



**Washington State
Department of Transportation**

Ultra-High-Speed Ground Transportation Business Case Analysis

Executive Summary

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JAY INSLEE
Governor



STATE OF WASHINGTON
Office of the Governor

Prosperity and growth in the Pacific Northwest have generated an appetite for innovative solutions that better connect our region and opportunities to carry us into the future. My vision for the megaregion — stretching from Washington, north to British Columbia, and south to Oregon — includes a transportation system that is fast, frequent, reliable, and environmentally responsible. Such a system would unite us in our common goals related to economic development, shared resources, affordable housing, new jobs, tourism, multimodal connections, and increased collaboration.

The ability to travel each segment between Seattle, Portland, and Vancouver, B.C. in less than an hour will revolutionize the way we live, work, and play in the Pacific Northwest. Moreover, it helps us preserve the natural beauty and health of our region by enabling faster, cleaner, and greener trips between our region's largest cities.

This Business Case Analysis is the result of a year of collaboration between the states of Washington and Oregon, the province of British Columbia, and Microsoft, and builds on a 2017-2018 feasibility study. It provides even greater confidence that an ultra-high-speed ground transportation system in the Pacific Northwest is worth the investment.

This is a bold undertaking that reflects the collective vision of businesses, government officials, and non-profit leaders from across the three jurisdictions. They recognize the transformative potential of improved cross-border collaboration and greater regional connectivity. I invite all of you to join me in moving this evolving concept forward as we look to broaden the base of understanding and support; develop a viable governance structure; and further refine plans for implementation. Let's make this happen!

Very truly yours,

Jay Inslee
Governor



In appreciation

Special thanks to members of the UHSGT Advisory Group who provided input on the analysis from a variety of perspectives. The group included representatives from the public, private and nonprofit sectors in Washington, Oregon, and British Columbia. Members represented the following organizations and agencies:

- British Columbia Ministry of Jobs, Trade and Technology
- British Columbia Ministry of Transportation
- British Columbia Office of the Premier
- City of Portland
- City of Seattle
- City of Surrey
- City of Vancouver
- Consul General of Canada
- Futurewise
- King County
- Microsoft
- Oregon Department of Transportation
- Oregon Metro
- Oregon Office of the Governor
- Oregon Transportation Commission
- Portland Business Alliance
- Puget Sound Regional Council
- Seattle Chamber of Commerce
- TransLink
- Transportation Choices Coalition
- Washington Building Trades
- Washington Roundtable
- Washington State Dept. of Commerce
- Washington State Dept. of Transportation
- Washington State Governor's Office
- Washington State House of Representatives
- Washington State Senate

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Executive Summary

Study context

At the 2016 Emerging [Cascadia Innovation Corridor](#) Conference, US and Canadian business and government leaders discussed how collaborating across the US–Canada border could enrich the region by expanding trade and forging collaboration in technology, research, transportation, and education. The State of Washington Governor Jay Inslee and British Columbia Premier Christy Clark issued a memorandum of understanding pledging to work together to create a new technology corridor, including an ultra-high-speed ground transportation (UHS GT) system to better connect the corridor’s major hubs and towns and promote the economic growth of the Cascadia Innovation Corridor. With the support of regional business, labor, environmental, and government leaders, Governor Inslee and the State Legislature requested that the Washington State Department of Transportation (WSDOT) study the feasibility of a UHS GT that would connect Vancouver, British Columbia (BC); Seattle, Washington (WA); and Portland, Oregon (OR).

In 2017-2018 WSDOT undertook a preliminary UHS GT Feasibility Study (2017-2018 Feasibility Study) that constituted an important first step in understanding and quantifying the potential benefits of a new transportation system in the Cascadia megaregion, reaching from Vancouver, BC to Portland, OR. UHS GT is defined as a system that could connect Vancouver, BC; Seattle, WA; Portland, OR, and points in-between and beyond, with frequent trains running at speeds as high as 250 miles per hour (400 kilometers per hour) that could reduce travel time between the major cities to less than an hour. The project team used the Federal Railroad Administration’s Conceptual Network Connections Tool (CONNECT) to estimate the ridership, revenue, capital and operations and maintenance (O&M) costs, and public benefits at an order-of-magnitude level. The 2017-2018 Feasibility Study projected annual ridership of 1.7 million to 2.1 million in 2035, and estimated capital costs ranging from \$24 billion to \$42 billion (2017).

In 2018, the Washington State Legislature moved UHS GT forward and approved funding to conduct a business case analysis. WSDOT was joined by the Oregon Department of Transportation, the Province of British Columbia, and Microsoft as funding partners and oversight contributors via representation on a Steering Committee. Moreover, an Advisory Group was formed to provide input from public, private and non-profit representatives from throughout the megaregion.

