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Washington State Ferries Financing Study

Technical Appendix 4: Forecasting Models Review

Prepared For:
Joint Transportation Committee
Washington State Legislature

Consultant Team

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Executive Summary

This review of Washington State Ferries' (WSF) forecasting models is part of the Washington State Ferries Financing Study. This review examines WSF's two forecasting models: the econometric demand model used for revenue forecasting and the network-based travel demand model used in developing the long-range strategic plan.

This review included interviews with staff from WSF, the Puget Sound Regional Council, and WSF's modeling consultants.

Foundation for Planning

Ridership projections are key to the development of the capital and operating forecasts for WSF, laying the foundation for future planning. WSF's projections of ridership are used to determine what vessel capacities are necessary to meet established level-of-service standards. Vessel capacities in turn drive the terminal and landside requirements. The vessel and terminal plans form the basis for the capital program, operating projections, and farebox recovery.

Models

WSF uses two models to project ridership: an econometric demand model for revenue forecasting and a network-based travel demand model for long-range planning.

Econometric Demand Model

The econometric demand model develops revenue and ridership forecasts for the relatively near term by six fare categories. It provides:

- Current biennium and sixteen-year projections of capacity constrained ridership and associated revenue corresponding to the capital plan
- Monthly revenue and ridership forecasts by route, month, and fare category for the forthcoming fiscal year
- Revenue and ridership impacts of alternative service and fare scenarios
- Unconstrained demand estimates underpinning capacity constrained demand
- Fare elasticities of demand estimates by six fare categories

Uses: WSF uses these projections for:

- Forthcoming fiscal year and current biennium budgeting and short-range service planning
- Revenue estimates for the Transportation Revenue Forecast Council for state-wide budgeting
- Testing fare policy scenarios for use by the Washington State Transportation Commission (WSTC) Tariff Policy Committee.

Accuracy: The econometric modeling process, which is updated quarterly, has proven to be quite accurate in forecasting revenues.

Data: The model relies on ridership and fares data from WSF, as well as economic and demographic data from the Office of Financial Management (OFM), the Washington State Department of Transportation (WSDOT) and Global Insight, a commercial provider of databases of economic information.

For forecasting, the demand models use fares as assumed by the legislature in the 2006 session--a 2.5 percent increase per year with fares rounded up to the nearest nickel. This assumed effective rate of increase results in rising real fares over time because inflation is currently projected to be less than the compound impact of 2.5 percent per year plus nickel up-rounding.

Forecasts: The models project both unconstrained systemwide demand and route ridership by six fare categories as well as anticipated vessel capacity constraints for vehicles in order to yield revenue forecasts. The model estimation process yields price elasticities of demand for each of the six fare categories. Over time, the models will adapt to changing ridership patterns, and the elasticities will evolve. For example, Parsons Brinckerhoff, the consultant who manages the model for WSF, notes that after a series of significant real fare increases in the first part of the current decade, "ridership has proved to be more inelastic to real fare and real gas price increases than previously estimated."

Travel Demand Model

The travel demand model, which is used by WSF for its long-range strategic plan, provides:

- Estimates of ridership for a twenty-five year period
- Estimates of ridership by route, method of boarding and mode of access/egress for the four-hour PM peak period on a typical weekday (assumed to be a Tuesday, Wednesday and/or Thursday in May)
- Estimates under service assumptions that tend to differ from the current programmed service levels employed by the more near-to-mid term econometric forecast. For the Draft Long-Range Strategic Plan 2006-2030, these assumptions are currently planned service (baseline) with four new 144-vehicle vessels, at service levels as designated in the WSF Draft Long-Range Strategic Plan.

Uses: WSF uses the projections from the travel demand model for:

- Long-range system, corridor, and route planning
- Identifying future service and capital needs
- Providing long-range travel demand forecasts to the Puget Sound Regional Council (PSRC) and Metropolitan Planning Organizations (MPOs) to support regional transportation planning
- Providing data for other major transportation projects such as the Alaskan Way Viaduct
- Guiding terminal design

Accuracy: WSF does not track actual ridership and/or revenues against this model, in part because it is updated only when a new long-range system plan is developed. The

consultants note that the projections developed from this model in the 1999 Long Range Systems Plan were very inaccurate because they could not anticipate the steep fare increases resulting from the loss of Motor Vehicle Excise Tax (MVET) support.

Data: The travel demand model relies on information from the PSRC Regional Travel Demand Model for King, Pierce, Snohomish and Kitsap counties; from OFM on population and growth outside of the PSRC areas; and on WSF data, including the results of the WSF 1999 origin and destination survey.

Forecasts: The forecasts provide the annual ridership for each route under different service assumptions by direction, total vehicle, in-vehicle passengers, and walk-on passengers.

Ridership Projections

The two models have significantly different ridership projections, with the econometric model's projections substantially lower than the travel demand model. The econometric model projects 24 percent growth between 2006 and 2023, while the travel demand model projects 56 percent. Projected ridership is closer for vehicle travel (4 percent higher in travel demand model) than for passenger travel (43 percent higher).

WSF's Draft Long-Range Strategic Plan anticipates adding new service. Ridership in the plan is projected to 2030, with a total growth of 88 percent projected with the new service additions, compared to 68 percent under the baseline service levels.

Model Differences

The models generate substantially different ridership projections because of the inputs used, how frequently they are updated, and their use of peak period forecasts. WSF has not attempted to reconcile the differences in the models.

Model Updates

The two models provide different results in part because they are updated on different cycles. The econometric model is updated quarterly based on OFM's quarterly updates of population and employment. The travel demand model is dependent on the PSRC updates, which are completed less frequently.

Auto Operating Costs

One difference between the two models is how they deal with the cost of operating an automobile. Automobile operating costs are a primary driver of vehicle ridership on the ferries. Ridership is reduced as the costs of operating an automobile increase. In the PSRC travel demand model, automobile operating costs are assumed to remain constant with inflation. In contrast, the econometric model factors in a variable for gasoline prices and for the changes in vehicle fuel efficiency.

Peak Period

Unlike the econometric model, the travel demand model is based on the four-hour PM peak period, which is then extrapolated to the rest of the day, week, and year. The comparison of outputs between the two models is highly dependent on the assumptions made for extrapolating weekday PM peak period demand into annual values. If the relationship between the peak and non-peak periods changes as a result of tariff increases or service modifications, it will effect the extrapolation to an annual ridership.

PSRC Travel Demand Model: Cross-Sound Demand

A key input to WSF's travel demand ridership projection is the PSRC model forecast of cross-Sound ferry ridership growth. The consultant's review indicates that the travel demand model may overstate cross-Sound demand due to its estimate of the number of vehicles that will use the new Tacoma Narrows Bridge instead of the ferry. The PSRC model assumes 66,000 vehicles will use the Tacoma Narrows Bridge daily in 2020, while WSDOT estimates the volume to be 120,000 vehicles a day.

For this study, Mirai Associates recalculated the cross-Sound ridership projection using a calculation of daily vehicle use of the Tacoma Narrows Bridge based on WSDOT's published projections of bridge use. The resulting estimate calculated 4.6 million fewer ferry trips than the travel demand model, resulting in a revised systemwide baseline ridership estimate in 2030 that is 11 percent lower than the current travel demand model projection.

Relationship to Historical Ridership Growth

WSF's Draft Long-Range Strategic Plan suggests that the relatively high growth rates anticipated in the baseline and the planned service projections are reasonable, in part because they are consistent with previous growth rates. However, this comparison to prior time periods should be reviewed with caution because of the following factors.

1. The 1970-1980 decade had the highest increase in two-worker households in U.S. history, resulting in an increase of work trips at a significantly higher percentage rate than in the current decade.
2. Rates during this period actually lagged behind inflation, so that the real cost of ferry ridership declined during this period.
3. The current plan for 2.5 percent annual rate increases assumed in both models is greater than the anticipated rate of inflation, resulting in an increase in real fares.

Recreational Uses

As is typical of transportation models, neither of the ones used by WSF includes specific information about trends in recreational use of the ferries. The models rely on projections of population and employment. This lack of information is most important in projecting demand for the Keystone-Port Townsend and Anacortes-San Juan Islands-Sidney routes, which have heavy recreational use.

Customer Information/Origin and Destination Study

WSF did not update its 1999 origin and destination study for the Draft Long-Range Strategic Plan, as it was less than five years old when the agency began drafting the plan

in 2003. WSF's Draft Long-Strategic Plan does incorporate a more limited origin and destination study conducted in 2003 in the South Sound to support analysis of passenger only ferry service.

WSF's service and tariff structure has changed substantially since 1999. A comprehensive review of the impact of those changes on customer origin and destination patterns will not be available until the survey is updated in 2006.

