Washington State

Amtrak *Cascades* Mid-Range Plan

Appendices

Washington State
Department of Transportation

December 2008

Exhibit KJ02a

Prepared by the Freight Systems Division
State Rail and Marine Office
Washington State Department of Transportation

For more information, contact:

- Call the WSDOT State Rail and Marine Office at (360) 705-7900 or 1-800-822-2015;
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- Fax your comments to (360) 705-6821; or
- E-mail your comments to rail@wsdot.wa.gov

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Washington State Amtrak *Cascades* Mid-Range Plan Appendices

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Appendix 1: Legislative Mandates

ESHB 1094

New Section. Sec. 226. For the Department of Transportation--Rail--Program Y--Operating

Multimodal Transportation Account--State Appropriation . . $37,034,000

The appropriation in this section is subject to the following conditions and limitations:

(1) The department shall publish a final long-range plan for Amtrak Cascades by September 30, 2007. By December 31, 2008, the department shall submit to the office of financial management and the transportation committees of the legislature a midrange plan for Amtrak Cascades that identifies specific steps the department would propose to achieve additional service beyond current levels.

RCW 47.06.040

Statewide Multimodal Transportation Plan

The department shall develop a statewide multimodal transportation plan under RCW 47.01.071(3) and in conformance with federal requirements, to ensure the continued mobility of people and goods within regions and across the state in a safe, cost-effective manner. The statewide multimodal transportation plan shall consist of:

(1) A state-owned facilities component, which shall guide state investment for state highways including bicycle and pedestrian facilities, and state ferries; and

(2) A state-interest component, which shall define the state interest in aviation, marine ports and navigation, freight rail, intercity passenger rail, bicycle transportation and pedestrian walkways, and public transportation, and recommend actions in coordination with appropriate public and private transportation providers to ensure that the state interest in these transportation modes is met.

The plans developed under each component must be consistent with the state transportation policy plan and with each other, reflect public involvement, be consistent with regional transportation planning, high capacity transportation planning, and local comprehensive plans prepared under chapter 36.70A RCW, and include analysis of intermodal connections and choices. A primary emphasis for these plans shall be the relief of congestion, the preservation of existing investments and downtowns, ability to attract or accommodate planned population, and employment growth, the improvement of traveler safety, the efficient movement of freight and goods, and the improvement and integration of all transportation modes to create a seamless intermodal transportation system for people and goods.

In the development of the statewide multimodal transportation plan, the department shall identify and document potential affected environmental resources, including, but not limited to, wetlands, storm water runoff, flooding, air quality, fish passage, and wildlife habitat. The department shall conduct its environmental identification and documentation in coordination with all relevant environmental regulatory authorities, including, but not limited to, local governments. The department shall give the relevant environmental regulatory authorities an opportunity to review the department's environmental plans. The relevant environmental regulatory authorities shall provide comments on the department's environmental plans in a timely manner. Environmental identification and documentation as provided for in RCW 47.01.300 and this section is not intended to create a private right of action or require an environmental impact statement as provided in chapter 43.21C RCW.

RCW 47.06.090

Intercity Passenger Rail Plan

The state-interest component of the statewide multimodal transportation plan shall include an intercity passenger rail plan, which shall analyze existing intercity passenger rail service and recommend improvements to that service under the state passenger rail service program including depot improvements, potential service extensions, and ways to achieve higher train speeds.

For purposes of maintaining and preserving any state-owned component of the state's passenger rail program, the statewide multimodal transportation plan must identify all such assets and provide a preservation plan based on lowest life cycle cost methodologies.

RCW 47.06.140

Transportation Facilities and Services of Statewide Significance – Level of Service Standards

(1) The legislature declares the following transportation facilities and services to be of statewide significance: Highways of statewide significance as designated by the legislature under chapter 47.05 RCW, the interstate highway system, interregional state principal arterials including ferry connections that serve statewide travel, intercity passenger rail services, intercity high-speed ground transportation, major passenger intermodal terminals excluding all airport facilities and services, the freight railroad system, the Columbia/Snake navigable river system, marine port facilities and services that are related solely to marine activities affecting international and interstate trade, and high capacity transportation systems serving regions as defined in RCW 81.104.015. The department, in cooperation with regional transportation planning organizations, counties, cities, transit agencies, public ports, private railroad operators, and private transportation providers, as appropriate, shall plan for improvements to transportation facilities and services of statewide significance in the statewide multimodal transportation plan. Improvements to facilities and services of statewide significance identified in the statewide multimodal transportation plan, or to highways of statewide significance designated by the legislature under chapter 47.05 RCW, are essential state public facilities under RCW 36.70A.200.

(2) The department of transportation, in consultation with local governments, shall set level of service standards for state highways and state ferry routes of statewide significance. Although the department shall consult with local governments when setting level of service standards, the department retains authority to make final decisions regarding level of service standards for state highways and state ferry routes of statewide significance. In establishing level of service standards for state highways and state ferry routes of statewide significance, the department shall consider the necessary balance between providing for the free interjurisdictional movement of people and goods and the needs of local communities using these facilities. When setting the level of service standards under this section for state ferry routes, the department may allow for a standard that is adjustable for seasonality.

RCW 47.79.030

Project priority – Funding Sources

The legislature finds it important to develop public support and awareness of the benefits of high-speed ground transportation by developing high-quality intercity passenger rail service as a first step. This high-quality intercity passenger rail service shall be developed through incremental upgrading of the existing service. The department of transportation shall, subject to legislative appropriation, develop a prioritized list of projects to improve existing passenger rail service and begin new passenger rail service, to include but not be limited to:

(1) Improvement of depots;

(2) Improved grade crossing protection or grade crossing elimination;

(3) Enhanced train signals to improve rail corridor capacity and increase train speeds;

(4) Revised track geometry or additional trackage to improve ride quality and increase train speeds; and

(5) Contract for new or improved service in accordance with federal requirements to improve service frequency.

Service enhancements and station improvements must be based on the extent to which local comprehensive plans contribute to the viability of intercity passenger rail service, including providing efficient connections with other transportation modes such as transit, intercity bus, and roadway networks. Before spending state moneys on these projects, the department of transportation shall seek federal, local, and private funding participation to the greatest extent possible. Funding priorities for station improvements must also be based on the level of local and private in-kind and cash contributions.

RCW 47.82

Amtrak

47.82.010
Service Improvement Program

The department, in conjunction with local jurisdictions, shall coordinate as appropriate with the designated metropolitan planning organizations to develop a program for improving Amtrak passenger rail service. The program may include:

(1) Determination of the appropriate level of Amtrak passenger rail service;

(2) Implementation of higher train speeds for Amtrak passenger rail service, where safety considerations permit;

(3) Recognition, in the state's long-range planning process, of potential higher speed intercity passenger rail service, while monitoring socioeconomic and technological conditions as indicators for higher speed systems; and

(4) Identification of existing intercity rail rights-of-way which may be used for public transportation corridors in the future.

47.82.020
Depot Upgrading

The department shall, when feasible, assist local jurisdictions in upgrading Amtrak depots. Multimodal use of these facilities shall be encouraged.

47.82.030
Service Extension

(1) The department, in conjunction with local jurisdictions, shall coordinate as appropriate with designated metropolitan and provincial transportation organizations to pursue resumption of Amtrak service from Seattle to Vancouver, British Columbia, via Everett, Mount Vernon, and Bellingham.

(2) The department, in conjunction with local jurisdictions, shall study potential Amtrak service on the following routes:

   (a) Daytime Spokane-Wenatchee-Everett-Seattle service;

   (b) Daytime Spokane-Tri-Cities-Vancouver-Portland service;

   (c) Tri-Cities-Yakima-Ellensburg-Seattle service, if the Stampede Pass route is reopened; and

   (d) More frequent Portland-Vancouver-Kelso-Centralia- Olympia-Tacoma-Seattle service or increments thereof.

47.82.040
Coordination with other rail systems and common carriers.

The department, with other state and local agencies shall coordinate as appropriate with designated metropolitan planning organizations to provide public information with respect to common carrier passenger transportation. This information may include maps, routes, and schedules of passenger rail service, local transit agencies, air carriers, private ground transportation providers, and international, state, and local ferry services.

The state shall continue its cooperative relationship with Amtrak and Canadian passenger rail systems.

47.82.900
Construction — Severability — Headings — 1990 c 43.

See notes following RCW 81.100.010.

Appendix 2: Advisory Group Meetings

In July 2008, the Washington State Department of Transportation (WSDOT), State Rail and Marine Office invited various agencies and organizations to participate on the *Amtrak Cascades Mid-Range Plan* Advisory Committee.

The intent of this committee was to monitor the development of the mid-range plan and identify potential benefits and concerns related to proposed rail corridor improvements. Members were also asked to make sure that their constituent's needs were being met.

The first meeting was held on July 23, 2008, in the Commission Board Room of the Transportation Building at 310 Maple Park Avenue, Olympia, WA.

Exhibit 2A-1 is a list of the people and organizations invited to the meeting.

Exhibit 2A-1: July 23, 2008 Advisory Committee Invite List

Invitees	Organization
Jeff Barsness	WSDOT Southwest Region
David Beal	Sound Transit
John Brickey	City of Longview
Jailyn Brown	Thurston Regional Planning Council
Dave Bugher	City of Lakewood
Shawn Bunney	Pierce County
Todd Carlson	WSDOT Northwest Region
Robert Chave	City of Edmonds
Dylan Counts	WSDOT Urban Corridors Office
Mike Cummings	Puget Sound Regional Council
Lynda David	SW Washington Regional Transportation Council
John Dyble	BC Province
Margaret Fleek	City of Burlington
Lloyd Flem	All Aboard Washington
Terry Galvin	City of Blaine
Allan Giffen	City of Everett
Jane Hague	King County
Jana Hanson	City of Mount Vernon
Laura Hudson	City of Vancouver
Peter Huffman	City of Tacoma
Bob Jones	WSDOT Olympic Region
Pat Jones	Washington Public Ports Association
Kurt Laird	Amtrak

Jerry Litt	City of Lacey
DJ Mitchell	BNSF Railway Company
Kurt Nabbefeld	City of Bellingham
Michael Nicholson	City of Stanwood
Jack Pace	City of Tukwila
Chris Picard	WSDOT Office of Urban Mobility
Emil Pierson	City of Centralia
Raul Ramos	Puyallup Tribe
Elizabeth Robbins	WSDOT Transportation Planning Office
Gordon Rogers	Whatcom Council of Governments
SangKapreecha Krong-Thip	Tullalip Tribe
Rosemary Siipola	CWCOG/SWRTPO/Kelso
Keith Stahley	City of Olympia
Diane Sugimura	City of Seattle
Brian Sullivan	Snohomish County
Mark Sullivan	Skagit Metropolitan Planning Organization
Kelly Taylor	Oregon DOT

Exhibit 2A-2 is a list of the attendees for the July 23, 2008 meeting.

Exhibit 2A-2: July 23, 2008 Advisory Committee Attendee List

Attendees	**Organization**
Jeff Barsness	WSDOT Southwest Region
Jailyn Brown	Thurston Regional Planning Council
David Burns	City of Lacey
Todd Carlson	WSDOT Northwest Region
Rob Chave	City of Edmonds
Dylan Counts	WSDOT Urban Corridors Office
Lloyd Flem	All Aboard Washington
Laura Hudson	City of Vancouver
Michael Nicholson	City of Snohomish (retired)
Elizabeth Robbins	WSDOT Transportation Planning Office
Rosemary Siipola	Cowlitz-Wahkiakum Council of Governments
WSDOT State Rail and Marine Staff: Kirk Fredrickson, Teresa Graham, Kevin Jeffers, Vickie Sheehan, Ken Uznanski, Scott Witt, Andrew Wood, George Xu	

During this meeting, the committee believed that there were many more groups that should be included on this committee.

Our second meeting was held on October 1, 2008, at the same location. Exhibit 2A-3 is a list of those invited to the second meeting.

Exhibit 2A-3: October 1, 2008 Advisory Committee Invite List

Invitees	Organization
Taylor Aalvic	Cowlitz Tribe
Stephen Abernathy	WSDOT Public Transportation Office
Cleto Achabal	Northwest Trailways
Ed Arthur	Cowlitz Tribe
Diana Barg	Samish Tribe
Jeff Barsness	WSDOT Southwest Region
David Beal	Sound Transit
Wendy Becker	Snohomish County
Richard Bellon	Chehalis Tribe
Michael Bowechop	Puyallup Tribe
John Brickey	City of Longview
Jailyn Brown	Thurston Regional Planning Council
Dave Bugher	City of Lakewood
dAVe Burlingame	Cowlitz Tribe
David Burns	City of Lacey
Larry Campbell	Swinomish Tribe
Todd Carlson	WSDOT Northwest Region
Kent A. Cash	Cowlitz County
Robert Chave	City of Edmonds
Gary Christensen	Skagit County
Dylan Counts	WSDOT Urban Corridors Office
Mike Cummings	Puget Sound Regional Council
David Danner	Utilities and Transportation Commission
Lynda David	SW Washington Reg Transportation Council
John Dyble	BC Province
Kelly Easter	Lummi Tribe
Thomas Edwards	Puyallup Tribe
Jessyn Farrell	Transportation Choices
Margaret Fleek	City of Burlington
Lloyd Flem	All Aboard Washington
Rhonda Foster	Squaxin Island Tribe
Terry Galvin	City of Blaine
Allan Giffen	City of Everett
Hank Gobin	Tulalip Tribe
Ernest Graichen	Twin Transit
Kim Gray	Cowlitz Indian Tribe
Lynne Griffith	Pierce Transit
Jane Hague	King County
Jeff Hamm	C-Tran
Jana Hanson	City of Mount Vernon
Mike Harbour	Intercity Transit
Steve Harris	City of Longview
Joe Hemmerich	Upper Skagit Tribe
Nicole Herman	Samish Tribe
Jeff Hertz	Nooksack Tribe
Tom Hingson	City of Everett
Thor Hoyte	Nisqually Tribe
Laura Hudson	City of Vancouver
Peter Huffman	City of Tacoma
Merle Jefferson	Lummi Tribe
Richard Jefferson	Lummi Tribe

Bob Johnson	Lewis County
Bob Jones	WSDOT Olympic Region
Pat Jones	Washington Public Ports Association
Ruth Jordan	King County
Bob Kelly	Nooksack Tribe
Lori Kirkeby	City of Stanwood
Ed Knight	Swinomish Tribe
SangKapreecha Krong-Thip	Tulalip Tribe
Kurt Laird	Amtrak
Jim Longley	Nisqually Tribe
Lorraine Loomis	Swinomish Tribe
Amy Loudermilk	Chehalis Tribe
Robert Melbo	Oregon DOT
Johnson Meninick	Yakama Nation
DJ Mitchell	BNSF Railway Company
Kurt Nabbefeld	City of Bellingham
Michael Nicholson	Private Citizen
Thomas Noyes	WSDOT Urban Planning Office
Dale O'Brien	Skagit Transit
Joyce Olson	Community Transit
Marvin Osborne	Sauk-Suiattle Tribe
Jack Pace	City of Tukwila
Lora Pennington	Stillaquamish Tribe
Chris Picard	WSDOT Office of Urban Mobility
Emil Pierson	City of Centralia
Ron Poulsen (Mayor)	City of Kalama
Raul Ramos	Puyallup Tribe
Phillip Rigdon	Yakama Nation
Elizabeth Robbins	WSDOT Transportation Planning Office
James Roberts	Sauk-Suiattle Tribe
Andrea Rodgers	Snoqualmie Nation
Gordon Rogers	Whatcom Council of Governments
Scott Schuyler	Upper Skagit Tribe
Rosemary Siipola	CWCOG/SWRTPO
Keith Stahley	City of Olympia
David Stalheim	Whatcom County
Casey Stevens	Stillaquamish Tribe
Pat Stevenson	Stillaquamish Tribe
Diane Sugimura	City of Seattle
Bill Sullivan	Puyallup Tribe
Brian Sullivan	Snohomish County
Mark Sullivan	Skagit Council of Governments
George Swanaset	Nooksack Tribe
Harold S. Taniguchi	King County Metro
Richard Tarry	City of Everett
Peter Thein	Washington State Transit Association
Gordon Thomas	Yakama Nation
Mike Timlin	Greyhound
David Trout	NW Indian Fisheries Commission
Lena Tso	Lummi Tribe
Kate Valdez	Yakama Nation
Kirk Vinish	Lummi Tribe
Richard G. Walsh	Whatcom Transit Authority

Larry Wasserman	Skagit Coop
Mark White	Chehalis Tribe
Andy Whitener	Squaxin Island Tribe
Richard Wolten	Sauk-Suiattle Tribe
Christine Woodward	Samish Tribe
Bill Wright	Clark County
Richard Young	Tulalip Tribe
Brian Ziegler	Pierce County

The total number of attendees for this meeting was 18 attendees and ten staff. Exhibit 2A-4 is a list of the attendees for the October 1 meeting.

Exhibit 2A-4: October 1, 2008 Advisory Committee Attendee List

Attendees	**Organization**
George Barner	Port of Olympia
Jeff Barsness	WSDOT Southwest Region
Jailyn Brown	Thurston Regional Planning Council
Pat Brown	Stillaguamish Tribe
Rose Brownfield	Squaxin Island Tribe
Tonia Buell	WSDOT Communications Office
Robert Chave	City of Edmonds
Lloyd Flem	All Aboard Washington
Mike Harbour	Intercity Transit
Laura Hudson	City of Vancouver
Debra Johnson	City of Lakewood
Jim Longley	Nisqually Tribe
Michael Nicholson	Private Citizen
Thomas Noyes	WSDOT Urban Planning Office
Rosemary Siipola	Cowlitz-Wahkiakum Council of Governments
Ed Storm	BC Province
Richard Tarry	City of Everett
WSDOT State Rail and Marine Staff: Brian Calkins, Kirk Fredrickson, Teresa Graham, Kevin Jeffers, Lynn Scroggins, Vickie Sheehan, Ken Uznanski, Scott Witt, Andrew Wood, George Xu	

Appendix 3: History of Rail Development in Washington State

In the Pacific Northwest, rail development began in 1864 when President Abraham Lincoln approved a Northern Pacific Railroad charter for a direct rail connection between the Great Lakes and Puget Sound. In the early 1900s the last of the transcontinental railroads reached Seattle and Tacoma, just as travelers began shifting to automobile and truck transportation for more flexibility and freedom than was available with rail transportation. In 1956 the Interstate Highway System began and, during the next two decades, more than 42,000 miles of high-quality, multiple-lane, limited-access highway was built. Passenger trains became more streamlined, but the popularity of passenger rail travel continued to decline.

In the mid-1890s, the national passenger rail market reached its peak with an estimated market share of 95 percent. It declined due to automobile and aviation use and other factors until World War II, when ridership rose to 67 billion passenger-miles per year in 1945. After World War II, ridership declined again, hitting a ridership low in 1970 of 4.4 billion passenger-miles per year.

Since then, ridership has fluctuated between 4.2 billion and 6.4 billion passenger-miles per year. In the 1970s the federal government relieved the railroads of their obligation to provide passenger service and formed the National Railroad Passenger Corporation, commonly referred to as Amtrak (*Am*erican *Tra*vel by Trac*k*). The Amtrak Improvement Act of 1978 required the U.S. Department of Transportation to optimize its intercity railroad passenger system based on current and future market and population requirements. The Amtrak Reorganization Act of 1979 called for reform and accountability to increase on-time performance, increase frequency and speed, and generate 50 percent of operating expenses, excluding depreciation, within six years (and at least 44 percent within three years), expecting Amtrak to act like both a business and a public-service agency. Other legislation followed to optimize Amtrak service with the goal of eliminating federal subsidies.

In the Pacific Northwest, the vision of reduced travel times and better passenger rail service began in the late 1980s when the Washington State Legislature funded a program to improve rail depots across the state. In 1987-1989 the Rail Policy Development Committee studied the feasibility of developing rail passenger service in Washington State.

In 1991 the Washington State Legislature directed the Washington State Department of Transportation (WSDOT) to develop a comprehensive feasibility assessment for a high speed ground transportation system in the state of Washington. In October 1992 the study was delivered to the Governor and the legislature, confirming the feasibility of developing high-speed rail in the region.

In 1992 the U.S. Department of Transportation, Federal Railroad Administration (FRA) designated the Pacific Northwest Rail Corridor (PNWRC) to be developed for high-speed passenger rail.[1]

Following release of this study, in April 1993, WSDOT was directed (Revised Code of Washington Chapter 47.79) to develop "high-quality intercity passenger rail service … through incremental upgrading of the existing [Amtrak] service." The legislature believed that this step-by-step approach would help build a "rail culture" in the region that would eventually make rail a competitive and viable alternative to automobile and regional air travel.

Regionally, in the early 1990s Washington and Oregon began to explore the feasibility of initiating a new, higher-speed rail passenger service between major Pacific Northwest cities. In 1993 the Washington State Legislature instructed WSDOT to develop high quality passenger rail service between Portland, Seattle, and Vancouver, B.C. In 1994 the first state funded Seattle to Portland service began (there was pre-existing Seattle to Portland service prior to WSDOT involvement). In 1995, after a 14-year hiatus, Seattle to Vancouver, B.C. service began.

Technologies were evaluated in the early to mid-1990s, then WSDOT made a strategic decision to invest in conventional high-speed diesel and passive-tilt technology for its train sets. WSDOT contracted with Renfe Talgo of America in 1995 to build train sets for the PNWRC. They were delivered and put into service in late 1998 and early 1999 and the service became officially known as Amtrak *Cascades*. In 2007 corridor ridership reached 676,760, the highest in the history of the program.

[1] Roughly 125 miles of PNWRC is Union Pacific Railroad track and the rest of the 466-mile corridor is BNSF Railway track. This designation helps the region compete for potential federal funds to assist the state with planning and implementing improved passenger and freight rail service throughout the corridor. Federal Rail Administration www.fra.dot.gov.

Appendix 4: Amtrak *Cascades* Ridership Forecasting

An extensive history of passenger train travel in the Amtrak *Cascades* corridor was available for analysis of ridership over time. Monthly history, from January 1996 to October 2008, was referenced for purposes of modeling and forecasting. Four major geographical segments of Amtrak *Cascades* ridership were segregated for evaluation: Seattle to Portland, Seattle to Bellingham, Portland to Eugene, and Bellingham to Vancouver, B.C. Only analysis for Seattle to Portland and Seattle to Bellingham is provided in this appendix.

As noted in Chapter 3, public use of Amtrak *Cascades* is measured by monthly and annual ridership and also by station on-offs, which measure passenger volumes per station. Station on-offs are a good indication of the geographical distribution of passenger use of stations, while ridership is a measurement of train usage for a given time period, whether by day, month, or year. In addition to ridership and station on-offs, a third method of measuring use is by train occupancy or loading. Occupancy is a measurement of the number of passengers riding a train over a given travel segment. It is a useful measurement for modeling and determining capacity needs for current and future levels of service.

Preparation of Ridership Data for Modeling

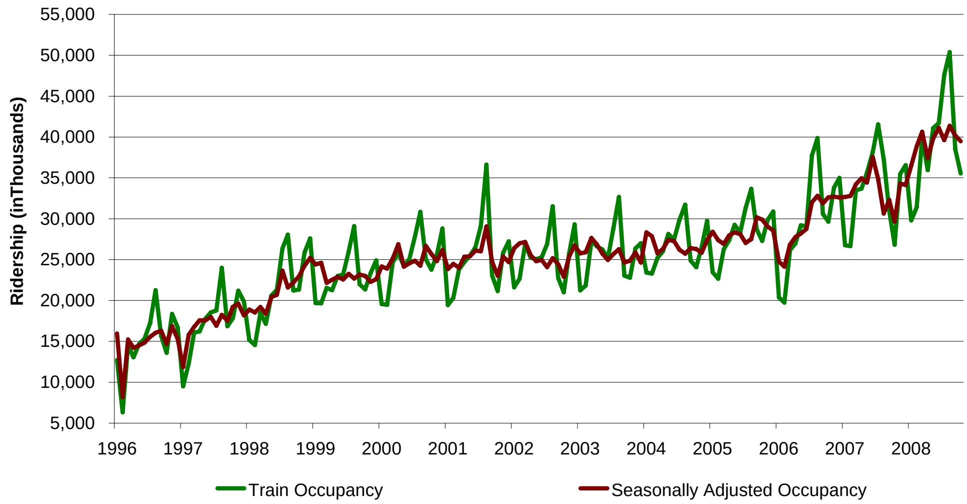
Eviews 6, an econometric software package, was employed for preparing Amtrak *Cascades* data for modeling. By month, train occupancy was averaged for each major travel segment. For example, the Seattle to Portland segment required averaging train occupancy for each station-to-station pair, both north and south. For Seattle to Portland, occupancy for 7 station-to-station pairs was averaged to determine the average ridership of the entire segment. The calculated average was then doubled to arrive at the round-trip average occupancy. Round-trip train occupancy for eight station-to-station pairs was averaged for the Seattle to Bellingham segment.

Average occupancy for the round-trip segment pairs of Seattle to Portland and Seattle to Bellingham was subsequently adjusted for seasonality using the U.S. Census X-11 seasonal adjustment program built into *Eviews 6*. Seasonality was present at the 0.1 percent level.

The seasonally adjusted variants of the Seattle to Portland and Seattle to Bellingham travel segments were used as the dependent variables in the models considered. Exhibit 4A-1 shows the strong monthly seasonality of train occupancy for the major segments of Seattle to Portland and Seattle to Bellingham. Using seasonally adjusted occupancy for the dependent variable helps to isolate the underlying causes of change over time, absent the large changes occurring from the seasonal effect.

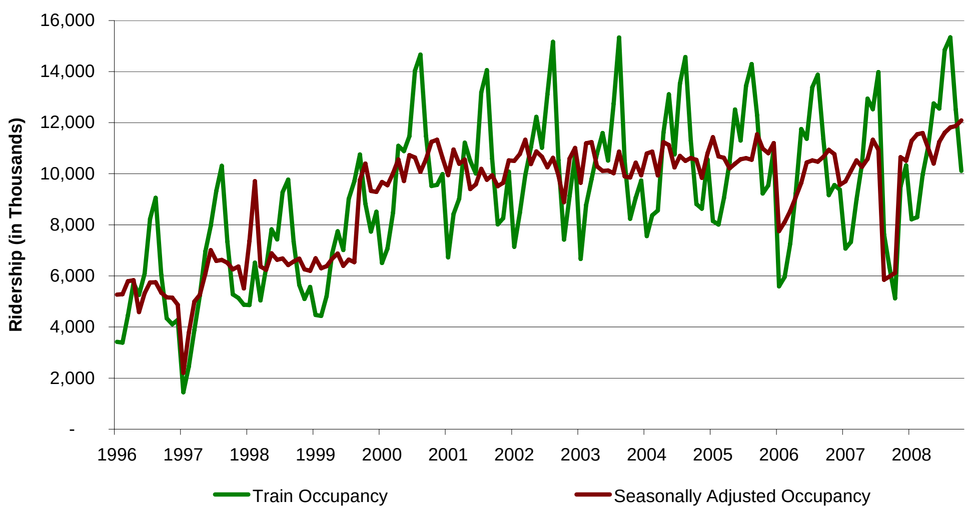
Exhibit 4A-1: Amtrak *Cascades* Monthly Train Occupancy by Segment

Seattle to Portland



Stations included are Seattle, Tukwila, Tacoma, Olympia/Lacey, Centralia, Kelso/Longview, Vancouver, and Portland.

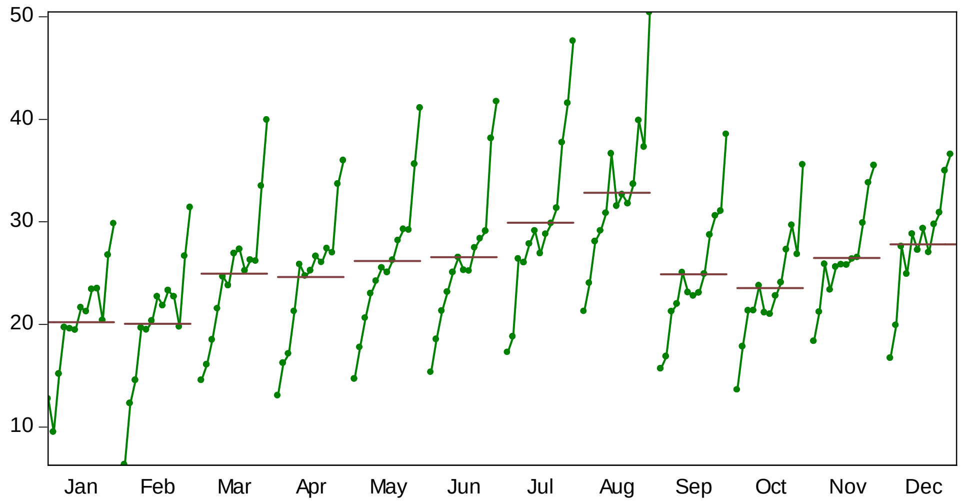
Seattle to Bellingham



Stations included are Seattle, Edmonds, Everett, Mount Vernon, and Bellingham.

Seasonality is also observed over time from 1996 to October 2008 in a seasonal graph format created by *Eviews*. Exhibit 4A-2 shows the highest ridership months as July and August and the lowest as January and February. It also highlights the remarkable increase in ridership from January to October in both 2007 and 2008.

Exhibit 4A-2: Monthly Amtrak *Cascades* Seasonal Train Occupancy (1996 to October 2008)
(in thousands)



The 12 vertical green lines represent train occupancy by month and year from January 1996 to October 2008 with the circular symbols representing each year. The brown horizontal lines indicate the average occupancy across all years for each month.

Independent Variables

Independent predicting variables were evaluated based on historical values and availability of respected forecasts of independent variables. Variables considered included employment, income, population, energy pricing, capacity, and train frequency. Employment and income were considered, but dropped, after initial testing of annual employment and income variables regressed on annual historical ridership. Also county and sub-county (i.e. census block) forecasts of employment and income of each geographical area containing an Amtrak *Cascades* station were not consistently available or regularly updated.

Population Estimates and Projections

Population estimates and forecasting, provided by the Washington Office of Financial Management (OFM), formed the basis of population data for Amtrak stations located in Washington State. OFM population forecasts were used given frequency of updates and their consideration of economic and employment factors in their migration factors along with the typical birth, death, and age attributes of population forecasting. OFM updates forecasts of the entire Washington State population annually in November each year and also updates forecasts of county populations in Growth Management Act population projections, the latest from 2007. County population estimates are updated in June each year. OFM also publishes census tract populations (2000 to 2007) for all of Washington in their Small Area Estimate Program.

The Office of Economic Analysis of Oregon (OEA) updated Oregon's state population forecast through 2015 in the 2008 second quarter issue of their Economic and Revenue Forecast. The OEA Web site also provides links to county level population estimates and forecasts, the forecast last updated in 2004. The Metro of Portland Web site also provided census tract level populations (2000-2004) for Multnomah, Clackamas, and Washington Counties in the Portland area.

BC STATS provided population estimates (1986-2007) and projections (2007-2036) for locations near the Vancouver, B.C. Amtrak station. Projections are updated annually.

Initial modeling of ridership forecasting employed estimates and projections of county population totals. Location of Amtrak stations determined whether a county was included in the population independent variable. The next step was to refine the population variable by limiting the relevant population based upon distance from the Amtrak station. This method was employed for the *Long-Range Plan for Amtrak Cascades*.

A new and more refined technique of defining service area population was used for the mid-range plan. The technique used the amount of time needed to drive to an Amtrak station. GIS software used WSDOT Cartographic Data and TeleAtlas Street Data with drive times calculated based on standard road impedances by ESRI Network Analyst Extension. Time intervals calculated ranged in minutes from 0 to 5, 5 to 10, 10 to 20, and 20 to 30. Populations defined by census tract, located within the geographical boundaries of each time interval, provided an estimate of the total population matched with each station.

Two additional population variables were calculated giving lower weights or damping to populations located further from the Amtrak station based upon drive time. This method assumes that as driving time increases the percentage of populations travelling by train decreases. No significant difference in modeling estimates and statistics resulted from the choice of the damping effect on population. The population variable chosen for final modeling weights 0 to 5 minutes at 100 percent, 5 to10 minutes at

80 percent, 10 to 20 minutes at 60 percent, and 20 to 30 minutes at 40 percent.

A map of all the Oregon and Washington Amtrak *Cascades* stations and drive-time populations are shown in Exhibit 4A-3. Exhibit 4A-4 follows with populations defined by time intervals. Note the steeper slope in 2002 when the Tukwila station opened.