The resulting 2019 Business Case presented herein is informed by a series of technical reports produced by the project team over the last year, including the following:

- **Benefit Analysis Technical Memorandum** (Appendix A), which evaluates the monetizable user and social benefits associated with the project.
- **Memorandum Assessing Potential Economic Gains in the Cascadia Megaregion** (Appendix B), which examines the potential for transformative economic impacts due to UHS GT in the megaregion
- **Corridor Planning Technical Memorandum** (Appendix C), which delineates conceptual service attributes, hypothetical routes, and potential major and minor station locations that would best support investment in UHS GT

- **Ridership and Revenue Forecasts** (Appendix D), which includes a travel demand model for intercity services between Vancouver, BC; Seattle, WA; and Portland, OR; and intermediate locations to test ridership and revenues for a series of scenarios
- **Final Draft Funding and Financing Strategy Plan** (Appendix E), which includes suggested near- and long-term strategies for obtaining new sources of funding to support pre-development activities, construction, and long-term operation of the project
- **Candidate Governance Structures Report** (Appendix F), which includes recommendations for potential governance models structured to effectively deliver and manage UHSGT that would include all three jurisdictions

UHSGT purpose and vision

The need for continued additional transportation infrastructure investment in the Cascadia megaregion is clear—crowded roads, congested airports and limited intercity rail service constrain the mobility of residents, businesses, and tourists. Vancouver, BC; Seattle, WA; and Portland, OR, have the fourth, sixth, and tenth-most congested roads in North America, respectively. Airport delays are making air travel increasingly unreliable, and the travel time and frequency of intercity rail service are not competitive for most trips.

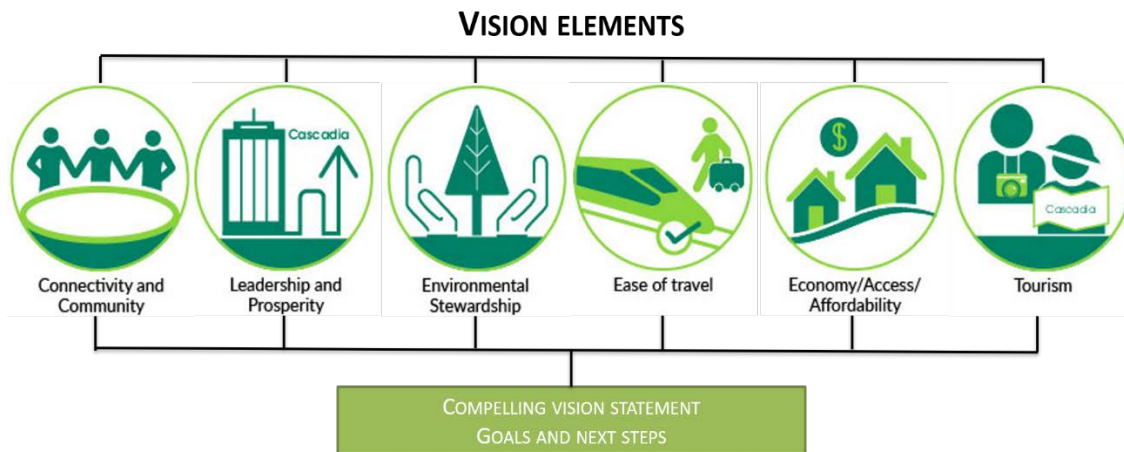
WSDOT estimated that adding a lane in each direction of US Interstate 5 through the state would cost approximately \$108 billion in 2018 dollars. Current plans for expansion at the region’s airports may not be sufficient to accommodate an expected doubling of demand. Amtrak’s Cascades rail service shares an alignment with freight rail and Sounder transit operations, which limits the opportunity to reduce travel times and improve frequencies. However, the success of major local initiatives to raise public funds for new transit development (such as the 2016 Sound Transit 3) demonstrates a public willingness to invest in new ground transportation systems.

The issues of increasing congestion, lack of capacity, and unreliable existing transportation networks has led to a need to set out a vision to unlock a globally competitive, equitable, and sustainable Cascadia megaregion. The vision elements illustrated in Figure ES-1 were identified by the UHSGT Advisory Group and Steering Committee, integrating feedback from interviews with community and business leaders, to guide the development of this effort. A successful UHSGT system would be designed to promote each of these vision elements in the Cascadia megaregion.

The UHSGT Advisory Group and Steering Committee recognized the importance of social equity and economic inclusion as core values during all phases of planning and implementation. They recommend that decision makers consider the following:

- How communities and individuals will be affected by new infrastructure
- Identify opportunities to elevate the quality of life through economic development, job creation and accessibility
- Address damaging burdens that might result from factors such as alignment selection, station locations, hiring practices, and land use.