Additionally, there is little information available on the characteristics of the vehicle market. The need for expanded capacity to support increased vehicular traffic is largely driving WSF's capital plan. There are no surveys or other market information available on vehicle or walk-on passengers' likely response to operational or tariff changes.

Recommendations

1. Reconcile the econometric and the travel demand model projections.
2. Pending reconciliation, use the econometric model projection of ridership for capital decisions.
3. Develop additional ferry market information, particularly about recreational use and vehicle use.
4. Add a performance measure focused on tracking actual versus forecasted ridership from the travel demand model.

The table on the following pages compares the two WSF demand forecasting processes and the consultants' observations and recommendations.

Comparison Matrix for the Two WSF Demand Forecasting Processes

Attribute	Econometric Demand Model & Revenue Forecasting Process	Network-Based Travel Demand Forecasting Process
Purpose	• To provide mid-range revenue and ridership projections monthly or annually for WSF budgeting and state financial planning purposes. • To assess revenue and ridership impacts of fare increases and various tariff policies. • To assess revenue and ridership impacts or conduct "what-if analyses" for minor service changes. • To estimate revenue impacts from major service changes as a result of demand changes reported from the network-based travel demand model Forecasting Process.	• To forecast how many people and vehicles will use WSF facilities on a daily basis (with emphasis on weekday peak travel periods) under a specified set of circumstances (e.g., with a given set of service specifications, land use assumptions, etc.). Time period is, from the present through long-range future, with current forecasts going out to 30-years. • To test the likely ferry travel demand and mode choice (by mode of access/egress) impacts of alternative ferry routes; service attributes (frequency, travel time, costs, capacity); and supporting highway and transit service characteristics. • To provide network-based demand estimates to support environmental work regarding WSF service and/or facility expansions, as required under NEPA.
Uses/Forum for Use	• WSF budgeting and short-range service planning. • Revenue estimates for the Transportation Revenue Forecast Council for statewide budgeting. • Testing of fare policy scenarios for use by the Washington State Transportation Commission Tariff Policy Committee.	• WSF long-range system, corridor, and route planning. • Identifying future service and capital needs. • Provides long-range travel demand forecasts in context of metropolitan transportation planning in cooperation with PSRC and outlying MPOs. • Provides pertinent data to other projects, e.g., Alaskan Way Viaduct, terminal design efforts, etc.
Main Outputs	• Sixteen year projections for revenue and ridership by month, route, and fare category • Fare elasticities of demand by fare category	• Weekday PM peak ridership in O-D form by route, boarding mode, and mode of access/egress for a selected forecast year and scenario; expandable to week, daily or annual volumes, with results for intermediate years via interpolation. • Ferry share of adjacent mode (transit/highway) demand.
Strengths	• Provides detailed quarterly route-by-route traffic and revenue estimates that can be used for operations budgeting. • Performance audit showed model to be quite accurate (particularly when service changes are limited to existing routes such that the route structure remains relatively static.) • Provides information on seasonal trends and annual trends and yields results at a monthly detail level. • Responds to quarterly changes in the projections for state-level economic and demographic input variables as well as existing ridership and revenue trends.	• Accepted standard industry practice for long-range (10, 20 and 30-year) forecasts and demand projections to support alternatives analysis and project-level environmental planning; conforms to both NEPA/SEPA and MTP Planning requirements. • Provides typical PM peak period (expandable to daily) travel volumes for weekday travel in a format that is consistent with other regional planning efforts. • Received high marks from performance audit; model updates have been implemented under direction of panel of experts. • Captures land side diversion (e.g., TNB), changes in mode shift,

Attribute	Econometric Demand Model & Revenue Forecasting Process	Network-Based Travel Demand Forecasting Process
	• Can be updated with relative ease to meet quarterly forecast requirements.	mode of access/egress, as well as impacts of new routes/terminals, travel patterns of each route's users. • Identifies future peak period ferry travel volumes by mode of access/egress to develop ferry terminal design requirements. • Captures anticipated effects of future land use and other localized conditions on ferry travel behavior; links land use and transportation analyses consistent with GMA. • Appropriate model for comparing alternative system plans against one another as well as alternatives at the corridor level.
Shortcomings	• Does not specifically capture relative geographic (e.g., TAZ-specific) changes in land use over time, nor major changes in the ferry system routes or levels of service. • Does not provide information about weekday versus weekend travel patterns, nor intra-day and directional travel patterns. • Provides only very limited travel mode information, and no mode of access/egress information about walk-on boardings.	• Does not capture monthly or seasonal variation in travel and relies on external expansion factors to predict annual demand.
Consultant Observations and Recommendations	• Very accurate • Includes auto operating costs/frequently updated • Used for performance measurement • Recommend using for legislature's capital decisions until models are reconciled	• Accuracy not tracked, but has changed substantially since last developed in 1999. • Infrequently updated. • Extrapolates from peak to non-peak which may have changed with fare increases and service reductions • Overstates ridership by understating vehicle use of Tacoma Narrows Bridge • Recommend adding performance measurement
Both Models/Consultants Observations & Recommendations	• Neither model provides information on recreational customers • Recommend study to gather more information on recreational customers, particularly for the Keystone-Port Townsend and San Juan routes • Recommend additional marketing study on vehicle customers with analysis of traffic demand and operational strategies	

Source: WSF Planning/Consultants

Section One
Introduction

This review of Washington State Ferries' (WSF) forecasting models is part of the Washington State Ferries Financing Study. The review examines WSF's two forecasting models: the econometric demand model used for revenue forecasting and the network-based travel demand model used in developing the long-range strategic plan.

This review was conducted in association with staff from the Senate Transportation Committee, the House Transportation Committee and the Joint Transportation Committee. It included interviews with staff from WSF, the Puget Sound Regional Council and WSF's modeling consultants.

A. Foundation for Planning

Ridership projections are key to the development of the capital and operating forecasts for WSF, with these projections laying the foundation for future planning. WSF's projections of ridership are used to determine what vessel capacities are necessary to meet established level of service standards. Vessel capacities in turn drive the terminal and landside requirements. The vessel and terminal plans form the basis for the capital program, operating projections, and farebox recovery. The projection of demand underpins WSF operational, capital, and financial planning (see *Washington State Ferries Financing Study Technical Appendix 1: Review of Studies and Reports* and *Appendix 2: Capital Program Prioritization and Terminal and Repair Facility Capital Projects Review* for further information).

Section Two
Models

WSF uses two models to project ridership: an econometric demand model for revenue forecasting and a network-based travel demand model for long-range planning.

A. Econometric Demand Model

1. Information Provided by the Model

The econometric demand model develops revenue and ridership forecasts for the relatively near term by six fare categories. It provides:

- Current biennium and sixteen-year projections of capacity constrained ridership and associated revenue corresponding to the capital plan
- Monthly revenue and ridership forecasts by route, month, and fare category for the forthcoming fiscal year
- Revenue and ridership impacts of alternative service and fare scenarios
- Unconstrained demand estimates underpinning capacity constrained demand
- Fare elasticities of demand estimates by six fare categories

2. Information Uses

WSF uses these projections for:

- Forthcoming fiscal year and current biennium budgeting and short-range service planning
- Revenue estimates for the Transportation Revenue Forecast Council for state-wide budgeting
- Testing fare policy scenarios for use by the Washington State Transportation Commission (WSTC) Tariff Policy Committee

3. Accuracy of Forecasts

The model, which is updated quarterly, has proven to be quite accurate, see Table 1 below. During the period from 2001 to 2005, when tariffs where raised by 56 percent, the difference between forecasted revenue and actual ranged from -8.3 percent for the June 2001 forecast of 2005 revenue, to a low of 0 percent for the June 2004 forecast of 2004 revenue. For ridership, the model ranged from a -6.3 percent variance between actuals and forecast for the June 2001 forecast of 2005 ridership, and -0.1 percent for the June 2004 forecast of 2004 ridership.