Exhibit 4A-3: Amtrak *Cascades* Service Areas – Drive Times

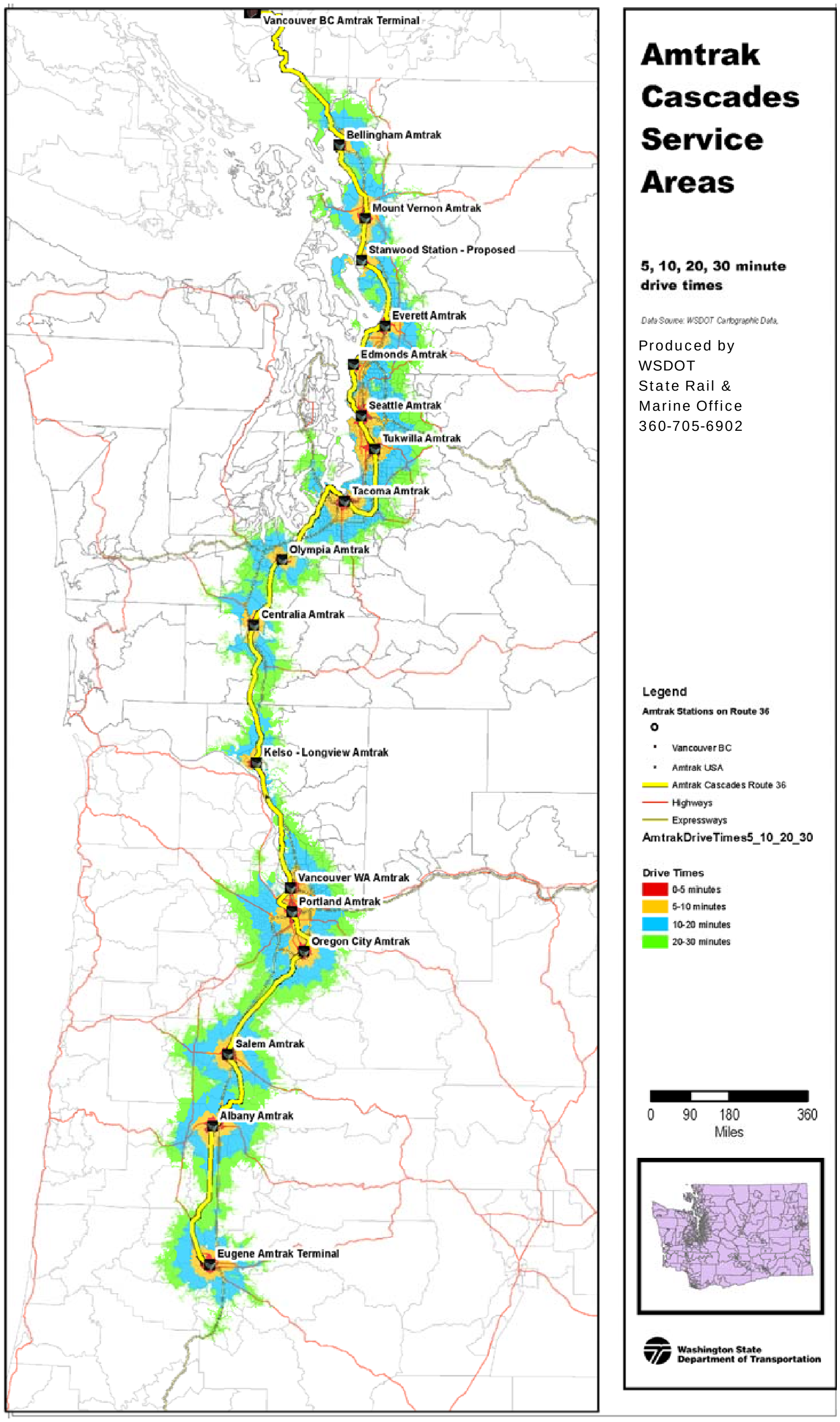
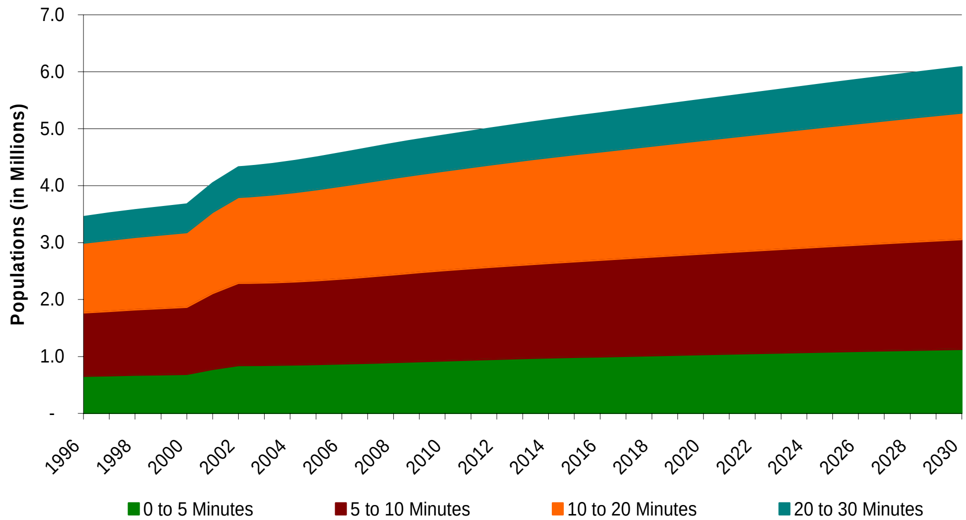


Exhibit 4A-4: Drive-Time Populations for Amtrak *Cascades* Stations
Seattle to Portland Segment



Stations included are Seattle, Tukwila, Tacoma, Olympia/Lacey, Centralia, Kelso/Longview, Vancouver, and Portland.

For reference, Exhibit 4A-5 shows tabular values associated with Exhibit 4A-4. A column total for all drive-time categories is also included.

Exhibit 4A-5: Annual Populations by Drive Times

Year	0 to 5 minutes	5 to 10 minutes	10 to 20 minutes	20 to 30 minutes	Total
1996	655,063	1,111,481	1,224,602	463,770	3,454,917
1997	664,915	1,129,992	1,249,083	473,545	3,517,536
1998	674,214	1,147,416	1,272,379	482,469	3,576,477
1999	682,445	1,162,842	1,292,760	489,920	3,627,967
2000	688,565	1,175,730	1,313,351	499,130	3,676,776
2001	776,368	1,332,228	1,425,025	516,186	4,049,807
2002	842,788	1,444,415	1,510,512	529,185	4,326,901
2003	846,122	1,450,439	1,534,225	540,349	4,371,136
2004	849,384	1,461,087	1,561,428	553,844	4,425,743
2005	858,224	1,473,695	1,595,614	568,060	4,495,594
2006	871,375	1,491,250	1,633,752	583,551	4,579,928
2007	885,660	1,512,656	1,666,839	595,556	4,660,711
2008	900,544	1,537,182	1,695,903	605,585	4,739,213
2009	915,066	1,560,864	1,724,759	615,604	4,816,293
2010	928,573	1,583,384	1,752,656	625,498	4,890,111
2011	940,259	1,603,850	1,778,797	635,078	4,957,984
2012	952,081	1,624,349	1,805,024	644,553	5,026,006
2013	963,471	1,644,136	1,830,583	653,885	5,092,075
2014	974,493	1,663,352	1,855,644	663,060	5,156,550
2015	984,947	1,681,449	1,879,580	672,165	5,218,142
2016	994,934	1,698,444	1,902,394	681,321	5,277,093
2017	1,005,059	1,715,866	1,925,848	690,481	5,337,254
2018	1,015,085	1,733,110	1,949,222	699,685	5,397,102
2019	1,024,985	1,750,138	1,972,499	708,934	5,456,555
2020	1,034,875	1,767,177	1,995,863	718,179	5,516,093
2021	1,044,844	1,784,381	2,019,239	727,266	5,575,730
2022	1,054,569	1,801,168	2,042,303	736,362	5,634,401
2023	1,064,183	1,817,805	2,065,335	745,475	5,692,798
2024	1,073,661	1,834,244	2,088,296	754,597	5,750,798
2025	1,083,038	1,850,565	2,111,202	763,747	5,808,552
2026	1,092,366	1,866,824	2,133,786	772,800	5,865,775
2027	1,101,534	1,882,832	2,156,202	781,828	5,922,396
2028	1,110,556	1,898,623	2,178,520	790,864	5,978,563
2029	1,119,429	1,914,190	2,200,728	799,906	6,034,254
2030	1,128,203	1,929,615	2,222,907	808,976	6,089,700

Stations included are Seattle, Tukwila, Tacoma, Olympia/Lacey, Centralia, Kelso/Longview, Vancouver, and Portland.

Capacity and Frequency

Ridership is correlated strongly with train capacity and frequency of trips. The history of monthly capacity of trains and trips travelling each segment (i.e. Seattle to Portland) was compiled from historical records within the WSDOT State Rail and Marine Office. Capacity changes over time resulted from the number of seats per train set, number of trips per day, and service disruptions. Initial modeling with a capacity variable in total number of seats proved to be not as favorable as using the number of trips per day along each travel segment. Adding capacity by increasing number of trips per day is also simpler and more convenient in forecasting various scenarios of capacity and trip changes.

Energy Costs

Record increases in Amtrak *Cascades* ridership this past year have, in part, occurred because of sharply increasing petroleum prices. Since 2002 inflation adjusted prices of petroleum products, such as gasoline and diesel, have risen steadily. From 2002 to 2008 prices have risen over 100 percent. More consumers are choosing to ride the train instead of travelling by automobile.

A national index of inflation adjusted prices of refined petroleum products is available from Global Insight, an international economic forecasting company. WSDOT subscribes to a monthly U.S. Macro Economic history and forecast from Global Insight. Data is provided in annual and quarterly frequencies. An index of inflation adjusted prices is generated from several indices provided by Global Insight. The indices include: JPCNEGAO (Chained price index for consumer gasoline and oil), CONS (Consumer spending on all goods and services), and CONSR (Real consumer spending on all goods and services). CONS divided by CONSR results in the general inflation index known as the Implicit Price Deflator for Personal Consumption (PIDC). JPCNEGAO is then divided by PIDC to arrive at an inflation-adjusted price for gasoline.

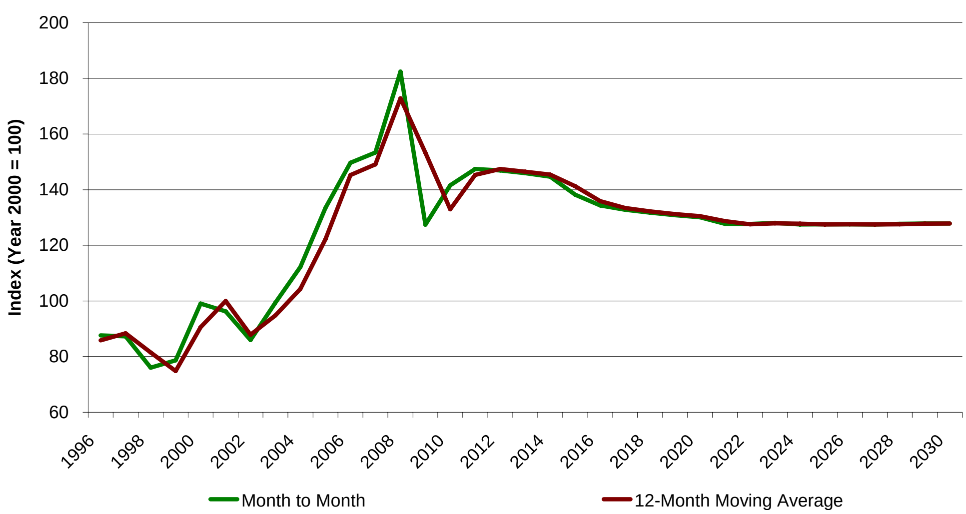
WSDOT uses the same index, converted into a 4-quarter moving average, as a major predictor for its gasoline consumption model and revenues derived from the state’s motor vehicle fuel tax. A 12-month moving average conversion was used for the modeling ridership for the Seattle to Portland segment.

Washington retail gasoline prices (all grades, all formulations) peaked in early July 2008, at $4.41 per gallon. Since July, both crude oil and gasoline prices have plummeted at a rapid rate due to the ever deepening financial economic crises. The U.S. Energy Department (Energy

Information Agency, EIA) reported a Washington retail price of $2.30 per gallon on November 17, 2008. Given the volatility and huge decline in gasoline prices, other forecast sources were considered for comparison with the November 2008 JPCNEGAO Global Insight forecast. A long-term forecast from June, published by EIA in their Annual Energy Outlook 2008 (AE02008) and the monthly 2008 Short-Term Energy Forecast (STEO) released by EIA in November 2008, provided alternative forecasts of future gasoline prices. A hybrid gasoline index was created through 2009 from EIA's STEO and Global Insight's November 2008 forecast. A long-term forecast from FY2010 through FY2030 was compiled by averaging Global Insight's forecast with the AEO2008 forecast.

Exhibit 4A-6 shows the dramatic increase in prices since 2002. In 2008 the price increases peaked, then rapidly decline in 2009, rise in 2010-2011, then decline gradually until 2022, and finally leveling off for the remainder of the forecast period. This exhibit also shows the smoothing of the 12-month moving average of the index variant used in forecasting models.

Exhibit 4A-6: Index of Real (Inflation Adjusted) Gasoline Prices History and Forecast



Modeling

Train occupancy forecast models were developed for each major segment of the Amtrak *Cascades* corridor: Seattle to Portland, Seattle to Bellingham, and Portland to Eugene. Insufficient data was available to forecast Bellingham to Vancouver, B.C. ridership. Only Seattle to Portland and Seattle to Bellingham sections are discussed here.

Many gasoline consumption models use a log-log model design where both independent and dependent variables are transformed to logarithmic form. Least-squares regression was used to determine the sign, magnitude, and statistical significance of the equation coefficients and the overall goodness-of-fit of the equation to historical data. This log-log design was successfully implemented for modeling Seattle to Portland train occupancy.

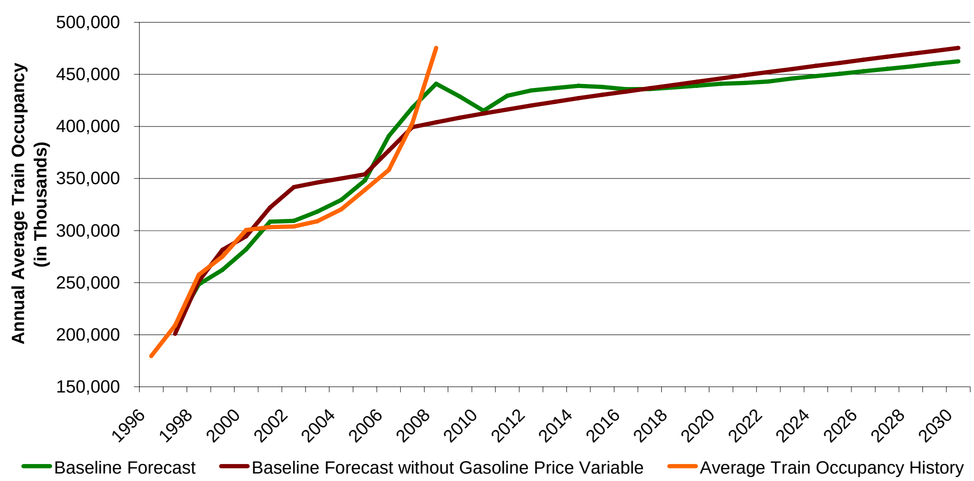
The modeled equation for the Seattle to Portland segment was determined as:

Log (Seasonally adjusted average train occupancy) = C(1)*log (12-month moving average of inflation adjusted gasoline prices) + C(2)*log (Number of Seattle to Portland round trips) + C(3)*log (Amtrak station drive-time populations weighted by nearness to station) + [AR(1) = C(4),AR(11) = C(5),AR(12) = C(6)]

AR (1,11, and 12) are serial correlation correction terms.

An alternative model that did not include the gasoline price variable was also calculated for comparison. Exhibit 4A-7 shows the history, the baseline forecast, and the alternative forecast. The baseline forecast has a better fit to historical average train occupancy, especially for the last several years when the alternative forecast underestimates occupancy. Including the price variable does provide support for greater occupancy in the next 15 years, but notably both forecasts end up with about the same annual ridership in FY2017, and parallel near each other through FY2030.

Exhibit 4A-7: Comparison of History, Baseline Forecast, and Alternative Forecast without Gasoline Price Variable
Seattle-Portland Segment



Stations included are Seattle, Tukwila, Tacoma, Olympia/Lacey, Centralia, Kelso/Longview, Vancouver, and Portland.

Modeling for the Seattle to Bellingham segment involved less frequent service and about one third of the train occupancy per trip compared to Seattle to Portland. Also, based on historical train occupancy for the Seattle to Bellingham segment, the gasoline price variable proved not to be statistically significant. Ridership for the Seattle to Bellingham segment is much less mature. It is more seasonal, provides half the number of round trips compared to Seattle to Portland, and of course is much less used. The modeled equation for the Seattle to Bellingham segment was calculated as:

log(Seasonally adjusted average train occupancy) = C(1)*log(Number of Seattle to Bellingham round-trips) + C(2)*LOG(Amtrak station drive-time populations weighted by nearness to station) + [AR(1)=C(3)

AR(1) is a serial correlation correction term.

Exhibit 4A-8 shows the average occupancy history and the baseline forecast for the Seattle to Bellingham segment. The baseline model provides a good fit to historical average train occupancy with occupancy peaking in 2008. Higher gasoline prices in 2008 most likely contributed this peak while the forecast from 2009 to 2030 follows the long-term trend driven by population growth.

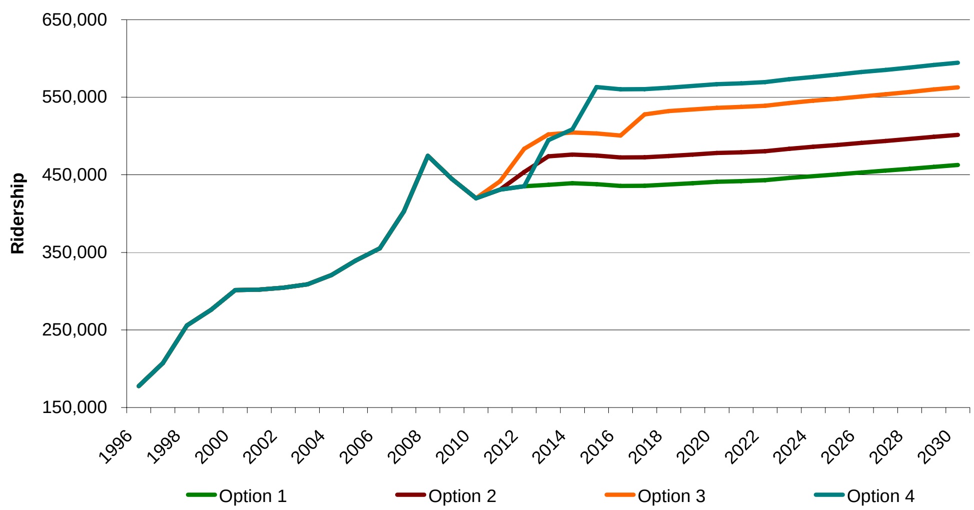
Exhibit 4A-8: Average Train Occupancy
Seattle to Portland

Stations included are Seattle, Tukwila, Tacoma, Olympia/Lacey, Centralia, Kelso/Longview, Vancouver, and Portland.

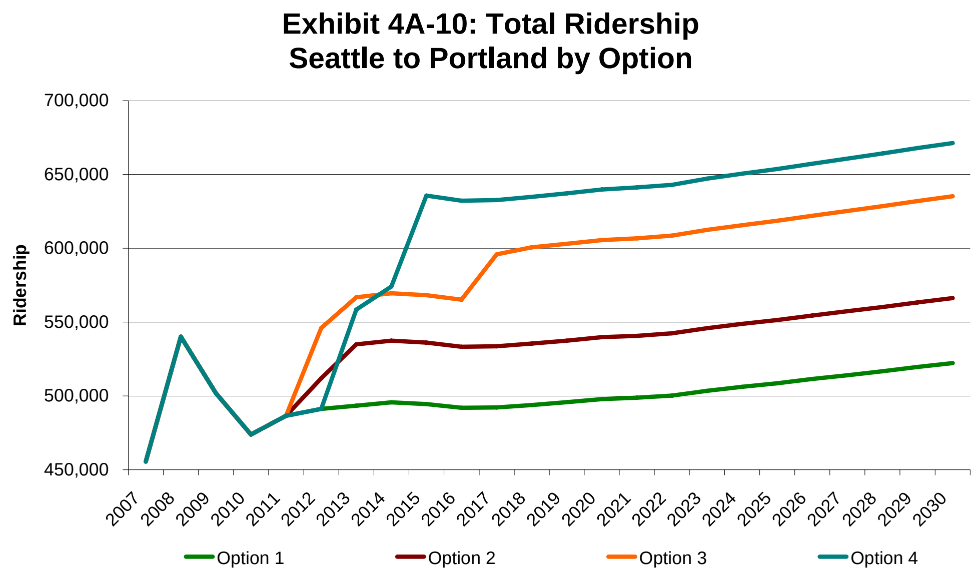
Model Results

Average train occupancy for the four capacity options from Seattle to Portland are shown in Exhibit 4A-9, followed by Exhibit 4A-10, escalates average train occupancy by 12.9 percent to arrive at total ridership for the segment. Since July 2006 actual total ridership has averaged 12.9 percent higher than average train occupancy for Seattle to Portland. Alternatively, since July 2006 actual total ridership has averaged 6.3 percent lower than average train occupancy for Seattle to Bellingham.

Exhibit 4A-9: Average Train Occupancy
Seattle to Portland by Option



Stations included are Seattle, Tukwila, Tacoma, Olympia/Lacey, Centralia, Kelso/Longview, Vancouver, and Portland.



Stations included are Seattle, Tukwila, Tacoma, Olympia/Lacey, Centralia, Kelso/Longview, Vancouver, and Portland.

Actual total ridership averaged 12.9 percent higher than average train occupancy since July 2006.

Appendix 5: Project Cost Estimates

Project cost estimates in this appendix are generic estimates assuming the costs occur in 2008. When these costs apply to a specific mid-range plan option, the costs are inflated to the years of their occurrences. Therefore, the total of the project costs will not match those in the mid-range plan options, because they are not adjusted for inflation.

Exhibit 5A-1: Rail Construction Unit Costs

These Unit Costs were provided by HDR Engineering at the request of WSDOT State Rail and Marine Office in June of 2008 and reflect their experience up to that time.

These unit costs are used in typical construction project in the Mid-Range Plan.

Equipment unit costs and non-typical track construction costs are specified in individual estimates, as appropriate.

	UNITS	UNIT COST	Source of Unit Costs	Comments
Earthwork				
Clear & Grub	AC	$6,000	2008 Actuals	WSDOT Unit Bid Analysis 2008 project average (NW&SW regions)
Common Excavation	CY	$15	2008 Actuals	WSDOT Unit Bid Analysis 2008 project average (NW&SW regions)
Rock Excavation	CY	$75	2008 Actuals	$50 ok for soft but too low for hammer or blast
Embankment	CY	$28	2008 Actuals	WSDOT Unit Bid Analysis Gravel Borrow Incl Haul + Compaction
General Excavation *	CY	$15	2008 Actuals	WSDOT Unit Bid Analysis Gravel Borrow Incl Haul + Compaction
Subballast	CY	$40	2008 Actuals	Vancouver NP Passing Track Prioject Average Bid Price
Erosion Controls	Mi	$50,000	2008 Actuals	Assume 1 mile of Silt Fence and 1 mile of Wattles WSDOT UBA
Seeding	AC	$3,200	2008 Actuals	WSDOT UBA for Seeding Fertilizing & Mulching
Place Topsoil	CY	$38	2008 Actuals	WSDOT UBA Average for Type A, B, and C Topsoil
Tunnel	MI			
Historical Accuracy Factor for Earthwork	%	100%		

Track				
Track Construction				
New Track	TF	$195	2008 Actuals	BNSF 2008 Unit Prices + Contingency for application variability
Rehab Track	TF	$125	2008 Actuals	Ballast, Line & Surface, 50% Tie Replacement and Spot Undercutting-No Rail
Yard Track	TF	$142	2008 Actuals	All relay material Geiger Spur bid price average
Lineover Track	TF	$25	2008 Actuals	2008 BNSF Unit Cost + 30%
Track/Turnout Removal/Relocation				
Remove Existing Track	TF	$15	2008 Actuals	2008 BNSF Unit Cost + 30%
Relocate Existing Track	TF	$145	2008 Actuals	RFR track +136# wood tie track from RFR materials
Remove Existing Turnout	EA	$28,000	2008 Actuals	Includes Track Panel, Surf, Line, Dress
Relocate Existing Turnout	EA	$49,500	2008 Actuals	2008 BNSF Unit Cost + 30%
Remove Existing Crossover	EA	$56,000	2008 Actuals	Includes Track Panel, Surf, Line, Dress
Relocate Existing Crossover	EA	$99,000	2008 Actuals	Relocate Existing Turnout x 2
Turnouts				
Split Point Derail	EA	$54,730	2008 Actuals	2008 BNSF Unit Cost + 30%
#9	EA	$130,500	2008 Actuals	Replacement #9 RBM BNSF 2008 Unit Costs
#11	EA	$188,400	2008 Actuals	BNSF 2008 Unit Prices New #11 RBM power or manual (average)
#15	EA	$221,000	2008 Actuals	BNSF 2008 Unit Prices #15 SPR
#20	EA	$292,000	2008 Actuals	BNSF 2008 Unit Prices (Avg 136# and 141# rail)
#24	EA	$299,650	2008 Actuals	BNSF 2008 Unit Prices (Avg 136# and 141# rail)
#33	EA	$630,000	2008 Actuals	2006 Unit Price x 1.75
#48	EA	$875,000	2008 Actuals	2006 Unit Price x 1.75
Crossovers				
#9	EA	$261,000	2008 Actuals	2 x Turnout Cost
#11	EA	$376,800	2008 Actuals	2 x Turnout Cost
#15	EA	$442,000	2008 Actuals	2 x Turnout Cost
#20	EA	$584,000	2008 Actuals	2 x Turnout Cost
#24	EA	$599,300	2008 Actuals	2 x Turnout Cost
#33	EA	$1,260,000	2008 Actuals	2 x Turnout Cost
#48	EA	$1,750,000	2008 Actuals	2 x Turnout Cost
Historical Accuracy Factor for Track	%	45%		
RR Structures				
Bridges				
< 32' PRCT	TF	$6,000	2008 Actuals	Assumes precast 30" double cell box girders on precast caps and exposed 14" H-pile bents
32- 45' PRCT	TF	$7,500	2008 Actuals	Assumes precast 42" double cell box girders on precast caps and exposed 14" H-pile bents
45-80' IB	TF	$10,500	2008 Actuals	Ballast Deck, WF Beams, cast-in-place concrete substructure
80-160' DPG	TF	$23,824	2006 Inflated	
80-160' TPG	TF	$22,000	2008 Actuals	Ballast Deck, cast-in-place concrete substructure
> 160' TRT	TF	$33,000	2008 Actuals	Ballast Deck, cast-in-place concrete substructure
Remove Existing Bridge	TF	$1,000	2008 Actuals	
Culvert Crossings				
Major Culverts (> 36" Diameter)	LF	$720	2008 Actuals	WSDOT UBA for 36" Cl 3 RCP with 2 Flared End Sections
Minor Culverts (< 36" Diameter)	LF	$264	2008 Actuals	WSDOT UBA for 18" Cl 3 RCP with 2 Flared End Sections
Other Drainage	LS	1		
Retaining Walls				
C.I.P.	SF	$130	2008 Actuals	Retaining wall supporting RR is larger section than WSDOT Standard @ $90/sf
Soldier Pile < 20'	SF	$130	2008 Actuals	WSDOT 2008 Bridge Design Manual 12.3-A-1 (High)
Soldier Pile w/ Tie Back > 20'	SF	$200	2008 Actuals	WSDOT 2008 Bridge Design Manual 12.3-A-1 (High)
Soil Nail	SF	$67	2008 Actuals	Vancouver NP Passing Track Prioject Average Bid Price
Station Platform	LS	$3,500,000	2008 Actuals	Stanwood Station estimate includes associated civil infrastructure
Historical Accuracy Factor for RR Structures	%	100%		

Roadway				
Roadway Construction	SY	$71	2006 Inflated	
At-Grade Crossing				
Concrete Crossing Panels Installed	TF	$953	2006 Inflated	
Urban Major Crossing Approaches	SY	$100	2008 Actuals	8" HMA @ (115 lbs/SY)/inch x 210 tons/SY
Urban Minor Crossing Approaches	SY	$75	2008 Actuals	6" HMA @ (115 lbs/SY)/inch x 210 tons/SY
Rural Major Crossing Approaches	SY	$50	2008 Actuals	4" HMA @ (115 lbs/SY)/inch x 210 tons/SY
Rural Minor Crossing Approaches	SY	$25	2008 Actuals	2" HMA @ (115 lbs/SY)/inch x 210 tons/SY - Could also be used for overlay
Grade-Separation Crossing				
Bridge	SF	$179	2006 Inflated	
Roadway (earthwork & paving)	SY	$100	2008 Actuals	Assume Major Urban Approach cost
MSE Wall	SF	$60	2008 Actuals	WSDOT 2008 BDM 12.3-A-1 (High) SE Wall w/CIP Fascia panels
Embankment (fill)	CY	$35	2008 Actuals	WSDOT UBA 2008 Projects (NW Region)
Misc. (non-typical per project)	LS	1		
Crossing Signals				
Upgrade Signal - Barrier Gates	EA	$238,238	2006 Inflated	
New Signal	EA	$300,000	2008 Actuals	
Historical Accuracy Factor for Roadway	%	100%		
Railroad Signals				
Per P.O. T.O.	EA	$420,000	2008 Actuals	Pt. Defiance Estimate
Per Mile	MI	$1,000,000	2008 Actuals	Industry Average
Electric Locks	EA	$25,000	2008 Actuals	
Historical Accuracy Factor for RR Signals	%	10%		Annual Inflation is about 16.9%
Utility Relocation & Protection				
Transmission Lines	LS	1		
Fiber Optic Lines	LF	$110	2008 Actuals	
Miscellaneous	LS	1		
Historical Accuracy Factor for Utilities	%	50%		
Enviromental Mitigation (20%)	LS	20%		
Wetland Compensation	AC	$60,000		
Construction Management (8%)	LS	8%		
Sales Tax (Varies by Location)	%			
Pre-Const'n Engineering and Admin. (10%)	LS	10%		
Historical Accuracy Factor for PE/Admin.	%	2%		
Right-of-Way Acquisition				
Undeveloped	AC	$23,528	2006 Inflated	
Residential**	AC	$117,640	2006 Inflated	
Commercial**	AC	$294,099	2006 Inflated	
Industrial**	AC	$411,739	2006 Inflated	
Historical Accuracy Factor for ROW	%	50%		

Misc. unit costs

Item	Unit	Cost
Demo existing passenger platform	LS	$50,000
Demo existing roadway	SY	$15
Demo existing overhead bridge	SF	$30
Crash wall	LF	$300

** General Excavation includes a fill section of 5' x 25' for 75% of the time and a cut section of 10' x 25' for 25% of the time*

*** Includes Relocation and related costs*

Exhibit 5A-2: Tacoma – Bypass of Pt. Defiance – 66th St. to Nisqually

Project:	**Tacoma - Bypass of Pt. Defiance - 66th St to Nisqually**				
Location:	Tacoma and Lakewood				
General Scope:	Double track 66th - Bridgeport including realignment of Curve 0, Rehab Bridgeport-Nisqually, Mutilple Crossing Safety Improvements				
Estimate Date:	6/15/2008				
	Estimate Summary from 100% design				**COMMENTS**
Earthwork					
		Earthwork Subtotal		$ 132,119	
Track					
		Track Subtotal		$ 45,338,067	Inc. All BNSF work which includes Tax
RR Structures					
		RR Structures Subtotal		$ 116,625	
Roadway					
		Roadway Subtotal		$ 2,564,119	
Railroad Signals					
		RR Signals Subtotal		$ 9,426,174	
Utility Relocation & Protection					
		Utilities Subtotal		$ -	
		CONSTRUCTION TOTAL		**$ 57,577,104**	
Enviromental Mitigation (0%)	LS	57,577,104	0%		
Wetland Compensation	AC	$60,000		$ -	
			SUBTOTAL	**$ 57,577,104**	
Construction Management (9%)	LS	57,577,104	9%	$ 5,061,101	
Sales Tax (5.5%)	%	57,577,104	5.5%	$ 3,188,365	Average tax rate as BNSF costs include sales tax
		"CN" PHASE SUBTOTAL		**$ 65,826,570**	
Pre-Const'n Engineering and Admin. (10%)	LS	57,577,104	10%	$ 6,686,516	
		"PE" PHASE SUBTOTAL		**$ 6,686,516**	
Right-of-Way Aquisition					
		"RW" PHASE SUBTOTAL		**$ 2,000,000**	
			TOTAL	**$ 74,513,086**	

Exhibit 5A-3: Vancouver – Yard Bypass and W 39th St. Bridge

Project:	**Vancouver - Yard Bypass and W 39th St. Bridge**				
Location:	Vancovuer Yard				
General Scope:	NP Extention, Single bypass track, Realign yard tracks & south of station, W 39th Br.				
Estimate Date:	3/1/2008				
	Estimate Summary from 50% design				**COMMENTS**
Earthwork					
Track					
		Track Subtotal		$ 101,225,858	Aslo Includes Earthwork, Signal, Retaining Walls & Tax
Roadway					
		Roadway Subtotal		$ 17,272,181	Includes Tax
Railroad Signals					
		CONSTRUCTION TOTAL		**$ 118,498,039**	
Enviromental Mitigation (0%)	LS	118,498,039	0%		
		SUBTOTAL		**$ 118,498,039**	
Construction Management (8%)	LS	118,498,039	8%	$ 9,059,224	
Sales Tax (0%)	%	118,498,039	0%	$ -	
		"CN" PHASE SUBTOTAL		**$ 127,557,263**	
Pre-Const'n Engineering and Admin. (7%)	LS	118,498,039	7%	$ 9,209,229	
		"PE" PHASE SUBTOTAL		**$ 9,209,229**	
Right-of-Way Aquisition					
		"RW" PHASE SUBTOTAL		**$ 13,516,075**	
			TOTAL	**$150,282,567**	

Exhibit 5A-4: Increase Capacity of Existing Train Sets

Project:	**Increase Capacity of Existing Train Sets**				
Location:	Statewide				
General Scope:	Purchase one new train set and reconfigure existing fleet to increase train set consist to 14 cars and add additional locomotive for each existing train set.				
Estimate Date:	7/1/2006	Increases passenger capacity without sacrificing schedule			
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Equipment					
Locomotives	EA	$3,000,000	5.00	$ 15,000,000	
Train Sets	EA	$16,000,000	1.00	$ 16,000,000	
Historical Accuracy Factor for Equipment	%	25%	31,000,000	$ 7,750,000	
		Equipment Total		$ 38,750,000	
Construction Management (4%)	LS	38,750,000	4%	$ 1,550,000	
Sales Tax (0%)	%	38,750,000	0.0%	$ -	No sales tax on rail equipment used in moving interstate commerce
		"CN" PHASE SUBTOTAL		**$ 40,300,000**	
Pre-Const'n Engineering and Admin. (1%)	LS	38,750,000	1%	$ 387,500	
Historical Accuracy Factor for PE/Admin.	%	2%	387,500	$ 7,750	
		"PE" PHASE SUBTOTAL		**$ 395,250**	
			TOTAL	**$ 40,695,250**	

Locomotive unit cost based on quotes from both GE and Talgo in mid-2006
Train Set unit cost based on Talgo 14 unit trains set quote in early 2008, adjusted for July 17, 2008 exchange rate.
Train set and locomotive costs will be heavily influenced by the number of units purchased at any one time.
As the number of units ordered will vary depending on scenario, the unit costs assume a minimum order, and thus are higher than if they are part of a larger order by as much as 67%.

