitsap Transit plans to temporarily move their Bremerton route to a Seattle landing site at Pier 55/56 (Argosy) to enable the Southworth route, which has larger vessels, to begin service and to use the bigger floats and more open waterway at Pier 50.

Environmental considerations

The Puget Sound shorelines and waterways are rich natural resources, providing essential habitat, livelihood, economic vitality, and transportation for all who live and visit the Puget Sound region. To minimize ecosystem impacts and to prevent habitat loss, this study focused on landing sites where in-water infrastructure was already present and vessel traffic common. Moreover, when determining route paths for this study, most of the travel distance was selected to be in deeper waters, at least 1500' from the shoreline. Travelling via deeper, more open waters minimizes wake impacts to shorelines and avoids shallow waters frequented by protected fish species. Multiple operating procedures and technologies will need to be considered in POF route implementation to minimize impacts to environmental resources. These include protocols related to marine mammal protection which will be guided by the Governor's Southern Resident Orca Task Force's November 2019 report.

Existing Seattle POF terminal at capacity

Almost 40% of the 45 potential POF routes identified for analysis due to either survey responses, studies, or technical feasibility had a landing site in downtown Seattle. Although route profiles were not developed for most of these routes, and this study has identified challenges that many will need to overcome, this shows the attraction of the POF form of public transit to the largest urban center on Puget Sound.



Tribal coordination

Tribal coordination is an essential element in nearly all waterfront development. Sovereign tribal nations have relied on the natural resources of the Puget Sound since long before European contact. Protecting natural resources, as mentioned above, is one component of typical tribal coordination. There are many geographic locations that may have cultural importance to tribes. In some instances, these sites are not appropriate for POF landing site locations. In others, opportunities may be present for interpretive exhibits or mitigation measures through close coordination with tribal governments.

Tribal coordination for this study identified an interest in updating assessment of Puget Sound vessel traffic of all types. Although assessing the growth in all types of vessel traffic is beyond this study's scope, information on potential POF routes from this report could be used for such a future study.

Prioritize equity

When planning for and implementing POF service, equity will be an important consideration. Equity—including planning for equitable outcomes and improving access for all residents—is important throughout the study area.

Factors to consider when incorporating equity as part of the implementation of any future POF service include gaining a thorough understanding of the area's demographics--including people of color, people of low income, older adults and people with disabilities--and an understanding of the travel and accessibility needs of all users. Other factors to consider include how the landing site amenities, multimodal connections, and fare structure are designed to provide an equitable service for all users.

For example, to help improve access to POF services for lower-income travelers, subsidized fare options like those provided through the ORCA LIFT program can be a tool to improve the overall equity of the service. Access for older adults and people with disabilities can be improved by addressing gaps in ADA-compliant facilities or connecting services.

An equity lens should be considered throughout the planning and implementation process for any future POF route, including robust community engagement.



Puget Sound Residents Gathered in a Park [PSRC]



Route findings

This section reflects key findings gathered regarding specific routes in this study. Some conclusions apply to all routes, while others are most applicable to only a select few. Implementation of any route will require additional planning.