Table 1. Econometric Model:
Comparison of Forecasts and Actuals (000s)

	2001	2002	2003	2004	2005
Historical Date					
Actual Revenue	$96,200	$110,497	$119,825	$126,920	$132,030
Actual Ridership	26,600	25,630	24,425	24,408	23,860
Actual Fare Changes					
Actual	20.0%	12.5%	5.0%	5.0%	5.0%
Effective with rounding	22.9%	13.6%	7.7%	5.4%	6.3%
June 2001 Forecast					
Forecast Revenue	$95,784	$103,308	$110,538	$117,860	$121,085
% variance	*-0.4%*	*-6.5%*	*-7.8%*	*-7.1%*	*-8.3%*
Forecast Ridership	26,695	24,702	23,644	23,029	22,349
% variance	*0.4%*	*-3.6%*	*-3.2%*	*-5.6%*	*-6.3%*
June 2002 Forecast					
Forecast Revenue		$109,744	$114,427	$123,531	$131,413
% variance		*-0.7%*	*-4.5%*	*-2.7%*	*-0.5%*
Forecast Ridership		25,630	23,714	23,142	23,001
% variance		*0.0%*	*-2.9%*	*-5.2%*	*-3.6%*
June 2003 Forecast					
Forecast Revenue			$119,755	$121,567	$128,756
% variance			*-0.1%*	*-4.2%*	*-2.5%*
Forecast Ridership			24,606	23,606	23,736
% variance			*0.7%*	*-3.3%*	*-0.5%*
June 2004 Forecast					
Forecast Revenue				$126,862	$129,099
% variance				*0.0%*	*-2.2%*
Forecast Ridership				24,377	24,056
% variance				*-0.1%*	*0.8%*

Source: PB Consult Presentation, June 19, 2006

4. Data

The model relies on ridership and fares data from WSF, as well as economic and demographic data from the following sources: the Office of Financial Management (OFM), the Washington State Department of Transportation (WSDOT), and Global Insight, a commercial provider of databases of economic information.

a) WSF ridership data

The model relies on detailed ridership, fares and revenue data from WSF. Monthly ridership by seventeen route breakdowns is provided (see Table 2 for a sample month's data). For each of the seventeen routes, ridership is provided by three passenger and three auto fare categories (full fare, commuter, and other), along with two further passenger delineations (surcharge and walk-on), and two further auto delineations (surcharge and oversized).

Table 2. Econometric Model:
Sample Monthly Ridership Data (April 2006)

(000s)

	Passenger Categories						Auto Categories					
Route (17)	Full Fare	Commuter	Other	Total	Sur	Walk-on	Full	Commuter	Other	Total	Sur	Over
Seattle-Bremerton	49,267	57,039	24,725	131,031	2,771	89,311	30,998	20,256	6,871	58,125	104	508
Seattle-Bainbridge Island	106,295	174,494	59,109	339,898	10,942	197,718	74,942	76,969	22,557	174,468	824	3,426
Edmonds-Kingston	71,636	38,381	50,269	160,286	510	42,384	101,196	62,191	27,215	190,602	736	6,222
Tahlequah-Pt. Defiance	6,044	10,544	5,338	21,926	274	6,614	6,750	22,620	2,720	32,090	452	1,332
Southworth-Vashon	1,502	3,312	1,206	6,020	8	3,580	2,484	6,604	912	10,000	122	2,342
Fauntleroy-Vashon	15,460	42,410	11,924	69,794	1,044	24,756	17,658	69,204	6,206	93,068	564	2,342
Fauntleroy-Southworth	10,388	15,944	6,549	32,881	472	13,168	17,581	19,345	7,822	44,748	86	397
Seattle-Vashon POF	880	9,148	202	10,230	428	10,230						
Mukilteo-Clinton	52,928	53,688	40,654	147,270	424	40,570	71,164	93,475	21,216	185,855	1,629	6,021
Pt. Townsend-Keystone	17,846	1,850	11,280	30,976	223	1,260	19,992	1,993	6,716	28,701	173	1,699
Interisland							3,192	4,066	672	7,930	156	522
Anacortes-Lopez	4,710	2,970	3,520	11,200	416	3,294	4,152	6,714	1,628	12,494	138	760
Anacortes-Shaw	316	316	432	1,064	6	244	280	732	110	1,122	4	60
Anacortes-Orcas	11,364	3,742	6,722	21,828	120	4,186	10,402	8,374	2,694	21,470	230	1,416
Anacortes-Friday Harbor	15,214	5,494	7,968	28,676	292	10,056	10,012	10,320	3,632	23,964	238	2,104
Interisland-Sidney	681		387	1,068	14	448	418		143	561		26
Anacortes-Sidney B.C.	2,401		1,376	3,777	21	806	1,584		412	1,996	6	67
Monthly Total	366,932	419,332	231,661	1,017,925	17,965	448,625	372,805	402,863	111,526	887,194	5,462	29,244

Source: Parsons Brinckerhoff Presentation, June 19, 2006

WSF provides monthly farebox revenue information by route, plus sales at the customer service kiosks, and by a total of twenty-two fare categories (seven passenger, ten vehicle, two motorcycle, three permit), and hazmat charter, freight, charter cruises, and miscellaneous fare revenues.

Table 3: Econometric Model:
Sample Farebox Revenue Monthly Data

($000s)

Farebox Revenue	Seattle-Bremerton	Seattle-Bainbridge	Edmonds-Kingston	Seattle-Vashon POF	➢ Cont. for Other Routes
Passenger					
Full Fare	209,994	430,300	317,088	-15,085	
Commuter	42,199	222,518	69,525	14,469	
Other	-246	266	-437	69	
Monthly Pass	504,228	381,497	42,968	52,589	
Passenger Only					
Full Fare				19,102	
Commuter				410	
Other Discount					
Vehicle					
Full Fare	384,166	800,834	1,077,390		
Commuter	200,806	822,725	656,522		

Farebox Revenue	Seattle-Bremerton	Seattle-Bainbridge	Edmonds-Kingston	Seattle-Vashon POF	➢ Cont. for Other Routes
Other Discount	32,855	84,688	145,609		
Oversize-Non-commercial	1,719	10,837	31,369		
Misc.		349			
Commercial					
Auto	0				
Auto Discount	0				
Oversize-Non-commercial	14,870	126,161	229,010		
Discount					
Reservation Fee					
Motorcycle					
Full Fare	2,764	5,812	7,514		
Commuter	9,859	42,909	17,002		
Permits					
Bicycles	517	671	185	49	
Vanpool			20		
Carpool	20	20			
Hazmat Charter					
Freight					
Charter Cruises					
Miscellaneous					
Total Farebox Revenue	1,403,750	2,929,587	2,593,763	71,604	

Source: Parsons Brinckerhoff Presentation, June 19, 2006

b) Economic and demographic data projections

Information is provided on employment, population, real personal income, inflation, price indices for gas and refined petroleum, vehicle fleet efficiency and housing units from OFM, WSDOT and Global Insight.

c) Fare data

Actual fare inputs are based on the historical and current nominal fares. Future fare increases are applied to the Central Puget Sound fares (i.e., rates for Seattle-Bainbridge, Seattle-Bremerton, and Edmonds-Kingston routes), and rounded up to the nearest nickel. Fares on other routes are then determined using the tariff route equity (TRE) relationships, with the fares expressed as a percentage of the Central Sound fares. For example, rate changes are applied to the Central Sound fares, rounded to the nearest nickel, and then applied to the other routes by the TRE percentage (i.e., 59 percent for Mukilteo-Clinton) and rounded to the nearest nickel. The resulting fare series for each fare category are converted to real (inflation adjusted) fares using the history and forecast for the Implicit Price Deflator for Personal Consumption as compiled by Global Insight.

Six fare categories of ridership are forecasted:

1. Passenger full fare

2. Passenger commuter (frequent user discount book/pass)
3. Passenger other discounted (seniors, youth, etc.)
4. Vehicle/driver full fare
5. Vehicle/driver commuter (frequent user discount book)
6. Vehicle oversize + other discounted (based on average fare realized)

Table 4 illustrates these fare categories and the TRE percentages.

Table 4. Econometric Model:
Actual (no inflation) Fare Inputs with Tariff Rate Equity Factor