Exhibit 5A-5: Kelso-Martin's Bluff – New Siding

Project:	**Kelso-Martin's Bluff - New Siding**				
Location:	Kalama, MP 104.5 to 110..2				
General Scope:	New CTC Siding along west side of main line				
Estimate Date:	7/1/2008				
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Earthwork					
Clear & Grub	AC	$6,000	2.87	$ 17,211	
Common Excavation	CY	$15	13,883.82	$ 208,257	
Rock Excavation	CY	$75	-	$ -	
Embankment	CY	$28	45,675.85	$ 1,278,924	
General Excavation *	CY	$15	-	$ -	
Subballast	CY	$40	10,814.81	$ 432,593	
Erosion Controls	MI	$50,000	2	$ 106,061	
Seeding	AC	$3,200	6.46	$ 20,676	
Place Topsoil	CY	$38	3,474.68	$ 132,038	
Tunnel	MI	$0	-	$ -	
Historical Accuracy Factor for Earthwork	%	100%	2,195,759	$ 2,195,759	
		Earthwork Subtotal		$ 4,391,518	
Track					
Track Construction					
New Track	TF	$195	4,700.00	$ 916,500	
Rehab Track	TF	$125	-	$ -	
Yard Track	TF	$142	4,500.00	$ 639,000	
Lineover Track	TF	$25	2,000.00	$ 50,000	
Track/Turnout Removal/Relocation					
Remove Existing Track	TF	$15	900.00	$ 13,500	
Relocate Existing Track	TF	$145	-	$ -	
Remove Existing Turnout	EA	$28,000	5	$ 140,000	
Relocate Existing Turnout	EA	$49,500	4	$ 198,000	
Remove Existing Crossover	EA	$56,000	1	$ 56,000	
Relocate Existing Crossover	EA	$99,000	-	$ -	
Turnouts					
Split Point Derail	EA	$54,730	-	$ -	
#9	EA	$130,500	3	$ 391,500	
#11	EA	$188,400	1	$ 188,400	
#15	EA	$221,000	-	$ -	
#20	EA	$292,000	1	$ 292,000	
#24	EA	$299,650	1	$ 299,650	
#33	EA	$630,000	-	$ -	
#48	EA	$875,000	-	$ -	
Crossovers					
#9	EA	$261,000	-	$ -	
#11	EA	$376,800	1	$ 376,800	
#15	EA	$442,000	1	$ 442,000	
#20	EA	$584,000	3	$ 1,752,000	
#24	EA	$599,300	-	$ -	
#33	EA	$1,260,000	-	$ -	
#48	EA	$1,750,000	-	$ -	
Historical Accuracy Factor for Track	%	45%	5,755,350	$ 2,589,908	
		Track Subtotal		$ 8,345,258	

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RR Structures					
Bridges					
< 32' PRCT	TF	$6,000	-	$ -	
32- 45' PRCT	TF	$7,500	-	$ -	
45-80' IB	TF	$10,500	-	$ -	
80-160' DPG	TF	$23,824	-	$ -	
80-160' TPG	TF	$22,000	-	$ -	
> 160' TRT	TF	$33,000	-	$ -	
Remove Existing Bridge	TF	$1,000	-	$ -	
Culvert Crossings					
Major Culverts (> 36" Diameter)	LF	$720	-	$ -	
Minor Culverts (< 36" Diameter)	LF	$264	-	$ -	
Other Drainage	LS	1	-	$ -	
Retaining Walls					
C.I.P.	SF	$130	3,000.00	$ 390,000	For Crash Wall at Oak St.
Soldier Pile < 20'	SF	$130	-	$ -	
Soldier Pile w/ Tie Back > 20'	SF	$200	-	$ -	
Soil Nail	SF	$67	-	$ -	
Station Platform	LS	$3,500,000	-	$ -	
Historical Accuracy Factor for RR Structures	%	100%	390,000	$ 390,000	
		RR Structures Subtotal		$ 780,000	
Roadway					
Roadway Construction	SY	$71	-	$ -	
At-Grade Crossing					
Concrete Crossing Panels Installed	TF	$953	190.00	$ 181,061	
Urban Major Crossing Approaches	SY	$100	1,222.00	$ 122,200	
Urban Minor Crossing Approaches	SY	$75	-	$ -	
Rural Major Crossing Approaches	SY	$50	-	$ -	
Rural Minor Crossing Approaches	SY	$25	-	$ -	
Grade-Separation Crossing					
Bridge	SF	$179	-	$ -	
Roadway (earthwork & paving)	SY	$100	-	$ -	
MSE Wall	SF	$60	-	$ -	
Embankment (fill)	CY	$35	-	$ -	
Misc. (non-typical per project)	LS	1	-	$ -	
Crossing Signals					
Upgrade Signal - Barrier Gates	EA	$238,238	-	$ -	
New Signal	EA	$300,000	2.00	$ 600,000	
Historical Accuracy Factor for Roadway	%	100%	903,261	$ 903,261	
		Roadway Subtotal		$ 1,806,522	
Railroad Signals					
Per P.O. T.O.	EA	$420,000	18.00	$ 7,560,000	
Per Mile	MI	$1,000,000	4.33	$ 4,330,000	
Electric Locks	EA	$25,000	11.00	$ 275,000	
Historical Accuracy Factor for RR Signals	%	10%	12,165,000	$ 1,216,500	
		RR Signals Subtotal		$ 13,381,500	
Utility Relocation & Protection					
Transmission Lines	LS	1	-	$ -	
Fiber Optic Lines	LF	$110	-	$ -	
Miscellaneous	LS	1	-	$ -	
				$ -	
Historical Accuracy Factor for Utilities	%	50%	-	$ -	
		Utilities Subtotal		$ -	
		CONSTRUCTION TOTAL		**$ 28,704,798**	

Enviromental Mitigation (20%)	LS	28,704,798	20%	$ 5,740,960	
Wetland Compensation	AC	$60,000		$ -	
			SUBTOTAL	**$ 34,445,758**	
Construction Management (8%)	LS	34,445,758	8%	$ 2,755,661	
Sales Tax (7.7%)	%	34,445,758	7.7%	$ 2,652,323	For Kelso
		"CN" PHASE SUBTOTAL		**$ 39,853,742**	
Pre-Const'n Engineering and Admin. (10%)	LS	34,445,758	10%	$ 2,870,480	
Historical Accuracy Factor for PE/Admin.	%	2%	2,870,480	$ 57,410	
		"PE" PHASE SUBTOTAL		**$ 2,927,889**	
Right-of-Way Acquisition					
Undeveloped	AC	$23,528	-	$ -	
Residential*	AC	$117,640	0.47	$ 55,291	
Commercial*	AC	$294,099	-	$ -	
Industrial*	AC	$411,739	-	$ -	
Other			-	$ -	
Historical Accuracy Factor for ROW	%	50%	55,291	$ 27,645	
		"RW" PHASE SUBTOTAL		**$ 82,936**	
			TOTAL	**$ 42,864,567**	

Misc. unit costs

Item	Unit	Cost
Demo existing passenger platform	LS	$50,000
Demo existing roadway	SY	$15
Demo existing overhead bridge	SF	$30
Crash wall	LF	$300

** General Excavation includes a fill section of 5' x 25' for 75% of the time and a cut section of 10' x 25' for 25% of the time*

*** Includes Relocation and related costs*

Exhibit 5A-6: Kelso-Martin's Bluff – Kelso-Longview Jct. – 3rd Main Track

Project:	**Kelso-Martin's Bluff - Kelso-Longview Jct. - 3rd Main Track**				
Location:	Kelso, MP 96.8 to 102.1				
General Scope:	Construct New Main Track				
Estimate Date:	7/1/2008				
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Earthwork					
Clear & Grub	AC	$6,000	20.58	$ 123,480	
Common Excavation	CY	$15	99,607.20	$ 1,494,108	
Rock Excavation	CY	$75	-	$ -	soft rock
Embankment	CY	$28	347,205.00	$ 9,721,740	
General Excavation *	CY	$15	-	$ -	
Subballast	CY	$40	39,407.41	$ 1,576,296	
Erosion Controls	MI	$50,000	5	$ 263,258	
Seeding	AC	$3,200	20.58	$ 65,856	
Place Topsoil	CY	$38	11,067.47	$ 420,564	
Tunnel	MI	$0	-	$ -	
Historical Accuracy Factor for Earthwork	%	100%	13,665,302	$ 13,665,302	
		Earthwork Subtotal		$ 27,330,603	
Track					
Track Construction					
New Track	TF	$195	25,800.00	$ 5,031,000	
Rehab Track	TF	$125	5,050.00	$ 631,250	
Yard Track	TF	$142	-	$ -	
Lineover Track	TF	$25	2,000.00	$ 50,000	
Track/Turnout Removal/Relocation					
Remove Existing Track	TF	$15	-	$ -	
Relocate Existing Track	TF	$145	-	$ -	
Remove Existing Turnout	EA	$28,000	2	$ 56,000	
Relocate Existing Turnout	EA	$49,500	-	$ -	
Remove Existing Crossover	EA	$56,000	-	$ -	
Relocate Existing Crossover	EA	$99,000	-	$ -	
Turnouts					
Split Point Derail	EA	$54,730	-	$ -	
#9	EA	$130,500	-	$ -	
#11	EA	$188,400	-	$ -	
#15	EA	$221,000	2	$ 442,000	
#20	EA	$292,000	1	$ 292,000	
#24	EA	$299,650	1	$ 299,650	
#33	EA	$630,000	-	$ -	
#48	EA	$875,000	-	$ -	
Crossovers					
#9	EA	$261,000	-	$ -	
#11	EA	$376,800	-	$ -	
#15	EA	$442,000	-	$ -	
#20	EA	$584,000	1	$ 584,000	
#24	EA	$599,300	2	$ 1,198,600	
#33	EA	$1,260,000	-	$ -	
#48	EA	$1,750,000	-	$ -	
Historical Accuracy Factor for Track	%	45%	8,584,500	$ 3,863,025	
		Track Subtotal		$ 12,447,525	

RR Structures					
Bridges					
< 32' PRCT	TF	$6,000	20.00	$ 120,000	MP 99.1 Pvt. Rd.
32- 45' PRCT	TF	$7,500	-	$ -	
45-80' IB	TF	$10,500	52.00	$ 546,000	MP 101.63 Pvt. Rd.
80-160' DPG	TF	$23,824	-	$ -	
80-160' TPG	TF	$22,000	-	$ -	
> 160' TRT	TF	$33,000	210.00	$ 6,930,000	Coweeman River
Remove Existing Bridge	TF	$1,000	-	$ -	
Culvert Crossings					
Major Culverts (> 36" Diameter)	LF	$720	-	$ -	
Minor Culverts (< 36" Diameter)	LF	$264	-	$ -	
Other Drainage	LS	1	-	$ -	
Retaining Walls					
C.I.P.	SF	$130	20,700.00	$ 2,691,000	MP 99.6 & 101.6
Soldier Pile < 20'	SF	$130	7,500.00	$ 975,000	
Soldier Pile w/ Tie Back > 20'	SF	$200	-	$ -	
Soil Nail	SF	$67	-	$ -	
Station Platform	LS	$3,500,000	-	$ -	
Historical Accuracy Factor for RR Structure	%	100%	11,262,000	$ 11,262,000	
		RR Structures Subtotal		$ 22,524,000	
Roadway					
Roadway Construction	SY	$71	278.00	$ 19,869	
At-Grade Crossing					
Concrete Crossing Panels Installed	TF	$953	106.00	$ 101,013	
Urban Major Crossing Approaches	SY	$100	160.00	$ 16,000	
Urban Minor Crossing Approaches	SY	$75	-	$ -	
Rural Major Crossing Approaches	SY	$50	-	$ -	
Rural Minor Crossing Approaches	SY	$25	-	$ -	
Grade-Separation Crossing					
Bridge	SF	$179	-	$ -	
Roadway (earthwork & paving)	SY	$100	1,600.00	$ 160,000	
MSE Wall	SF	$60	-	$ -	
Embankment (fill)	CY	$35	-	$ -	
Misc. (non-typical per project)	LS	1	-	$ -	
Crossing Signals					
Upgrade Signal - Barrier Gates	EA	$238,238	-	$ -	
New Signal	EA	$300,000	2.00	$ 600,000	
Historical Accuracy Factor for Roadway	%	100%	896,882	$ 896,882	
		Roadway Subtotal		$ 1,793,764	
Railroad Signals					
Per P.O. T.O.	EA	$420,000	9.00	$ 3,780,000	
Per Mile	MI	$1,000,000	4.76	$ 4,760,000	
Electric Locks	EA	$25,000	2.00	$ 50,000	
Historical Accuracy Factor for RR Signals	%	10%	8,590,000	$ 859,000	
		RR Signals Subtotal		$ 9,449,000	
Utility Relocation & Protection					
Transmission Lines	LS	1	-	$ -	
Fiber Optic Lines	LF	$110	-	$ -	
Miscellaneous	LS	1	-	$ -	
				$ -	
Historical Accuracy Factor for Utilities	%	50%	-	$ -	
		Utilities Subtotal		$ -	
		CONSTRUCTION TOTAL		**$ 73,544,892**	

Enviromental Mitigation (20%)	LS	73,544,892	20%	$ 14,708,978	
Wetland Compensation	AC	$60,000		$ -	
			SUBTOTAL	**$ 88,253,871**	
Construction Management (8%)	LS	88,253,871	8%	$ 7,060,310	
Sales Tax (7.7%)	%	88,253,871	7.7%	$ 6,795,548	For Kelso
		"CN" PHASE SUBTOTAL		**$ 102,109,729**	
Pre-Const'n Engineering and Admin. (10%)	LS	88,253,871	10%	$ 7,354,489	
Historical Accuracy Factor for PE/Admin.	%	2%	7,354,489	$ 147,090	
		"PE" PHASE SUBTOTAL		**$ 7,501,579**	
Right-of-Way Acquisition					
Undeveloped	AC	$23,528	-	$ -	
Residential**	AC	$117,640	-	$ -	
Commercial**	AC	$294,099	0.89	$ 261,748	
Industrial**	AC	$411,739	-	$ -	
Other			-	$ -	
Historical Accuracy Factor for ROW	%	50%	261,748	$ 130,874	
		"RW" PHASE SUBTOTAL		**$ 392,623**	
			TOTAL	**$110,003,930**	

Misc. unit costs

Item	Unit	Cost
Demo existing passenger platform	LS	$50,000
Demo existing roadway	SY	$15
Demo existing overhead bridge	SF	$30
Crash wall	LF	$300

** General Excavation includes a fill section of 5' x 25' for 75% of the time and a cut section of 10' x 25' for 25% of the time*

*** Includes Relocation and related costs*

Exhibit 5A7: Cascades – Two New Train Sets

Project:	**Cascades - Two New Train Sets**				
Location:	Statewide				
General Scope:	Purchase two new train sets				
Estimate Date:	7/1/2006	Fills needs for 6 SEA-PDX & 2 SEA-VBC Round trips, using 5 1998-era t			
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Equipment					
Locomotives	EA	$3,000,000	-	$ -	
Train Sets	EA	$16,000,000	2.00	$ 32,000,000	
Historical Accuracy Factor for Equipment	%	25%	32,000,000	$ 8,000,000	
		Equipment Total		$ 40,000,000	
Construction Management (4%)	LS	40,000,000	4%	$ 1,600,000	
Sales Tax (0%)	%	40,000,000	0.0%	$ -	No sales tax on rail equipment used in moving interstate commerce
		"CN" PHASE SUBTOTAL		**$ 41,600,000**	
Pre-Const'n Engineering and Admin. (1%)	LS	40,000,000	1%	$ 400,000	
Historical Accuracy Factor for PE/Admin.	%	2%	400,000	$ 8,000	
		"PE" PHASE SUBTOTAL		**$ 408,000**	
			TOTAL	**$ 42,008,000**	

Locomotive unit cost based on quotes from both GE and Talgo in mid-2006
Train Set unit cost based on Talgo 14 unit trains set quote in early 2008, adjusted for July 17, 2008 exchange rate.
Train set and locomotive costs will be heavily influenced by the number of units purchased at any one time.
As the number of units ordered will vary depending on scenario, the unit costs assume a minimum order, and thus are higher than if they are part of a larger order by as much as 67%.

Exhibit 5A-8: Blaine to Vancouver, WA – Main Line Track Upgrade

Project:	**Blaine to Vancouver, WA - Main Line Track Upgrade**				
Location:	Washington State segment of Corridor				
General Scope:	Upgrade main tracks to FRA Class V Track Standard to Eliminate Slow Orders; operations remain at Class VI due to existing train control siganls				
Estimate Date:	3/1/2008				
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Earthwork					
		Earthwork Subtotal		$ -	
Track					
Upgrade from Class IV to Class V track	MI	$150,000	318	$ 47,700,000	Unit Cost based on BNSF quote in March 2008.
Historical Accuracy Factor for Track	%	45%	47,700,000	$ 21,465,000	
		Track Subtotal		$ 69,165,000	
RR Structures					
Roadway					
Railroad Signals					
Utility Relocation & Protection					
		CONSTRUCTION TOTAL		**$ 69,165,000**	
Enviromental Mitigation (0%)	LS	69,165,000	0%	$ -	None Required
			SUBTOTAL	**$ 69,165,000**	
Construction Management (0%)	LS	69,165,000	0%	$ -	Included in unit cost
Sales Tax (0%)	%	69,165,000	0.0%	$ -	Included in unit cost
		"CN" PHASE SUBTOTAL		**$ 69,165,000**	
Pre-Const'n Engineering and Admin. (5%)	LS	69,165,000	5%	$ 3,458,250	
Historical Accuracy Factor for PE/Admin.	%	2%	3,458,250	$ 69,165	
		"PE" PHASE SUBTOTAL		**$ 3,527,415**	
Right-of-Way Aquisition					
		"RW" PHASE SUBTOTAL		**$ -**	
			TOTAL	**$ 72,692,415**	

Exhibit 5A-9: Centralia – New Crossover near China Creek

Project:	**Centralia - New Crossover near China Creek**				
Location:	MP 53.3				
General Scope:	New Single Crossover adjacent to Centralia Station				
Estimate Date:	7/1/2008				
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Earthwork					
Clear & Grub	AC	$6,000	-	$ -	
Common Excavation	CY	$15	2,600.00	$ 39,000	
Rock Excavation	CY	$75	-	$ -	
Embankment	CY	$28	2,600.00	$ 72,800	
General Excavation *	CY	$15	-	$ -	
Subballast	CY	$40	-	$ -	
Erosion Controls	MI	$50,000	-	$ -	
Seeding	AC	$3,200	-	$ -	
Place Topsoil	CY	$38	-	$ -	
Tunnel	MI	$0	-	$ -	
Historical Accuracy Factor for Earthwork	%	100%	111,800	$ 111,800	
		Earthwork Subtotal		$ 223,600	
Track					
Track Construction					
New Track	TF	$195	-	$ -	
Rehab Track	TF	$125	-	$ -	
Yard Track	TF	$142	-	$ -	
Lineover Track	TF	$25	-	$ -	
Track/Turnout Removal/Relocation					
Remove Existing Track	TF	$15	-	$ -	
Relocate Existing Track	TF	$145	-	$ -	
Remove Existing Turnout	EA	$28,000	-	$ -	
Relocate Existing Turnout	EA	$49,500	-	$ -	
Remove Existing Crossover	EA	$56,000	-	$ -	
Relocate Existing Crossover	EA	$99,000	-	$ -	
Turnouts					
Split Point Derail	EA	$54,730	-	$ -	
#9	EA	$130,500	-	$ -	
#11	EA	$188,400	-	$ -	
#15	EA	$221,000	-	$ -	
#20	EA	$292,000	-	$ -	
#24	EA	$299,650	-	$ -	
#33	EA	$630,000	-	$ -	
#48	EA	$875,000	-	$ -	
Crossovers					
#9	EA	$261,000	-	$ -	
#11	EA	$376,800	-	$ -	
#15	EA	$442,000	-	$ -	
#20	EA	$584,000	-	$ -	
#24	EA	$599,300	1	$ 599,300	
#33	EA	$1,260,000	-	$ -	
#48	EA	$1,750,000	-	$ -	
Historical Accuracy Factor for Track	%	45%	599,300	$ 269,685	
		Track Subtotal		$ 868,985	
RR Structures					
		RR Structures Subtotal		$ -	
Roadway					
		Roadway Subtotal		$ -	

Railroad Signals					
Per P.O. T.O.	EA	$420,000	2.00	$ 840,000	
Per Mile	MI	$1,000,000	-	$ -	
Electric Locks	EA	$25,000	-	$ -	
Historical Accuracy Factor for RR Signals	%	10%	840,000	$ 84,000	
		RR Signals Subtotal		$ 924,000	
Utility Relocation & Protection					
		Utilities Subtotal		$ -	
		CONSTRUCTION TOTAL		**$ 2,016,585**	
Enviromental Mitigation (20%)	LS	2,016,585	20%	$ 403,317	
Wetland Compensation	AC	$60,000		$ -	
			SUBTOTAL	**$ 2,419,902**	
Construction Management (8%)	LS	2,419,902	8%	$ 193,592	
Sales Tax (7.9%)	%	2,419,902	7.9%	$ 191,172	For Centralia
		"CN" PHASE SUBTOTAL		**$ 2,804,666**	
Pre-Const'n Engineering and Admin. (10%)	LS	2,419,902	10%	$ 201,659	
Historical Accuracy Factor for PE/Admin.	%	2%	201,659	$ 4,033	
		"PE" PHASE SUBTOTAL		**$ 205,692**	
Right-of-Way Acquisition					
		"RW" PHASE SUBTOTAL		**$ -**	
			TOTAL	**$ 3,010,358**	

Misc. unit costs

Item	Unit	Cost
Demo existing passenger platform	LS	$50,000
Demo existing roadway	SY	$15
Demo existing overhead bridge	SF	$30
Crash wall	LF	$300

Units for this estimate are unchanged from those in the Amtrak *Cascades* Capital Cost Estimates 2006 Technical Report

** General Excavation includes a fill section of 5' x 25' for 75% of the time and a cut section of 10' x 25' for 25% of the time*

*** Includes Relocation and related costs*

Exhibit 5A-10: Cascades – Two New Train Sets & Four Locomotives

Project:	**Cascades - Two New Train Sets & Four Locomotives**				
Location:	Statewide				
General Scope:	Purchase two new train sets and four higher speed locomotives for expansion of service.				
Estimate Date:	7/1/2006	Fills needs for 8 SEA-PDX & 2 SEA-VBC Round trips, using 5 1998-era t			
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Equipment					
Locomotives	EA	$3,000,000	4.00	$ 12,000,000	2 locos per train set
Train Sets	EA	$16,000,000	2.00	$ 32,000,000	
Historical Accuracy Factor for Equipment	%	25%	44,000,000	$ 11,000,000	
		Equipment Total		$ 55,000,000	
Construction Management (4%)	LS	55,000,000	4%	$ 2,200,000	
Sales Tax (0%)	%	55,000,000	0.0%	$ -	No sales tax on rail equipment used in moving interstate commerce
		"CN" PHASE SUBTOTAL		**$ 57,200,000**	
Pre-Const'n Engineering and Admin. (1%)	LS	55,000,000	1%	$ 550,000	
Historical Accuracy Factor for PE/Admin.	%	2%	550,000	$ 11,000	
		"PE" PHASE SUBTOTAL		**$ 561,000**	
			TOTAL	**$ 57,761,000**	

Locomotive unit cost based on quotes from both GE and Talgo in mid-2006

Train Set unit cost based on Talgo 14 unit trains set quote in early 2008, adjusted for July 17, 2008 exchange rate.

Train set and locomotive costs will be heavily influenced by the number of units purchased at any one time.

As the number of units ordered will vary depending on scenario, the unit costs assume a minimum order, and thus are higher than if they are part of a larger order by as much as 67%.

Exhibit 5A-11: Kelso-Martin's Bluff – Kalama 3rd Main Track

Project:	**Kelso-Martin's Bluff - Kalama 3rd Main Track**				
Location:	Kalama, MP 105.7 to 108.7				
General Scope:	Construct 3rd Main around most of Port of Kalama				
Estimate Date:	7/1/2008				
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Earthwork					
Clear & Grub	AC	$6,000	10.65	$ 63,900	
Common Excavation	CY	$15	51,546.00	$ 773,190	
Rock Excavation	CY	$75	33,796.00	$ 2,534,700	
Embankment	CY	$28	98,897.00	$ 2,769,116	
General Excavation *	CY	$15	-	$ -	
Subballast	CY	$40	24,977.78	$ 999,111	
Erosion Controls	MI	$50,000	3	$ 173,295	
Seeding	AC	$3,200	10.65	$ 34,080	
Place Topsoil	CY	$38	5,727.33	$ 217,639	
Tunnel	MI	$0	-	$ -	
Historical Accuracy Factor for Earthwork	%	100%	7,565,031	$ 7,565,031	
		Earthwork Subtotal		$ 15,130,062	
Track					
Track Construction					
New Track	TF	$195	15,900.00	$ 3,100,500	
Rehab Track	TF	$125	-	$ -	
Yard Track	TF	$142	-	$ -	
Lineover Track	TF	$25	2,400.00	$ 60,000	
Track/Turnout Removal/Relocation					
Remove Existing Track	TF	$15	2,900.00	$ 43,500	
Relocate Existing Track	TF	$145	-	$ -	
Remove Existing Turnout	EA	$28,000	1	$ 28,000	
Relocate Existing Turnout	EA	$49,500	-	$ -	
Remove Existing Crossover	EA	$56,000	-	$ -	
Relocate Existing Crossover	EA	$99,000	-	$ -	
Turnouts					
Split Point Derail	EA	$54,730	-	$ -	
#9	EA	$130,500	-	$ -	
#11	EA	$188,400	-	$ -	
#15	EA	$221,000	-	$ -	
#20	EA	$292,000	1	$ 292,000	
#24	EA	$299,650	1	$ 299,650	
#33	EA	$630,000	-	$ -	
#48	EA	$875,000	-	$ -	
Crossovers					
#9	EA	$261,000	-	$ -	
#11	EA	$376,800	-	$ -	
#15	EA	$442,000	-	$ -	
#20	EA	$584,000	-	$ -	
#24	EA	$599,300	3	$ 1,797,900	
#33	EA	$1,260,000	-	$ -	
#48	EA	$1,750,000	-	$ -	
Historical Accuracy Factor for Track	%	45%	5,621,550	$ 2,529,698	
		Track Subtotal		$ 8,151,248	

RR Structures					
Bridges					
< 32' PRCT	TF	$6,000	-	$ -	
32- 45' PRCT	TF	$7,500	-	$ -	
45-80' IB	TF	$10,500	-	$ -	
80-160' DPG	TF	$23,824	-	$ -	
80-160' TPG	TF	$22,000	-	$ -	
> 160' TRT	TF	$33,000	-	$ -	
Remove Existing Bridge	TF	$1,000	-	$ -	
Culvert Crossings					
Major Culverts (> 36" Diameter)	LF	$720	-	$ -	
Minor Culverts (< 36" Diameter)	LF	$264	75.00	$ 19,800	
Other Drainage	LS	1	-	$ -	
Retaining Walls					
C.I.P.	SF	$130	750.00	$ 97,500	Crash Wall for SR 432 Bridges & Ret. Walls
Soldier Pile < 20'	SF	$130	-	$ -	
Soldier Pile w/ Tie Back > 20'	SF	$200	-	$ -	
Soil Nail	SF	$67	7,500.00	$ 502,500	
Station Platform	LS	$3,500,000	-	$ -	
Historical Accuracy Factor for RR Structures	%	100%	619,800	$ 619,800	
		RR Structures Subtotal		$ 1,239,600	
Roadway					
Roadway Construction	SY	$71	-	$ -	
At-Grade Crossing					
Concrete Crossing Panels Installed	TF	$953	-	$ -	
Urban Major Crossing Approaches	SY	$100	-	$ -	
Urban Minor Crossing Approaches	SY	$75	-	$ -	
Rural Major Crossing Approaches	SY	$50	-	$ -	
Rural Minor Crossing Approaches	SY	$25	-	$ -	
Grade-Separation Crossing					
Bridge	SF	$179	11,750.00	$ 2,099,475	Longer Existing 10' wide pvt. Box culvert
Roadway (earthwork & paving)	SY	$100	-	$ -	
MSE Wall	SF	$60	-	$ -	
Embankment (fill)	CY	$35	-	$ -	
Misc. (non-typical per project)	LS	1	-	$ -	
Crossing Signals					
Upgrade Signal - Barrier Gates	EA	$238,238	-	$ -	
New Signal	EA	$300,000	-	$ -	
Historical Accuracy Factor for Roadway	%	100%	2,099,475	$ 2,099,475	
		Roadway Subtotal		$ 4,198,951	
Railroad Signals					
Per P.O. T.O.	EA	$420,000	8.00	$ 3,360,000	
Per Mile	MI	$1,000,000	3.27	$ 3,270,000	
Electric Locks	EA	$25,000	-	$ -	
Historical Accuracy Factor for RR Signals	%	10%	6,630,000	$ 663,000	
		RR Signals Subtotal		$ 7,293,000	
Utility Relocation & Protection					
Transmission Lines	LS	1	-	$ -	
Fiber Optic Lines	LF	$110	-	$ -	
Miscellaneous	LS	1	5,000,000.00	$ 5,000,000	
				$ -	
Historical Accuracy Factor for Utilities	%	50%	5,000,000	$ 2,500,000	
		Utilities Subtotal		$ 7,500,000	
		CONSTRUCTION TOTAL		**$ 43,512,861**	

Enviromental Mitigation (20%)	LS	43,512,861	20%	$ 8,702,572	
Wetland Compensation	AC	$60,000		$ -	
			SUBTOTAL	**$ 52,215,433**	
Construction Management (8%)	LS	52,215,433	8%	$ 4,177,235	
Sales Tax (7.7%)	%	52,215,433	7.7%	$ 4,020,588	For Kelso
		"CN" PHASE SUBTOTAL		**$ 60,413,256**	
Pre-Const'n Engineering and Admin. (10%)	LS	52,215,433	10%	$ 4,351,286	
Historical Accuracy Factor for PE/Admin.	%	2%	4,351,286	$ 87,026	
		"PE" PHASE SUBTOTAL		**$ 4,438,312**	
Right-of-Way Acquisition					
Undeveloped	AC	$23,528	1.19	$ 27,998	
Residential**	AC	$117,640	-	$ -	
Commercial**	AC	$294,099	-	$ -	
Industrial**	AC	$411,739	-	$ -	
Other			-	$ -	
Historical Accuracy Factor for ROW	%	50%	27,998	$ 13,999	
		"RW" PHASE SUBTOTAL		**$ 41,997**	
			TOTAL	**$ 64,893,565**	
Misc. unit costs					
Item	**Unit**	**Cost**			
Demo existing passenger platform	LS	$50,000			
Demo existing roadway	SY	$15			
Demo existing overhead bridge	SF	$30			
Crash wall	LF	$300			

** General Excavation includes a fill section of 5' x 25' for 75% of the time and a cut section of 10' x 25' for 25% of the time*

*** Includes Relocation and related costs*

Exhibit 5A-12: Cascades – Higher Speed Locomotives

Project:	**Cascades - Higher Speed Locomotives**				
Location:	Statewide				
General Scope:	Purchase 16 new locomotives to replace the 1990's-era fleet and increase the number of units available.				
Estimate Date:	7/1/2006	Fills needs for 6 SEA-PDX & 2 SEA-VBC round trips.			
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Equipment					
Locomotives	EA	$3,000,000	16.00	$ 48,000,000	Assumes two unit per trains set and two spares.
Train Sets	EA	$16,000,000	-	$ -	
Historical Accuracy Factor for Equipment	%	25%	48,000,000	$ 12,000,000	Development of New Locomotives
		Equipment Total		$ 60,000,000	
Construction Management (4%)	LS	60,000,000	4%	$ 2,400,000	
Sales Tax (0%)	%	60,000,000	0.0%	$ -	No sales tax on rail equipment used in moving interstate commerce
		"CN" PHASE SUBTOTAL		**$ 62,400,000**	
Pre-Const'n Engineering and Admin. (10%)	LS	60,000,000	10%	$ 6,000,000	
Historical Accuracy Factor for PE/Admin.	%	2%	6,000,000	$ 120,000	
		"PE" PHASE SUBTOTAL		**$ 6,120,000**	
			TOTAL	**$ 68,520,000**	

Locomotive unit cost based on quotes from both GE and Talgo in mid-2006
Train Set unit cost based on Talgo 14 unit trains set quote in early 2008, adjusted for July 17, 2008 exchange rate.
Train set and locomotive costs will be heavily influenced by the number of units purchased at any one time.
As the number of units ordered will vary depending on scenario, the unit costs assume a minimum order, and thus are higher than if they are part of a larger order by as much as 67%.