Figure ES-1: UHSGT Vision



Note: As developed with UHSGT Advisory Group and Steering Committee

The 2019 Business Case assessment has resulted in a clearer, more comprehensive and detailed picture of the wide range of benefits that would accrue to the region should an UHSGT system be built. It provides policymakers and stakeholders details on the strategic, economic, environmental, and financial case for UHSGT in the Cascadia megaregion. The data generated by the analyses reinforces the compelling case for this cost-effective and transformative project, provides government and business leaders with a better understanding of the unique characteristics and travel demands of the Cascadia megaregion, outlines steps to secure funding and financing, and provides a governance framework—important factors to consider if the project moves forward.

Reduced journey times, improved reliability and better connections would enable easy and quick access to the region's major cities and towns

The 2019 Business Case demonstrates that UHSGT can be among the most effective transportation investment solutions to promote the economic health and growth of the Cascadia megaregion. UHSGT offers an opportunity to transform mobility beyond what current travel modes can provide. The reduced journey times—comparable to air travel—improved reliability, and the potential for direct downtown-to-downtown connections would enable residents and visitors to easily and quickly access the region's major cities and towns.

The Business Case for UHSGT provides the following key benefits or outcomes:

- A **better-connected megaregion** resulting from faster journeys, increased capacity, and reduced congestion
 - UHSGT would achieve this by integrating the megaregion's major commercial hubs and population centers including intermediate stations along a new transportation spine using a greener, environmentally advanced travel mode.
 - Travel times between each of the three major cities would be less than an hour for each segment, with connections to other transportation modes at all stations.

- Travelers are projected to shift to UHSGT with annual ridership exceeding 3 million trips and **farebox revenues exceeding \$250 million**, which could result in one of the best performing rail services in North America.
- There is a clearly stated willingness of travelers in the region to **shift to UHSGT from other modes** and support **greener modes of travel** that provide shorter travel times and more reliable service with a significant reduction in greenhouse gas emissions.
- A **stronger, more productive megaregion** as more businesses/jobs locate in the Cascadia megaregion due to the dramatically improved access to housing, jobs, schools, and other destinations, as well as the creation of new regional industry clusters. Once implemented, UHSGT would catalyze the **transformation** of the Cascadia regional economy into a more dynamic, globally competitive, megaregion.
- A **more affordable megaregion** as residents benefit from easier access to more affordable housing as well as wider access to higher-paying jobs and opportunities. This would improve mobility for residents throughout the megaregion and support a commitment to developing an equitable transportation network.
- A **cleaner environment** by shifting trips to more sustainable modes, reducing carbon emissions and environmental impacts, protecting habitats and improving the resilience of the transportation network.
- A **better value infrastructure investment** than possible alternative projects, whether interstate highways or airport expansion.
- **Broad support from businesses, other stakeholders, and travelers** given its ability to unlock sustainable growth, would make the Cascadia megaregion more competitive, and deliver higher quality, more cost-effective and safer journeys compared to existing road or air options.
- A **modern delivery approach** drawing on proven governance and procurement models plus innovative funding mechanisms.
 - These include lessons learned from other similar infrastructure projects related to funding mechanisms, phasing approaches, private investments, risk management, governance structure, and public accountability
 - Recent trans-border and international models include the Gordie Howe International Bridge, Vancouver’s Canada Line, Montreal’s REM, UK HS1/Channel Tunnel, and London’s Crossrail.

UHSGT provides a better-connected megaregion

Potential UHSGT station areas and routes studied are designed to integrate major commercial hubs, population centers, intermediate stations and existing transportation modes.

A UHSGT system can support the growth of the Cascadia megaregion by providing a more integrated transportation network. The identification of major hubs for testing is straightforward; however, the creation of a high-performing network also requires an analysis of intermediate stations. The entire system must be evaluated for its impact from a

policy and quantitative perspective, including considering ease of access across the Cascadia megaregion, journey times, and ultimately ridership forecasts.

The Corridor Planning Technical Memorandum (Appendix C) undertaken in support of the 2019 Business Case identified and analyzed potential station areas and outlined their attributes in a series of fact sheets. Station areas studied included (from north to south): Vancouver, BC (including Vancouver International Airport); Surrey, BC; Bellingham, WA; Everett, WA; Seattle, WA; Bellevue/Redmond, WA; Tukwila, WA; Tacoma, WA; Olympia, WA; Kelso-Longview, WA; Portland, OR (including Portland International Airport).