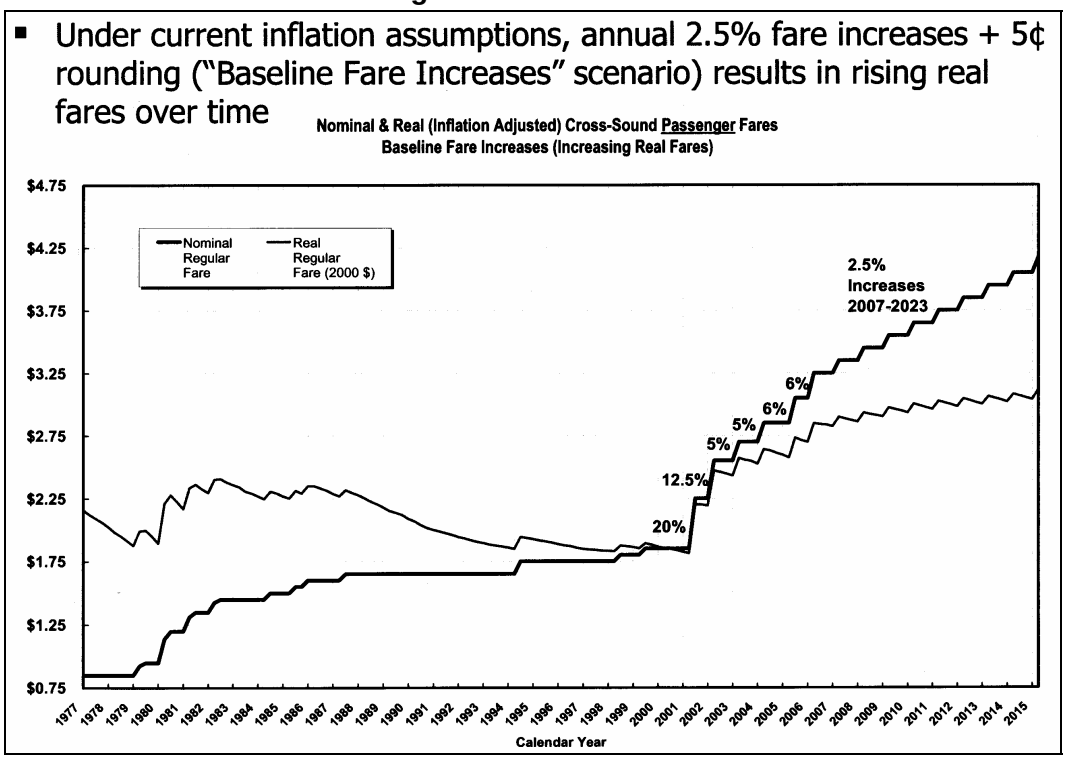
	Central Puget Sound*		Port Townsend-Keystone & Fauntleroy-Southworth & Interisland		Pt. Defiance-Tahlequah & Fauntleroy-Vashon & Vashon-Southworth		Mukilteo-Clinton		Anacortes-San Juans (Ave)	
Fares**	Pass	Veh/Driver	Pass	Veh/Driver	Pass	Veh/Driver	Pass	Veh/Driver	Pass	Veh/Driver
One Way Fares	$3.25	$11.25	$2.50	$8.70	$2.10	$7.20	$1.93	$6.65	$5.12	$14.96
Regular Fare:		$14.10		$10.90		$9.00		$8.35	$6.16	$20.14
Peak Season Fare		$9.00		$6.69		$5.76		$5.32	$3.46	$10.90
Commuter Fare	$2.60		$2.00		$1.68		$1.54		$2.55	
Half Fare (Pass)	$1.60		$1.25		$1.05		$0.95		$1.00	
Surcharge Fare:	$0.50	$11.25	$0.50	$8.70	$0.50	$7.20	$0.50	$6.65	$2.00	$14.96
Peak Season Vehicle		$14.10		$10.90		$9.00		$8.35		$20.14
Tariff Rate Equity % Central Puget Sound			77%	77%	64%	64%	59%	59%	115% Lopez 138% Shaw, Orcas 164% Friday Harbor	

* Includes Bainbridge-Seattle, Bremerton-Seattle and Edmonds-Kingston routes

** Model also uses actual other average fares peak and non-peak, which vary by route.

For forecasting, the demand model uses "real" fares, which are the actual fares adjusted for inflation. Current forecasts assume an average fare increase of 2.5 percent per year, which results in rising real fares over time because inflation is assumed to be less than 2.5 percent per year. This is shown in Figure 1 below.

Figure 1. Fares and Inflation



Source: PB Consult Presentation, June 19, 2006

4. Forecasts

Using the ridership, revenue, economic forecast, and fare data described above, the model projects both unconstrained and constrained systemwide demand, and route ridership and revenue by six fare categories for the current biennium and the sixteen-year period of the capital plan.

a) Unconstrained demand

Systemwide unconstrained demand is projected using quarterly data from 1981 forward by the six fare categories. Different sets of demand forecasts are produced for different sets of fare policy assumptions. A separate process using autoregressive-integrated-moving average models with monthly data is used to apportion the system-wide projections by route and fare category.

b) Constrained demand

The constrained demand is factored for vehicle capacity constraints on vessels and resultant mode shifts (i.e., from vehicle to walk-on) on a quarterly basis. The model is not adjusted for constraints on walk-on passengers because none currently exist. Passenger and vehicle surcharges are forecast for revenue purposes.

c) Revenue forecasts

The process applies projected fares to the capacity constrained ridership forecasts to yield revenue forecasts by six fare categories. The econometric model estimation process yields price elasticities of demand for each of the six fare categories. Over time, the

models will adapt to changing ridership patterns, and the elasticities will evolve. For example, Parsons Brinckerhoff, the consultant who manages the model for WSF, notes that after a series of significant real fare increases in the first part of the current decade, "Ridership has proved to be more inelastic to real fare and real gas price increases than previously estimated." (Presentation, June 19, 2006). Vehicle-driver full fare revenues have proven to be the most inelastic fares.

B. Travel Demand Model

1. Information Provided by the Model

The travel demand model, which is used by WSF for its long-range strategic plan, provides:

- Estimates of ridership for a twenty-five year period
- Estimates of ridership by route, method of boarding and mode of access/egress for the four-hour PM peak period on a typical weekday (assumed to be a Tuesday, Wednesday or Thursday in May)
- Estimates under different service assumptions, which for the Draft Long-Range Strategic Plan 2006-2030 are for the baseline or currently planned service with four new 144-vehicle vessels and for the Draft Plan service levels.

2. Information Uses

WSF uses the projections from the travel demand model for:

- Long-range system, corridor, and route planning
- Identifying future service and capital needs
- Providing long-range travel demand forecasts to the Puget Sound Regional Council (PSRC) and Metropolitan Planning Organizations (MPOs) to support regional transportation planning
- Data for other major transportation projects such as the Alaskan Way Viaduct
- Guiding terminal design

3. Accuracy of Forecasts

WSF does not track actual ridership and/or revenues against this model, in part because it is updated only when a new long-range system plan is developed. The consultants note that the twenty-year projection for the 1999 Long-Range Systems Plan was for a 70 percent increase in ridership by 2018. By comparison the 2006-2030 Draft Long-Range Strategic Plan projects a 39 percent increase in ridership between 1998 and 2018 (see Table 5). This reflects the actual drop in ridership that occurred with the increase in fares between 2001 and 2005, which was not anticipated in the 1999 Long-Range Systems Plan.

Table 5. Travel Demand Model Ridership Projections for 2018, From 1999 and 2006 Long-Range Plans

Ridership	1998 Actual	2005 Actual	98-05	2018 (1999 Proj)	2018 (2006 Proj)	98-18
Passenger	14,701	13,071	-11%	n/a	14,130	-4%
Vehicle	11,215	10,810	-4%	n/a	21,967	96%
Total Riders	25,916	23,881	-8%	70%	36,097	39%

4. Data

The travel demand model relies on information from the PSRC Regional Travel Demand Model, which includes King, Pierce, Snohomish and Kitsap counties; from OFM on population and growth outside of the PSRC areas; and on WSF data, including the results of the WSF 1999 origin and destination survey. As shown in Table 6, below, eighty-one percent (81%) of 2005 ridership is from the eleven terminals in the PSRC counties.

Table 6. Terminals: Location in Relation to PSRC Counties

Terminal	Within PSRC	Outside PSRC
Bainbridge	x	
Bremerton	x	
Edmonds	x	
Kingston	x	
Seattle	x	
Pt. Defiance	x	
Tahlequah	x	
Southworth	x	
Vashon	x	
Fauntleroy	x	
Mukilteo	x	
Clinton		x
Port Townsend		x
Keystone		x
Anacortes		x
Friday Harbor		x
Lopez		x
Orcas		x
Shaw		x
Sidney		x
# of terminals	11	9
% 2005 ridership	81%	19%

a) PSRC Regional Travel Demand Model

The PSRC Regional Travel Demand Model "is one of a number of regional models whose inputs and outputs are interrelated to form a set of regional analytic and forecasting tools. They include a regional forecast model, land use model, land use sketch

planning tool and travel demand model" (Draft Long-Range Strategic Plan, Technical Appendix A, p 2).

The Regional Travel Demand Model includes four sub-models:

- Trip generation model, which uses information from the land-use model and other information to generate projected trips classified by purpose and time of day;
- Trip distribution model, which uses information from the trip generation models along with other information to distribute trips across the PSRC region by origin and destination;
- Mode choice model, which determines which trips are assigned to highways and which to transit; and
- Trip assignment model, which distributes modal flows of trip origins and destinations to each mode's own transportation network.

Information inputs to the PSRC model include two inputs from WSF—transit route and ferry fares. Other inputs include: roads and non-motorized facilities, other transit routes, other tolls, park-and-ride lots with capacities, transit walk access, time transfer stations, through trips and external trips, and vanpool demand.

The Draft Long-Range Strategic Plan 2006-2030 used Version e05 of the PSRC model. The model is currently being updated by PSRC.

b) OFM

OFM projections are used to forecast employment and population outside of the four county PSRC area. WSF also receives input regarding local land-use forecasts and local transportation plans compiled by OFM.

c) WSF data

WSF provides data to the travel demand model including information from its 1999 Origin and Destination Survey (See *Washington State Ferries Financing Study Technical Appendix 1: Review of Studies and Reports,* for further information.*)*. Other information provided by WSF includes: data on levels of service including fares, frequencies of service, and capacities. For the Draft Long-Range Strategic Plan, this included for each route: the average headway; the average vehicle capacity per sailing; the average vehicle capacity over the four-hour PM peak; the average crossing time; the average passenger fare; and the average vehicle fare for 2003, 2020, and 2030.