Exhibit 5A-13: Tacoma – Reservation to Stewart – New 3rd Main Track

Project:	**Tacoma - Reservation to Stewart - New 3rd Main Track**				
Location:	MP 34.0X to 39.0X				
General Scope:	Third Main Track from Reservation near Tacoma to Stewart, west of Puyallup				
Estimate Date:	7/1/2008				
	UNITS	**UNIT COST**	**QUANTITY**	**TOTAL**	**COMMENTS**
Earthwork					
Clear & Grub	AC	$6,000	-	$ -	
Common Excavation	CY	$15	-	$ -	
Rock Excavation	CY	$75	-	$ -	
Embankment	CY	$28	-	$ -	
General Excavation *	CY	$15	134,904.00	$ 2,023,560	
Subballast	CY	$40	28,551.11	$ 1,142,044	
Erosion Controls	MI	$50,000	4	$ 182,500	
Seeding	AC	$3,200	-	$ -	
Place Topsoil	CY	$38	-	$ -	
Tunnel	MI	$0	-	$ -	
Historical Accuracy Factor for Earthwork	%	100%	3,348,104	$ 3,348,104	
		Earthwork Subtotal		$ 6,696,209	
Track					
Track Construction					
New Track	TF	$195	19,272.00	$ 3,758,040	
Rehab Track	TF	$125	4,856.00	$ 607,000	
Yard Track	TF	$142	-	$ -	
Lineover Track	TF	$25	-	$ -	
Track/Turnout Removal/Relocation					
Remove Existing Track	TF	$15	-	$ -	
Relocate Existing Track	TF	$145	-	$ -	
Remove Existing Turnout	EA	$28,000	-	$ -	
Relocate Existing Turnout	EA	$49,500	-	$ -	
Remove Existing Crossover	EA	$56,000	-	$ -	
Relocate Existing Crossover	EA	$99,000	-	$ -	
Turnouts					
Split Point Derail	EA	$54,730	-	$ -	
#9	EA	$130,500	-	$ -	
#11	EA	$188,400	-	$ -	
#15	EA	$221,000	1	$ 221,000	
#20	EA	$292,000	-	$ -	
#24	EA	$299,650	1	$ 299,650	
#33	EA	$630,000	-	$ -	
#48	EA	$875,000	-	$ -	
Crossovers					
#9	EA	$261,000	-	$ -	
#11	EA	$376,800	-	$ -	
#15	EA	$442,000	1	$ 442,000	
#20	EA	$584,000	-	$ -	
#24	EA	$599,300	1	$ 599,300	
#33	EA	$1,260,000	-	$ -	
#48	EA	$1,750,000	-	$ -	
Historical Accuracy Factor for Track	%	45%	5,926,990	$ 2,667,146	
		Track Subtotal		$ 8,594,136	

RR Structures					
Bridges					
< 32' PRCT	TF	$6,000	68.00	$ 408,000	MP 34.12X2 - 31' IB, RCT; MP 37.57X 6' CA
32- 45' PRCT	TF	$7,500	-	$ -	
45-80' IB	TF	$10,500	-	$ -	
80-160' DPG	TF	$23,824	-	$ -	
80-160' TPG	TF	$22,000	-	$ -	
> 160' TRT	TF	$33,000	-	$ -	
Remove Existing Bridge	TF	$1,000	-	$ -	
Culvert Crossings					
Major Culverts (> 36" Diameter)	LF	$720	60.00	$ 43,200	Assume 60' ext.
Minor Culverts (< 36" Diameter)	LF	$264	270.00	$ 71,280	Assume 60' ext.
Other Drainage	LS	1	-	$ -	
Retaining Walls					
C.I.P.	SF	$130	-	$ -	
Soldier Pile < 20'	SF	$130	-	$ -	
Soldier Pile w/ Tie Back > 20'	SF	$200	-	$ -	
Soil Nail	SF	$67	-	$ -	
	LF	$1,000	3,750	$ 3,750,000	Unknown type
Station Platform	LS	$3,500,000	-	$ -	
Historical Accuracy Factor for RR Structures	%	100%	4,272,480	$ 4,272,480	
		RR Structures Subtotal		$ 8,544,960	
Roadway					
Roadway Construction	SY	$71	-	$ -	
At-Grade Crossing					
Concrete Crossing Panels Installed	TF	$953	210.00	$ 200,120	
Urban Major Crossing Approaches	SY	$100	-	$ -	
Urban Minor Crossing Approaches	SY	$75	700.00	$ 52,500	
Rural Major Crossing Approaches	SY	$50	-	$ -	
Rural Minor Crossing Approaches	SY	$25	525.00	$ 13,125	
Grade-Separation Crossing					
Bridge	SF	$179	-	$ -	
Roadway (earthwork & paving)	SY	$100	-	$ -	
MSE Wall	SF	$60	-	$ -	
Embankment (fill)	CY	$35	-	$ -	
Misc. (non-typical per project)	LS	2	5,000,000.00	$ 10,000,000	Rebuild Gay Rd. & River Road Bridges
Crossing Signals					
Upgrade Signal - Barrier Gates	EA	$238,238	2.00	$ 476,477	
New Signal	EA	$300,000	4.00	$ 1,200,000	
Historical Accuracy Factor for Roadway	%	100%	11,942,222	$ 11,942,222	
		Roadway Subtotal		$ 23,884,444	
Railroad Signals					
Per P.O. T.O.	EA	$420,000	6.00	$ 2,520,000	
Per Mile	MI	$1,000,000	3.65	$ 3,650,000	
Electric Locks	EA	$25,000	-	$ -	
Historical Accuracy Factor for RR Signals	%	10%	6,170,000	$ 617,000	
		RR Signals Subtotal		$ 6,787,000	
Utility Relocation & Protection					
Transmission Lines	LS	1	-	$ -	
Fiber Optic Lines	LF	$110	-	$ -	
Miscellaneous	LS	1	-	$ -	
				$ -	
Historical Accuracy Factor for Utilities	%	50%	-	$ -	
		Utilities Subtotal		$ -	
		CONSTRUCTION TOTAL		**$ 54,506,748**	

Enviromental Mitigation (20%)	LS	54,506,748	20%	$ 10,901,350	
Wetland Compensation	AC	$60,000		$ -	
			SUBTOTAL	**$ 65,408,098**	
Construction Management (8%)	LS	65,408,098	8%	$ 5,232,648	
Sales Tax (8.8%)	%	65,408,098	8.8%	$ 5,755,913	For Tacoma/ Pierce County
		"CN" PHASE SUBTOTAL		**$ 76,396,658**	
Pre-Const'n Engineering and Admin. (10%)	LS	65,408,098	10%	$ 5,450,675	
Historical Accuracy Factor for PE/Admin.	%	2%	5,450,675	$ 109,013	
		"PE" PHASE SUBTOTAL		**$ 5,559,688**	
Right-of-Way Acquisition					
Undeveloped	AC	$23,528	9.20	$ 216,457	
Residential**	AC	$117,640	-	$ -	
Commercial**	AC	$294,099	-	$ -	
Industrial**	AC	$411,739	-	$ -	
Other			-	$ -	
Historical Accuracy Factor for ROW	%	50%	216,457	$ 108,229	
		"RW" PHASE SUBTOTAL		**$ 324,686**	
			TOTAL	**$ 82,281,032**	

Misc. unit costs

Item	Unit	Cost
Demo existing passenger platform	LS	$50,000
Demo existing roadway	SY	$15
Demo existing overhead bridge	SF	$30
Crash wall	LF	$300

Units for this estimate are unchanged from those in the Amtrak *Cascades* Capital Cost Estimates 2006 Technical Report

** General Excavation includes a fill section of 5' x 25' for 75% of the time and a cut section of 10' x 25' for 25% of the time*

*** Includes Relocation and related costs*

Appendix 6: Operational Capacity Considerations

Operational Concepts

Operational Considerations

In order to understand operating methods that are studies in rail capacity modeling, it is important to know the relationships between scheduling, track capacity, and train delays. Each plays an important role in determining methods of operating trains that are efficient, reliable, and consistent.

Timetables

The timetable is the train's operating schedule. The timetable for rail passenger service is the time from the service starting point to the anticipated arrival time at the terminal station. It includes the following time elements:

- ***Running time*** is the time between station stops, influenced by the operating characteristics of the locomotive and the passenger cars in use, and the permanent track and signal speed limits as influenced by the railroad design.
- ***Station dwell time*** is for the boarding and alighting of passengers, as well as for servicing equipment.
- ***Recovery time*** is for unforeseen delays en route. Typical recovery time for rail passenger operations on BNSF Railway (BNSF) right of way is 8 percent of pure running time.
- ***Tolerance time***, consistent with long-standing Interstate Commerce Commission (ICC) measurements of "on time," is a 10-minute tolerance window above and beyond running time and recovery time.

After individual timetables are established, they are arranged to ensure that no two trains require the same resources (track, station, equipment, crew, etc.) simultaneously. This important concept is the basis for the operation simulation modeling that is performed on a corridor.

Track Capacity

It is often not possible to add more trains on a particular route until or unless there is sufficient track capacity to allow for their operation. Examples of track capacity improvements include:

- Building sidings adjacent to main line track.
- Building additional main line track.
- Providing yard or industry tracks of sufficient length to allow all yard operations to occur off main lines.
- Constructing crossovers to allow connections between main lines.
- Reducing signal spacing to allow for tighter tolerances.
- Increasing track and switch speeds.
- Improving train acceleration, speed, and braking characteristics.
- Minimizing speed differential between types of trains to keep traffic flowing.

Reliability Improvements

Reliability improvements include infrastructure and/or operating changes that improve reliability and on-time performance by better enabling passenger trains to meet schedules and prevent delays. Passenger train delays due to conditions other than capacity constraints include:

- An engineer that operates the train slower than allowable speeds.
- Temporary speed restrictions, usually due to ongoing track, bridge, or signal maintenance.
- Density of train movements on a segment or corridor.
- Speed differentials between types of trains.
- Poor reliability of other trains in the system.
- Track, bridge, signal, or switch failures that occur en route.
- Unanticipated weather, accidents, or natural or man-made disasters.

Additional recommended reliability improvements include:

- Adequate training and supervision of all engineers operating in a territory.
- Planning, staffing, and execution and review of appropriate maintenance work in a manner that minimizes opportunities to induce delay.
- Adequate powering of trains (freight and passenger) so they can meet expected travel times.
- Managing train movements appropriately by following proper dispatching protocols.
- Using advanced technologies as appropriate.

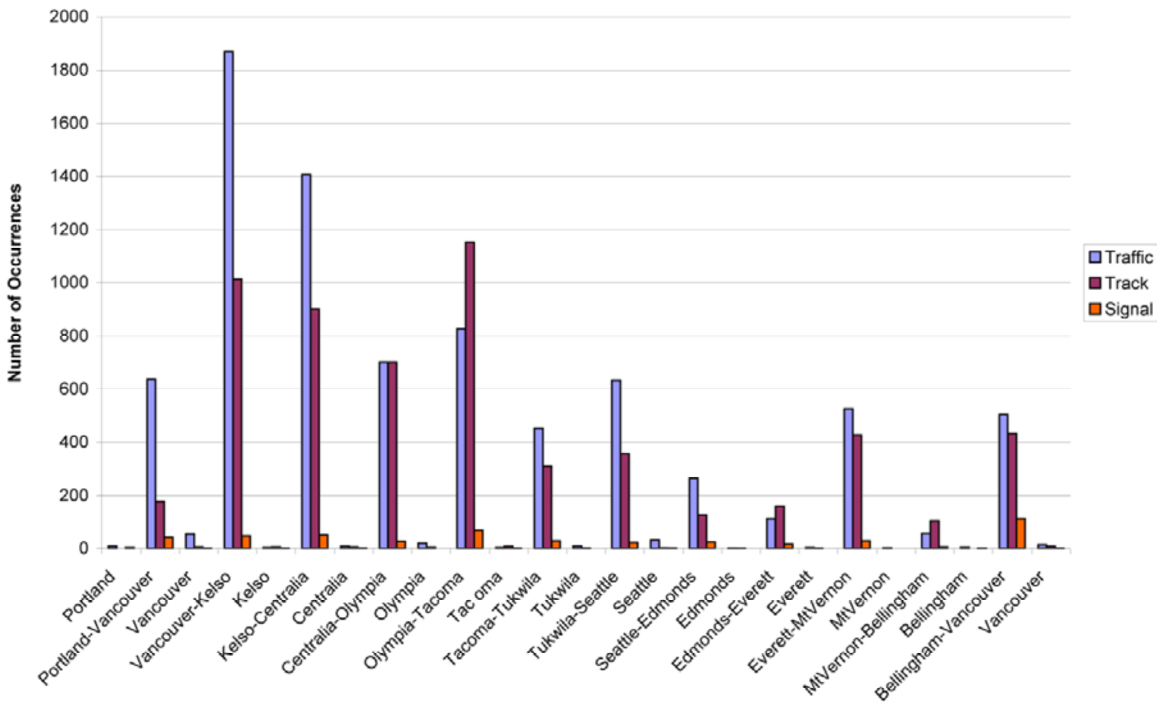
Amtrak Reported Delays

Understanding the causes of delays and methods of reducing delay can help identify temporary conditions from long-term problems. The

Washington State Department of Transportation (WSDOT) receives information provided on the Amtrak Conductor Daily Delay reports that are provided by Amtrak personnel upon completion of every trip. While the data is derived from the conductor's perspective and includes all delays, it is useful to note that significant traffic delays occur between Vancouver and Kelso and between Olympia and Tacoma. There are also notable delays due to track conditions between Vancouver and Tacoma. Signal delays appear to be relatively minor in frequency.

Exhibit 6A-1 demonstrates Amtrak reported delays between November 2006 and April 2008.

Exhibit 6A-1: Summary of All Passenger Train Delays as Reported by Amtrak Conductor Daily Reports – November 2006 to April 2008



Source: BNSF Railway

Slow Orders

Slow orders are placed on a track when conditions exist that restrict the ability for either a freight train, passenger train, or both to operate at track allowable speeds.

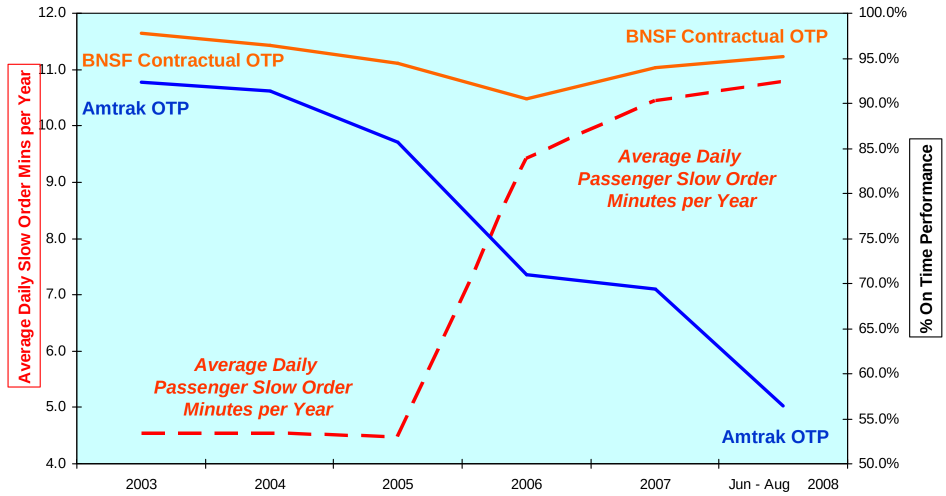
There are numerous conditions that can cause slow orders. They are generally temporary in nature. Winter rains and mud slides that dominate the region's weather patterns between November and April each year are one cause. Such rains soften the soil under the track, which, in turn, leads to a loss of track surface (vertical and/or horizontal alignment), requiring the application of slow orders. Mud slides also can and do block the railroad with dirt, trees, and debris during periods of heavy rains, resulting in cancelled or severely delayed passenger train service.

More commonly, slow orders are related to work activities that are necessary to address routine maintenance. Other causes of slow orders may include track "defects" (issues that reduce the allowable speed in a particular area). The numerous crossovers (roughly every ten miles) throughout the territory that serve a vital function by allowing faster moving Amtrak *Cascades* trains keep to their schedules by getting around slower, heavier freight trains, require regular maintenance. Current maintenance practices cause slow orders. Alternate methods of providing for track maintenance that could reduce or eliminate slow orders, which would enhance Amtrak *Cascades* service reliability, will be discussed later in this appendix.

During the construction season, slow orders arise both from new construction and from "capitalized maintenance," the major replacement of rail, ties, and ballast that have reached the end of their useful life. BNSF has invested more than $61.9 million between 2003 and 2007 to keep the track structure safe and reliable, with the unfortunate and unintended consequence of substantial slow orders that reduce train performance.

Exhibit 6A-2 shows the relationship between Amtrak *Cascades* on-time performance (OTP) and average daily slow orders per year. It is clearly evident that passenger train slow orders have increased substantially since 2005, with a major impact on train performance. In order to ensure proper on-time performance, consideration should be given to reducing or eliminating slow orders to the greatest extent possible.

Exhibit 6A-2: Pacific Northwest On-Time Performance vs. Speed Restrictions, Seattle to Portland Segment



Source: BNSF Railway

Operations Simulation Modeling to Validate Infrastructure Requirements

Operations modeling to validate the infrastructure improvements required for service level options in this plan are presented below.

Description

In order to understand the methodology linking proposed Amtrak *Cascades* infrastructure (capital) investments to operating benefits, a brief historical perspective on the operations analysis is needed and described below.

This process has been updated and reviewed several times during the development and implementation of WSDOT's Amtrak *Cascades* program. It provides:

- A way to reach agreement with BNSF, the host railroad, on infrastructure requirements and their resulting operating benefits.
- A blueprint for future Amtrak *Cascades* program implementation.

The infrastructure projects described in the *Amtrak Cascades Operating and Infrastructure Plan Technical Report*, Volume 1, Chapter 2 of the 2006 long-range plan were analytically developed and extensively tested to validate their appropriateness and robustness.

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Generally, new testing and validation occurs when there is a change in conditions or infrastructure. For example, the introduction of Sounder Commuter Rail service in the Central Puget Sound required a "re-testing" of the system due to the large increase in passenger traffic in that region. WSDOT, in cooperation with BNSF, has "re-tested" the rail network, approximately every five years or so, to ensure that there are no unexpected or undesired consequences that are not addressed.

The current computer simulation effort re-validates the results of multiple studies that support the infrastructure program in the long range plan. In particular, the focus of the current simulation is to review the infrastructure required to reliably add up to four additional Amtrak *Cascades* daily round trips between Seattle and Portland in service increments of one, two, and four additional trains. Care has been taken to ensure that potential infrastructure improvements remain part of the long-range plan, while minimizing waste and redundancy.

Traffic for the simulation included passenger train service plans and operating plans developed by WSDOT and freight traffic from BNSF data systems, based upon both real time traffic and transportation schedules. BNSF took care to ensure that each freight train was represented on only the days it was scheduled to operate. BNSF used the car count, tonnage, and length input that is typical for that freight train.

Railroad infrastructure and traffic simulations are complex. Results may not be accurate if the assumptions, input data, and analysis of the output data are not correct. In order to provide the greatest opportunity to reach consensus on the simulations results and conclusions, WSDOT worked jointly with BNSF on the infrastructure, traffic input, and assumptions. BNSF ran the railroad traffic and infrastructure simulation and analysis at their headquarters in Fort Worth, Texas, using Rail Traffic Controller (RTC) model, a commercial product prominently used throughout the railroad industry.

BNSF provided all of the input and output data to WSDOT for analysis. WSDOT performed extensive and detailed checks of the input and output data, at the individual train level, if necessary, to ensure that the assumptions were correct and current and future operations were reasonably represented. If there was conflict between the BNSF analysis result and the WSDOT analysis result, the specific areas of conflict were subjected to closer inspection by both parties. If necessary, simulation input data was corrected and the simulation repeated until BNSF and WSDOT agreed on the analysis result.

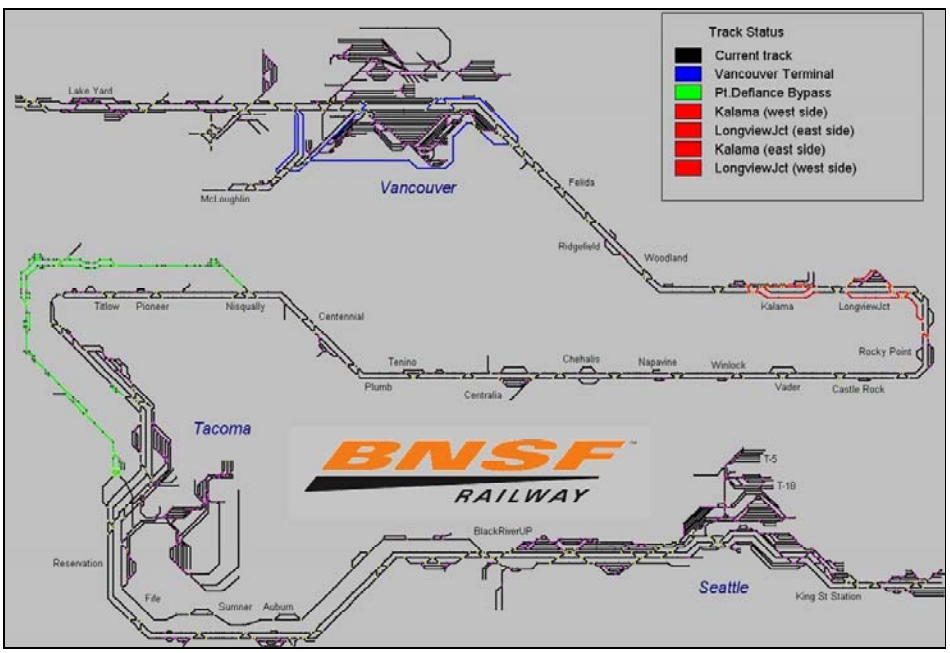
The simulations used in this exercise represented four weeks of railroad operations. Traffic patterns were randomized to represent the way the railroad is currently operated. The complete data set contained over 2,800 trains in each of 16 simulations representing the infrastructure program described in this report. The process took almost a year to complete, ensuring that the results represented the infrastructure requirements accurately.

Base Case

Each series of simulations begins with a base case (current condition). It must be accurate to ensure that the results of comparison to succeeding tests are not misleading. Therefore, the base case is subjected to extensive analysis before proceeding. The simulation infrastructure is checked to make sure that it represents the actual current infrastructure in detail, including the location of tracks, switches, signals, speed limit (speed and location), gradient, and other important elements.

Exhibit 6A-3 shows a schematic representing the infrastructure between Seattle and Portland as modeled for this exercise.

Exhibit 6A-3: Modeled Proposed WSDOT Capacity Improvement Projects



Source: BNSF Railway

Traffic is checked to ensure that the base case traffic day reasonably represents a typical traffic day on the line including all of the freight and passenger trains, the passenger stops, and the freight stops for picking up and delivering cars along the line. Since typical freight railroad schedules are a basic framework for operation and do not represent accurately the times at which trains operate, the simulation included a variation for each train on the time that it normally operates. Passenger trains operate on a detailed schedule in which the times represent the exact time when a train is expected to arrive or leave at any station area.

Exhibit 6A-4 summarizes several service attributes used for the simulation model.

Exhibit 6A-4: Modeled Service Attributes
Seattle to Portland Segment

Station Stops:					
Seattle King St. Station	MP	0.0	Tukwila	MP	10.9
Tacoma	MP	39.5	Centennial	MP	32.2
Centralia	MP	54.3	Kelso	MP	97.3
Vancouver	MP	9.8	Portland Union Depot	MP	0.0
All intermediate station stops are 30 seconds.					
Vehicles (per WSDOT): 13 Talgo cars – 430 ton, 640 feet					
Maximum track speeds:	Passenger	79 mph			
	Freight	50 mph Seattle – Longview Jct. 60 mph Longview Jct. - Vancouver			

Traffic (Trains/week):	**WSDOT/ Amtrak**	**Amtrak**	**ST**	**Freight**	**Local/ SW**
Base Case (current)	56 (8/day)	42	60	629	385
Vancouver	56 (8/day)	42	60	629	385
Pt. Defiance Bypass	70 (10/day)	42	60	629	385
Kalama/Longview Jct Phase 1	84 (12/day)	42	60	629	385
Kalama/Longview Jct Phase 2	112 (16/day)	42	60	629	385
Oregon Projects	112 (16/day)	42	60	629	385
WSDOT Napavine Bypass	112 (16/day)	42	60	629	385
Kalama-Longview Jct. 3rd MT	112 (16/day)	42	60	629	385

Source: BNSF Railway

Results

Modeling results validated and confirmed the previous 2003 operations analysis. See Chapter 5, for discussion of the modeling results. Exhibit 5-1 shows anticipated on-time performance when a cumulative set of improvements, adding 1, 2, or 4 additional daily Amtrak *Cascades* round trips between Seattle and Portland, is complete. Exhibit 5-2 shows the relationship between infrastructure improvements, additional Amtrak *Cascades* service, and freight train delay. The modeling confirms that the infrastructure plan can be implemented without negatively impacting freight business.

The simulations that were performed are an effective tool to predict train performance. However, it must be noted that not all operational issues that can influence performance or reliability are adequately addressed by capacity simulation models. Reliability related items, slow orders, and the "state of good" railroad repair and maintenance must also be considered when exploring opportunities to meet or exceed performance goals.

Additional Investments to Enhance Reliability

Infrastructure Investments

BNSF ran additional simulations to address issues outside the scope of up to four new Seattle to Portland daily round trips to see what impacts they could have on service reliability.

Oregon

Approximately ten miles of territory, between the Columbia River and Portland Union Station, are a highly congested segment of the corridor, with several drawbridges and crossing movements of freight traffic to get to and from port facilities and yard traffic. In Oregon, four projects were simulated. The first two are currently funded under the state of Oregon's "Connect Oregon II" infrastructure program. These projects include:

- A controlled siding at East St. Johns (funded).
- East Wye switch at Wilbridge to Astoria (funded).
- Speed improvements over bridges (not currently funded).
- Speed improvements through North Portland Junction (not currently funded).

Napavine Bypass

This project, as identified in the long-range plan, provides a separate passenger dedicated main line track between Chehalis Junction and Winlock. This would allow passenger trains to travel unimpeded by slow moving freight trains traveling on the gradient of the Napavine Hill. Heavily loaded freight trains are not able to maintain allowable track speeds in this territory, causing delays and congestion for the entire system. This new passenger route also eliminates sharp curvature, allows higher travel speeds, and would help reduce travel times.

Kelso-Martin's Bluff – 3rd Main Line

Mid-range plan Options 3 and 4 include a phase of this project. Future phases provide an extensive third main line track between Kalama and Longview Junction.

These improvements, although not required for the additional service contemplated in the mid-range plan, further enhance service reliability. The simulations performed with these improvements achieved passenger train on-time performance of 96 percent or better. Oregon projects, Napavine Bypass, and Kelso-Martin's Bluff – 3rd Main Line are the only "reliability" projects specifically addressed in the computer modeling simulations.

Facility Investments and Integrated Scheduling

Maintenance Facility

Amtrak *Cascades* trains rotate throughout the system on a multi-day cycle. Although minor servicing and cleaning is provided at various locations, each train set returns to the Seattle Maintenance Facility every four days for more intensive servicing and maintenance. On-time performance while the train is in operation and punctuality at the maintenance facility are necessary to keep the fleet in operation and "on schedule." Amtrak is currently finalizing plans to reconstruct the Seattle Maintenance Facility to provide for current and future needs of Amtrak *Cascades*, Amtrak long distance trains, and Sounder commuter trains.

Stations

Each station between Seattle and Portland, with the exception of Tukwila, has a boarding platform on only one side of the tracks. As a matter of safety and efficiency, trains should make the stops at the stations on the track adjacent to the main boarding platform. Each station has a narrow platform between tracks to allow access to a train from the opposite track. However, passengers must cross a track in order to reach the train or the station, posing a safety hazard. Boarding and de-boarding time is also increased on the platform between the tracks because of the narrow width and limited access for the passengers. Wheelchair access and baggage loading or unloading can also be difficult and time-consuming on the platform between the tracks.

Stations with only one main platform can also pose a significant capacity constraint. Arranging traffic to allow each train to be on the appropriate track for the main platform can have unintended traffic consequences. There are two basic remedies. A station may have a second main platform constructed on the opposite side, or crossovers may be arranged at each end of the station to allow access to the main platform from either track. The latter solution is reasonable as long as passenger trains moving in opposite directions do not require the platform simultaneously or in close succession. The second main platform solution is required when schedules are arranged with simultaneous or close succession arrivals of trains moving in the opposite direction. A station with main platforms on both sides of the line should still have crossovers in close proximity to allow access to either platform from either track in the case of a track failure, track maintenance, or rail traffic situation that would pose a delay by preventing access to the scheduled platform.

Although great care has been given to schedule Amtrak *Cascades* trains in a manner to reduce "passenger train to passenger train" conflicts, there are areas where it may be advantageous to consider an additional platform or crossovers at stations, similar to the work that was recently completed at Centennial Station (Olympia/Lacey).

Integrated Scheduling

As discussed in Chapter 5 and this appendix, careful attention to development of train schedules is necessary to minimize conflicts and maximize the utility of the infrastructure. In the Seattle to Portland segment, nowhere is this more important than between Seattle, Tacoma, and Nisqually, where Amtrak *Cascades* intercity passenger trains and Sound Transit commuter trains must be able to operate on schedule with a minimum of conflicts.

An integrated service plan has been devised to ensure that each type of service is able to accommodate its passenger demands with minimum adverse impact on the other service's ability to meet their schedule. In addition, coordinating the schedules allows for opportunities to provide rail to rail connections at common stations in Tacoma, Tukwila, and Seattle for transfer of passengers between services as necessary to meet individual travel needs.

It is incumbent upon public agencies, WSDOT, and Sound Transit to work together with Amtrak to make sure that the services are complimentary and well coordinated. Arbitrary schedule changes without such careful coordination could lead to serious conflicts and degraded performance for the services.

Track Maintenance Investments

The current methods of performing track maintenance during the normal daylight hours require "work windows" that reduce the capacity to move more freight and passenger trains efficiently through the system. Slow orders, increased passenger train frequencies (commuter and intercity), and modest increases in freight service conflict with maintenance work windows and impact train movements.

There are several opportunities to modify maintenance practices and methods. These need to be considered by BNSF as the demands on the infrastructure and the need for absolutely reliable service increases.

Night Maintenance

Careful consideration should be given to performing maintenance activities at night. Although freight traffic operates 24 hours a day, such traffic is generally lighter and there is little, if any, passenger traffic that occurs during the night. Performing maintenance activities at night could greatly reduce slow orders or increase operational capacity during daytime hours.

Alternate Methods/Equipment

Careful consideration should also be given to performing maintenance using multi-function, high-speed track maintenance machines that can line, surface, and stabilize track at a rate of up to 1.5 miles per hour. An important feature of such machinery is that many units are able to stabilize the track immediately, eliminating today's need for slow orders for traffic until certain tonnage amounts have rolled over the freshly resurfaced track.