Station areas were combined into three basic scenarios that prioritized connections to existing or committed local transit networks, including transit (bus and light rail), commuter rail, and Amtrak services. Within these scenarios, variations differing in intermediate stops and stopping patterns were developed. Conceptual routes

Potential routes look to integrate commercial hubs, population centers, intermediate stations, transportation modes

(approximately 310 miles long or 500 kilometers) linking the station areas based on 220 mile per hour (350 kilometers per hour) design criteria were developed to generate trip travel times and conceptual timetables. This information by scenario variation was then provided as inputs to the ridership and revenue model.

The iterative work with the ridership model (described below) demonstrated that the addition of intermediate stops increased ridership volumes, despite the incremental

increase in travel times. The project team also worked with a higher frequency of service than in the 2017-2018 Feasibility Study. Both factors contributed to higher volumes of ridership as compared to the earlier study.

The result of the corridor planning work is a comprehensive understanding of the potential of each station area to contribute to the vitality of a new transportation network by examining connections and creating opportunities that do not currently exist.

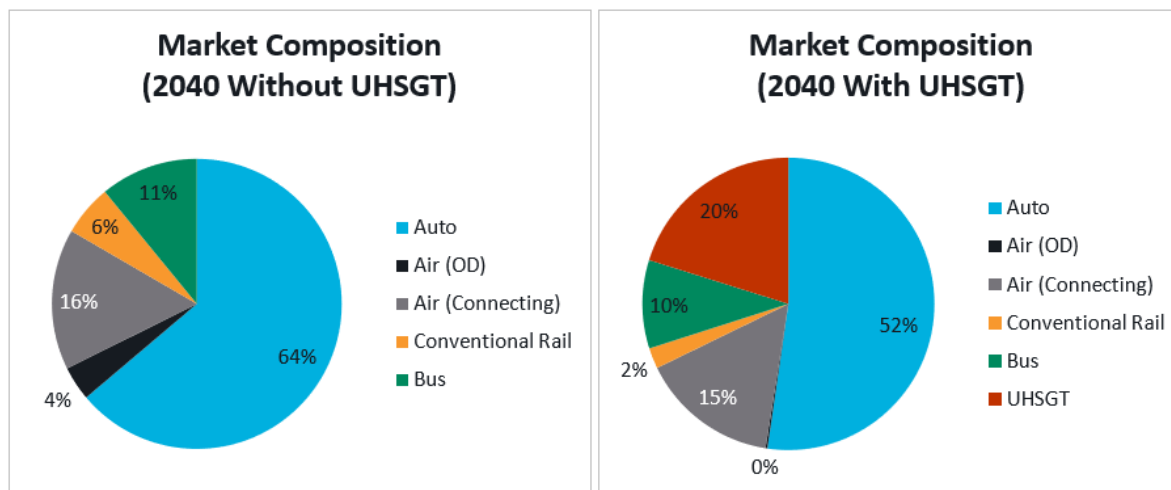
UHS GT will result in significant shifts away from alternative travel modes

Enhanced Ridership and Revenue Forecasts (Appendix D) undertaken for the 2019 Business Case created an intercity travel demand model to test UHS GT ridership in the Cascadia megaregion using travel preference assumptions obtained through a comprehensive stated preference survey. The results of this survey—in which 74% of survey respondents stated they would “definitely try UHS GT”—allow the 2019 Business Case indicate that travelers would shift from auto and air travel to a new UHS GT system for a significant percentage of intercity trips.

The ridership model survey results show that UHS GT almost completely captures the direct intra-regional air travel market. Depending on the scenario, UHS GT will capture between 12% and 20% of total intercity trips (Figure ES-2).¹

¹ Figure ES-2 illustrates the market composition for one scenario where UHS GT accounts for 20% of intercity trips; other scenarios have smaller shares.

Figure ES-2: 2040 Demand by Mode Comparison Without and With UHSGT



The ridership volumes forecasted in the enhanced Ridership and Revenue Forecasts (Appendix D) exceed those estimated in the 2017-2018 Feasibility Study. The significant reduction in travel times, combined with more reliable and higher frequency services, would result in a better-connected megaregion with major shifts in existing trips from auto and air to UHSGT. Travelers would be able to arrive earlier or leave later from origins, tailor travel schedules to meet individual needs, and have more time to conduct business or enjoy leisure activities. Depending on the scenario, between 1.7 million and 3 million annual trips would be made by 2040. Ridership on UHSGT would be more than three times the current number of travelers on intercity rail in the Pacific Northwest corridor.