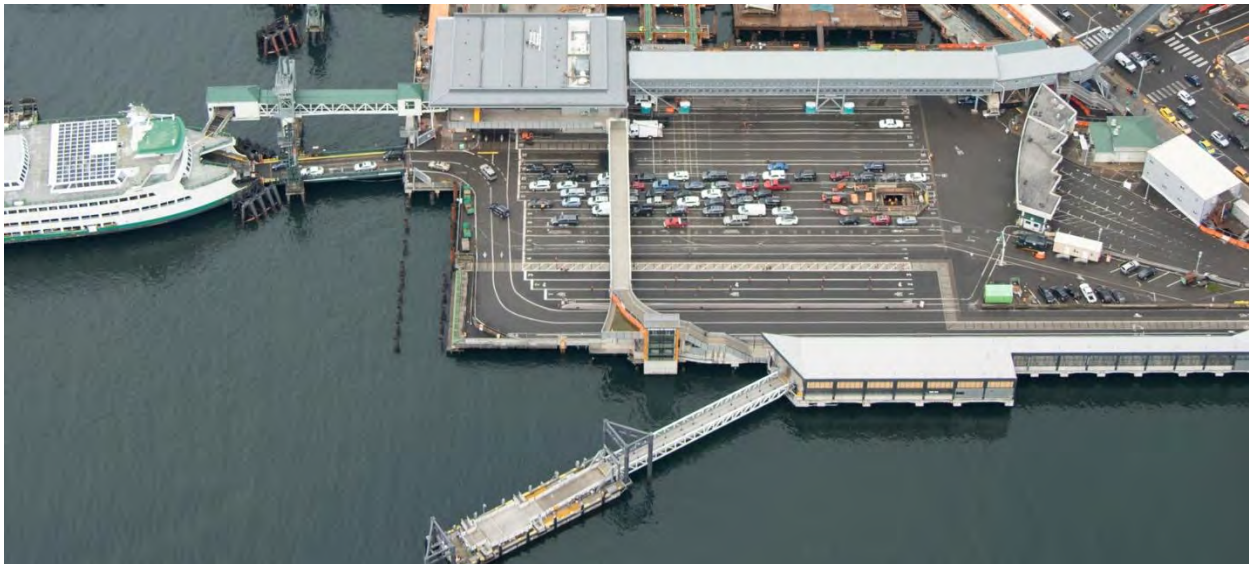
INFRASTRUCTURE

Landing site procurement: A major challenge to route implementation will be identifying and developing landing sites. Landing site location availability and agreements will need to be established to specify the level of improvements needed and a timeline to deliver those improvements.

All routes with a landing site in Seattle require additional analysis and planning. The downtown POF terminal is at capacity and the Lake Washington and Lake Union landing sites will require on-going partner discussions and agreements. Outside of the City of Seattle, many jurisdictions appear to be more eager to host a POF landing site.

Level of terminal improvements as a key driver of capital costs: Terminal improvements by location and their construction costs can vary widely depending on the state of current shoreline property and presence of over-water/docking structures to serve the ferry. High levels of in-water and overwater work incur higher permitting costs and larger project timelines due to longer and more extensive environmental review processes.

All routes that terminate in the City of Seattle likely require more extensive landing site improvement infrastructure. The Bellingham–Friday Harbor and South Whidbey–Everett routes are the only profiled routes where retrofits of existing facilities at both terminals on the route are feasible.



Pier 50 POF Terminal [King County]



FLEET

Vessel sizes by route type: Route operating requirements for time-competitive travel differ depending on whether the route is on the waters of Puget Sound or in the lakes.

Puget Sound routes generally need larger vessels at higher speeds to meet travel time and passenger comfort needs. The lake route vessel profiles include smaller vessels at relatively high speeds (although slower than the Puget Sound routes profiled).

Vessel type as a key driver of capital costs: The size and propulsion technology desired for the POF service vessel will determine the service's overall capital cost. In the current technological landscape, larger and faster vessels are more expensive due to the quantity of material required and the need for more powerful engines.

The Tacoma–Seattle route requires a large, fast vessel to achieve time competitiveness and for passenger comfort. A total of three vessels are needed for this route, as the length of the trip requires two vessels operate during the commute period plus a back-up vessel.

OPERATING PROFILES

Operating protocols: For any new service, operating protocols are established for marine mammal protection and confined waterway navigation.

Current and future POF operators must have operating and communication protocols in place as it relates to sighting, avoidance and operations in the presence of marine mammals. In addition, slow-down zones are present in every route profiled in this study and must be observed during transit. Confined waterways such as Rich Passage, on the Bremerton to Seattle POF route, may require a specially designed vessel and/or specified transit speeds to minimize wake wash.

Potential demonstration service: If the market demand is assured and funding available, a demonstration operation could be initiated relatively quickly with a leased vessel and contract operator.

Routes such as the potential Bellingham-Friday Harbor service, where landing site infrastructure is in place on both route ends and community interest is high, may present opportunities for demonstration service.

Routes without landing infrastructure in place on both route ends would need to construct adequate landing infrastructure before either a demonstration service or permanent service could begin.



RIDERSHIP

Modeling: Ferry ridership demand is more nuanced than other travel demand, making it difficult to accurately project for new routes. As such, numbers represented in the route profiles use the best available information and may be understated as related to induced demand or other local development initiatives not currently captured.

The Renton and Kirkland landings have experienced recent and on-going growth, with new residential and commercial development within the watershed of a potential landing. These changes could have noteworthy impacts on potential travel demand, which may not be fully accounted for in the PSRC 2018 travel demand model.

COST SUMMARY

Management and support: Key operating cost drivers for POF include the management of the service itself, which could realize efficiencies through partnerships with current operators or grouping routes together under a single management structure or contract.