Table 7 below shows the level-of-service assumptions used in the travel demand model for the Draft Long-Range Strategic Plan 2006-2030.

Table 7: Level of Service Assumptions

	2003						2020											
							Under Currently Planned Service						Under Draft Plan Service					
Route	Hway	Cap	Cap-4h	Xtime	Pfare	Vfare	Hway	Cap	Cap-4h	Xtime	Pfare	Vfare	Hway	Cap	Cap-4h	Xtime	Pfare	Vfare
Point Defiance - Tahlequah	50	65	312	15	93	371	56	87	373	15	151	567	56	87	373	15	151	567
Southworth - Vashon	55	75	327	15	91	378	50	40	192	15	151	567	50	40	192	15	151	67
Fauntleroy - Vashon	30	90	720	15	93	370	35	91	624	15	151	567	30	107	856	15	151	567
Southworth - Fauntleroy	40	61	366	31	141	569	44	75	409	31	164	745						
Seattle - Southworth													50	124	595	35	239	979
Seattle - Southworth (Psngr Only)	86	125		50	132		86	125		50	296							
Seattle - Vashon (Psngr Only)	60	125		25	132		86	125		30	296		86	250		30	296	
Seattle - Bremerton	75	110	352	55	143	583	75	144	461	55	239	979	50	136		55	239	979
Seattle - Bremerton (Psngr Only)	60	350		37	136													
Seattle - Bainbridge Island	46	218	1,137	30	139	567	51	202	951	30	239	979	51	202	951	30	239	979
Seattle - Kingston (Psngr Only)													30	350	2,800	35	478	
Edmonds - Kingston	40	212	1,272	25	144	582	40	195	1,170	25	239	979	22	166	1,811	25	239	979
Mukilteo - Clinton	30	130	1,040	15	95	387	30	144	1,152	15	124	564	20	136	1,632	15	124	564
Port Townsend - Keystone	46	75	391	30	153	614	90	124	331	30	175	822	90	144	384	30	175	822
Total			5,917						5,663						9,594			

	2030											
	Under Currently Planned Service						Under Draft Plan Service					
Route	Hway	Cap	Cap-4h	Xtime	Pfare	Vfare	Hway	Cap	Cap-4h	Xtime	Pfare	Vfare
Point Defiance - Tahlequah	56	87	373	15	151	567	56	87	373	15	151	567
Southworth - Vashon	50	40	192	15	151	567	50	40	192	15	151	567
Fauntleroy - Vashon	35	91	624	15	151	567	30	124	992	15	151	567
Southworth - Fauntleroy	44	75	409	31	164	745						
Seattle - Southworth							50	188	902	35	239	979
Seattle - Southworth (Psngr Only)	86	125		50	296							
Seattle - Vashon (Psngr Only)	86	125		30	296		86	250		30	296	
Seattle - Bremerton	75	144	461	55	239	979	50	144	691	55	239	979
Seattle - Bremerton (Psngr Only)												
Seattle - Bainbridge Island	51	202	951	30	239	979	51	202	951	30	239	979
Seattle - Kingston (Psngr Only)							30	350	2,800	35	478	
Edmonds - Kingston	40	195	1,170	25	239	979	22	144	1,571	25	239	979
Mukilteo - Clinton	30	144	1,152	15	124	564	20	144	1,728	15	124	564
Port Townsend - Keystone	90	124	331	30	175	822	90	144	384	30	175	822
Total			5,663						10,584			

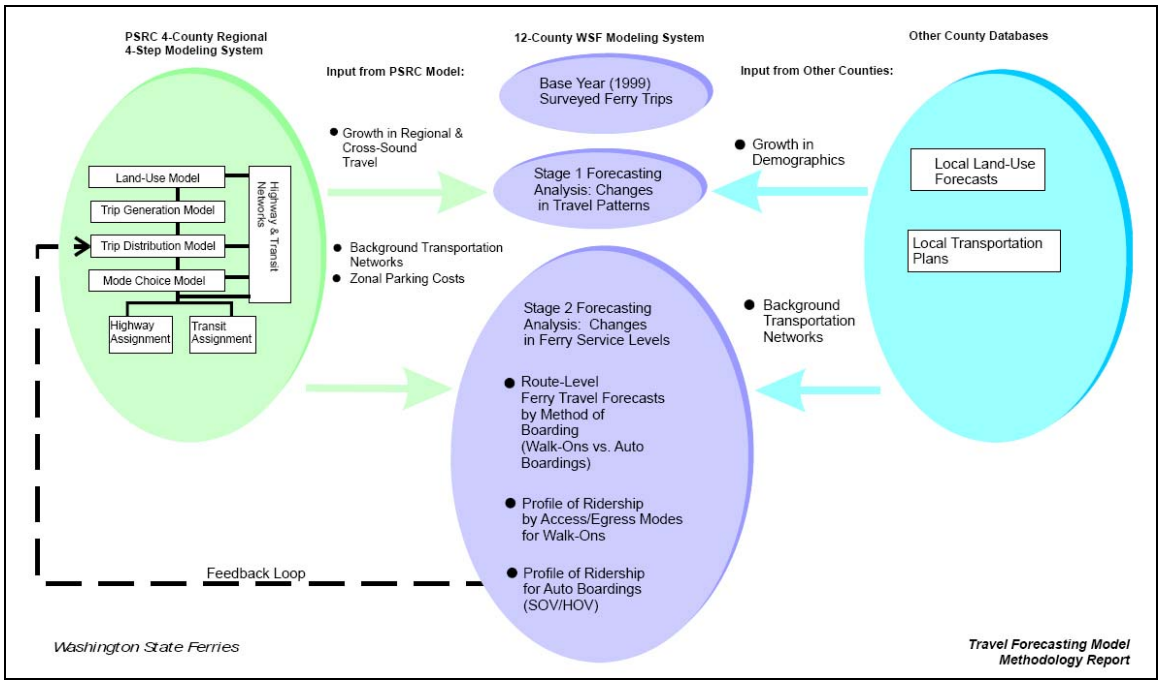
Key:

Hwy (in minutes): Average headway, or the average time between departures. Cap: Average capacity per sailing (with the exceptions of the passenger only routes, which are average passenger capacity per route.) Ca-4h: Average vehicle capacity over the 4-hour PM peak.
Xtime (in minutes): Average crossing time.
Pfare (in cents): A measure of the average passenger fare (constant $2005).
Vfare (in cents): A measure of the average vehicle fare (constant $2005).

4. Forecasts

Figure 2 below shows the relationship between the PSRC model, other county information, and the WSF model in developing forecasts.

Figure 2. Schematic Relationship Among the PSRC Model, WSF Model, and Other Jurisdictional Databases



Source: Draft Long-Range Plan, Technical Appendix

The forecasts are developed in two stages, as follows.

- *Stage One* – Takes into consideration changes in demographics between the base year 2003 and future years, and produces expected growth rates in cross-Sound trips by auto and transit modes. "This stage is necessary so that WSF's ridership forecasts reflect expected changes in regional demographics, transportation system development and cross-Sound travel patterns, especially the dynamics of modal shifts between auto and transit. It also captures the diversion of cross-Sound trips using the Tacoma Narrows Bridge. Ridership forecasts in this stage are primarily dependent on the PSRC Regional Model, which encompasses four of the twelve counties included in the WSF model and approximately 60 percent of WSF's systemwide ridership" (Draft Long-Range Strategic Plan, Technical Appendix A, p. 11).
- *Stage Two* – Uses the growth rates calculated in stage one to expand the ferry trip tables by boarding mode as observed in the 1999 origin and destination survey. The expanded trip tables are then distributed among ferry routes using equilibrium travel assignment principles. "Trips are also segregated into four walk-on modes of travel (walk-walk, walk-auto, auto-walk and auto-auto) and

two auto-boarding modules (single-occupancy vehicle and high-occupancy vehicle)" (Draft Long-Range Strategic Plan, Technical Appendix A, p. 11).

The forecasts provide the annual ridership for each route under different service assumptions by direction, total vehicle, in-vehicle passengers, and walk-on passengers. For the Draft Long-Range Strategic Plan, projections were made for a baseline level of service (current service plans including acquisition of four new 144-vehicle vessels) and for the planned level of service.

Section Three
Ridership Projections

The two models have significantly different ridership projections, with the econometric model's projections substantially lower than those from the travel demand model. The baseline ridership projection from the travel demand model is compared with the econometric model in Table 8 below. These are the most comparable projections from the models. There are some differences, as follows.