From a revenue perspective, the potential of UHSGT would be even greater. UHSGT is projected to generate between \$156 million and \$250 million in fare revenues annually by 2040 (2019 prices). This level of revenue could make UHSGT in the Cascadia megaregion corridor one of the highest performing intercity rail services in North America. Early comparisons of costs and revenues suggest that projected farebox revenue could be

Between 1.7 and 3 million annual trips and \$156-250 million in annual revenue

expected to cover operating costs by 2055. In the nearer term, a 10% increase in ridership or a 10% decrease in operating costs would allow UHSGT to cover its operating costs by 2040.

UHSGT may perform even better, since the methodology and assumptions used in the ridership and revenue projections were conservative. The

assumptions in the ridership report do not reflect recent projections of increasing highway congestion across the Cascadia megaregion as well as any real increases in auto or air operating costs. In addition, increased ridership is likely to occur due to improved integration with future connecting services and the potential for additional induced demand resulting from enhanced economic activity arising from investment in UHSGT. Accordingly, if implemented effectively, there is significant potential to attract even more riders to UHSGT.

UHS GT supports a stronger, more productive megaregion

A well-developed UHS GT would integrate and strengthen the ability of the Cascadia megaregion to compete globally in key industries. By doing so, more businesses and jobs will locate in the Cascadia megaregion due to the dramatically improved access to housing, jobs, schools, and other destinations, as well as the creation of new regional industry clusters. For example, the organizations active in the knowledge economy (including technology, university, medical) have shown that they increasingly gravitate toward dense urban areas to attract qualified employees and build connections to wider markets. A new UHS GT system would maximize these agglomeration effects by offering a high-performance transportation link to connect the existing and future talent pools, employers, and centers of innovation throughout the region.

The link between connectivity and global competitiveness has been clearly demonstrated by Microsoft CEO Brad Smith, who offered this insight in 2018:

Our ability to compete in the world's economy will be enhanced dramatically by having a region that is 6 million inhabitants strong versus two or three regions of 3 million each. By combining the sub-regions, it is the only way for this megaregion to reach scale. None of the sub-regions can get to 6 million by itself.

Drawing upon the selection of station areas, UHS GT could improve connections among industry clusters, enterprise accelerators (web-based investors), world-renown research institutions, qualified labor, and financial and logistics organizations providing fundamental services for a strong regional economy. UHS GT would sustain and build upon the growth already underway by collapsing distances, and thus provide employers with access to a much larger workforce, and provide workers with a greater variety of employment options. The value of quicker, easier, and more reliable transportation links (including UHS GT) have been demonstrated elsewhere around the world where UHS GT projects have been implemented.²

Economic benefits will yield a robust return on investment to the region

UHS GT is expected to generate three types of economic benefits: (1) direct user benefits such as travel-time savings; (2) social benefits such as reductions in greenhouse emissions; and (3) wider economic benefits (WEBs) linked to an increase in jobs, higher productivity, and other economic impacts resulting from the significant improvement in connectivity.

***UHS GT catalyzes the
megaregion's global
competitiveness***

The 2019 Business Case used forecasted ridership volumes to calculate a range of direct use and social benefits, including travel time and vehicle cost savings, safety and reduced crashes, reduced emissions, and productivity gains. These benefits were estimated to exceed \$14 billion, yet they tell only part of the story. The WEBs were estimated in the Initial Estimate of Economic Impacts published as an addendum to the

² Various studies, including *The Economic Benefits of HS1 10 Years On*, HS1 Ltd. with Input from Volterra Partners.

2017-2018 Feasibility Study.³ It estimated that as many as 160,000 permanent new jobs in the wider economy could be unlocked by UHSGT, generating as much as \$355 billion in additional economic activity.⁴ The ridership data generated in the 2019 Business Case exceeds the inputs used in the 2017-2018 Feasibility Study, which, combined with regional economic factors being stronger, indicates that the level of overall economic activity is anticipated to be even greater.

UHSGT supports a more affordable and equitable Cascadia megaregion

UHSGT can support a more affordable megaregion by improving the time, convenience, and connections between areas with lower housing costs and employment centers, whether directly or via improved local connections. While average wage growth in Vancouver, BC; Seattle, WA; and Portland, OR; has been a little over 20% since 2010, housing costs have increased by 60% or more, which is nearly twice the North America rate. Combined with the increase in transportation costs as a percentage of household incomes, this indicates there is a serious affordability crisis across the Cascadia megaregion. UHSGT can foster more dense transit-oriented residential development near stations and open up new areas to large-scale, mixed-use development where residential and office development can be built in close proximity. UHSGT can increase housing supply and help create live-work communities with complementary changes in land-use policies.

UHSGT can support a cleaner environment

Washington state, Oregon, and British Columbia are all committed to reducing harmful emissions and creating healthier environments for their residents. The State of Washington estimates that the transportation sector accounts for 44% of all its greenhouse gas

**Could reduce
carbon emissions
by 6 million metric
tons over 40 years**

emissions. An UHSGT system—powered by electricity from green energy sources—can support the Cascadia megaregion in creating a better environment by reducing carbon emissions.