Capitalized Maintenance – State of Good Repair

One of the most promising methods of reducing or eliminating slow orders is to develop a multi-year capitalized maintenance program that brings the entire infrastructure up to a "state of good repair." In spring 2008, WSDOT requested that BNSF provide information on what would be necessary to maintain the railroad to Federal Railroad Administration Class V standards, one class above the current standard and anticipated standard during the time period of this mid-range plan.

An intensive track maintenance program, similar to the multi-year capitalized maintenance program on the Capitol Corridor in California, would bring the track structure up to a "state of good repair," virtually eliminating slow orders in the future. It would allow for greater system throughput due to the ability to reduce speed differentials between freight and passenger trains. And it would guarantee a high degree of on-time performance for all passenger trains in the future. Initial cost estimates for such a program range between $125,000 and $175,000 per track mile for initial rehabilitation, with ongoing maintenance between $10,000 and $13,000 per track mile annually in the future.

Implementation of such a maintenance program will virtually eliminate the effect of right-of-way maintenance activities on passenger trains. Improved maintenance of way practices are expected to reduce track condition speed limits and slow orders to a degree that makes any that may occur inconsequential.

Traffic Management

Railroad operation, especially on a line as busy as the BNSF line in Washington State, is complex and can be difficult to manage. It is generally managed through the mental processes of the train dispatchers and the managers in the BNSF Network Operations Center in Fort Worth, Texas. Because many decisions that are made concerning traffic movement are done to address an immediate problem, the undesired consequences of a given traffic management decision may not manifest itself for several hours after the decision is made. The correct dispatching or routing decisions made to address a specific issue may not be the best systemic solution to ensure the efficient operation of the entire railroad.

It is important to note that BNSF has made some important changes in their operating practices. Although the current real time traffic management methods are not optimum, BNSF has made some extensive changes to their scheduling and operating practices affecting congested areas. These changes have, to the extent possible, eliminated some of the traffic in the congested area of Longview Junction and Kalama. The effect of these changes can be plainly seen in the difference between simulations conducted in 2006 and simulations conducted in 2008. In the long term, it appears that these changes may result in some reduction in the amount of new infrastructure referenced in the long-range plan for the Amtrak *Cascades* program.

Currently, the train dispatchers and control center managers have virtually no support for more accurate projection and planning. The results of this condition can be seen in the delays currently sustained by Amtrak *Cascades* trains.

BNSF has considered the implementation of a “movement planner” system to assist them with management of traffic throughout their entire system. This technology provides the opportunity develop sophisticated and highly specialized software for real-time operations management of the railroad. Such systems, already in use in many parts of Europe and elsewhere, have allowed for a much greater level of precision in day-to-day operations, improving performance of all traffic.

BNSF is beginning the process of acquiring, evaluating, and testing such a “movement planner” for future implementation on their system. This powerful tool, if customized and implemented, shows great promise in assisting dispatchers to facilitate a high degree of operating precision and dependable performance. Once development is complete, the traffic planning and management software can be expected to contribute significantly to achieving the desired on-time performance of Amtrak *Cascades* trains that the simulations have demonstrated are achievable.

Advanced Train Control

The infrastructure requirements discussed in the long-range plan include a safety improvement called an advanced signal system. "Advanced signal system" is a nonspecific term representing the federal regulation requiring a signal system that displays the current track condition in the locomotive cab, in plain view of the engineer. Signal systems may also ensure that the engineer complies with the requirements of the signal. Such signal systems are commonly referred to as "positive train control."

Trains are the only land transportation vehicle that cannot stop within the range of the operator's vision under normal operating conditions. The very low amount of friction between the steel rails and steel wheels, which provides great fuel economy of trains, also produces very long stopping distances. To overcome the speed restrictions that would be imposed due to sight distance, signals are placed at relatively consistent intervals along the line. Signals are similar in appearance to a highway traffic signals and represent, by combinations of colored lights, the condition of the track between that signal and the next signal. They may convey information about the second, third, or fourth ensuing signal as well. Locomotive engineers are required to comply with the requirements of a particular signal at the time the train passes it. The requirements may include a speed limit specific to the track beyond the signal. Once the train has passed the signal, it is up to the engineer to remember the requirements of that signal until the next signal comes into view.

An advanced signal system continually displays the information of the signal the train has passed, so that it need not be committed to memory. Also, most systems currently in use and all systems under development ensure that the engineer complies with the signal requirements. Some systems may stop the train immediately regardless of the requirement to stop, and others may ensure that speed limits and restrictions requiring stopping at a future point are complied with or without stopping the train immediately.

Such signal systems have secondary efficiency and reliability benefits in reducing travel times and increased reliability. Advanced signal systems instantly provide the engineer with the changed condition, eliminating the need to slow or stop for a signal that no longer requires that action. They also provide instant information of a restrictive condition. For example, if a train passes a wayside signal that includes warning of landslides, there is no warning of a subsequent event until the train encounters it. An advanced signal system will display the change of condition in the locomotive cab the instant it occurs.

Such signal systems are currently rare in the U.S. There were attempts in the 1920s and the 1950s to encourage, through regulation, all railroads to install such systems. However, they resulted in only limited application of the systems. Generally, the railroad industry reduced passenger train speed limits to 79 mph, just below the regulatory requirement of such signal systems for speeds of 80 mph or more. For many years a cost benefit analysis of such systems has indicated to the railroad industry that they were not worthwhile. Most of the limited applications of these systems currently in use involve rail lines such as the Northeast Corridor, which have high-speed passenger train service currently or formerly in operation.

Advanced signal systems have been developed extensively in Europe and Japan, generally in association with much higher train speeds than are generally found in the U.S. The U.S. rail industry has done very little development until recent times. BNSF’s predecessor, Burlington Northern, began development of advanced signal and train control systems in the 1980s. The railroad’s development of an advanced train control system continues to this day in conjunction with a private vendor. Known as ETMS (Electronic Train Management System), this new system has been undergoing rigorous testing and approval by the Federal Railroad Administration (FRA) prior to implementation throughout the BNSF system. New systems such as this require an extensive amount of fail-safe testing (one-year of operational testing without failure) and approval by the FRA before they can be installed and implemented. The first phase of testing and approval of the ETMS system has been approved and is now being implemented on select corridors within the BNSF system.

First phase ETMS implementation involves approval as a safety overlay of the existing signal systems. It can prevent collisions due to the engineer not complying with the requirements of signals, and it can eliminate the delays that are associated with the lack of visibility of signals. This first level of approval is an important safety factor for the Amtrak *Cascades* program. As rail traffic density increases, the consequences of an engineer not complying with a signal have a greater potential to be serious or catastrophic. Also, as traffic density grows, the possibility increases that a train would pass through a signal requiring it to slow down or stop by the next signal, but by the time it reaches the next signal, there is no longer a restricting condition.

Testing of the ETMS system is expected to continue over the next several years to prove its viability to meet requirements for operations above 80 mph. Higher speed territory of this kind was anticipated in the long-range plan, but is not necessary for service requirements studied in this mid-range document. It is anticipated that ETMS, or some variant thereof, would become the advanced train control system used in the Pacific Northwest Rail Corridor in the future.

On October 1, 2008, the U.S. Congress passed rail safety legislation that requires the implementation of positive train control on rail lines with both freight and passenger traffic by the year 2015.

Opportunities for Service Enhancements

In 2008 WSDOT and Amtrak performed extensive surveys on service enhancements. The surveys identified the following potential amenities:

WiFi (Onboard)

The most often requested enhancement to existing service is to provide a wireless computer network (WiFi) for service onboard the Amtrak *Cascades* trains. To date, WSDOT and Amtrak have performed limited testing of onboard WiFi with mixed results, due to coverage issues at points throughout the corridor. WSDOT is continuing to explore the use of emerging WiFi technologies for implementation on Amtrak *Cascades* trains.

WiFi (In Stations)

Customers surveyed are very interested in the availability of WiFi connections at stations throughout the route. This is of particular interest to potential business travelers. WSDOT is working with Amtrak and Oregon Department of Transportation to determine how to implement this amenity at a reasonable cost.

Quiet Car

Many respondents have expressed interest in a "quiet car," where passengers would be able to relax, rest, or be connected through WiFi without interruption from others conversing, people talking on cell phones, etc.

Business Class Upgrades

Individuals that travel in Amtrak *Cascades* Business Class pay a premium for that service. Business Class passengers have wider seats, complementary newspapers, and a voucher for use in the Bistro car. When surveyed, Business Class passengers indicated that they would be willing to pay premium costs for enhanced amenities. Included in suggested improvements are a Business Class Only self-service beverage/snack counter, complementary light snacks, at-seat food/beverage cart service, and access to First Class lounges in Seattle and Portland. Also of interest is a reserved “conference room” area, similar to amenities provided on many European services.

Each of these suggested improvements has cost implications on the service, and several would require reconfiguration of the trains used for Amtrak *Cascades* service. WSDOT is looking at opportunities to provide these types of enhancements in the future.

Enhanced Passenger Information Display System

In addition to the GPS-based route map that is displayed onboard Amtrak *Cascades* trains to indicate the position of the train and the estimated time of arrival at the next station, similar real-time data on train location and time for arrival would be useful at stations throughout the route. An Enhanced Passenger Information Display System that provides up-to-the-minute information to persons onboard and at stations could greatly enhance the traveling experience on Amtrak *Cascades* and could contribute to enhanced connectivity with other modes of transportation services.

Each of these opportunities is worthy of consideration. Careful study will need to be performed to understand the costs and service implications of any proposed service enhancement in order to make informed decisions concerning the adoption of any of these potential improvements.

Appendix 7: Peak Ridership and Effective Capacity

Ridership demand for Amtrak *Cascades* service is accompanied by seasonality and uneven distribution in route segments. This creates a supply and capacity development issue. If the Washington State Department of Transportation (WSDOT) meets the demand determined by peak seasons and peak segments, WSDOT needs to build a higher capacity, which might have a very low use rate in the off peak seasons and segments. This results in a low loading ratio. If WSDOT maximizes efficiency by not serving the peak demand, the loading ratio would be higher, but unsatisfied customers would increase and some might abandon rail as an alternative form of transportation.

Therefore, demand and supply in passenger rail service are determined by considering both efficiency and service availability. The balance between the two is set by policy goals—to what degree the demand should be met. This appendix provides peak ridership and effective capacity analyses that help define optimal demand and supply.

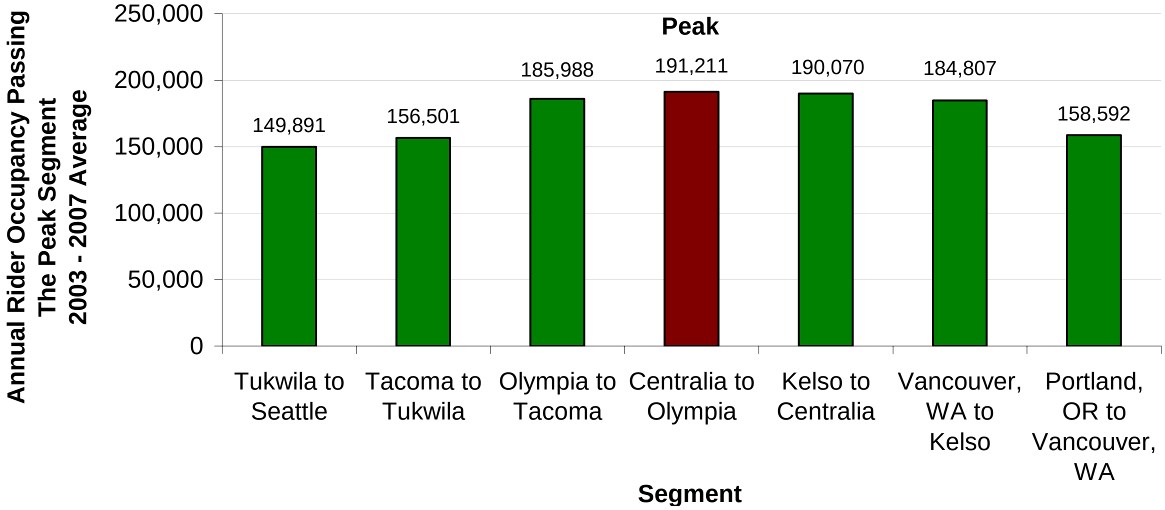
Understanding Demand of Amtrak *Cascades* Service

Demand is the number of riders at a certain time period for Amtrak *Cascades* service. The number of served riders is indicated by the tickets sold. For the ridership growth forecast, the model developed the average ridership along a corridor to represent the effects of various motivating factors of ridership. The forecast model does address peak ridership that occurs when the train is at its fullest along the corridor. During the peak months of ridership in summer and the winter holidays, the Olympia to Centralia segment is usually the section where the train is sold out and passengers are turned away. It is the peak ridership that determines the bottleneck of the supply or capacity.

Peak Segment Ridership

Peak segment ridership for a route, such as from Seattle to Portland, is where a train has the highest occupancy. Peak segment ridership reflects the peak demand in terms of geographic distribution of ridership. Exhibit 7A-1 shows ridership distribution by station-to-station segment between Seattle and Portland. For the Seattle to Portland route this maximum regularly occurs between Olympia and Centralia going north or south.

Exhibit 7A-1: Ridership Distribution between Seattle and Portland Ridership by Route Segment



Source: WSDOT State Rail and Marine Office, Amtrak *Cascades* Ridership Database

Peak Months and Peak Days

Peak months reflect the seasonality of the demand and peak days of the week (from Friday to Sunday) reflect the dominance of leisure attribute in travel demand. People's travel patterns via passenger rail are affected by many factors, such as the ridership profile and economic conditions. Exhibits 7A-2 and 7A-3 provide detailed information about ridership and the loading ratio for peak months and peak days in the peak segment.

Exhibit 7A-2: Ridership and Loading Ratio by Month for Peak Segment (Olympia to Centralia) July 2007 to June 2008

Indicator	Month	Southbound Trains (Olympia to Centralia Section)					Northbound Trains (Centralia to Olympia Section)				
		501	507	509	513	Sum	500	506	508	516	Sum
Monthly Riders	July-07	129	179	172	191	671	216	203	158	202	779
	August-07	139	195	199	170	703	241	186	154	228	809
	September-07	92	161	150	122	522	193	142	98	182	615
	October-07	84	133	120	103	438	148	123	89	147	507
	November-07	114	153	156	149	572	172	166	134	162	634
	December-07	137	176	164	183	660	179	181	158	187	705
	January-08	87	132	133	135	488	132	136	118	142	528
	February-08	116	160	150	176	601	142	148	138	158	585
	March-08	144	190	172	203	708	185	179	157	180	701
	April-08	129	170	166	183	648	179	170	149	173	671
	May-08	161	182	188	180	712	219	197	171	178	764
	June-08	154	189	193	201	737	218	197	159	202	776
Monthly Loading Factor	July-07	51%	71%	68%	75%	66%	85%	80%	63%	80%	77%
	August-07	55%	77%	79%	67%	69%	95%	73%	61%	90%	80%
	September-07	36%	64%	59%	48%	52%	76%	56%	39%	72%	61%
	October-07	33%	53%	48%	41%	43%	58%	49%	35%	58%	50%
	November-07	45%	61%	62%	59%	57%	68%	66%	53%	64%	63%
	December-07	54%	70%	65%	72%	65%	71%	72%	62%	74%	70%
	January-08	35%	52%	53%	53%	48%	52%	54%	47%	56%	52%
	February-08	46%	63%	59%	70%	59%	56%	58%	55%	62%	58%
	March-08	57%	75%	68%	80%	70%	73%	71%	62%	71%	69%
	April-08	51%	67%	66%	72%	64%	71%	67%	59%	69%	66%
	May-08	64%	72%	74%	71%	70%	87%	78%	67%	70%	76%
	June-08	61%	75%	76%	79%	73%	86%	78%	63%	80%	77%

Source: WSDOT State Rail and Marine Office Ridership Database

Exhibit 7A-3: Ridership and Loading Factors at Peak Segment by Weekday (Olympia to Centralia) July 2007 to June 2008

Indicator	Month	Southbound Trains (Olympia to Centralia)					Northbound Trains (Centralia to Olympia)				
		501	507	509	513	Sum	500	506	508	516	Sum
Average Riders per Train	July-07	129	179	172	191	671	216	203	158	202	779
	August-07	139	195	199	170	703	241	186	154	228	809
	September-07	92	161	150	122	522	193	142	98	182	615
	October-07	84	133	120	103	438	148	123	89	147	507
	November-07	114	153	156	149	572	172	166	134	162	634
	December-07	137	176	164	183	660	179	181	158	187	705
	January-08	87	132	133	135	488	132	136	118	142	528
	February-08	116	160	150	176	601	142	148	138	158	585
	March-08	144	190	172	203	708	185	179	157	180	701
	April-08	129	170	166	183	648	179	170	149	173	671
	May-08	161	182	188	180	712	219	197	171	178	764
	June-08	154	189	193	201	737	218	197	159	202	776
Average Loading Factor per Train	July-07	51%	71%	68%	75%	66%	85%	80%	63%	80%	77%
	August-07	55%	77%	79%	67%	69%	95%	73%	61%	90%	80%
	September-07	36%	64%	59%	48%	52%	76%	56%	39%	72%	61%
	October-07	33%	53%	48%	41%	43%	58%	49%	35%	58%	50%
	November-07	45%	61%	62%	59%	57%	68%	66%	53%	64%	63%
	December-07	54%	70%	65%	72%	65%	71%	72%	62%	74%	70%
	January-08	35%	52%	53%	53%	48%	52%	54%	47%	56%	52%
	February-08	46%	63%	59%	70%	59%	56%	58%	55%	62%	58%
	March-08	57%	75%	68%	80%	70%	73%	71%	62%	71%	69%
	April-08	51%	67%	66%	72%	64%	71%	67%	59%	69%	66%
	May-08	64%	72%	74%	71%	70%	87%	78%	67%	70%	76%
	June-08	61%	75%	76%	79%	73%	86%	78%	63%	80%	77%

Source: WSDOT State Rail and Marine Office Ridership Database

Peak Demand

Peak demand is the ridership during peak seasons for the peak segment of Olympia to Centralia. We used this demand to assess what is the adequate supply.

Understanding Supply of Amtrak *Cascades* Service

There are concepts that need to be understood about supply of Amtrak *Cascades* service: maximum capacity, effective capacity, and loading factor.

Maximum Capacity

Maximum capacity reflects the availability of seats over the report period. If the report period were one year, the maximum capacity would be total seats of four round trips multiplied by 365. Maximum capacity indicates the ultimate potential availability of Amtrak *Cascades* service at a given period. The average number of seats available for reservation for an Amtrak *Cascades* train is 253, so the maximum annual capacity for a single train, one-way trip is 92,345, and the whole route from Seattle to Portland would be 369,380 for one way and 738,760 for both ways.

Effective Capacity

Effective capacity is defined as average annual loading factor where the target peak demand is met. For example, if the target to be met is 99 percent of the peak riders, the average loading (peak or non-peak) would be considered as effective capacity. In other words, the capacity would be considered as saturated at this loading level, because the targeted riders cannot be served as capacity is constrained at the peak.

Effective capacity is calculated as:

$$EC_Y = \frac{\sum_{i=1}^{2910} T_i [R_i G]}{\sum_{i=1}^{2910} T_i C_i G} \qquad \text{Given} \qquad \Pr\left\{\left[\frac{\sum T_i [R_i G - C]}{\sum T_i R_i G}\right] > Y\right\} = 0$$

Where:

EC_Y = Effective capacity to meet target peak demand
Pr = Probability Function
T = Train Trip
R = Riders in a Train
C = Capacity of Train (Seats)
G = Growth Factor of Ridership for Modeling
Y = Riders cannot be served due to capacity limit at peak.

i = subscript for any one-way Amtrak *Cascades* train trip during July 1, 2007 to June 30, 2008, excluding 10 trips disrupted by natural conditions.

Based on current ridership patterns, a model is developed to analyze effective capacity at various growth rates. This model also analyzed the distribution of daily ridership at the peak section for a full year for all four round-trip trains in the Olympia to Centralia section.

Exhibit 7A-4 shows the current effective capacity for southbound passengers (Seattle to Portland) and Exhibit 7A-5 shows the current effective capacity for northbound passengers (Portland to Seattle).

Exhibit 7A-4: Current Status of Effective Capacity (Seattle to Portland)

Daily Rider Per Train	Daily Train Trip		Modeling					
	Distribution	Cumulative	Total Peak	Cumulative Distribution (Peak Section Riders)	Average Peak Section Riders Per Train Day	Marginal Demand	Loading
10	5	5	4	4	1	0	0%
20	1	6	15	19	15	0	0%
30	1	7	23	42	0	0	0%
40	3	10	107	149	36	0	0%
50	18	28	831	980	46	0	0%
60	35	63	1,965	2,945	56	0	1%
70	47	110	3,074	6,019	65	0	2%
80	86	196	6,463	12,482	75	0	3%
90	90	286	7,724	20,206	86	0	5%
100	80	366	7,622	27,828	95	0	8%
110	84	450	8,870	36,698	106	0	10%
120	62	512	7,177	43,875	116	0	12%
130	95	607	11,917	55,792	125	0	15%
140	64	671	8,670	64,462	135	0	17%
150	64	735	9,324	73,786	146	0	20%
160	67	802	10,432	84,218	156	0	23%
170	63	865	10,409	94,627	165	0	26%
180	54	919	9,483	104,110	176	0	28%
190	48	967	8,881	112,991	185	0	31%
200	60	1,027	11,734	124,725	196	0	34%
210	49	1,076	10,078	134,803	206	0	36%
220	44	1,120	9,478	144,281	215	0	39%
230	47	1,167	10,618	154,899	226	0	42%
240	75	1,242	17,662	172,561	235	0	47%
250	90	1,332	22,044	194,605	245	0	53%
260	67	1,399	17,076	211,681	255	0	57%
266	29	1,428	7,633	219,314	263	0	59%
>266	26	1,454	7,373	226,687	284	795	61%
Total/Average			**Marginal Demand Without Supply**				**795**
			Marginal Demand as % of Total Demand				**0.4%**
			Actual Capacity				**369,380**
			Effective Peak Loading				**61%**
			Effective Peak Capacity				**225,892**

Source: WSDOT State Rail and Marine Office Amtrak *Cascades* Capacity Models

Exhibit 7A-5: Current Status of Effective Capacity (Portland to Seattle)

Daily Rider Per Train	Daily Train Trip		Modeling				
	Distribution	Cumulative	Total Peak	Cumulative Distribution (Peak Section Riders)	Average Peak Section Riders Per Train Day	Marginal Demand	Loading
10	10	10	14	14	1	0	0%
20	1	11	19	33	19	0	0%
30	-	11	0	33	0	0	0%
40	3	14	101	134	34	0	0%
50	8	22	371	505	46	0	0%
60	19	41	1,059	1,564	56	0	0%
70	35	76	2,309	3,873	66	0	1%
80	66	142	4,968	8,841	75	0	2%
90	58	200	4,935	13,776	85	0	4%
100	89	289	8,493	22,269	95	0	6%
110	64	353	6,772	29,041	106	0	8%
120	76	429	8,766	37,807	115	0	10%
130	67	496	8,417	46,224	126	0	13%
140	68	564	9,191	55,415	135	0	15%
150	56	620	8,157	63,572	146	0	17%
160	54	674	8,402	71,974	156	0	19%
170	57	731	9,427	81,401	165	0	22%
180	49	780	8,621	90,022	176	0	24%
190	66	846	12,262	102,284	186	0	28%
200	58	904	11,300	113,584	195	0	31%
210	60	964	12,319	125,903	205	0	34%
220	63	1,027	13,553	139,456	215	0	38%
230	62	1,089	13,998	153,454	226	0	42%
240	101	1,190	23,804	177,258	236	0	48%
250	98	1,288	24,044	201,302	245	0	54%
260	99	1,387	25,287	226,589	255	0	61%
266	17	1,404	4,467	231,056	263	0	63%
>266	52	1,456	14,709	245,765	283	1,553	67%
Total/Average	**1,456**		**Unsupplied Marginal Demand**				**1,553**
			Unsupplied Marginal Demand as % of Total				**0.6%**
			Actual Capacity				**369,380**
			Effective Peak Loading				**66%**
			Effective Peak Capacity				**244,212**

Source: WSDOT State Rail and Marine Office Amtrak *Cascades* Capacity Models

Combining both southbound and northbound travel, the computations indicate that, of total demand during the year, approximately 0.5 percent, or 2,348 passengers of a total demand of 474,800, was not provided reserved seats. Extra or overflow passengers sat in the Bistro or Lounge cars as ridership exceeded train capacity. The model set train capacity at 266 passengers considering the capacity of the Bistro or Lounge cars. Exhibit 7A-6 illustrates the concept. Effective peak capacity is calculated as total peak section riders when ridership is at its maximum. Effective peak capacity divided by a full year's actual capacity of 738,760 seats results in an effective peak loading of 64 percent.

Effective Capacity and Policy Goals

Effective capacity is defined as average annual loading factor where the target peak demand is met. As discussed before, effective capacity is determined by both an efficiency goal and a service availability goal. For public sector investment decisions, optimizing efficiency is not the only criterion. Serving the public and making service available to the public often have a higher priority. To help understand the relationship between serving the public and efficiency (cost and budget issues), we performed a sensitivity analysis to look at the tradeoff between the two criteria.

Sensitivity analysis of unsupplied marginal demand levels from one to five percent indicated a range of 5,515 to 27,518 riders.

Exhibit 7A-6 summarizes the results from the sensitivity analysis.

Exhibit 7A-6: Sensitivity Analysis: Trade-off between Efficiency and Service Availability

Scenarios	Current Status	1% Unsupplied Demand	2.5% Unsupplied Demand	5% Unsupplied Demand
Total Demand	474,800	497,550	527,709	583,122
Effective Peak Capacity	472,452	492,035	514,973	555,604
Unsupplied Marginal Demand	2,348	5,515	12,736	27,518
Unsupplied Marginal Demand as % of Total Demand	0.5%	1.1%	2.5%	5.0%
Actual Capacity	738,760	738,760	738,760	738,760
Effective Peak Loading	64.0%	66.6%	69.7%	75.2%

Source: WSDOT State Rail and Marine Office Amtrak *Cascades* Capacity Models

It is a policy decision to determine what level the demand should be met at the cost of efficiency. If WSDOT would like to achieve 75 percent use level of the capacity, WSDOT has to compromise the goal of service availability and leave 5 percent of riders not served.

One percent unsupplied demand leading to an effective peak loading of 67 percent was chosen as a reasonable amount of unsupplied demand. Meeting demand during peak trips is imperative, given the potential lost revenue of high paying passengers and resulting dissatisfied customers. Therefore, the mid-range plan team decided that 67 percent of capacity use level is considered as effective capacity. Average loading ratio above that gives a red signal of undersupply.

Exhibit 7A-7 to Exhibit 7A-10 provides detailed capacity use profiles for four scenarios of sensitivity analysis.

Exhibit 7A-7: Distribution of Daily Riders at Peak Section Olympia to Centralia for all Four Round-Trip Trains – Current Situation

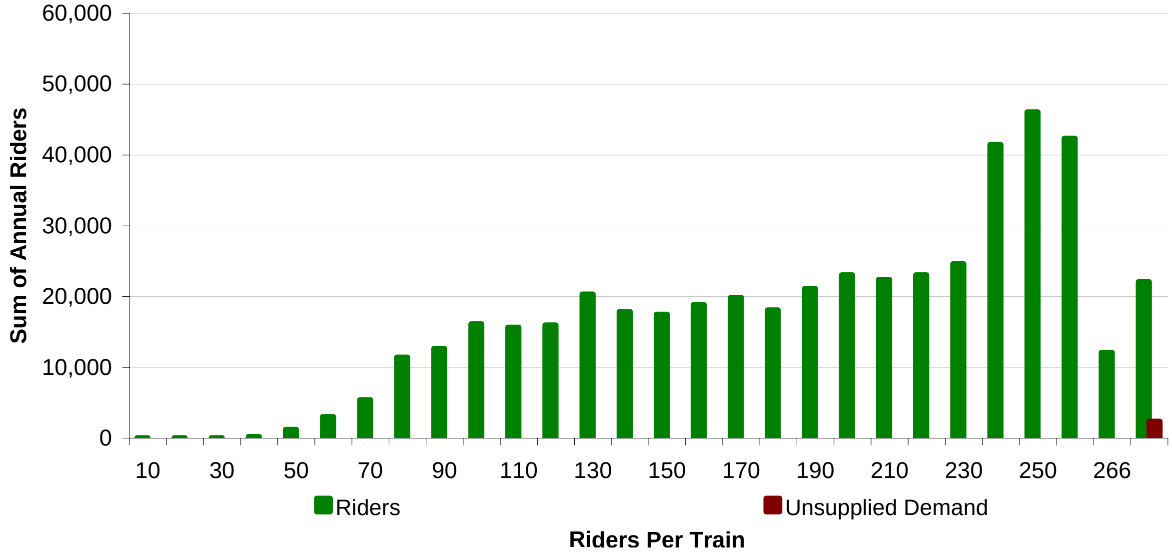


Exhibit 7A-8: Distribution of Daily Riders at Peak Section Olympia to Centralia for all Four Round-Trip Trains – 1% Unsupplied Demand

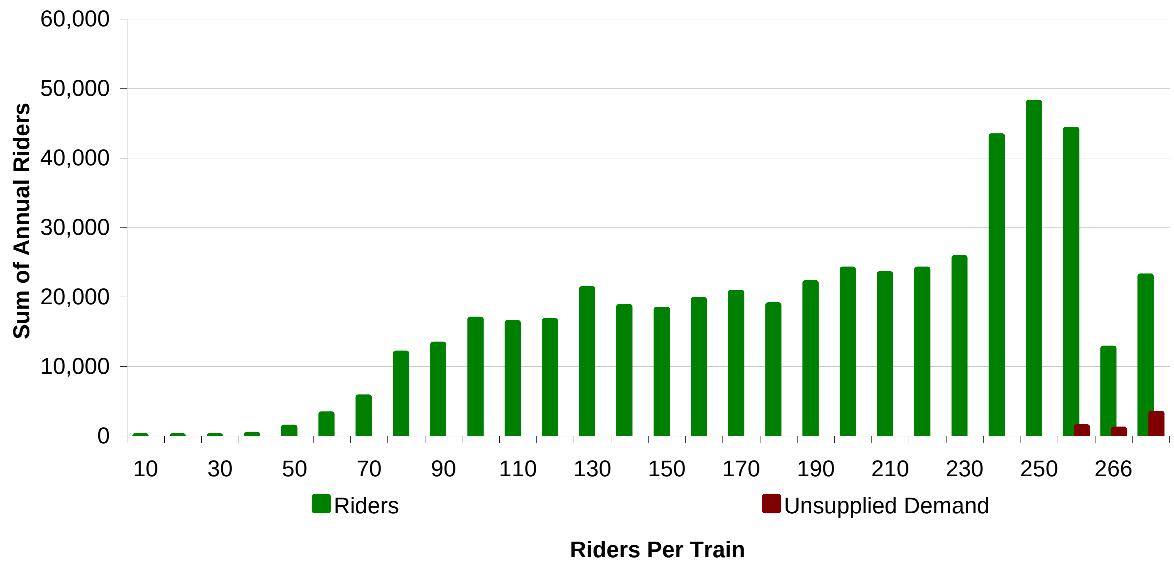


Exhibit 7A-9: Distribution of Daily Riders at Peak Section
Olympia to Centralia for all Four Round-Trip Trains – 2.5% Unsupplied Demand

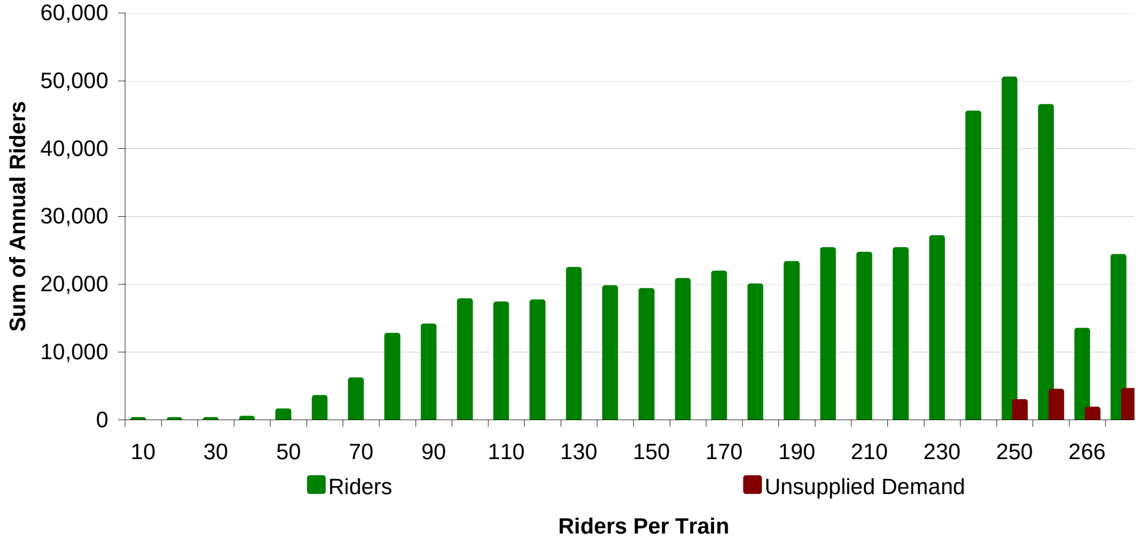
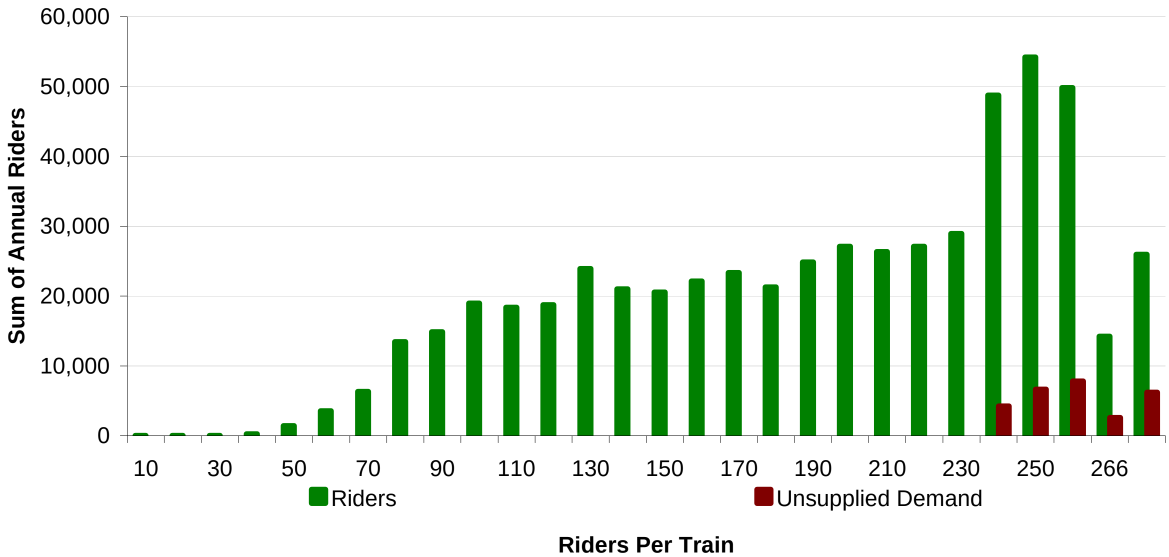


Exhibit 7A-10: Distribution of Daily Riders at Peak Section
Olympia to Centralia for All Four Round-Trip Trains – 5% Unsupplied Demand



Appendix 8: Societal Benefit Assessment

Three types of benefits to society are assessed in the mid-range plan. They are:

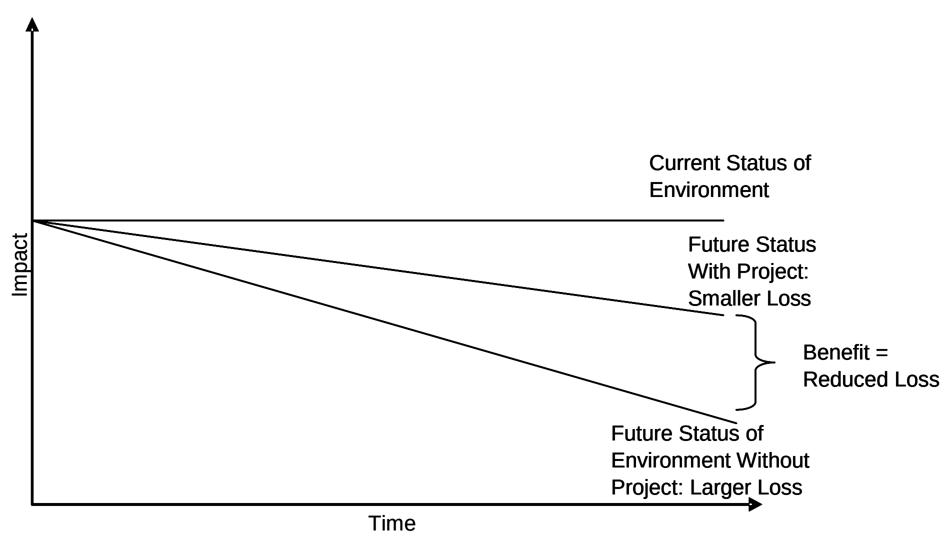
- Congestion Relief Benefit Assessment
- Safety Improvement Benefit Assessment
- Environmental Benefit Assessment

All transportation modes—auto, rail, air, barge, and so on—produce externalities that are used by economists to describe an unintended consequence or indirect effect that is created by some activity. The costs associated with these unintentional actions are not directly charged to any specific individual, but are borne by society as a whole. The negative health impacts associated with air pollution are a classic example of such an externality. Although travel by air, car, or rail creates air pollution impacts, riders are not charged for their contribution to decreasing air quality.