A route's management and support costs could be minimized through partnership with an existing operator. There are a number of potential routes identified in Step 3 that are located within the jurisdiction of current POF operators (King County and Kitsap Transit).

Fuel and labor: Key operating cost drivers are labor and fuel. They are higher for longer commuter-oriented routes because two vessels must be in operation to make the desired number of trips within the peak commute travel windows.

The Tacoma-Seattle service, due to the high fuel consumption, will be significantly impacted by fuel cost volatility if a traditional diesel engine vessel is used in the implemented service.

Revenue forecasting: The financial findings of this study are preliminary only and represent planning-level estimates. In the future, a more complete financial analysis should be conducted for any route considered for implementation, including a revenue forecast to identify the level of cost recovery that can be realized through fares and other operating revenue.

ELECTRIFICATION

Emerging technologies: The future potential for electrified or zero-emissions POF routes is promising due to rapidly advancing technologies such as battery weight and energy storage and hydrogen fuel cell propulsion. Other new technologies may emerge to help make potential POF service zero-emissions and/or more environmentally-friendly by reducing wake and underwater noise impacts.

The Whidbey-Everett route currently has the highest potential for electrification, though emerging technologies could be studied for all analyzed route options.



Implementation Considerations

This is a conceptual planning study focused on identifying opportunities for passenger-only service expansion in the 12-county Puget Sound study area. This feasibility analysis is intended to provide decision makers information about future POF service. Elements of successful POF service and areas of concern have been identified. A variety of geographic areas have been assessed and are discussed below.

While additional study will be required before any routes can be implemented, this section identifies the potential engagement at multiple levels of government.

Federal funding opportunities

Federal grants can be used for POF vessel and terminal capital investments. Federal environmental permitting processes are required for terminal construction elements that include in-water and over-water work.

State and regional opportunities

Although the Legislature in 2006, directed the state to leave the POF implementation business to local entities, there are some opportunities for the state to provide support and influence POF implementation. The state has already enacted funding options for local jurisdictions to support POF and is allowing POF operators to use state-owned landing site facilities, such as at Vashon Island and Southworth. The state can continue to support policy work and explore funding provisions to ensure local jurisdictions have the tools they need to support implementation. In addition, stakeholder feedback on environmental considerations and tribal treaty rights indicates that an analysis of cumulative impacts of all types of marine traffic and uses--not just POF should be conducted. Currently, no agency is charged with monitoring or reporting on cumulative impacts of traffic on Puget Sound. Information in this study could help inform the range of possible POF routes for consideration in such a study.

Regional entities, such as RTPOs, can work with local implementers to ensure that POF is considered in the multimodal planning analysis for their regional plans, and incorporated where warranted.

Local tasks for implementation

Within the route profiles presented, there are implementation steps identified specific to each route. The next step from feasibility analysis will vary by route; however, an important first step is to incorporate this connection into local and regional planning documentation. Concurrent with or after planning framework integration is the development of a Business and Implementation Plan. A Business and Implementation Plan will include the development of a full financial plan with costs and revenues, as well as potential funding scenarios. The common elements of a Business and Implementation Plan are outlined in the section below.



Some next steps for implementation include:

Incorporate Route and Facilities in the Local Planning Framework

- Incorporate the route, associated facilities and first/last mile connections into regional transportation plan(s), local comprehensive plan(s); and other appropriate implementer plans (transit agency, port, etc.).

Develop a Business and Implementation Plan

- Reach out to citizens, the community and business leaders to understand local needs and support
- Conduct environmental analyses
- Prepare more detailed ridership and revenue forecasting
- Refine service cost forecasts
- Identify funding sources and develop a funding plan for capital investments and ongoing operations
- Develop and adopt a fare structure and fare policy
- Partner with existing planning efforts wherever feasible
- Identify potential maintenance and overnight tie-up locations
- Identify and develop agreements for landing sites locations
- Refine vessel requirements and shoreside infrastructure needs
- Explore service delivery and management options
- Build a realistic implementation schedule

POF provides several potential advantages in the 12-county multimodal transportation network, including more direct connections, potentially faster service than comparable modes, and additional resiliency for the transportation system. The unique marine environment offers advantages, as well as unique challenges that a potential POF implementer must consider in planning a service. This feasibility study builds on the lessons learned through implementation of existing POF services and identifies elements of successful POF service. The study provides a balanced assessment of POF opportunities and constraints within the 12-county study area. It is up to potential implementers to use the information within this study to advance this form of public transportation.