1. The travel demand model assumes changes in service level resulting from the addition of four 144-vehicle vessels to the fleet and the retirement of four 65-vehicle vessels.
2. The econometric model makes an adjustment in 2009 for closure of the Hood Canal Bridge.
3. The travel demand model ridership does not include the Interisland route or the Vashon-Seattle passenger-only ferry service, the econometric model does include these services.

Both projections assume 2.5 percent annual nominal fare increases, rounded up to the nearest nickel, on May 1 of each year, and both are capacity constrained.

The econometric model's September forecast anticipates that annual ridership will increase by between .8 percent and 3.5 percent between 2008 and 2010 but otherwise will grow at between 0.7 percent and 1.5 percent per year. The travel demand model assumes ridership will grow at rates as high as 5 percent per year.

Total growth between 2006 and 2023 is anticipated in the econometric model to be 24 percent, compared to 56 percent under the travel demand model (see Table 8). By 2023, the models show a 25 percent difference in projected ridership, with the econometric model having total ridership of 29.5 million and the travel demand model having ridership of 36.9 million. Projected ridership is closer for vehicle travel (4 percent higher in travel demand model) than for passenger travel (43 percent higher).

Table 8. Econometric Model and Travel Demand Model Ridership Projections, 2006-2023

(000s)

	Econometric Model Forecast Sept. 2006* Sept. 2006 Capacity Constrained Projections				Travel Demand Model** Baseline Projection - Draft Long Range Strategic Plan				
	Passenger	Vehicle/Driver	Total Ridership	Annual Rate of Growth	Passenger	Vehicle/Driver	Total Ridership	Annual Rate of Growth	% Econ vs. Travel Demand
2006	13,033	10,784	23,817		13,056	10,563	23,619		1%
2007	13,380	10,637	24,017	0.8%	13,253	10,740	23,993	1.6%	0%
2008	13,634	10,966	24,600	2.4%	13,412	11,093	24,505	2.1%	0%
2009	13,913	11,237	25,150	2.2%	13,456	11,187	24,643	0.6%	2%
2010	14,366	11,657	26,023	3.5%	13,707	11,309	25,016	1.5%	4%
2011	14,525	11,901	26,426	1.5%	14,204	11,463	25,667	2.6%	3%
2012	14,659	12,061	26,720	1.1%	14,956	11,648	26,604	3.7%	0%
2013	14,799	12,213	27,012	1.1%	15,942	11,860	27,802	4.5%	-3%
2014	14,931	12,365	27,296	1.1%	17,104	12,091	29,195	5.0%	-7%
2015	15,064	12,502	27,566	1.0%	18,341	12,328	30,669	5.0%	-11%
2016	15,182	12,624	27,806	0.9%	19,501	12,555	32,056	4.5%	-15%
2017	15,316	12,704	28,020	0.8%	20,326	12,743	33,069	3.2%	-18%
2018	15,452	12,778	28,230	0.7%	21,036	12,918	33,954	2.7%	-20%
2019	15,600	12,843	28,443	0.8%	21,786	13,098	34,884	2.7%	-23%
2020	15,762	12,914	28,676	0.8%	22,579	13,282	35,861	2.8%	-25%
2021	15,935	12,985	28,920	0.9%	22,806	13,408	36,214	1.0%	-25%
2022	16,116	13,064	29,180	0.9%	23,036	13,536	36,572	1.0%	-25%
2023	16,307	13,146	29,453	0.9%	23,270	13,666	36,936	1.0%	-25%
Total Growth 2006-2023				23.7%				56.4%	

*Adjusted to eliminate Seattle-Vashon POF service not included in the travel demand model

** Does not include San Juan Interisland ridership

Source: WSF and Parsons Brinckerhoff June 2006 Projections

WSF's Draft Long-Range Strategic Plan anticipates adding new service. With these additions, total ridership in 2023 is projected at 39.4 million, an increase of 67 percent over the 2006 projected ridership in the travel demand model. Ridership in the plan is projected to 2030, with a total growth of 88 percent projected with the new service additions compared to 68 percent under the baseline service levels. See Table 9, below.

Table 9. Travel Demand Model Projections: Baseline vs. Planned Service in Draft Long-Range Strategic Plan (2006-2030)

(000s)

	Travel Demand Model* Baseline Projection - Draft Long-Range Strategic Plan				Travel Demand Model* Planned Service Projection - Draft Long-Range Strategic Plan				
	Passenger	Vehicle/Driver	Total Ridership	Annual Rate of Growth	Passenger	Vehicle/Driver	Total Ridership	Annual Rate of Growth	% Base vs. Planned Demand
2006	13,056	10,563	23,619		13,056	10,563	23,619		0%
2007	13,253	10,740	23,993	1.6%	13,253	10,740	23,993	1.6%	0%
2008	13,412	11,093	24,505	2.1%	13,412	11,093	24,505	2.1%	0%
2009	13,456	11,187	24,643	0.6%	13,456	11,187	24,643	0.6%	0%
2010	13,707	11,309	25,016	1.5%	13,868	11,349	25,217	2.3%	-1%
2011	14,204	11,463	25,667	2.6%	14,296	11,488	25,784	2.2%	0%
2012	14,956	11,648	26,604	3.7%	15,042	11,674	26,716	3.6%	0%
2013	15,942	11,860	27,802	4.5%	16,241	11,979	28,220	5.6%	-2%
2014	17,104	12,091	29,195	5.0%	17,328	12,218	29,546	4.7%	-1%
2015	18,341	12,328	30,669	5.0%	19,213	13,051	32,264	9.2%	-5%
2016	19,501	12,555	32,056	4.5%	20,366	13,621	33,987	5.3%	-6%
2017	20,326	12,743	33,069	3.2%	21,155	13,888	35,043	3.1%	-6%
2018	21,036	12,918	33,954	2.7%	21,967	14,130	36,097	3.0%	-6%
2019	21,786	13,098	34,884	2.7%	22,755	14,329	37,084	2.7%	-6%
2020	22,579	13,282	35,861	2.8%	23,590	14,532	38,122	2.8%	-6%
2021	22,806	13,408	36,214	1.0%	23,866	14,701	38,567	1.2%	-6%
2022	23,036	13,536	36,572	1.0%	24,148	14,872	39,020	1.2%	-7%
2023	23,270	13,666	36,936	1.0%	24,434	15,047	39,481	1.2%	-7%
Total Growth 2006-2023				56.4%				67.2%	
2024	23,506	13,797	37,303	1.0%	25,036	15,389	40,425	2.4%	-8%
2025	23,746	13,930	37,676	1.0%	25,436	15,623	41,059	1.6%	-9%
2026	23,989	14,064	38,053	1.0%	25,829	15,855	41,684	1.5%	-10%
2027	24,236	14,199	38,435	1.0%	26,231	16,091	42,322	1.5%	-10%
2028	24,486	14,337	38,823	1.0%	26,641	16,332	42,973	1.5%	-11%
2029	24,739	14,476	39,215	1.0%	27,061	16,578	43,639	1.5%	-11%
2030	24,996	14,616	39,612	1.0%	27,490	16,829	44,319	1.6%	-12%
Total Growth 2006-2030				67.7%				87.6%	

* Does not include POF Vashon Service nor San Juans Interisland ridership

Section Four
Model Differences

The models generate substantially different ridership projections because of the inputs used, how frequently they are updated, and their use of peak period forecasts. WSF has not attempted to reconcile the differences in the models. As noted in WSF's Draft Long-Range Strategic Plan: "Ridership projections are adjusted to match the econometric model's annual totals through 2008. Projections for the year 2017 and beyond rely only on the regional transportation model and a smooth curve is assumed during the transition period between 2008 and 2017" (p. 13).

A. Model Updates

The two models provide different results in part because they are updated on different cycles. The econometric model is updated quarterly based on OFM's quarterly updates of population and employment. The travel demand model is dependent on the PSRC updates, which are completed less frequently. "In contrast, the statewide projections for population and employment prepared by OFM are quarterly time series — four data points for each year from the present through 2030. The population series is for the adult population age 18 and over. The employment series includes all non-agricultural employment, with quarterly seasonality removed. The population projection is updated annually; all other forecast variables including employment are revised each quarter. As a result, the WSF revenue and ridership forecasts will get revised over time as they react to changing forecasts for the input variables — an expected and desired result" (Parsons Brinckerhoff response to consultant questions, Oct. 24, 2006).