Since rail also imposes negative externalities to society, how are these externalities assessed as benefits to society? This can be explained by a classic theory in benefit/cost analysis or project investment analysis—with or without analysis.

Exhibit 8A-1 demonstrates the concept of with/without analysis.

Exhibit 8A-1 Principle of With/Without Analysis



As the chart shows, pollution will increase over time because of current practices. With a project that could lead to less pollution, society gets benefits by having less negative impacts. The reduction in cost of loss would be the benefits of the project invested.

This principle applies to Amtrak *Cascades* investment. In general, rail has less negative impacts on society. When more people use rail service, fewer people drive cars. This reduces total pollution. The reduced negative impacts of pollution would be the benefit of investment in passenger rail service.

Congestion Relief Benefit Assessment

The congestion in the I-5 corridor continues to increase. Incremental services of Amtrak *Cascades* help relieve the congestion on I-5 by removing auto traffic from I-5. While this traffic diverted from I-5 is not substantial due to the high traffic volumes on I-5, the benefits generated are significant compared to the investment in Amtrak *Cascades* passenger rail services. As Exhibit 8A-2 demonstrates, it is the last amount of traffic that causes the most congestion. Therefore, even a small fraction of traffic diversion from I-5 could lead to tremendous improvement in reducing delayed hours that are costs to travelers. Therefore, the potentials and investment return are very promising, if rail is considered as a strategic alternative for transportation resilience to natural and man-made disasters.

Exhibit 8A-2: The Relationship between Traffic Reduction and Delay Reduction

Average Daily Traffic Reduction and Hours of Delay				
	Current Delay	**Traffic Reduction %**		
		-5%	**-10%**	**-20%**
Hours of Delay	302,000	90,000	64,000	30,000
% Delay Reduction from Today	n/a	-70%	-79%	-90%

Source: WSDOT Urban Planning Office

Congestion benefits were assessed based on following procedure:

- Based on the Urban Planning Office (UPO) model, WSDOT developed average costs and marginal costs of congestion for I-5.

- WSDOT estimated the portion of I-5 traffic that could be diverted from I-5 to Amtrak *Cascades* due to incremental services provided by the mid-range plan options. Without Amtrak *Cascades* service, this traffic would be added to I-5 traffic and cause more congestion.

- Based on diverted traffic by Amtrak *Cascades*, WSDOT estimated reduction in daily delay resulting from incremental Amtrak *Cascades* passenger rail service.

- WSDOT assessed the congestion relief benefit of Amtrak *Cascades* using marginal costs of congestion and diverted traffic by Amtrak *Cascades* passenger rail.

The congestion relief benefits were calculated using following formula:

$$CB_i = \sum_{t=2009}^{2023} \left(\frac{ACT_{it} * HS}{I5T_t} \right) * RMD * HC_t$$

Where:

CB = Estimated congestion relief benefit due to incremental Amtrak *Cascades* passenger train service.
ACT = Incremental Amtrak *Cascades* service level indicated by passenger mile.[1]
HS = Highway share of intercity traffic along I-5 corridor.
I5T = Forecasted I-5 traffic indicated by passenger miles.
RMD = Marginal reduction in delay hours caused by congestion estimated by UPO model.
HC = Cost of delay estimated by UPO ($/hour).
t = Subscript for benefit estimation period (FY2010 to FY2030).
i = Subscript for mid-range plan option.

Exhibit 8A-3 provides detailed estimates of congestion relief benefits using year 2008 as baseline.

[1] A passenger mile is the total number of passengers (in a plane, train, or car) multiplied by the total number of miles travelled.

Exhibit 8A-3: Congestion Relief Benefit by *Amtrak Cascades Mid-Range Plan* Option (2008 Dollars)

Fiscal Year	I-5 Passenger Miles Traveled (Million)	Option 1			Option 2			Option 3			Option 4		
		Diverted Traffic from I-5 (Million Passenger Miles)	Diverted Traffic from I-5 (%)	Congestion Relief Benefit	Diverted Traffic from I-5 (Million Passenger Miles)	Diverted Traffic from I-5 (%)	Congestion Relief Benefit	Diverted Traffic from I-5 (Million Passenger Miles)	Diverted Traffic from I-5 (%)	Congestion Relief Benefit	Diverted Traffic from I-5 (Million Passenger Miles)	Diverted Traffic from I-5 (%)	Congestion Relief Benefit
2010	11,897	0	0.00%	$0	0	0.00%	$0	0	0.00%	$0	0	0.00%	$0
2011	11,925	0	0.00%	$0	0	0.00%	$0	0	0.00%	$0	0	0.00%	$0
2012	11,852	0	0.00%	$0	0	0.00%	$0	2	0.01%	$8,083,599	0	0.00%	$0
2013	11,915	0	0.00%	$0	3	0.03%	$16,152,370	5	0.04%	$24,968,291	2	0.02%	$11,888,259
2014	12,031	0	0.00%	$0	4	0.04%	$21,151,293	6	0.05%	$30,226,291	7	0.05%	$31,506,904
2015	12,082	0	0.00%	$0	5	0.05%	$26,189,106	7	0.06%	$35,552,586	9	0.08%	$44,485,080
2016	12,130	0	0.00%	$0	6	0.05%	$30,950,301	8	0.07%	$40,520,921	12	0.10%	$58,468,433
2017	12,160	0	0.00%	$0	8	0.06%	$35,802,642	10	0.08%	$45,921,655	13	0.11%	$63,578,189
2018	12,164	0	0.00%	$0	8	0.06%	$35,881,929	12	0.10%	$57,856,648	13	0.11%	$63,718,988
2019	12,209	0	0.00%	$0	8	0.06%	$35,879,159	12	0.10%	$57,852,182	13	0.11%	$63,714,069
2020	12,260	0	0.00%	$0	8	0.06%	$35,872,949	12	0.10%	$57,842,169	13	0.11%	$63,703,041
2021	12,313	0	0.00%	$0	8	0.06%	$35,850,913	12	0.10%	$57,806,638	14	0.11%	$63,663,910
2022	12,369	0	0.00%	$0	8	0.06%	$35,728,885	12	0.10%	$57,609,876	14	0.11%	$63,447,212
2023	12,403	0	0.00%	$0	8	0.06%	$35,821,312	12	0.10%	$57,758,907	14	0.11%	$63,611,344
2024	12,433	0	0.00%	$0	8	0.06%	$35,963,129	12	0.10%	$57,987,575	14	0.11%	$63,863,182
2025	12,473	0	0.00%	$0	8	0.06%	$36,009,151	12	0.10%	$58,061,782	14	0.11%	$63,944,908
2026	12,515	0	0.00%	$0	8	0.06%	$36,081,228	13	0.10%	$58,178,001	14	0.11%	$64,072,902
2027	12,562	0	0.00%	$0	8	0.06%	$36,137,063	13	0.10%	$58,268,030	14	0.11%	$64,172,053
2028	12,609	0	0.00%	$0	8	0.06%	$36,185,124	13	0.10%	$58,345,525	14	0.11%	$64,257,400
2029	12,650	0	0.00%	$0	8	0.06%	$36,265,895	13	0.10%	$58,475,762	14	0.11%	$64,400,833
2030	12,690	0	0.00%	$0	8	0.06%	$36,348,788	13	0.10%	$58,609,419	14	0.11%	$64,548,034
Sum				**$0**			**$598,271,236**		**$0**	**$939,925,855**		**$0**	**$1,041,044,741**

* Weighted hourly rate for delay is $23.98 in 2008.

** Total delay hours are derived based on WSDOT UPO model and *Amtrak Cascades Mid-Range Plan* ridership forecast.

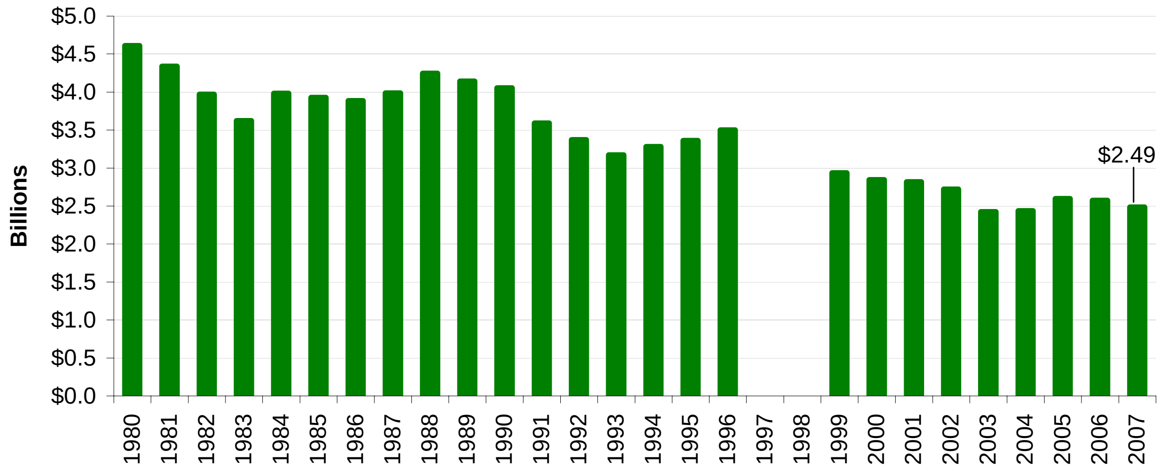
Source: WSDOT State Rail and Marine Office

Safety Improvement Benefit Assessment

The societal cost of motor vehicle collisions for all roadways (state, county, city, tribal, and federal) was estimated at $4 billion in 2007. Societal cost of motor vehicle collisions for state highways is shown in Exhibit 8A-4.

Exhibit 8A-4: Societal Costs from Motor Vehicle Collisions

State Routes Collision Societal Costs
1980-2007



Data were not collected by WSDOT for 1997 and 1998.

Source: WSDOT Transportation Data Office

Passenger rail transportation has a strong safety record with a national accident fatality rate that is only a fraction of highway (Exhibit 8A-5).

Exhibit 8A-5: Fatality and Injury: Highway vs. Passenger Rail

	Fatality Per Million Passenger Mile	Injury Per Million Passenger Mile	Sum
Rail	0.0005	0.0590	0.06
Highway	0.0119	0.7689	0.78
Rail to Highway Ratio	0.0387	0.0768	0.08

Source: USDOT Bureau of Transportation Statistics

It is clearly evident rail passenger travel benefits public safety and is in the public interest. Work remains to further improve rail safety, including rail crossings, trespassing, and oversight of light rail and monorail systems. If more highway traffic is diverted to rail, the societal cost of motor vehicle collisions for roadways will be reduced due to the lower rates of accidents. Since passenger rail has lower fatality and injury rates, overall passenger safety improves. Therefore, reduced societal costs will be assessed as public benefits of investing in passenger rail based on the with/without principle discussed in this appendix earlier.

Safety benefits were assessed based on the following procedure:

- Based on statistics of societal benefits developed by the Transportation Data Office, WSDOT calculated average costs of collisions and injuries per passenger mile.

- WSDOT estimated the portion of I-5 traffic that is diverted from I-5 to Amtrak *Cascades* passenger service. Without Amtrak *Cascades* service, this traffic would be part of the I-5 traffic.

- Based on the traffic of *Amtrak Cascades Mid-Range Plan* options, WSDOT estimated reduction in societal costs caused by collisions and injuries resulting from Amtrak *Cascades* passenger rail services.

The safety improvement benefits were calculated using following formula:

$$SB_i = \sum_{t=2009}^{2023} \left(AVC_{it} * ACT_{it} \right)$$

Where:

SB = Estimated safety improvement benefit due to Amtrak *Cascades* passenger train services.
ACT = Amtrak *Cascades* service level indicated by passenger mile.
AVC = Societal cost resulting from state highway collisions and injuries indicated by $/passenger mile.
t = Subscript for benefit estimation period (FY2010 to FY2030).
i = Subscript for mid-range plan option.

Exhibit 8A-6 provides detailed estimates of safety improvement benefits from FY2010 to FY2030.

Exhibit 8A-6: Safety Benefit by *Amtrak Cascades Mid-Range Plan* Option (2008 Dollars)

Fiscal Year	I-5 Passenger Miles Traveled (Million)	Option 1			Option 2			Option 3			Option 4		
		Amtrak Cascades Passenger Miles (Million)	Diverted Traffic from I-5 (%)	Safety Benefit	Amtrak Cascades Passenger Miles (Million)	Diverted Traffic from I-5 (%)	Safety Benefit	Amtrak Cascades Passenger Miles (Million)	Diverted Traffic from I-5 (%)	Safety Benefit	Amtrak Cascades Passenger Miles (Million)	Diverted Traffic from I-5 (%)	Safety Benefit
2010	11,893	94	0.79%	$4,814,329	94	0.79%	$4,832,665	94	0.79%	$4,832,665	94	0.79%	$4,832,665
2011	11,911	92	0.77%	$4,554,074	95	0.80%	$4,705,901	95	0.80%	$4,705,901	95	0.80%	$4,705,901
2012	11,889	93	0.79%	$4,453,327	96	0.81%	$4,600,640	102	0.85%	$4,846,000	96	0.81%	$4,600,640
2013	11,883	94	0.79%	$4,306,697	107	0.90%	$4,923,301	113	0.95%	$5,181,910	105	0.88%	$4,798,216
2014	11,973	94	0.79%	$4,155,334	111	0.93%	$4,895,015	117	0.98%	$5,153,093	118	0.98%	$5,189,512
2015	12,057	95	0.78%	$3,995,868	115	0.95%	$4,846,330	121	1.00%	$5,102,681	127	1.05%	$5,347,233
2016	12,106	94	0.78%	$3,808,011	118	0.97%	$4,751,201	124	1.02%	$5,003,051	135	1.12%	$5,475,338
2017	12,145	94	0.77%	$3,635,276	121	0.99%	$4,661,959	127	1.05%	$4,917,100	139	1.14%	$5,362,293
2018	12,162	94	0.78%	$3,479,181	121	1.00%	$4,461,831	135	1.11%	$4,990,667	139	1.14%	$5,131,748
2019	12,186	95	0.78%	$3,327,026	122	1.00%	$4,266,739	136	1.12%	$4,772,258	140	1.15%	$4,907,119
2020	12,235	95	0.78%	$3,175,742	122	1.00%	$4,072,756	137	1.12%	$4,555,131	140	1.15%	$4,683,817
2021	12,286	96	0.78%	$3,023,573	123	1.00%	$3,877,635	137	1.12%	$4,336,740	141	1.15%	$4,459,219
2022	12,341	96	0.78%	$2,865,147	123	0.99%	$3,674,509	137	1.11%	$4,109,298	141	1.14%	$4,225,290
2023	12,386	96	0.78%	$2,717,464	123	1.00%	$3,485,118	138	1.11%	$3,897,445	142	1.15%	$4,007,445
2024	12,418	97	0.78%	$2,571,776	124	1.00%	$3,298,273	139	1.12%	$3,688,499	143	1.15%	$3,792,602
2025	12,453	97	0.78%	$2,421,461	125	1.00%	$3,105,508	140	1.12%	$3,472,861	143	1.15%	$3,570,862
2026	12,494	98	0.78%	$2,272,893	125	1.00%	$2,914,975	140	1.12%	$3,259,768	144	1.15%	$3,351,751
2027	12,539	98	0.78%	$2,123,625	126	1.01%	$2,723,543	141	1.13%	$3,045,673	145	1.16%	$3,131,610
2028	12,586	99	0.79%	$1,973,726	127	1.01%	$2,531,301	142	1.13%	$2,830,675	146	1.16%	$2,910,541
2029	12,630	99	0.79%	$1,824,082	127	1.01%	$2,339,384	143	1.13%	$2,616,058	147	1.16%	$2,689,868
2030	12,670	100	0.79%	$1,673,950	128	1.01%	$2,146,839	143	1.13%	$2,400,742	147	1.16%	$2,468,478
Sum				**$67,172,562**			**$81,115,421**			**$87,718,219**			**$89,642,150**
** Unit value is derived based on WSDOT Transportation Data Office collision cost estimates.													

Source: WSDOT Transportation Data Office and State Rail and Marine Office.

Environmental Benefit Assessment

Environmental cost estimation is discussed in Appendix 9. Based on the data compiled from Appendix 9, WSDOT estimated environmental cost per passenger mile for each of the three transportation modes (Exhibit 8A-7).

Exhibit 8A-7: Environmental Costs by Transportation Mode ($ per Passenger Mile)

Pollutants	Automobile	Airplane	Rail
CO_2	$0.046	$0.029	$0.018
Volatile Organic Compounds	$0.006	$0.000	$0.000
CO	$0.001	$0.000	$0.000
NO_x	$0.012	$0.003	$0.012
Particulate Matter	$0.001	N/A	$0.010
Road Dust	$0.034	N/A	N/A
SO_x	$0.003	N/A	$0.006
Noise	$0.006	$0.014	$0.004
Total Environmental Cost	***$0.109***	***$0.047***	***$0.051***

Source: Compiled by WSDOT State Rail and Marine Office based on multiple sources.

Based on diverted traffic from I-5 to Amtrak *Cascades* passenger trains, WSDOT estimated reduction in environmental costs resulting from incremental Amtrak *Cascades* passenger rail service.

WSDOT assessed the environmental benefit of investing in Amtrak *Cascades* service for all plan options using different between average costs of highway and rail, and diverted traffic by Amtrak *Cascades* passenger rail.

The environmental benefits were calculated using following formula:

$$EB_i = \sum_{t=2009}^{2023} \left(\left[CH_{it} - CR_{it} \right] * ACT_t \right)$$

Where:

EB = Estimated environmental benefit due to incremental Amtrak *Cascades* passenger train service.
ACT = Incremental Amtrak *Cascades* service level indicated by passenger mile.
CH = Environmental cost of highway mode indicated by dollars per passenger mile.
CR = Environmental cost of passenger rail mode indicated by dollars per passenger mile.
t = Subscript for benefit estimation period (FY2010 to FY2030).
i = Subscript for mid-range plan option.

Exhibit 8A-8 provides detailed estimates of environmental benefits for Amtrak *Cascades* plan options from FY2010 to FY2030.

Exhibit 8A-8: Environmental Benefit by Amtrak Cascades Mid-Range Plan Option (2008 Dollars)

FY	I-5 Passenger Miles Traveled (Million)	Option 1			Option 2			Option 3			Option 4		
		Diverted Traffic from I-5 (Million Passenger Miles)	Diverted Traffic from I-5 (%)	Emission Reduction Benefit	Diverted Traffic from I-5 (Million Passenger Miles)	Diverted Traffic from I-5 (%)	Emission Reduction Benefit	Diverted Traffic from I-5 (Million Passenger Miles)	Diverted Traffic from I-5 (%)	Emission Reduction Benefit	Diverted Traffic from I-5 (Million Passenger Miles)	Diverted Traffic from I-5 (%)	Emission Reduction Benefit
2010	11,893	94	0.79%	$5,364,579	94	0.79%	$5,385,011	94	0.79%	$5,385,011	94	0.79%	$5,385,011
2011	11,911	92	0.77%	$5,423,254	95	0.80%	$5,604,057	95	0.80%	$5,604,057	95	0.80%	$5,604,057
2012	11,889	93	0.79%	$5,677,585	96	0.81%	$5,865,396	102	0.85%	$6,178,208	96	0.81%	$5,865,396
2013	11,883	94	0.79%	$5,882,692	107	0.90%	$6,724,936	113	0.95%	$7,078,181	105	0.88%	$6,554,078
2014	11,973	94	0.79%	$6,089,356	111	0.93%	$7,173,306	117	0.98%	$7,551,502	118	0.98%	$7,604,871
2015	12,057	95	0.78%	$6,291,470	115	0.95%	$7,630,517	121	1.00%	$8,034,141	127	1.05%	$8,419,187
2016	12,106	94	0.78%	$6,450,315	118	0.97%	$8,047,966	124	1.02%	$8,474,570	135	1.12%	$9,274,568
2017	12,145	94	0.77%	$6,635,804	121	0.99%	$8,509,903	127	1.05%	$8,975,636	139	1.14%	$9,788,288
2018	12,162	94	0.78%	$6,855,613	121	1.00%	$8,791,894	135	1.11%	$9,833,949	139	1.14%	$10,111,945
2019	12,186	95	0.78%	$7,089,916	122	1.00%	$9,092,450	136	1.12%	$10,169,715	140	1.15%	$10,457,103
2020	12,235	95	0.78%	$7,334,238	122	1.00%	$9,405,850	137	1.12%	$10,519,875	140	1.15%	$10,817,070
2021	12,286	96	0.78%	$7,584,460	123	1.00%	$9,726,826	137	1.12%	$10,878,466	141	1.15%	$11,185,697
2022	12,341	96	0.78%	$7,825,816	123	0.99%	$10,036,494	137	1.11%	$11,224,071	141	1.14%	$11,540,889
2023	12,386	96	0.78%	$8,104,537	123	1.00%	$10,393,978	138	1.11%	$11,623,700	142	1.15%	$11,951,761
2024	12,418	97	0.78%	$8,400,656	124	1.00%	$10,773,745	139	1.12%	$12,048,410	143	1.15%	$12,388,461
2025	12,453	97	0.78%	$8,693,165	125	1.00%	$11,148,929	140	1.12%	$12,467,743	143	1.15%	$12,819,572
2026	12,494	98	0.78%	$9,003,193	125	1.00%	$11,546,554	140	1.12%	$12,912,320	144	1.15%	$13,276,675
2027	12,539	98	0.78%	$9,322,767	126	1.01%	$11,956,422	141	1.13%	$13,370,583	145	1.16%	$13,747,847
2028	12,586	99	0.79%	$9,652,191	127	1.01%	$12,378,925	142	1.13%	$13,842,966	146	1.16%	$14,233,538
2029	12,630	99	0.79%	$9,996,188	127	1.01%	$12,820,103	143	1.13%	$14,336,312	147	1.16%	$14,740,802
2030	12,670	100	0.79%	$10,351,773	128	1.01%	$13,276,140	143	1.13%	$14,846,289	147	1.16%	$15,265,168
Sum				**$158,029,566**			**$196,289,402**			**$215,355,705**			**$221,031,984**

Source: WSDOT State Rail and Marine Office

Appendix 9: Assessing Environmental Costs

Environmental costs caused by transportation modes are externalities. They are negative impacts on society. The term externality, or “external costs,” is used by economists to describe an unintended consequence or indirect effect that is created by activities such as traveling. The costs associated with these unintentional actions are not directly charged to any specific individual, but are borne by society as a whole. The negative health impacts associated with air pollution are a classic example of such an externality. Although the travel by air, car, or rail creates air pollution impacts, riders are not charged for their contribution to decreasing air quality.

Many previous studies have focused on examples such as this, and attempted to measure external costs associated with pollution and environmental degradation. These studies point out that excluding such costs from cross modal comparisons can lead to misleading conclusions, because the magnitude of these costs can be large and their impacts vary from one mode to another.

Factors Affecting Environmental Impacts

In comparing external costs across modes, one should recognize that the magnitude of external effects has been changing over time. There are many factors that affect environmental impacts caused by transportation. The major factors include regulation changes, user behavior changes, and technology advancements.

Environmental Regulation

Many environmental impacts have been converted to direct costs as environmental legislation has forced users to more fully bear the costs of their activities. For example, automobile-related air pollution has been reduced by legal constraints that have forced automobile manufacturers to equip cars with more sophisticated emission control systems. In this sense, some portion of the costs that were formerly external to the user have been “internalized” and converted to a direct, out-of-pocket expense.

User Behavior

Current literature debates whether or not future emission levels will increase or decrease from current levels. The outcome is unclear. Better technology may lead to reduced emissions on individual models, but this may be offset by a mode shift towards larger vehicles. During the 1990s and early 2000s, the trend towards larger, more polluting vehicles is clear, and this negative trend offsets positive impacts caused by other factors, such as stringent regulations and technology advancements. With the fuel cost spikes observed in recent years, it seems that an increasing number of users prefer smaller vehicles now.

Technology Advancements

Technology advancements affect environmental impacts in two ways. Cleaner technology helps reduce environmental impacts as evidenced by reduced emission levels of the newer models of some motor vehicles. On the other side, technology may lead to new models that have higher emission due to their size and features. Large SUVs are an example. Technology also has effects on different modes. Currently, rail has a lower emission level than auto. Hydrogen cars may change the landscape. However, hydrogen technology could also be adopted for locomotives.

Implication

Changing environmental impacts, caused by the factors mentioned above, suggest that past and current studies of environmental costs will tend to either overstate or understate the current and future magnitude of environmental impacts. For this reason, the cost estimates in this plan reflect the current information available and understanding of future trends. The results may not hold in the future as many factors continue shaping the environmental impacts imposed by different modes of transportation.

Methodology for Developing External Costs

The existing studies of environmental costs generally adopt a two-step approach toward the difficult task of developing cost estimates for each externality.

The first step involves a review of data that describes the link between the use of each transportation mode and the level of air pollution and noise. This link relies on engineering studies of emissions or on statistical data specific to each mode.

In the second step, an economic value or cost must be associated with each externality. Estimates of these costs are derived from direct assessments of damages or by measuring the costs of mitigating potential impacts. This same basic methodology was applied to the current analysis of the external costs associated with air, highway, and rail travel.

Emission Level

Among the potential environmental impacts, air pollution is generally thought to be associated with the largest external costs. Fossil fuel combustion generates by-products that have both immediate and long-term impacts on the environment and human health. As noted above, measures of the external costs of air pollution rely both on models that predict the level of vehicle emissions and on separate estimates of the costs associated with the resulting levels of air contaminants.

The most frequently cited estimates of automobile emissions were developed by Small and Kazimi. Small and Kazimi's study continues to be referenced in contemporary studies. Small and Kazimi's figures relied on existing engineering models, but were calibrated to match data on observed levels of air pollution. The estimates available for airplane emissions were provided by the University of California's Institute of Transportation Studies cost analysis for the San Francisco-Los Angeles-San Diego travel corridor. Emission estimates for rail travel were drawn from the cost analysis completed in 1993 by Miller and Moffet for the National Resources Defense Council.

Exhibit 9A-1 presents emission rates for all three modes on a per passenger mile basis.

Exhibit 9A-1: Emission Rate by Transportation Mode
Grams per Passenger Mile

	Automobile	Airplane	Rail
CO_2	430.0	273.3	172.0
Volatile Organic Compounds	2.680	0.145	0.160
CO	16.400	0.461	0.600
NOx	0.900	0.209	0.900
Particulate Matter	0.008	Not Applicable	0.080
Road Dust	0.879	Not Applicable	Not Applicable
SOx	0.027	Not Available	0.051

Source: Compiled by WSDOT State Rail and Marine Office based on multiple sources.

Health Impacts Due to Air Pollution

Small and Kazimi (1995) also offers the most compelling analysis of potential health impacts. They assessed both the illness (morbidity) and death (mortality) that could be attributed to tailpipe particulate and ozone emissions. The cost estimates they developed reflect the increased expenditures on health care, the value of lost work time, and the number of deaths that can be attributed to each component of vehicle emissions. These results, summarized in Exhibit 9A-2, were the basis for the cost estimates applied to all travel modes in the current study.

Exhibit 9A-2: Estimated Health Impact Costs per Gram of Emissions

	Low Cost Estimate	High Cost Estimate
Volatile Organic Compounds	$0.002	$0.003
NOx	$0.006	$0.012
Particulate Matter	$0.051	$0.110
Road Dust	$0.017	$0.037
SOx	$0.055	$0.121

Source: Compiled by WSDOT State Rail and Marine Office based on multiple sources.

The variation between the low and high cost estimates is driven by differing assumptions about the monetary value of the human lives lost to air pollution. The lower estimate of cost corresponds to a value of $2.1 million per life, while the higher estimate is driven by an assumption that an average human life has a value of $4.3 million.

While it may seem stark in its implications, placing a value on human life is an essential component of measuring the magnitude of external costs. If the increased mortality risks associated with pollution are not quantified, then the full costs of each mode will be systematically understated. Economists have adopted several different approaches to developing an estimate for the value of a life. How much more are construction workers paid to take on more risky job assignments? The tradeoffs made between increased pay and increased risk imply an underlying value of life. Alternatively, survey methods can also be used to develop value estimates that are more representative of the general population.

Although the estimates developed by Small and Kazimi reflect costs in a relatively high-density urban area, they were directly applied to the emissions data reported for each mode. This approach may overstate costs somewhat for travel in rural areas, but the I-5 corridor is characterized by high-density areas.