UHSGT would shift trips to more sustainable modes, thus reducing environmental impacts, protecting habitats and improving the resilience of the transportation network. Rail travel has historically been one of the most environmentally friendly modes of travel, generating 12 times less carbon

dioxide (CO₂) emitted than air and 3 to 5 times less than automobiles.

Over the first 40 years of operations, UHSGT would avoid release of 6 million metric tons (tonnes) of CO₂, as a result of 27 million avoided flight miles and 6.1 billion avoided vehicle miles in the Cascadia megaregion. In addition, every year on average of more than 960 metric tons of harmful non-CO₂ pollutants (e.g., particulate matter, carbon monoxide, and nitrogen oxide) would be kept out of the ecosystem.

³ WSDOT 2017-2018 UHSGT Feasibility Study: Addendum, Initial Estimate of Economic Impacts. https://www.wsdot.wa.gov/publications/fulltext/LegReports/1719/UltraHighSpeedGroundTransportation_FINAL.pdf

⁴ The addendum did not include estimates of economic impacts on the Portland, OR area.

UHS GT would also transform the environmental footprint of the megaregion by encouraging denser development near stations and improved local connections through transit, cycle, and walking facilities. UHS GT can play a key role in the Cascadia megaregion by further reducing its carbon footprint and matching the more efficient levels achieved in Europe and Japan. There is a potential to achieve zero emission levels should the all-electric system rely solely on clean power sources, such as hydro, wind and solar energy.

UHS GT can be a better value infrastructure investment

The capital cost estimates in the 2017-2018 Feasibility Study ranged from \$24 billion to \$42 billion (2017). Capital costs will be affected by alignment geometries, station locations, and topography to minimize the need for expensive tunneling (compared to at-grade or aerial viaduct structures). Estimated operating costs in the 2019 Business Case are similar to those presented in the 2017-2018 Feasibility Study. The estimated operating costs of additional UHS GT roundtrips were offset by lower estimated operating costs per service and at stations.

UHS GT can be a better value infrastructure investment than possible alternative projects that can support the growth of the Cascadia megaregion. While there are several significant transportation infrastructure projects committed in the Cascadia megaregion, most of these are to address localized congestion hotspots such as the US I-5 improvements around Tacoma, the central Puget Sound region's ST3 transit expansion package, or the airport expansions at Seattle-Tacoma International Airport or Vancouver International Airport.

Cascadia megaregion future growth is at risk without substantial increase in infrastructure investment. UHS GT could mitigate the need for some future infrastructure projects such as further major expansions of US I-5, estimated to possibly exceed \$108 billion or building an additional runway, which could exceed \$10 billion. In addition, UHS GT provides greater reliability and increased capacity than highway or airport options. Reliability on high-speed rail services can reach 99% on-time performance compared to less than 80% for air services and widely variable auto journey times. Constructing a UHS GT transportation spine can be designed to allow for a range of services, including intercity, commuter/regional, and high-value freight as shown in other places around the world that have constructed high-speed rail lines.⁵ By providing a range of services, this spine can exceed the existing capacity of the US I-5/ Canada Highway 99 highway corridor.

UHS GT has broad support from businesses, stakeholders, and travelers

Support from business leaders is linked to UHS GT's ability to promote strong and sustainable growth, to make the Cascadia megaregion more competitive, and to deliver higher-quality and safer journeys compared to existing road or air options. Specifically, the region's business community recognizes that UHS GT would help solve real-world issues and that these benefits are tangible. These stakeholders view the UHS GT system as a tool

⁵ For example, more than half of the capacity of the UK HS1 line is used for commuter rail services and freight such as car parts, fresh produce and other high value products. On the Northeast Corridor, nearly 80% of services are commuter rail and freight in addition to Amtrak intercity service.

for both overcoming existing structural economic challenges in the region as well as a unique opportunity to unlock untapped potential in the region.

Business representatives have pointed out that if the region does not move quickly, various elements of today's lifestyle and economy will decline, grow substantially worse, and within decades threaten the Northwest as we know it. One business leader described UHSGT, "by creating a strong bond from Vancouver to Seattle to Portland, we're building connections that allow us to compete on a global level." Another business leader remarked, "knowing the unbelievable congestion that is occurring every day in the Vancouver-to-Seattle-to-Portland corridor, can you imagine what that will be like in 50 years?"

The overarching economic benefits resulting from UHSGT identified by business leaders include greater connectivity; access to a larger, more cohesive pool of qualified talent throughout the region; and better facilitation of research and other innovation. They have clearly expressed the concern that the region must do something now to ensure prosperity in future years.