B. Auto Operating Costs

One of the difference between the two models is in how they deal with the cost of operating an automobile. Auto operating costs are a primary driver of vehicle ridership on the ferries. Ridership is reduced as the costs of operating an automobile increase. In the PSRC travel demand model, auto operating costs are assumed to remain constant with inflation. "A primary difference is that constant real auto operating costs within the PSRC travel demand model is an assumption — there is no forecast for auto operating costs in one sense because the model bases costs in constant year dollars, and no real growth in this cost has been assumed. In contrast, real gasoline prices — as well as a measure of marginal vehicle operating costs per mile that take into account the projection for vehicle fleet fuel efficiency — are forecast inputs as time series variables with quarterly resolution [in the econometric model]. In other words, changes in the projections for real fuel costs are assumed to affect travel decisions with respect to ferry use" (Parsons Brinckerhoff response to consultant questions, Oct. 24, 2006).

C. Peak Period

Unlike the econometric model, the travel demand model is based on the four-hour PM peak period, which is then extrapolated to the rest of the day, week, and year. "To develop revenue projections WSF extrapolates commute-period ridership to the rest of

the day, week and year. To annualize the models' commute-period projections, WSF uses historic ridership data on the relationships between peak-period ridership and ridership totals for other periods (daily & annual) supplemented by an econometric model that provides reliable projections of annual ridership in the short-term. Ridership projects are adjusted to match the econometric model's annual totals through 2008. Projections for the year 2017 and beyond rely only on the regional transportation models and a smooth curve is assumed during the transition period between 2008 and 2017" (Draft Long-Range Strategic Plan, p. 13).

If the relationship between the peak and non-peak periods changes as a result of tariff increases or service modifications from the historic pattern, it will affect the extrapolation to an annual ridership. The 2003 South Sound Travel Survey indicates that some of this may be happening, noting particularly the increased ridership in the PM peak on the Point Defiance-Tahlequah route between 1999 and 2003, which "may be the result of service reductions since 1999, which could be concentrating more ridership within the PM peak period" (2003 South Sound Travel Survey Analysis and Results Report, p. 17).

Section Five
PSRC Travel Demand Model: Cross-Sound Demand

A key input to WSF's travel demand ridership projection is the estimate of cross-Sound growth forecast by the PSRC model. WSF used model Version e05 of the PSRC travel demand model, which is currently being updated, for development of the Draft Long-Range Strategic Plan 2006-2030.

The consultant's review of the methodology used to estimate cross-Sound growth, which is based on interviews with PSRC and WSF staff and consultants, indicates that Version e05 of the travel demand model may overstate cross-Sound demand. "A new Tacoma Narrows Bridge is being built. The bridge is an important transportation corridor in the South Sound and is a key factor in the forecast of future ferry ridership. The PSRC regional model . . . accounts for the relative attractiveness of ferry service and the new expanded bridge" (Draft Long-Range Strategic Plan, p.25). The bridge will have tolls collected one-way, with the toll currently estimated at $3.00.

As explained in more detail in Appendix A, there is a significant discrepancy between the WSDOT estimate of vehicles that will use the Tacoma Narrows Bridge and the numbers included in the forecast in Version e05 of the PSRC model. The PSRC model assumes 66,000 vehicles will use the Tacoma Narrows Bridge daily in 2020, compared to an estimate of 120,000 vehicles a day made by WSDOT (www.wsdot.wa.gov).[1]

Mirai Associates recalculated the cross-Sound ridership projection in the PSRC model using a more reasonable calculation of daily vehicle use of the Tacoma Narrows Bridge. The resulting estimate calculated 4.6 million fewer ferry trips across the Sound, resulting in a revised systemwide baseline ridership estimate in 2030 of 36.1 million—an 11 percent reduction in systemwide ridership projected in the travel demand model.

Table 10. Tacoma Narrows Bridge Revised Use: Impact on Systemwide Ridership

PSRC Model-Daily Vehicles TNB	Mirai Estimate Daily Vehicles TNB*	Difference	AVO**	2030 Person Trips	% Non-Ferry	Daily Person Trips Transferred from Ferry to TNB	Reduction in Annual Cross-Sound Ferry Riders	Systemwide Ridership (000s)	%
85,765	132,555	46,790	1.2	56,148	75%	14,037	4,562,025	35,050	-11%

* Calculated from WSDOT estimate of 120,000 vehicles in 2020.

** Average vehicle occupancy

[1] WSF estimate is 95,000 vehicles per day in 2020. The web site was revised in Dec. 2006.

Appendix B shows the ridership by route as projected by the econometric model and the travel demand forecast for 2007, 2010, 2015 and 2020. The largest discrepancy in the projections is for the Seattle-Bremerton route which in 2020 in the econometric model has 53 percent fewer trips (2.5 million) than the travel demand model. The South Sound total is 52% (840,000 trips) lower in 2020 in the econometric model than in the travel demand model. Both of these routes are particularly affected by the Tacoma Narrows Bridge projections and together account for 48% of the difference in the ridership projections.

Section Six
Relationship to Historical Ridership Growth

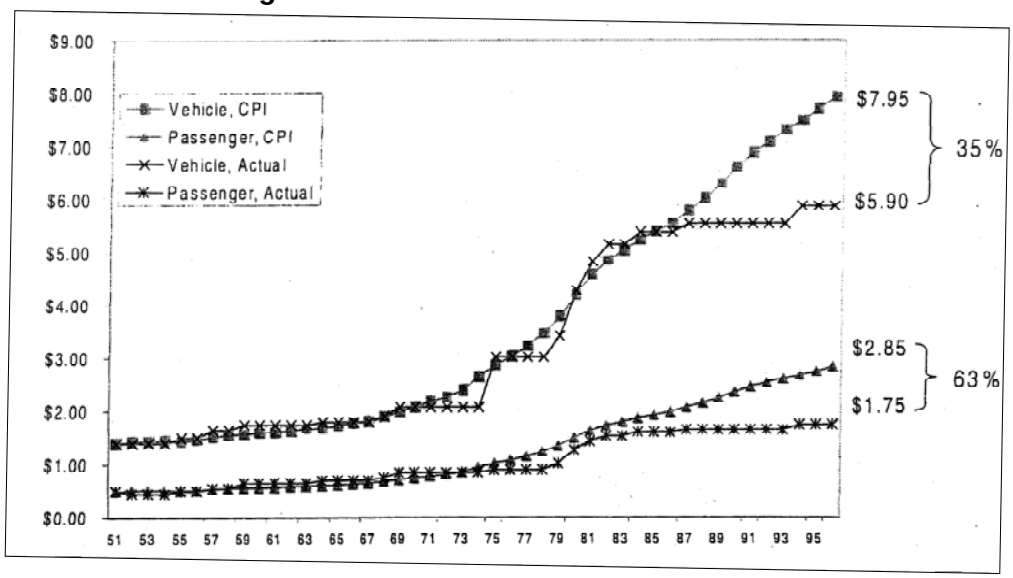
The Draft Long-Range Strategic Plan suggests that the relatively high growth rates anticipated in the baseline and the planned service projections are reasonable in part because they are consistent with previous growth rates.

> History shows the influence of fares on ridership demand. Ridership increased substantially from 1985 to 2000 while inflation-adjusted fares declined to historically low levels. Since 2000 when fares were increased rapidly in response to I-695, systemwide ridership declined by about 10 percent. A regional recession in this time frame also contributed to the decline in ridership. As future inflation-adjusted fares stabilize, ridership is projected to bounce back. . . . . While the . . . annual rate of growth expected in total trips is high (trips grow more than population at the same time period) it is certainly not unprecedented in WSF history. Average rate of growth from 1970-1979 was 6.4 percent, led primarily by significant vehicle growth—a period where fares where similar to those projected for the planning period. This suggests that the recent fare increases have only temporarily suppressed demand growth, and once fares stabilize, ridership will return to a pre-I-695 trajectory (Draft Long-Range Strategic Plan, p. 17).

This comparison with growth in previous time periods should be reviewed with caution because of the following factors:

1. The 1970-1980 decade cited above had the highest increase in two-worker household formation in U.S. history. During that time period an increase in households would create an increase of work trips at a significantly higher percentage rate than in the current decade, which has already absorbed women into the workforce.
2. Rates during this period actually lagged behind inflation, so that the real cost of ferry ridership declined during this period. The 1999 Long-Range System Plan included the following chart (Figure 3) comparing inflation and fare price increases.

Figure 3. Historic Rates vs. Inflation



Source: WSF 1999-2018 Long Range Systems Plan

3. The current plan for 2.5 percent annual rate increases assumed in both models is greater than the anticipated rate of inflation, resulting in an increase in real fares (see Figure 1, above).

Section Seven
Recreational Uses

Neither model includes specific information about trends in recreational use of the ferries. The models rely on projections of population and employment. While to some extent patterns in recreational use may be inferred from calculations such as the effect of auto operating costs on ferry demand, and/or can be derived from the 1999 origin and destination study, which included the purpose of the trip, there are no specific indicators developed for tourist or other recreational use. This lack of information is most important in projecting demand for the Keystone-Port Townsend and Anacortes-San Juan Islands-Sidney routes, which have heavy recreational versus commuter use.