Climate Impacts/Global Warming

Beyond their immediate impact on human health, fossil fuel emissions have also been linked to changes in global climate. While global warming is clearly an area of controversy, if human activity is affecting the overall climate, then transportation is clearly a major contributory factor. Fossil fuel emissions are a major source of carbon dioxide and other greenhouse gases. Linking emissions to changes in climate and the economic impacts that result from such changes is a nearly impossible task. As a result, attempts to quantify the impact of greenhouse gases have focused on the cost of technologies that can be used to reduce emissions. Although they use the same basic methodology, these types of analyses have produced an extremely wide range of potential impacts.

The Environmental Protection Agency's 1997 Federal Highway Cost Allocation Study Final Report notes that "The Intergovernmental Panel on Climate Control has concluded it cannot endorse any particular range of values for the marginal damage of CO_2 emissions on climate change, but noted that published estimates range between $5 and $125 (1990 dollars) per metric ton of carbon emitted." Using the lower range of these alternatives places this study's overall cost estimates within the ranges established by previous research.

Noise Pollution

The available estimates of noise pollution impacts are largely based on studies of how property values are affected by proximity to roads, airports, and train tracks. The impact on property values is taken as a measure of how much individuals are willing to pay to avoid exposure to high levels of noise. By focusing on property values, these studies limit impact estimates to residents and ignore the effects of noise on other users and other non-resident groups. This implies that the available studies likely understate the overall impact of noise. This understatement applies to all travel modes and should not bias the overall results in favor of any particular mode. One should also note that many of these studies have been conducted in areas where some type of mitigation has been installed, so the available cost estimates already recognize that some portion of noise impacts have been internalized. Exhibit 9A-3 presents summary of noise costs by mode based on compiling data from multiple sources.

Exhibit 9A-3: Cost of Noise per Passenger Mile by Mode (2008 Dollars)

	Low	High	Average
Air	$0.002	$0.016	$0.009
Rail	$0.001	$0.004	$0.003
Highway	$0.001	$0.006	$0.004

Source: Compiled by WSDOT State Rail and Marine Office based on multiple sources.

Unit Environmental Cost by Transportation Mode

Based on emission rate per passenger mile and cost per gram of emission, WSDOT calculated the unit costs of environmental emission per passenger mile by transportation mode. WSDOT then added the noise costs to the table. Exhibit 9A-4 presents unit environmental costs by transportation mode.

Exhibit 9A-4: Environmental Costs per Passenger Mile by Mode (2008 Dollars)

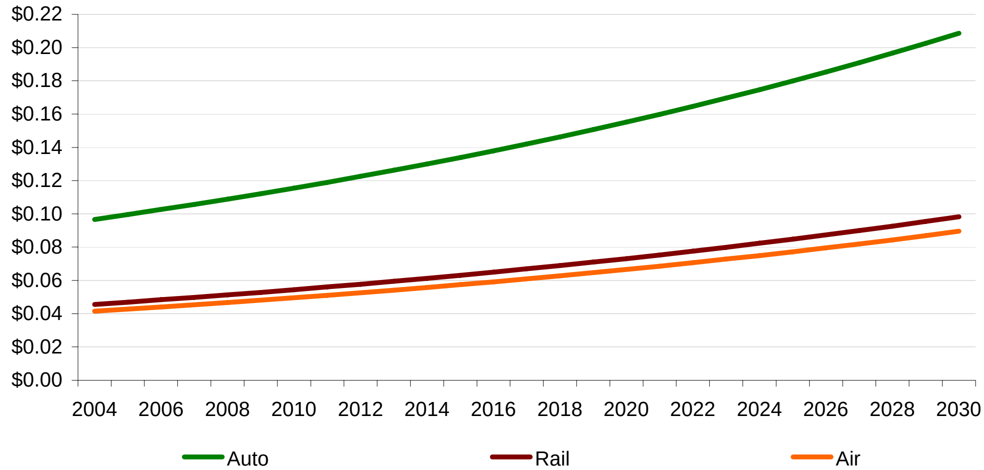
Pollutants	Automobile	Airplane	Rail
CO_2	$0.046	$0.029	$0.018
Volatile Organic Compounds	$0.006	$0.000	$0.000
CO	$0.001	$0.000	$0.000
NO_x	$0.012	$0.003	$0.012
Particulate Matter	$0.001	N/A	$0.010
Road Dust	$0.034	N/A	N/A
SO_x	$0.003	N/A	$0.006
Noise	$0.006	$0.016	$0.004
Total Environmental Cost	***$0.11***	***$0.05***	***$0.05***

Source: Compiled by WSDOT State Rail and Marine Office based on multiple sources.

Environmental Cost Estimates by Mode

Exhibit 9A-5 summarizes the cost estimates that were used as a base for each environmental factor considered in the cross-modal cost analysis.

Exhibit 9A-5: Comparison of Environmental Costs
($ per Passenger Mile)



The results presented in this table have been escalated at the rate of inflation and represent current dollar estimates of costs for each year in the planning horizon. Notice that environmental costs are significantly larger for highway travel than for either rail or air. In 2008 highway costs are estimated to range from 11 cents per passenger mile, while rail costs are estimated to be 5 cents per passenger mile. Environmental costs for air travel are just 5 cents per passenger mile.

Appendix 10: Acronyms

Amtrak

*Am*erican *Tr*avel by Trac*k*

B.C.

British Columbia

BNSF

BNSF Railway Company

CEVP

Cost Estimate Validation Process®

CN

Canadian National Railway

CO

Carbon Monoxide

CO_2

Carbon Dioxide

CRA

Cost Risk Assessment

EIA

Energy Information Agency

EMD

Electro-Motive Diesel

EPA

Environmental Protection Agency

ESHB

Engrossed Substitute House Bill

ETMS

Electronic Train Management System

FFY

Federal Fiscal Year

FRA

Federal Railroad Administration

FY

Fiscal Year

I-5

Interstate 5

ICC

Interstate Commerce Commission

MAX

Tri-Met’s light rail in Portland

MP

Milepost or railroad milepost

MPO

Metropolitan Planning Organization

NEPA

National Environmental Protection Act

NO_x

Nitrogen Oxides

NSC

National Safety Council

OEA

Office of Economic Analysis of Oregon

OFM

Office of Financial Management

OTP

On-Time Performance

PM

Particulate Matter

PNWRC

Pacific Northwest Rail Corridor

RCW

Revised Code of Washington

RTC

Railroad Traffic Controller

RTPO

Regional Transportation Planning Organization

SO_x

Sulfur Oxides

ST

Sound Transit

Talgo

Renfe Talgo of America

UP

Union Pacific Railroad

UPO

Urban Planning Office

U.S.

United States

U.S.D.O.T.

United States Department of Transportation

VO_x

Volatile Organic Compounds

WSDOT

Washington State Department of Transportation

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Appendix 12: Glossary

The terms below are featured in the *Amtrak Cascades Mid-Range Plan* and are defined in the context of the railroad industry and economic theory.

Benefits

Positive contributions from an economic activity or project. Public benefits resulting from enhanced Amtrak *Cascades* service include congestion relief, improved safety, and reduced greenhouse gases.

Bypass

A track that goes around other rail facilities (bypasses them) or provides a more direct route between two points. A bypass may be as simple as a track that goes around a small yard, or as significant as a complete route revision.

Cab car

A cab car is a locomotive without power.

Capacity

The number of trains a specific section of railroad track can carry over a given time frame, or the number of people a passenger train can carry between two stations.

Capital costs

One-time costs required to construct or improve the rail line, including the purchase of train sets, track improvements, station rehabilitation, and design and administrative costs associated with these improvements.

Capital investment

Investment in a capital project with an expected rate of return determined by the amount, timing, and riskiness of the funds expected from the investment.

Capital project

A one-time infrastructure investment project that usually includes design, construction, and administration (i.e. new train sets, track improvements, station rehabilitation, capitalized maintenance).

Capitalized maintenance

A large maintenance project, such as the replacement of rail, ties, and ballast, that is undertaken when an asset has reached the end of its useful life.

Centralized Traffic Control

An electronic system that uses remote controls to change signals and switches along a designated portion of railroad track.

Commuter rail

A type of passenger rail service that travels between a central city and its suburbs. Sound Transit's *Sounder* is an example of a commuter rail service. The average trip length is around 20 miles.

Comparative advantage

The ability to produce a particular good or service at a lower opportunity cost (the value of the next best alternative foregone as the result of making a decision).

Congestion

A condition on any transportation network as use increases. It is characterized by slower speeds, longer trip times, and increased waiting lines.

Consist

The number of cars forming a train set, not including the locomotive or cab car.

Corridor

Any designated land area which is between two geographic points, suitable for the movement of people and goods by one or more modes of transportation. The Pacific Northwest Rail Corridor is a federally designated rail corridor in use by Amtrak *Cascades*.

Cost escalation

A concern with capital projects, especially projects that can take a long time to develop, due to uncertainties such as real estate, fuel, and construction costs.

Cost validation

A process to identify and address the root causes of cost escalation, and to develop more accurate capital project cost estimates, especially in the medium- and long-terms. The WSDOT State Rail and Marine Office uses Cost Risk Assessment (CRA) and Cost Estimate Validation Process (CEVP) systems to help validate cost estimates.

Crossover (and power crossover)

A set of turnouts connecting multiple railroad tracks. A crossover allows a train to move from one track to another. A power crossover may be controlled by a Centralized Traffic Control system.

Demand

The amount of goods or services that buyers are willing and able to purchase at various prices, under varied conditions. For Amtrak *Cascades*, ridership at a certain time period is an important demand indicator, as indicated by the number of tickets sold.

Dispatcher

The individual who plans and controls the movement of trains.

Economic efficiency

The allocation of resources that produce the greatest satisfaction of wants within the constraints of scarce resources and technological limits. For example, Amtrak *Cascades* efficiency can be improved through attracting riders in non-peak times through service improvements and marketing.

Economic development

The development of economic wealth and well-being in a community or area.

Economic development policies

Generally designed to improve the quality of life in an area by increasing income, job choices, activity choices, stability through diversification, and amenities.

Effective capacity

A supply and demand indicator, effective capacity is the average occupancy level with peak time and peak section constraints. For example, if the target to be met is 99 percent of the peak riders (1 percent would not be served as capacity is constrained at the peak), the average occupancy loading (peak or non-peak) at 99 percent capacity would be considered the effective capacity.

Effective peak capacity

Calculated as total peak section riders when ridership is at its maximum. A supply and demand indicator, effective capacity is the average occupancy level where one percent of unsupplied demand happens due to peak time and peak section constraints.

Externalities

Unintended consequences or indirect effects created by activities such as traveling. The costs associated with these unintentional actions are not directly charged to any specific individual, but are borne by society as a whole. Environmental costs caused by transportation modes are externalities.

Farebox recovery

Measures the percentage of total operating costs funded by passenger fares.

Federal Railroad Administration (FRA) classifications

A safety standard based on track structure, geometry, inspection, and road bed. The FRA Class IV maximum allowable speed for passenger service is 79 miles per hour. The FRA Class V has a higher standard with a speed limit of 90 miles per hour.

Forecast

A prediction of the future, based on history and key variables such as the population base around train stations, train capacity, and fuel prices.

Frequency

A term used to describe the number of trains that stop at a station each day. For intercity rail, frequent service means that trains serve a particular station at least every four hours.

Goods

Any product or service that increases its usefulness, either directly or indirectly.

Grade crossing (at-grade crossing)

A place where railroad tracks intersect with roads on the same plane or level.

Grade-separated crossing

A place where railroad tracks and roads cross one another, but not on the same plane or level, i.e. bridge overpasses or underpasses.

High-speed rail

A passenger rail service that travels at speeds greater than 125 miles per hour on exclusive right of way. It is economically feasible only in the world's densely populated areas. Japan's Bullet Train is an example of a high-speed rail service.

IMPLAN

A widely used economic impact assessment model based on input-output data published by Bureau of Economic Analysis, U.S. Department of Commerce.

Infrastructure

The physical support system needed for the functioning of a community or society. Infrastructure systems are public and/or private, and include transportation and communications systems, water and power lines, and public institutions including schools, post offices, and prisons.

Intercity passenger rail service

A type of passenger rail service that travels from central city to central city within a rail corridor. Amtrak *Cascades* is an example of an intercity passenger rail service.

Leveraging

The use of funds, investments, or partnerships to gain more funds, investments, or partnerships; the use of credit or borrowed funds to improve one's speculative capacity, increasing the rate of return from an investment, as in leveraging state funds to gain federal funds in grant programs.

Light rail

A passenger rail service that carries a light volume of traffic per trip. Light rail may share right of way on a roadway or operate on exclusive right of way. It may have multiple cars or single cars. Trolley cars and Portland's MAX system are examples of light rail.

Loading factor

A measurement of train occupancy. The percentage of total available seats occupied by passengers between two stations.

Long-distance train

A passenger rail service that serves major transportation centers that are over 500 miles apart. Amtrak's *Coast Starlight* that travels between Los Angeles and Seattle is an example of a long-distance train.

Macroeconomics

Concerned about the performance of the overall economy within the larger context of society.

Main line

A railroad's primary track that usually extends great distances and carries both freight and passenger trains.

Maximum capacity

The highest number of trains that can travel over a section of track or the greatest number people that can ride on a train, based on the available space that exists or will be available after a capital investment.

Metropolitan Planning Organization (MPO)

A federally designated forum for cooperative decision making in a metropolitan planning area. The Rural Transportation Planning Organization (RTPO) is similar for a rural planning area.

Mileposts (or railroad mileposts)

Mileposts (MP) are designations by the railroad indicating the railroad track distance from an established starting point to an ending point. On the Pacific Northwest Rail Corridor (PNWRC) they follow a variety of numbering systems created by BNSF's predecessors, including the Northern Pacific Railway, the Great Northern Railway and the Spokane, Portland and Seattle Railway. For example, on the Seattle-to-Portland segment of the PNWRC, going south from Tacoma the rail mileposts start with MP 0 and end with MP 136 at the Columbia River. Going north from Tacoma the rail mileposts begin with MP 40 and end with MP 0 in Seattle.

Mobility

The availability and reliability of a variety of transportation modes to complete desired trips or to move people and goods from place to place.

Multimodal transportation system

A system comprised of multiple transportation modes (i.e. aviation, marine, rail, transit, pedestrian) serving the transportation needs of the system area. The terms *multimodal* and *intermodal* are sometimes interchangeable. Multimodal typically refers to people movement. Intermodal typically refers to freight movement.

On-time performance

A key measure of service reliability, the number of times or percentage of times that a train is on-time in meeting its schedule.

Operating costs

Recurring costs of operating a service, including wages, maintenance of facilities and equipment, fuel, supplies, employee benefits and insurance, taxes, marketing, and other administrative costs. Funds used to operate a program or service such as the Amtrak *Cascades* intercity passenger rail service.

Operation investment

Net investment to maintain the operation of a service; the total operating cost minus operating revenue. It is the subsidy for Amtrak *Cascades* service.

Operational efficiencies

Capacity increases or practices that cause a more efficient operation.

Operation revenue

Revenue from ticket, food, and beverage sales.

Opportunity cost

The value of the next best alternative foregone as the result of making a decision.

Option demand

The demand to retain/develop an option for potential use in the future.

Passenger mile

The movement of one passenger the distance of one mile.

Peak ridership

Ridership measured at the point of greatest development, value, or intensity of the route. For the purposes of the mid-range plan, plan peak ridership is calculated as reserved seating plus overflow seating.

Peak segment

Segment at the point of greatest development, value, or intensity of the route. Olympia/Lacey to Centralia is the peak segment of the Amtrak *Cascades* Seattle to Portland route.

Positive Train Control

A modern railroad signal system that monitors and controls train movements to provide increased safety.

Public benefits

Benefits to society.

Rail

A rolled steel shape, commonly a T-section designed to be laid end-to-end in two parallel lines on cross ties or other suitable supports to form a track for railway rolling stock.

Rail yard

A system of tracks within defined limits, designed for storing, switching, cleaning rail cars, making up trains, and other purposes.

Reliability

A service measure that includes on-time performance used in transit planning. If a train or bus arrives at its final destination within five to ten minutes of its scheduled time, it is considered reliable. Reliability can be impacted by congestion on the tracks, delays at stations, and equipment malfunction.

Revenue

The amount of money received from goods or services in a given period.

Ridership

The number of passengers who ride on a public transportation system.

Right of way (ROW)

A strip of land for which an entity has a right to build, operate, and maintain a linear facility such as a road, railroad, or pipeline. In the Pacific Northwest Rail Corridor, BNSF owns the right of way. Amtrak, WSDOT, and Sound Transit run their trains on BNSF right of way through operating agreements.

Rolling stock

A collective term that describes all the train vehicles that move on a railway. It usually includes both powered and unpowered vehicles, for example locomotives, railroad cars, and passenger coaches. The term is sometimes used to refer to only non-powered vehicles (excluding locomotives). The term contrasts with *fixed stock* (infrastructure), which is a collective term for the track, signals, stations, other buildings, etc., necessary to operate a railway.

Seasonality

Any predictable change or pattern in a time series that recurs or repeats over a one-year period can be said to be seasonal.

Segment

A portion of the Pacific Northwest Rail Corridor, such as the Seattle to Portland segment.

Service recovery

The ability to effectively address customer/passenger concerns, demonstrating a commitment to customer service.

Siding

An auxiliary track located next to a main line that allows a train to move out of the way of an oncoming train. Sidings are also used to store trains or to add/subtract rail cars.

Slow order

A speed restriction placed by railroad management on a designated segment of track due to its condition. A slow order, usually temporary in nature, can cancel or severely delay train service (i.e. track damage due to a winter storm, track maintenance in process).

Socioeconomic

Pertaining to the relationship between economic activity and social life; concerns such as environmental sustainability, poverty, emergency management, public safety, and justice.

Station

A place where people get on and off passenger trains. Stations can consist of simple platforms or enclosed buildings.

Station on-offs

A measurement of traffic volumes per train station, determined by the number of passengers who get on and off trains at each station along the Amtrak *Cascades* corridor.

Sunk costs

Sunk costs are costs that cannot be recovered once they have been incurred. If there is no additional investment to complete projects that increase service capacity, then the cost of the uncompleted projects are lost or sunk.

Supply and demand

The market relations between prospective sellers and buyers of a good (product or service).

Switch

The component of a turnout consisting of switch rails and connecting parts providing the means for making a path over which to transfer rolling stock from one track to another. The switch may be thrown manually or electronically.

Terminal

A place where trains load or unload passengers or goods (freight). A terminal is larger than a *station*, which has a more limited scope.

Through-ticketing

One ticket for multiple transportation modes to multiple segments of a trip.

Time saving effect

An effect used in ridership analysis. The ridership analysis (Appendix 4) notes in Options 2 through 4 that for each 1 percent of time savings due operational and infrastructure improvements, ridership increases by 1.58 percent.

Timetable

The authority for the movement of regular trains subject to railroad operating rules. It may contain classified schedules and include special instructions.

Total investment

The sum of investments in capital projects and train operations from all funding sources.

Total public investment

The sum of investments in capital projects and train operations from public funding sources.

Track

An assembly of rails, ties, and fastenings that are used to move trains.

Track capacity

The number of trains a given segment of railroad track can carry over a given timeframe.

Train

A line of railroad cars coupled together and pulled or pushed by a locomotive.

Train set

The set of cars on a train including the passenger cars, dining/Bistro car, baggage car, and power car, but *not* including the locomotives and cab car.

Transit

Mass transportation by bus, rail, or other transportation mode, which provides general or special services to the public on a regular and continuing basis. It does not include school buses, charter buses, or sightseeing tour services.

Travel time

The elapsed time between the beginning and end of a trip. It includes travel, transfers, and waiting time.

Travel planner

An online service for multimodal travel planning, providing connectivity with multimodal transportation, accommodations, and other resources. There are many kinds of travel planners. The Washington State has a travel planner on www.experiencewa.com.

Viability

In economic development, viability indicates the ability of benefits to cover costs in development projects. In environmental conservation, viability indicates the ability of a conservation target to persist for many generations or over long time periods.

Appendix 13: WSDOT Responses to Stakeholders' Comments or Questions

Chapter 1

Comment

In the mid-1980s, the idea of the State being involved in passenger train service was met with derision by some in the Legislature and coolness by many within WSDOT. A few years later, some in the Legislature and others in the WSDOT felt the extremely expensive and technologically-unproven leap to a Maglev system was the direction the State should go in high-capacity intercity ground transportation. WashARP [Association of Railroad Passengers, the Washington Chapter is now called All Aboard Washington] argued the successful European and Japanese high-speed train systems did not arrive as "quantum leaps", but were a result of incrementally building from slower, older steel-on-steel conventional railroad technologies. Following a trip to Europe by some Legislators and WSDOT employees, indeed the incremental "building-blocks" approach was seen as most appropriate and doable for investment by our state in the Northwest Corridor. AA WA fully endorses this approach.

While AA WA [All Aboard Washington] would prefer Option 4, "…policymakers willing to promote rail as a strategic component….", as is the case in the remainder economically-developed world outside North America, Option 3 "Incremental Strategies" are realistic political and economic goals.

WSDOT

WSDOT worked hard to provide policymakers with fact-based, objective analysis for informed decision making in continuing Amtrak *Cascades* incremental development.

Comment

There is no discussion of how this plan relates to and fits into other plans and planning efforts either at the state, regional or local level. This is a major omission in the Amtrak *Cascades* Mid-Range Plan. How does this plan integrate into and support the policy goals and objectives of the Washington Transportation Plan? This plan also has considerable relevance at the regional and local level, given that the *Cascades* passenger rail service operates up and down the I-5 corridor in

Washington State. The description of the Public Involvement in Chapter One indicates that there was participation by Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Organizations (RTPOs) in the "Stakeholders" outreach. However it isn't clear to what extent, if any, this plan integrates into or supports regional plans prepared by MPOs/RTPOs under state and federal planning mandates.

WSDOT

We added a new section clarifying the mid-range plan's relationship with the *Washington Transportation Plan* and the *Long-Range Plan for Amtrak Cascades*. To develop the mid-range plan at the local and regional levels, WSDOT coordinated with MPOs, RTPOs, and with other state, regional, tribal, and local stakeholders.

Comment

Inclusion of the language "…the draft plan was available for two weeks for public review and comment, followed by final approval by WSDOT executive management" within the draft suggests that there will be no consideration of or meaningful response to comments received, that comments are only being taken as a matter of form. Further, it is not clear whether the Plan was made available for "public" review and comment as stated or was only e-mailed to the stakeholders' group (which is how I received it). It does not appear to have been posted on WSDOT's Web site or otherwise distributed for open public review. This approach tends to devalue the public participation process.

WSDOT

The mid-range plan included communication and stakeholder involvement throughout the planning process with stakeholder advisory committee opportunities for participation and feedback. Their participation is documented in Appendix 2: Advisory Group Meetings.

Chapter 2

Comment

While teaching economic geography at the University of Wisconsin in the early 1970s, I cited the Northwest Corridor, that served by today's Amtrak Cascades, as the textbook case for an environment where passenger rail service should have a significant role in intercity transportation. As stated in the Plan, much of and a growing percentage of the population of the Pacific Northwest lives in close proximity to the I-5, BNSF Mainline Corridor. The geographic pattern of "linear density", with major and minor population nodes about 30 miles apart, from Eugene to Vancouver BC, is model spatial environment for passenger trains.

While neither trains nor more lanes will “cure” traffic congestion, particularly if the highways are seen as “free”, passenger train service offers an alternative to the increasingly unpleasant and congested highways and airways. I am very pleased WSDOT is now acknowledging the potential affirmative impact trains can have to reduce the supposed demand for more runways and short-hop flights as well as an alternative to I-5.

Tragic that the recent multi-fatality event near Los Angeles appeared necessary to move action on HR 2095 and accompanying HR 6003. Assuming appropriations for HR 6003, the bills would have very positive effects on both safety and development of America’s freight and passenger railroads.

WSDOT

Linear density is a good term to describe the condition of the I-5 corridor and adjacent Pacific Northwest Rail Corridor.

Comment

“Economic development…would embrace transportation strategies to change driving patterns and develop infrastructure that includes transportation options.” This is debatable as applied to Amtrak Cascades service. The outbound routes, particularly to Oregon where there is notably no sales tax, probably represent retail and tax leakage for Washington businesses (later in the Plan, it’s noted that over 80 percent of Cascades trips are leisure-based). In this sense service is not a boon to, but provides competition with, economic development in Washington State.

WSDOT

This section was revised. Economic driving factors impact Amtrak *Cascades* development and address congestion through the modal shift toward intercity passenger rail. The mid-range plan shows how highway congestion occurs as a result of Amtrak *Cascades* development.

Comment

Competition with air service is discussed in the fourth paragraph, stating that “intercity passenger rail service…could potentially ease air travel congestion…and it could reduce the number of flights between cities.”

Headquartered in the City of SeaTac, Alaska Air Group, Inc. (dba Alaska Airlines and Horizon Air) is not just one of SeaTac’s and King County’s, but also the state's largest employers, with around 14,000 employees. *Washington CEO* magazine lists it among the "top public companies" in Washington. According to Alaska's 2007 annual report, it relies on a limited number of key markets as a primary strategy of its business focus. "A significant portion of our flights occurs to and from our Seattle hub. In 2007, traffic to and from Seattle accounted for 62% of our total traffic. …we remain highly dependent on our key markets. Our business would be harmed by any circumstances causing a reduction in demand for air transportation in our key markets. An increase in competition in our key markets could also cause us to reduce fares or take other competitive measures that could harm our business, financial condition and results of operations." The downward economy is already pressing on Alaska; its November 2008 Securities and Exchange Commission filing reports that the company is 'reducing planned capacity at both Alaska and Horizon for the fourth quarter and in 2009. …the global financial instability has put downward pressures on demand for air travel and results in a great deal of uncertainty…" Although not all market data is readily available on Alaska's Web site, Alaska cites an almost 88 percent market share of trips from Portland to Seattle.

WSDOT

The plan shows the socioeconomic context of Amtrak *Cascades* development, that even small modal shifts can make a difference in highway congestion and socioeconomic trends. Individual businesses were not analyzed in this plan due to resource constraints.

Comment

Despite the LA tragedy, the data have shown passenger rail travel to be much safer than the "….relatively safe mode…" mentioned on page 2-6. The debate seems to be only whether one is 10, 20, or 30, times less likely to suffer a fatality in an intercity passenger train than in private motor vehicle, per million passenger miles.

AA WA will continue to emphasize this somewhat stark reality when advocating for more investment in passenger trains.

WSDOT

The section was revised and enhanced with National Safety Council data.

Comment

The environmental, fuel-efficiency, and community-building and preservation benefits of passenger trains, particularly in comparison to more highways and when near-total reliance on private motor-vehicle travel are considered. Again, we of the rail advocate community need to emphasize these benefits to transportation decision-makers.

WSDOT

Many of the benefits you mention are part of the socioeconomic context of Amtrak *Cascades* development that we analyzed in this plan.

Comment

The discussion of the University of California comprehensive life-cycle passenger transport assessment indicates that "High Speed Rail can perform better than automobile and aircraft, but only if ridership is optimized." This is a key point and should be noted more prominently at the introduction of this section. We also wonder about the validity of the analysis from this University of California Study, which is based upon analysis from the Cal Train commuter rail service, which is a 47 mile commuter rail corridor from San Francisco-to-San Jose, and comparing it with the Amtrak Cascades passenger train operation in Washington State, which is a 300+ mile corridor (including the entire Oregon segment of this service). Care should be taken in drawing comparisons between these two different types of passenger rail operations and the environmental benefits that they could derive.

WSDOT

The life-cycle assessment does not directly compare intercity passenger rail service because Caltrain is a commuter passenger rail service. However, some comparisons with Caltrain as a diesel-based passenger rail service can be made. Mass transportation such as buses, trains, planes, and ships are generally most sustainable when full and least sustainable when empty. Maximizing ridership and building service capacity are key to an efficient and sustainable transportation system.

Comment

This suggests that investing $1B in rail will not only result in 20,000 new jobs but that all of those jobs will have positive impacts upon global warming and clean energy. This is unlikely.

WSDOT

The statement was corrected to state that a $1 billion investment will generate about 20,000 new jobs. This estimate is based on input-output data, the U.S. Department of Commerce, Bureau of Economic Analysis.

Comment

Demand for a good or service is something that might be expected to occur organically, but based on information discussed at the stakeholders' meeting, demand for Amtrak Cascades service appears to be strongly tied to marketing. This is more strongly put on p. 2-8, "A cultural shift will need to take place across America to encourage our citizens to take…passenger rail…" This relationship and influence should be disclosed in the context of driving ridership growth.

WSDOT

Improvements and cultural shifts can increase ridership, but the optimization of Amtrak *Cascades* ridership based on available service capacity is strongly tied to marketing. Chapter 9 discusses the marketing role in Amtrak *Cascades* development.

Comment

This appears to be an incomplete introductory sentence, what are you trying to say here?

WSDOT

The sentence was deleted. The section title, Consumer and Travel Industry Trends, speaks for itself.

Comment

Generally, the Plan is organized in a rather confusing manner. It seems as though it would be beneficial to look at reediting similar or related portions of the information presented, which are located in various portions of the document, into single sections. The bullets on pp. 6-1 & -2 stating the purpose of the mid-range plan options seem more appropriately brought to the front of the document as purposes of the plan overall. Additionally, as there are numerous acronyms included in the Plan that may or may not be familiar to end users, it would be helpful to include a list of acronyms in the prefatory material. A list of acronyms is slated as Appendix 10 (missing from draft), but relocating this information to the front would improve the document's readability.

WSDOT

The *Amtrak Cascades Mid-Range Plan* is atypical, more an economic policy study than a standard transportation plan. The mid-range plan purposes are stated in the Executive Summary and in Chapter 1. The options are moved to Chapter 2. Acronyms are defined anew in each chapter and are listed in Appendix 10.

Chapter 3

Comment

There is discussion in this plan about the growth in travel on the Interstate 5 corridor in Washington State and how the increase in Amtrak Cascades service under Options Two, Three and Four will help alleviate or reduce congestion. Although an increase in Amtrak *Cascades* passenger service could indeed help provide viable alternative travel options for users on the I-5 corridor in Washington State, it does not appear that the level of increased passenger train service will be able to divert enough travelers off I-5 to really reduce congestion on the I-5 corridor. The current (2007) ridership figures of 676,760 passengers that used the Amtrak *Cascades* passenger rail services suggests an (average) daily ridership of approximately 1,854 passengers. The growth in ridership as suggested in Exhibit 3-5 suggests that annual ridership could top approximately 700,000 annual riders by years 2018 to 2020. This is a respectable level of ridership but only translates into approximately 2,000 daily riders, which would not divert enough drivers away from I-5 to effect a reduction in congestion on I-5.

Further explanation of the cross-modal analysis is needed in order to justify the claim a ramp-up of Amtrak *Cascades* passenger rail service, particularly in Option Four, will really help alleviate (or reduce) congestion on the I-5 corridor

WSDOT

(The response to this comment actually belongs with the chapter that discusses congestion and cross-modal analysis. The inference the reviewer makes about Exhibit 3-5 and ridership has been corrected.)

Annual Amtrak *Cascades* ridership from 2007 encompasses ridership for the entire corridor from Vancouver, B.C. to Eugene, Oregon. Exhibit 3-5 only portrays peak ridership associated with the minimal investment of Option 2 for a subset of the Amtrak *Cascades* corridor between Seattle and Portland. Passenger rail alone cannot alleviate highway congestion but can provide a marginal reduction in road traffic.

Comment

"Ridership Distribution" - Page 3-3: The discussion here about station passenger volumes and "on/offs" at specific stations should also include some discussion and acknowledgement of parking needs at Amtrak stations along the corridor. While many *Cascades* riders will use public transit to access local stations, there are many who will drive as well and will need to park. The analysis of existing and future projected parking demand at specific Amtrak *Cascades* stations should also be included in the summary of "Parking Availability" at Amtrak *Cascades* Stations as shown in Exhibit **8-2** in Chapter 8.

WSDOT

Current parking for Amtrak *Cascades* stations is discussed in Chapter 8. The mid-range plan timeline and resources did not allow for time to analyze current and future parking demand.

Comment

Exhibit 3-3 – "Amtrak Cascades On-Offs by Station – 2007" - Page 3-5: It would be helpful to have either a numerical or percentage reference provided on the graphic here. It appears to link to the numerical/percentage summary of Station "On/Offs" shown in Exhibit 3-2, but it isn't clear if this is so.

WSDOT

Percentages for station on-offs were added to the pie chart in Exhibit 3-3.

Comment

"Factors that Drive Ridership Growth" - Page 3-6: The third paragraph in this section discusses the idea that in general, passengers are sensitive to ticket pricing. Therefore they might switch modes if they can save money by switching to other travel times. This will be an important factor to consider in the development of the marketing and business development plans for expanding the Amtrak *Cascades* services in the future and in the effort to obtain maximum ticket revenue yield from each ticket sale. This pricing discussion should also discuss how prices for competing modes (highway/air) might change in the future. What will be the impact, for example, on highway travel, from more fuel-efficient or new fuel technology automobiles? How might higher (or lower) air fares impact corridor travel on the Amtrak *Cascades* as well?