*Imagine what
congestion will be
like in 50 years
without this system*

Travelers also exhibited a high interest in UHSGT. Based on a survey of existing intercity travelers in the Cascadia megaregion, 74% indicated a willingness to "definitely try" UHSGT. Combined with additional trips from induced demand generated by additional trips made possible by the impacts of shorter journey times and higher density near UHSGT stations, demand is likely to be strong.

UHSGT can be successfully achieved using a modern delivery approach

While the challenges in delivering UHSGT are significant, evidence from this assessment suggests that the project can be delivered and operated successfully. The key to this success would be to draw on effective governance and procurement models used on other trans-border and international infrastructure projects. Developing an effective funding and operating strategy would also be critical in the successful delivery of UHSGT.

An overview of trans-border and large-scale infrastructure projects (domestic and international) strongly indicates that UHSGT would require a multi-jurisdictional governance model that ensures robust and timely decision making while protecting public accountability. In addition to a bi-national and bi-state authority, actual project delivery could be facilitated through the creation of a separate public entity tasked with the design, procurement, and financing of UHSGT. Government oversight of this entity would ensure both transparent accountability and performance. The project would also need to ensure compliance with laws governing international agreements and project delivery mechanisms, among other issues, both for two US states and Canada.

This approach would build on that being used to deliver the Gordie Howe International Bridge linking the US and Canada and lessons learned from the successfully delivered Channel Tunnel between the United Kingdom and France. Key objectives include the following:

- Achieve an effective transfer of risks to those who are best able to manage them.
- Ensure effective public accountability while protecting timely decision making.
- Retain control and flexibility to meet future needs in the project owner’s hands
- Achieve competitive pricing while aligning incentives.

Experience over the last several decades in the US and internationally suggests that costs can be further reduced by mobilizing private-sector expertise and financing. Nevertheless, the project would likely require some measure of public investment to pay for the upfront costs to design and construct the new transportation service. Such public investment can be spread over the combined construction and operating term of the project; whereby upfront private financing would be recovered with public funds linked to the successful delivery of the project’s key deliverables to a set of strict criteria. This “availability payment” approach has been used in many recent projects in the US on toll roads; Canada on both road and rail projects; and world-wide to incentivize the private sector to deliver the project on-time, within budget, and to a set of performance targets established in the contract. By doing so, UHSGT can be delivered cost effectively by the private sector while ensuring public accountability.

Assembling the funding for a large-scale infrastructure project requires a clear strategy and timeline for pursuing project funding through all stages of project delivery: project initiation (near term), project development (intermediate term), and construction and O&M (long term). The 2019 Business Case has created a framework that will be updated as the project progresses. The outline of this strategy is shown in Table ES-1.

Table ES-1: Funding Strategy and Timeline

	Project Initiation	Project Development	Construction and O&M
Timeline	Present to 2 to 3 years	Approximately 3+ years	Dependent on phasing
Scope	<ul style="list-style-type: none"> • Governance • Stakeholder engagement • Pre-environmental clearance • Conceptual engineering 	<ul style="list-style-type: none"> • Environmental clearance • Preliminary engineering • Risk assessment • Procurement 	<ul style="list-style-type: none"> • Land acquisition • Vehicles • Final design • Construction • O&M
Strategy	<ul style="list-style-type: none"> • Rely on readily available funding streams to deliver scope. • Begin outreach to secure state, provincial, private, and federal funding to support project development. 	<ul style="list-style-type: none"> • Support project development through federal, state, local and private funding. • Begin proper technical, executive, and legislative outreach to secure support for any alternative funding streams needed. • Explore private investment to line up construction and O&M funding streams well in advance. 	<ul style="list-style-type: none"> • Support construction and O&M through a sustainable, long-term funding streams tied to the economic benefit of the project, supplemented with new federal funds • Financing: issue public or private debt as needed to cover capital deficits during the construction stage.

Recommended next steps

The 2019 Business Case identifies a series of next steps. These have been split into steps that can be progressed based on the availability of funds as designated by the Washington State Legislature in the 2019-2021 Transportation Budget (ESHB 1160), and other not-yet-funded priorities as summarized below:

Initial steps in accordance with the direction of the Washington State Legislature

- Establish an initial steering committee comprised of designated representatives from each of the three jurisdictions (Washington, Oregon and British Columbia) to carry out governance study and other activities described below.
- Finalize the preferred governance model including general powers, operating structure, legal and contracting requirements.
- Assess the current laws in the state and provincial jurisdictions and identify any proposed changes to laws, regulations, and/or agreements that are needed to proceed with development.

Additional activities to evaluate depending on available funding

- Develop a statement of purpose and need for UHSGT, drawing on the conclusions of the business case report
- Develop conceptual alignment options for further study
- Develop potential funding and financing alternatives
- Identify and pursue funding to enable planning and design at the preliminary environmental assessment level
- Finalize the communications plan and identify a possible outreach engagement strategy

Additional activities currently not-yet-funded

Preliminary environmental assessment planning and design:

- Develop specific alignment alternatives during the preliminary design and pre-environmental phases.
- Continually refine cost estimates based on selected alignments and station locations.
- Assess impact of future increased highway congestion and other possible changes on ridership forecasts (including sensitivities).
- Expand ridership analysis to include commuter and local travel markets.
- Further analysis of the economic impact of UHSGT including both user and wider impacts and possible application of Canadian guidelines.
- Continue exploration of emerging technology options.

Robust outreach and engagement:

- Greatly expand the stakeholder engagement process to include a wider cross-section of residents, businesses, tribes, interest groups, policy makers, and travelers.

- Focus on equity, access and affordability by ensuring equitable representation on decision-making groups, including advisory groups and councils, and Incorporating, encouraging and supporting equity throughout the public consultation and outreach program.
- Refresh the Advisory Group roles and responsibilities.
- Assess private involvement options in delivery to incentivize robust and cost-effective delivery through integration of design, procurement, construction, and operational requirements.
- Coordinate findings with local jurisdictions and governments to have UHSGT reflected and supported in local and regional plans and programs.
- Examine in more detail published and emerging local and regional transportation plans to better understand how UHSGT can complement other infrastructure priorities.

Economic impact analysis:

- Commission a comprehensive Wider Economic Benefits (WEB) analysis to better understand agglomeration and other impacts applying WebTAG guidance as used on projects in Canada.
- Compare similar projects both within the Cascadia megaregion and elsewhere to benchmark assumptions and incorporate lessons learned.
- Review sensitivities (positive and negative) to ensure economic analysis is well understood.

Funding and financing strategy:

- Consult with the Advisory Group, local stakeholders, business groups, and developers on the feasibility of potential funding and financing alternatives.
- Progress funding strategy options with a focus on viability of alternative funding streams that can minimize dependence on traditional government sources and spread obligations across a wider set of beneficiaries.
- Begin discussions with involved state, local, and private stakeholders to mobilize support and secure funding contributions that are readily available to support the project initiation stage.
- Simultaneously begin discussions with involved stakeholders and government leaders that can champion substantial state/provincial and US and Canadian federal funding to support the project development stage.
- Identify and secure a sustainable funding mechanism that will support the project's construction and O&M costs.
- Build a funding and financing model based on refined cost and revenue estimates when all sources of revenues become more realistic.

Governance and delivery:

- Once established, the multi-jurisdictional entity should also examine the following:
 - Establishing a separate delivery company to split responsibilities of policy and funding from delivery and implementation, in part to improve the decision-making process and transparency on public accountability.
 - Outlining roles and responsibilities for integrated project teams to be formed that include members from the delivery company, the governing entity, and other relevant organizations.
 - Developing outcomes-based requirements soon after establishing the delivery company to ensure clarity on project deliverables.
- Ensure the delivery entity has full implementation powers to apply for federal grants and loans, acquire property, enter into agreements and contracts, develop its own procurement processes, and raise funding, including borrowing/issuing bonds.
- Establish an independent regulatory scheme during the project definition stage to protect users, stakeholders, and affected parties, as well as challenge project performance.

Conclusions

The 2019 Business Case demonstrates the UHSGT concept would be an effective transportation project, and once implemented UHSGT would likely to have a transformative impact on the Cascadia megaregion.

- UHSGT would move over 3 million passengers a year, and produce \$165 million in revenues after the first few years of ramp-up.
- Including intermediary stops in Surrey, Bellingham, Everett, Tacoma, Olympia, Kelso/Longview and others would expand UHSGT ridership notwithstanding minor time penalties.
- Revenues from the farebox are expected to cover operating expenses in the long term.
- UHSGT calls for very high-tech power and guidance systems and could catalyze a new industrial base around the production of high-speed rail equipment.

UHSGT as a travel mode would support sustainable growth.

- Fixed guideway systems encourage concentrated growth around accessible station areas.
- UHSGT would contribute substantially to the reduction of greenhouse gases from a sector of the economy—transportation—that currently accounts for more than 40% of all emissions.
- The cost of UHSGT would be less than that of expanding other modes, and there are funding and financing strategies that can make UHSGT a reality.

UHSGT would transform the Cascadia region into a globally competitive, sustainable megaregion, by creating a stronger, more productive, more environmentally sound, and better connected megaregion.