WSDOT

The time and resources to adequately address extensive pricing scenarios were not available for the mid-range plan. This includes how pricing and costs of other modes of travel may change passenger rail. We intend to address ticket pricing and demand in future work.

Comment

The marketing and business development plan for the Amtrak *Cascades* services should identify the different market sectors for this service (leisure/business travel) and their sensitivity to ticket price in order to maximize ticket revenue yield without potentially reducing future growth in ridership.

WSDOT

The time and resources to adequately address extensive pricing scenarios were not available for the mid-range plan. This includes how pricing and costs of other modes of travel may change.

Comment

The fourth paragraph in this section mentions the planning effort for the new I-5 Columbia River Bridge crossing between Portland and Seattle. This section also states this project will be tolled and that "This project has the potential of furthering rail passenger growth between Portland and Seattle." What is the basis of this statement and what analysis supports it?

WSDOT

The draft states that tolling is being considered for the I-5 Columbia River Bridge. Tolling expenses, in similar fashion to rising gasoline prices, increase the cost of automobile travel, and make rail passenger service relatively less costly to automobile travel. Rising gasoline prices have contributed to the record Amtrak *Cascades* ridership this past year.

Comment

Reference is made to "population based upon driving time from Amtrak stations" as a factor in determining the baseline forecast. I am aware that our staff attending the last stakeholders' meeting expressed skepticism as to the reliability of growth forecasts in the area of stations as a predictor of actual growth and, in turn, its relationship with ridership. This appears to be addressed further in the appendices that have yet to be included. One means of testing the reliability of this approach relates back to an earlier statement made on p. 3-3: "Station volumes can assist local planners and businesses in determining population levels using a local train station." Similarly, station volumes, or the "on-offs" as shown in Exhibit 3-2, could provide a basis for testing the validity of assuming that increased population within a certain drive time of stations results in heightened ridership. Is there a correspondence between current on-offs and proximate population density in those areas? If not, then perhaps population forecasts are not the most reliable basis for determining future demand.

WSDOT

On-offs provide a measurement of train station use. They do not provide sufficient detailed history to define specific passengers riding a selected

Amtrak *Cascades* run such as the Seattle to Portland segment. For example, the on-offs for the Seattle station also includes passengers travelling to destinations north of Seattle. Portland's on-offs includes passengers travelling south. On-offs for all stations also include passenger volumes created by travel on Amtrak's *Empire Builder* and *Coast Starlight* trains.

The criticism expressed at the October 1 stakeholder's meeting focused more on the use of population estimates and projections developed by the Washington State Office of Financial Management (OFM) rather than the use of a population variable in the ridership demand model. OFM official population estimates and projections are considered a standard source and are used extensively by many state and local governments to allocate revenues and for developing forecasts.

Potential predictor variables for forecasting are screened for existence of both history and projections of the variable. OFM population estimates and projections satisfy this requirement while on-offs lack a forecast that would be independent of ridership. As suggested for analysis, the correspondence between on-offs and the drive-time population variable measured a correlation coefficient of 91 percent.

Comment

Marketing is not discussed as a factor that drives ridership growth (p. 3-6). However, it was clear to our staff attending the last stakeholders' meeting that marketing is seen as a crucial and primary driver of ridership growth; and that lacking marketing, ridership growth would stall. (Correspondingly, a marketing component is included in the plan.) Demand for a good or service is something that might be expected to occur organically, but based on information discussed at the stakeholders' meeting, demand for Amtrak Cascades service appears to be strongly tied to marketing.

WSDOT

We discussed marketing in more detail in Chapter 9. One of the planned activities is tracking the marketing effect by establishing performance measures.

Comment

The data serving as the bases for this chapter give concrete evidence of the success of the Amtrak Cascades program. Indeed, the most common concerns heard from members of AA WA and other potential riders of the trains are not train speeds, quality of service, or even the sometimes on-time problem, but the elementary fact that….”We need more trains!”.

Record per-month ridership extending into October continues to reinforce this issue. While such objective measures as scheduled times, OTP, gasoline prices, etc. apparently can predict ridership changes, it would be instructive to know how many "new riders" resulting from, say, $4.00/gallon gasoline would continue traveling by train as gasoline prices fall, believing that "taking the train" is seen as preferable to driving I-5.

WSDOT

We do not have sufficient data to measure the retention of "new riders" as the price of gasoline dropped at a record pace since July 2008. The model for Seattle to Portland does incorporate a moving average for price variable for gasoline which tends to smooth out the forecast for ridership demand as prices change abruptly. We will continue to monitor gasoline prices and determine the response of ridership to changing prices.

Chapter 4

Comment

Does the Federal Railroad Administration (FRA) or the Association of American Railroads (AAR) maintain this type of historical cost information for rail infrastructure projects?

WSDOT

No, they do not.

Comment

Exhibit 4-1 on p. 4-4 could be improved by adding a column indicating the amount currently funded (if any). As this section progresses into discussion of specific projects beginning on p. 4-6, it's clear there are funding disparities.

WSDOT

The table is very busy already and so this information will not be added.

Comment

Wherever projects for "Vancouver" are discussed – such as on p. 4-6 – it would make it more clear to add "Wash." to differentiate between the city in our state and Vancouver, BC, since it is also addressed within the service area.

WSDOT

This report uses Vancouver, B.C. to differentiate between the two cities.

Comment

With the construction of the Port of Vancouver's rail bypass, access to the Amtrak station in Vancouver will become more difficult. We would like to see consideration of how that might be mitigated – possibly by moving the station to a more accessible location.

There is no mention of potential service disruptions by seismic damage to important bridges such as the BNSF bridge crossing the Columbia. This is one of the oldest bridges on the route and its loss would cripple the Cascades Service. Yet its planned replacement or retrofitting is not identified in the plan. Is it in the long-range plan?

WSDOT

The Vancouver station also serves the Amtrak *Empire Builder*, which comes from and to Pasco. Relocating this city-owned, historically designated station would lead to a 2-station quandary for passenger and other services such as dial-a-lift, taxi, and hotel shuttles. The long-range plan does include a proposed project to re-construct the BNSF-owned Columbia River Bridge.

Comment

I must address a concern voiced by many of my members who regularly ride the Amtrak Cascades: They question the expenditure of scores of millions to gain six minutes while trading what is essentially the signature scenery of the Seattle-Portland section of the Corridor for among the least-inspiring man-made landscapes in Western Washington. If indeed BNSF has effectively mandated the costly movement of passenger trains from the Shoreline to the Bypass and more round trips are dependent on that, I then will have a valid case to argue with them!

WSDOT

The main reason is to allow for increases in service.

Comment

The second paragraph states that freight trains on the Lakewood line currently serve only Ft. Lewis. This is not our understanding. When Sound Transit entered into an agreement with Tacoma Rail to use the Tacoma-to-Nisqually segment of the line, we were given to understand Tacoma Rail would serve areas within Thurston Co., and we believe users of this line also serve Port of Olympia. However, this information may be outdated.

WSDOT

This has been corrected in the text.

Comment

The funding for design, right-of way and partial construction of this project is available. However the funding for construction of this project is short by approximately $46M. This raises questions about how and when this funding gap might be addressed. Clearly the bids for construction of this project will not proceed until and unless this funding gap is addressed. This project might also need to be included in the Puget Sound Regional Council's regional Transportation Improvement Program (TIP) if <u>any</u> federal funds are included in this project. Other rail projects in the central Puget Sound region that include federal funds will also need to be included in the PSRC Regional TIP.

WSDOT

How and when the funding gap is filled is unknown at this time. The requirement for rail projects to be on the STIP is limited to projects using FHWA and FTA funds, but it is WSDOT's intent that all future rail projects be added to the STIP.

Comment

For instance, the current cost estimate for Ph. 1 Pt. Defiance Bypass is $74.1M (Exhibit 4-1 and p. 4-8) while added text on p. 4-8 shows that $59.8 is funded. Including this information into the table would make it more clear where additional funding is needed.

WSDOT

The table is very busy already and so this information will not be added.

Comment

On p. 4-8, it is stated that "initial work between S. 66th Street and Bridgeport Way is planned to begin construction…in late 2008." Given the funding gap, to what extent is this work capable of being finished? If left in an unfinished state, it is not clear how that would impact our local crossings. We would appreciate further clarification on this.

WSDOT

The four Lakewood and one Tacoma grade crossings that will be affected by the first stages of work will be completed with the funds avaiable. Work south of Bridgeport Way will not start until funding is increased. This has been discussed with Desere Winkler with Lakewood Public Works.

Comment

We suggest using a different photo on p. 4-9. Inserting a photo of seats, particularly as the comfortable seating on Cascades trains have long been a marketing point, under the title "Increase Capacity of Existing Train Sets" immediately leads the reader to the conclusion that more seats will be fitted into existing trains. This, of course, is not the intent of the text that follows, but is a likely first impression just given the title and photo. Using a photo of train exterior may be more on-point.

WSDOT

The photo has been changed.

Comment

While the interchangeability of passenger car equipment and economies of scale associated with nationwide purchases of equipment are considerations in parts of North America, the "tilt-train" technology of the current Talgo train sets allow significantly faster trip times in our distinctively curvy corridor that "conventional" equipment simply cannot match. In addition, the Talgo train cars have proven to be exceptionally reliable and Renfe Talgo of America has, in my experience, proven to be an excellent partner to Amtrak and the State of Washington in the development of the Amtrak Cascades train service.

WSDOT

Noted.

Chapter 5

Comment

It appears the work inherent in Operational Analysis and Costs should be convincing to not only technical readers but State Legislative and Executive decision makers.

WSDOT

The intent of this chapter is to provide fact-based information that has been rigorously analyzed to validate infrastructure needs, anticipated service characteristics, and operating costs resulting from such investments. The mid-range plan provides decision makers with data upon which to make their decisions.

Comment

On-time performance is cited in several places within the Plan. Given the information on p. 4-8, which would have the Pt. Defiance Bypass project shaving six minutes off travel time, and that in Exhibit 5-1 (p. 5-2, and text on p. 5-3), those six minutes evidently equate to an on-time difference of almost 27 percent. Generally, on-time performance is characterized as a customer service issue; but there is no discussion of the on-time performance penalty clause in the Amtrak/WSDOT contract. This would seem to be the most pressing reason compelling trip time improvement, and it would be much more honest to openly discuss on-time trips as a matter of historic performance within the Plan, particularly as this is already included as a Gray Notebook performance measure. Potentially, this is discussed in Appendix 6 (not included) but would benefit from being brought into a broader discussion of on-time performance in the body of the document.

WSDOT

Current on-time performance (OTP) is a result of many factors, including capacity constraints, slow orders, operating/dispatching decisions, etc.

The Pt. Defiance Bypass project provides additional capacity necessary in the Tacoma area to expand service frequencies. The existing alignment has capacity limitations with the single track Nelson Bennett tunnel, Port of Tacoma traffic, and through freight traffic. This area is a bottleneck/ chokepoint that delays trains consistently. The primary reason for the improvement in on-time performance tied to the Pt. Defiance Bypass project is the capacity improvements that will be gained. The time savings are an additional benefit of being able to travel faster through that region.

The operational modeling performed indicates that these major capacity improvements, coupled with reliability improvements as discussed in Chapter 5 and in Appendix 6 (discussion on slow orders, capitalized maintenance, ETMS, movement planner, etc.), all contribute to a substantial improvement in OTP than currently exists.

While the OTP contract goal between Amtrak and WSDOT is 80 percent or better, as reported in the Gray Notebook, this agreement provides little ability to influence the behavior of the host railroad (BNSF). The October 2008 enactment of a new federal law (Rail Safety and Investment Act of 2008 PL110-432), now provides the federal Surface Transportation Board (STB) with the ability to enforce penalties on host railroads if they do not meet on-time performance standards for intercity rail passenger trains (i.e. Amtrak *Cascades*) that operate on their tracks.

Comment

While BNSF has been and is the most cooperative of North America's Class 1 railroads in working with intercity passenger trains, BNSF does repeat what I regard as the AAR "party line" that the considerable public investments which allow passenger trains on Class 1 property only "….will not negatively impact freight service." I submit the very significant improvements to, in our case, BNSF infrastructure, are permanently in effect, do not go away after passenger trains have passed, and are of direct benefit to freight service efficiency much of the time!

Certainly PTC, now a virtual certainty following HR 2085, will additionally benefit freight and passenger operations, and importantly, railroad safety.

WSDOT

The statement in the text provides a context for what is determined to be an "acceptable" result from an operations modeling perspective. BNSF, and most of the freight rail industry's standard for allowing passenger expansion to occur, is that their own business not be "negatively impacted." The chart that shows hours of delay proves the point. Certainly, the entire system benefits from the investment and all traffic.

Comment

It is not clear what the down side is, or if there is a down side to, simply adjusting the schedule to reflect historic performance patterns, thus creating greater on-time compliance. If a trip is, say, a three-hour trip by its circumstances, and it usually takes three hours to arrive no matter what interventions are introduced, willpower and economizing may not be able reshape it into a two-and-a-half-hour trip; perhaps it's just best to set the expectation that it's a three-hour trip.

WSDOT

"In real time" adjustments also help to manage customer expectations. This seems to be the contemporary standard for airports, where flight schedules are adjusted while planes are in the air; and is reflective of Amtrak *Cascades* onboard scheduling information broadcast to riders, which shows and adjusts anticipated arrival time at the next destination.

Comment

Also, we are given to understand that Sound Transit does own the line between Tacoma and Nisqually; while p. 5-6 states that BNSF owns "the track in Washington State." Please check your sources to be certain the information portrayed here is accurate.

WSDOT

Schedules are developed based upon the operational modeling and are verified and adjusted by actual "check rides". The schedules are set accordingly. Making schedules longer for non-technical reasons lessens the operating utility received from capital investment, causes a ripple-effect throughout the entire schedule that suboptimizes use of equipment, and legitimizes historic operating decisions and practices of BNSF that limit system capacity and throughput. The addition of more service will require a higher level of operating precision than has historically existed.

While it is technically correct that Sound Transit owns the Nisqually to Reservation segment of the corridor, the context of this discussion deals with maintenance activities on the BNSF main lines. Fundamental modifications to current maintenance practices are necessary in order to accommodate all the traffic that is out there with minimal disruption. The Slow Order discussion in Appendix 6 addresses this issue more thoroughly. Maintenance practices on the Sound Transit-owned segment will be negotiated and implemented separately under a yet to be developed operating agreement for that territory.

Comment

"Additional Recommended Reliability Improvements" – Page 5-5: What is the funding status of Napavine – Winlock to Chehalis 3rd Main Track, Kelso-Martin's Bluff – Phase 4 and the Amtrak Seattle Maintenance Facility projects listed here?

WSDOT

The Winlock to Chehalis 3rd Main Track and the Kelso-Martin's Bluff Phase 4 are unfunded and beyond the scope of this mid-range plan.

The Amtrak Seattle Maintenance Facility is under final design and is anticipated to be funded by Amtrak.

Chapter 6

Comment

Again, a North American rail advocate could only hope our transportation decision makers would perceive the multiple values inherent in an aggressive regime of capital investments in passenger rail. INTERNATIONAL RAILWAY JOURNAL monthly summarizes the financial commitments made by the rest of the world in passenger rail systems that by our standards, are already superior. But Option 4, the kinds of investments made elsewhere outside North America, is not probably politically doable here in the near future. Option 3, The "Incremental Strategy" would seen the best to be reasonably sought. AA WA will push for that Option to be realized.

The detail and quality of analysis in this chapter as throughout the Plan is worthy of compliment. The only caveat is that these, like all predictions, are based on current assumptions. Few could have guessed two years ago the national spike in rail ridership, the roller coaster of gasoline prices, the severe economic meltdown now being experienced, or that Barack Obama would be our next President! I remain optimistic that the American people will continue to wake up to the reality that passenger trains need to be the third leg of the stool of personal mechanized transportation, and that "fly or drive" is simply insufficient.

WSDOT

The high gas prices in past several years have many travelers and commuters rethinking their choices of transportation modes. The sharp increase of passenger rail ridership is evidence of such choices. Now the gas prices are starting to decline. WSDOT watches the ridership trends closely and is studying the price elasticity of rail ridership demand. We are very interested in identifying the behavior changes caused by high energy prices and will incorporate the results of the study in future planning.

Comment

Generally, the Plan is organized in a rather confusing manner. It seems as though it would be beneficial to look at reediting similar or related portions of the information presented, which are located in various portions of the document, into single sections. The bullets on pp. 6-1 & -2 stating the purpose of the mid-range plan options seem more appropriately brought to the front of the document as purposes of the plan overall. Additionally, as there are numerous acronyms included in the Plan that may or may not be familiar to end users, it would be helpful to include a list of acronyms in the prefatory material. A list of acronyms is slated as

Appendix 10 (missing from draft), but relocating this information to the front would improve the document's readability.

WSDOT

We have made the following changes to improve the plan organization based on your comments:

- Moved the purposes of options and general descriptions of options to Chapter 2.
- We created a list of acronyms as Appendix 10 and listed it in the table of contents.

Comment

Comparatively, we are not clear about where the costs included in Exhibit 6-1 (p. 6-4) came from. Again looking at the Ph. 1 Pt. Defiance Bypass project, the amounts included in the table under options 2-4 do not align with either the budgeted amount or current cost estimate information expressed earlier in the document (as cited above). From this information, it appears that Ph. 1 Pt. Defiance Bypass would cost less than even the budgeted amount – or, if the budgeted amount was for the entire bypass project and not just Ph. 1, that is not articulated in the earlier information. Please revisit the cost information to be sure that it all aligns.

WSDOT

We completed the final modeling and cost estimates. The costs listed in this table reflect final results.

Comment

The economic impact analysis provided for the options (pp. 6-14 & -15) is superficial and does not go far enough to address this issue, nor to meaningfully express the impacts; and there did not appear to be supporting documentation slated for the appendices beyond the stating in the text that computer modeling was used.

WSDOT

The economic impacts of plan options are assessed using IMPLAN, a widely accepted economic impact assessment model built upon input-output data published by Bureau of Economic Analysis, U.S. Department of Commerce. The methods are widely used by transportation agencies and consultants. The commenter expected project level economic impact assessment from this plan. However, many projects listed in the plan are conceptual or early design stages, detailed information is not available until the project gets funded for its EIS or PE, when more detailed analysis would be available. The plan level economic impact assessment is to provide essential information about economic impacts of plan options.

Chapter 7

Comment

I applaud the content of this chapter in particular. What is done here is a comprehensive look at particularly the wide-ranging benefits resulting from investments in passenger train service. This is extremely important as a tool to educate those (thankfully fewer) public decision makers whose simplistic analyses evoke the conclusion that "we'd be better off buying them a first-class airfare or hiring a limo."

WSDOT

One of the purposes stated in this plan is to provide information to policymakers to consider transportation alternatives as a part of the solution to address multiple ends of public policies. The analysis of benefits and costs is a reflection of WSDOT's effort to provide such information.

Comment

The discussion of "With/Without Principle" on p. 7-2 states that "…with an investment in Amtrak *Cascades* capacity, more people would ride trains instead of driving cars." While it is possible that with some marketing work, WSDOT might be able to achieve a certain degree of mode shift; but capacity investments alone are not going to spur the behavior. (This, in turn, is used as an argument that rail investment equates to I-5 congestion relief on p. 7-5.)

WSDOT

In the analysis, WSDOT used standard economic analysis to measure the cross mode shifts. Elasticity of price and elasticity of time savings are used to analyze economic choices. WSDOT did not make assumptions of any policies that spur the behavior.

Comment

Similarly, the benefits and cost assessment (pp. 7-3 through -7) does not do far enough to probe tax and economic aspects. The outcome data in both chapters does not explore the potential loss to all areas of economic impacts expressed if Alaska Air is negatively impacted, which well may be significant.

WSDOT

Amtrak *Cascades* provides substantial benefits as a return on its investment. It could help reduce congestion because the congestion is sensitive to marginal traffic increase or decrease even if such a change is small. Given the forecasted traffic volumes of Amtrak *Cascades* service (less than one percent of I-5 corridor traffic), the volumes would not be large enough to have ***significant*** economic impacts on other modes.

Comment

The discussion of congestion-relief on I-5 in this paragraph suggests that congestion on I-5 is increasing and that "By removing auto traffic from I-5, incremental services of Amtrak *Cascades* can help relieve the congestion of I-5." This discussion goes on to cite analysis of the benefit of congestion reduction on I-5 and implies that incremental increases in Amtrak *Cascades* passenger rail service could occur if there are traffic reductions of 5, 10 and 20 percent respectively on I-5. This is misleading since this discussion does not specifically indicate how and if increases in Amtrak *Cascades* services will achieve these defined percentages of traffic reduction on I-5. Additional clarification is needed here.

WSDOT

In Appendix 8, the traffic volumes diverted from I-5 are listed in Exhibit 8A-3. The basic assumption is that as overall traffic volumes in the I-5 corridor increases, increased Amtrak *Cascades* services share pressure with other modes such as air and highway. Without the existence of Amtrak *Cascades*, the congestion pressures would be larger for other modes. By diverting some traffic away from other modes, Amtrak *Cascades* helps relieve congestion. Although the volumes diverted from I-5 by Amtrak *Cascades* is small, such diversion of traffic could help reduce congestion on I-5 because the congestion is sensitive to marginal traffic increase or decrease even if such a change is small.

Comment

As previously noted, Option two, "Incremental Strategy One – Minimum Capital Investment" has the highest operational benefit-cost (B/C) ratio of 2.7. The incremental (marginal) estimated B/C ratio for Option Two is also highest at 3.4, of the three incremental options. This suggests that if the B/C ratio is key factor in selecting investment options that it might be difficult to move beyond Option Two for future investment, particularly in considerably constrained budget climate in Washington State. Therefore, should the legislature choose to move forward and seek to invest further in the Amtrak *Cascades* passenger rail program, its investment timeline might not match the timeframe of this mid-range plan, given current budget constraints.

WSDOT

First, the benefit/cost ratios are not final as the State Rail and Marine Office are updating its ridership forecasts and operational costs. Second, the benefit/cost ratio is not the only criterion to make investment decisions. Many other decision criteria related to public policy goals are weighed in decision processes by policymakers.

Comment

Why was Option Three used for comparison purposes? Option Four also has heavy capital and operations investments for increasing capacity and improving reliability on the Amtrak *Cascades* passenger rail network. Why wasn't this Option selected for this cross-modal comparison?

WSDOT

Option 3, which has heavy capital and operation investments for increasing capacity and improving reliability, is used to calculate system development/utilization costs because Option 3 reflects the best match of demand and supply. Option 4, which has more intensive investment for capacity and reliability improvements, assumes no financial constraint. Therefore, using Option 4 to represent capital costs would overstate the costs. However, even if Option 4 is used for comparison, the result would be same.

Comment

While Exhibit 7-11 demonstrates precisely the value of rail, rail advocates need to also emphasize the indirect societal, environmental, even personal health costs associated with a society addicted (not too strong a word) to driving absolutely everywhere. Nonetheless, I shall urge rail advocates to make good use of Chapter 7's information.

WSDOT

As stated in Chapter 1, WSDOT aims at providing fact-based and objective information.

Chapter 8

Comment

This addresses what AA WA has for years felt was a shortcoming in our State's public (and private) mass transportation systems. That some tax-supported transportation entities lack even basic information about what should be complementary providers is unacceptable. AA WA would go so far as to mandate any transportation provider, including private operators (as Greyhound), which rents or uses public-supported facilities be required to have available information about other potentially connecting modes. A next step, again mentioned, is to urge coordination of schedules. Finally, and not without costs, physical improvements and added services of public transportation providers are needed to effect connectivity.

Thruway-type bus connections in particular would prove valuable. The great increases in ridership and wide public support for the San Joaquin trains in central California are substantially due to a strong system of thruway buses. Several points on the Cascades Corridor not currently so served are eminently suited to coordinated regional bus connections. Thus, a “backbone” of trains, intersecting with less heavily-traveled “ribs” served by buses constitutes an excellent paradigm for Western Washington’s intercity mass transportation network.

WSDOT

The way that connecting modes work with each other will impact ridership and it is encouraging to see that is supported by a Rail Action User group.

Comment

The report mentions car-sharing services for station area resources, but the analysis is incomplete, as Zipcar provides service to more than just the areas near Seattle and Portland. Vancouver has Zipcar service within walking distance and could have a 'station car' carshare location ('pod') if supported by WSDOT. Zipcar is currently serving the station areas around Portland, Seattle and Vancouver BC. There are other independent car sharing services serving other Cascades stations such as: Community Car (Bellingham) and Cooperative Auto Network (Vancouver BC). This is an under-marketed opportunity for the Cascades service to attract business ridership, especially if they understand they can have quick and affordable access to a vehicle at the end of their trip at many station locations.

The report is silent on station area improvement for bicycling to enhance affordable 'last/ first mile' trips. Installation of bike parking stations, lockers, and bike lane links to area network (as some stations are remote from area bikeways and pedestrian sidewalks). The report only includes a bike parking facility census as part of the larger car parking analysis.

The report also is silent on the necessary enhancement for additional on-demand bike capacity on trains, as the train's baggage car's 5 bike limit is often too little to meet seasonal demands even with a $5 fee. Additional bikes can be brought on board if they are preboxed, but this is more expensive ($15 plus box cost), can damage bikes, and can limit what stations riders use. Nor is there any discussion of improved bike rack designs and service quality such as is found on similar routes, (Amtrak Capitol Corridor and Surfliner routes). These routes do not require advanced reservations or fees (improved convenience) for loading bicycles. Additionally, the 5 bike limit makes it difficult to regional excursion trains for bike groups - these 'bike trains' like the 'ski trains' were an effective tool used by the private train companies to boost non peak ridership.

WSDOT

The example shown for car-sharing was meant to represent an example of alternative services that are available. The research that had been undertaken did not reveal these other locations or other providers, but a suitable change will be made to reflect this.

The aspect on bicycles has been suggested by other stakeholders and their comments have been combined with these to reflect this oversight.

Comment

The report misses mentioning station area improvements for bicycling to enhance affordable 'last/ first mile' trips – bike parking such as the Bikestation (as part of the renovated King Street Station) and bike lanes leading to from the stations.

The document should include mention the entire range of bike parking tools for station areas: Bikestation type facilities (valet and automated), smart lockers (BikeLink by eLock - used in Vancouver Wa and along the Surfrider route), and racks (covered and uncovered). The report only includes a bike parking facility census secondarily as part of the larger car parking analysis. The Bay Area is a good US model for this type of service.

The report misses the relationship on how the current limited on-demand bike rack capacity on trains (5 bikes) would generate denied boardings with unboxed bikes and thus need for bike parking at high demand stations —especially in the peak season. Data on the number of bike tickets vs. boxed bikes per station could be used as a proxy for this discussion (Cascades only). This rate could be compared to rates on other routes with similar level of service (Capitol Line in Northern California, etc.).

There are also other tourist based services such as bike rental and repair that could be included in the report in more detail.

WSDOT

This aspect has now been included in the report.

Chapter 9

Comment

Again, the marketing proposals seem appropriate. Seeking out a higher number of business travelers, who willingly pay higher fares for superior service (THIS is where on-time-reliability becomes evermore vital) is a good strategy.

AA WA is fully aware of surveys of existing passengers , but is not aware of any studies of those who might seemingly "qualify" to become Amtrak Cascades passengers but in fact do not ride our trains. While not as technically easy as polling existing passengers, it might prove very instructive to also discover why potential passengers do not avail themselves of riding the Amtrak Cascades. (I remain amazed by seemingly well-informed adults here in Olympia who remain unaware that passenger trains to Seattle or Portland exist!) While almost humorous, I have also encountered "big strong men" who will attempt to ride neither our trains nor even a transit bus because they "don't know what to do" to effect the process of other than driving or flying. Marketing may also include some elementary education and hand-holding, it seems.

WSDOT

We agree that constant public outreach in addition to advertising is necessary to educate the public regarding Amtrak *Cascades*. As mentioned in the Promotions section on page 9-5, Amtrak employs two field marketing representatives that work assigned markets, executing grassroots marketing and promotions, and drive trial (sampling) through cooperative marketing efforts with travel and tour operators. We will continue to support this program and combine efforts whenever possible.

Comment

One issue that is not raised in relation to the Pt. Defiance Bypass, marketing, or any other aspect of the Plan is that of view loss due to rerouting. Many people consider the waterward line along Puget Sound to be the most scenic portion of the Tacoma-to-Portland (or other points southward) Cascades experience. Loss of this view segment may make the route less marketable and desirable and deter demand. How does WSDOT plan to approach the loss of this important asset?

WSDOT

Although Amtrak *Cascades* travelers will likely be disappointed at the loss of the portion of the route along the water in the area between Tacoma and Steilacoom, the opportunity to reduce the travel time between Seattle and Portland and improve reliability will be paramount to the continued success of the service. In our public outreach, we will continue to stress these important improvements that will be made to the Amtrak *Cascades* service through the completion of the Pt. Defiance bypass.

Comment

Other station area services and marketing opportunities could be included, such as working with local jurisdictions or business owners to install remote ticketing machines away from stations remote from city centers such as Vancouver, Lacey, Olympia, etc. This would be similar to service offered to some airlines in other cities.

WSDOT

As Amtrak is the operator of the Amtrak *Cascades* service, they are responsible for the ticketing and operation of the ticketing machines. We will share this suggestion with them for consideration.

Comment

The report is silent on the strong negative influence on the quality of the Cascade service caused by the perpetual tardiness of the Amtrak Coast Starlight service due to service and reliability problems in OR and CA. Its nickname here is the 'Coast Starlate'.

WSDOT

As Amtrak is the operator of the *Coast Starlight* service, they are responsible for the operation of this route. We realize that the *Coast Starlight* reliability and on-time performance has negatively affected the Amtrak *Cascades* service and we have encouraged Amtrak to make improvements to the *Coast Starlight* service. As of the last six months, the *Coast Starlight* has actually seen substantial improvement in their on-time record. If passenger train performance is below 80 percent for two consecutive months, the Surface Transportation Board can investigate and issue penalties of the host carrier as they determine.

Comment

In the marketing section there is no mention of the opportunity to add Amtrak routes to web based airline ticketing programs for routes that can compete successfully for regional air trips 300 miles or less, such as the Portland/ Vancouver to Seattle route. These trip links could also be joined with air route for Amtrak's airline partners such as Horizon. Currently air travelers may not be aware of this option now that most travelers no longer visit traditional travel agents. This type of marketing is common in Europe and Asia.

WSDOT

As the Amtrak *Cascades* service grows, we will explore all opportunities to promote and develop demand for the service.

Comment

Further, Chapter 9 (p. 9-1) states an intent to "position [Amtrak Cascades] as the preferred method of [both intercity and business] travel," which would even more closely compete with Alaska Air. I do not recall that either airline industry or WSDOT Aviation representation was included among your stakeholders for this Plan, although Alaska Air in particular appears to be a stakeholder.

WSDOT

It is anticipated that the impact Amtrak *Cascades* will have in competing for airline passengers for the I-5 route will be incremental.

Comment

The first bullet under "Current Travel Options" makes no sense. Is this meant to refer to intercity trips along the corridor? Even at that, the number seems low.

WSDOT

This section has been removed from the current draft.

Comment

This competition is shaped as positive at its earliest mention in the Plan, while hidden in the marketing chapter on p. 9-2 is the statement that "Amtrak Cascades poses no direct competition to international air travel, but will compete directly with air travel in the I-5 corridor that it serves." Thus, Amtrak Cascades service directly competes with a major state employer which is currently faced with economic downturn, and in doing so likely poses a threat to Alaska Air (which also serves Vancouver, BC, out of both Seattle and Portland; contrary to the statement indicating no direct competition with international air travel).

WSDOT

It is correct about the international air travel statement and we will re-work this comment to better reflect our marketing strategy. Amtrak *Cascades* is competing for all travel business whether it be by air, vehicle, leisure, business, intercity, commuting, etc.

Chapter 10

Comment

The unprecedented opportunities of a rapidly growing appreciation for the many advantages of both urban and intercity passenger rail tied with decreasing satisfaction with much highway and air travel inspire rail advocates nationwide. This, coupled with an incoming Federal Administration with a good Senatorial record and apparent commitment to passenger trains not seen since WW II, adds to the upbeat mood. Passage of Congressional authorization bills gives hope. But the reality of the current (November 2008) financial crisis, now worldwide, must dampen rail advocates' enthusiasm. That said, IF the feds do follow through with pending legislation, Washington state, with our top-tier record of passenger rail planning (as exemplified by this Plan) and service delivery will be well positioned for not only a share of federal funding, but would also be better placed to leverage scarce State monies. Without an instituted set of Federal funding sources, moving to the reasonable Option 3 will be quite challenging. AA WA will vigorously work with our Congressional Delegation to help ensure that Federal dollars move our way.

WSDOT

We are working with the legislature, OFM, and various partners to develop funding for incremental passenger rail services.

Comment

The language at the top of page 10-5 about the current economic situation seems insufficient, given the nature and intensity (as well as probable duration) of the economic downturn. We believe the downturn is highly likely to impact multimodal funding as tough choices about transportation investments come to the forefront.

WSDOT

We revised the paragraph to display both challenges and potential opportunities created by the recent economic downturn.