Section Eight
Customer Information/Origin and Destination Study

The 1998 performance audit by Booz Allen for the Joint Legislative Audit and Review Committee, while finding the travel demand model to be "robust and comprehensive" (p. 8-20), recommended that the origin and destination study be updated every five years. The 1999 Origin and Destination Study was less than five years old when work on the Draft Long-Range Strategic Plan started in 2003, which is the base year for the plan. Consequently it was not updated prior to the development of the 2006-2030 plan. In 2003 a more limited origin and destination study was undertaken in the South Sound to support analysis of passenger only ferry service.

WSF's service and tariff structure has changed substantially since 1999. A comprehensive review of the impact of those changes on customer origin and destination patterns will not be available until the survey is updated. This is anticipated to occur in 2006.

Additionally, there is little information available on the characteristics of the vehicle market. The need for expanded capacity to support vehicular use of the ferries is driving the capital plan. There are no surveys or other market information available on vehicular drivers' likely response to operational or tariff changes.

Section Nine
Recommendations

The projection of ridership is critical to WSF's financial, operational, and capital planning. The consultant's recommendations are intended to meet the study objectives of reviewing the accuracy of ridership and revenue forecast and developing performance measures.

A. Reconcile Econometric and Travel Demand Model Projections

The consultants recognize that the two models provide different and important information for WSF planning. It is recommended that the two models be reconciled so consistent projections are used for short and long-term planning.

The consultants have found that the econometric model is quite accurate and is updated frequently. The model is critical to the ability of WSF and the state to forecast revenue and ridership, and helps support tariff decisions. The travel demand model provides important information that is not available from the econometric model on rider origin and destination, peak and non-peak patterns, and actual vehicle wait times. This is information critical to understanding the ferry market and allows ferry planning to integrate with work done by the PSRC and MPOs.

B. Use of Model Information

The consultants found that WSF is using the travel demand forecast for capital planning and terminal design. Until the reconciliation of ridership forecasts can occur and/or the legislature has approved a revised forecast, it is recommended that the legislature use the econometric demand model forecast as the basis for its review of capital requests. This is particularly important for decisions in the Central and South Sound travel sheds where ridership forecast in the travel demand model is substantially higher than that forecast in the econometric model.

C. Develop Additional Ferry Market Information

1. Recreation Use

The travel demand model provides little information on recreation users since it relies primarily on forecasts of population and income. The consultants recommend a market study of current and forecast recreational use of the ferry system with a particular focus on the Keystone-Port Townsend and Anacortes-San Juans-Sidney routes.

2. Vehicle Use

A new origin and destination survey will be undertaken in 2006. This will provide more current information on ferry users. The consultants recommend a supplementary market study of vehicle customers to help inform planning, operations. and tariff policies affecting this key market, which is driving capital planning. The study should be

designed to provide information on the reaction of this market to traffic demand strategies and tariff alternatives.

D. Performance Measures

WSF regularly reports on actual ridership and revenue against the quarterly forecasts from the econometric model in the WSDOT Gray Notebook and other performance reports. WSF has not historically reported ridership in comparison to the forecast in the travel demand model. The consultants recommend that WSF add a key performance measure focused on tracking actual versus forecasted ridership from the travel demand model.

Table 11 on the following pages summarizes the two WSF demand forecasting models and the consultants' recommendations.

Table 11. Comparison Matrix for the Two WSF Demand Forecasting Processes

Attribute	Econometric Demand Model & Revenue Forecasting Process	Network-Based Travel Demand Forecasting Process
Purpose	• To provide mid-range revenue and ridership projections monthly or annually for WSF budgeting and state financial planning purposes. • To assess revenue and ridership impacts of fare increases and various tariff policies. • To assess revenue and ridership impacts or conduct "what-if analyses" for minor service changes. • To estimate revenue impacts from major service changes where the demand impacts come from the network-based travel demand model forecasting process.	• To forecast how many people and vehicles will use WSF facilities on a daily basis (with emphasis on weekday peak travel periods) under a specified set of circumstances (e.g., with a given set of service specifications, land use assumptions, etc.). Forecasting period is from the present through long-range future, with current forecasts going out to 30 years. • To test the likely ferry travel demand and mode choice impacts of alternative ferry routes; service attributes (frequency, travel time, costs, capacity); and supporting highway and transit service characteristics. • To provide network-based demand estimates to support environmental work regarding WSF service and/or facility expansions, as required under NEPA.
Uses/Forum for Use	• WSF budgeting and short-range service planning. • Provides revenue estimates for the Transportation Revenue Forecast Council for statewide budgeting. • Tests fare policy scenarios for use by the Washington State Transportation Commission Tariff Policy Committee.	• WSF long-range system, corridor, and route planning. • Identifies future service and capital needs. • Provides long-range travel demand forecasts in context of metropolitan transportation planning in cooperation with PSRC and outlying MPOs. • Provides pertinent data to other projects, e.g., Alaskan Way Viaduct, terminal design efforts, etc.
Brief Description of Methods	• Employs both ARIMA and econometric time-series techniques to estimate monthly system and route-specific travel demand by six fare categories plus two fare surcharge categories. • Considers the impacts of economic and demographic variables that drive travel behavior. • Estimates fare elasticities based upon historical impacts to changes in real fares. • Employs EViews statistical package for demand forecasting and spreadsheet models to apply fares and vessel capacity constraints for revenue forecasts.	• Employs an incremental modeling process that is closely tied in with the PSRC regional forecasting model as well as with pertinent databases from outlying jurisdictions. • Estimates weekday PM peak travel demands by route, boarding method, mode of access/egress and travel direction for a given scenario and horizon year under a single blended fare structure. • Considers the impacts of individual traveler behavior (destination, route substitution, travel modes and boarding methods), and changes to population and employment by small area geography. • Employs the EMME/2 modeling software.

Attribute	Econometric Demand Model & Revenue Forecasting Process	Network-Based Travel Demand Forecasting Process
Input Requirements	• Detailed existing ridership history by route, mode, and fare category. • Detailed existing and proposed nominal fare structures by route and category. • Historical fare revenue by month and route. • History and projections for regional and national economic and demographic variables (e.g., real personal income, population, employment, inflation and vehicle travel costs.) • Demand and growth rates for any proposed new routes (from the network-based travel demand forecasting process).	• Existing and forecast year land use, population and employment level. and parking costs by transportation analysis zone (TAZ) developed regionally and consistent with databases used by local jurisdictions. • Trip tables (origin-destination travel patterns) derived from periodic travel survey data. • Base year ridership history for calibration purposes. • Route level of service and physical operating characteristics including vessel specifications. • Average real fares by route (can calculate blended fares from real fares out of the econometric demand model & revenue forecasting process, if desired). • Background information including highway and transit networks, generalized costs of travel, and other inputs "borrowed" from the PSRC Regional Model and outlying jurisdictions.
Main Outputs	• Sixteen-year projections for revenue and ridership by month, route, and fare category. • Fare elasticities of demand by fare category.	• Weekday PM peak ridership in origin-destination form by route, boarding mode, and mode of access/egress for a selected forecast year and scenario; expandable to week, daily or annual volumes, with results for intermediate years via interpolation. • Ferry share of adjacent mode (transit/highway) demand.
Strengths	• Provides detailed quarterly route-by-route traffic and revenue estimates that can be used for operations budgeting. • As part of a performance audit, was shown to be quite accurate (particularly when service changes are limited to existing routes such that the route structure remains relatively static.) • Provides information on seasonal and annual trends and yields results at a monthly detail level. • Responds to quarterly changes in the projections for state-level economic and demographic input variables as well as existing ridership and revenue trends. • Can be updated with relative ease to meet quarterly forecast requirements.	• Accepted standard industry practice for long-range (10-, 20- and 30-year) forecasts and demand projections to support alternatives analysis and project-level environmental planning; conforms to both NEPA/SEPA and MTP Planning requirements. • Provides typical PM peak period (expandable to daily) travel volumes for weekday travel in a format that is consistent with other regional planning efforts. • WSF model received high marks from performance audit; model updates have been implemented under direction of panel of experts. • Captures land side diversion (e.g., TNB), changes in mode shift, mode of access/egress, as well as impacts of new routes/terminals, travel patterns of each route's users.

Attribute	Econometric Demand Model & Revenue Forecasting Process	Network-Based Travel Demand Forecasting Process
		• Identifies future peak period ferry travel volumes by mode of access/egress to develop ferry terminal design requirements. • Captures anticipated effects of future land use and other localized conditions on ferry travel behavior; links land use and transportation analyses consistent with GMA. • Appropriate model for comparing alternative system plans against one another as well as alternatives at the corridor level.
Shortcomings	• Does not specifically capture relative geographic (e.g., TAZ-specific) changes in land use over time, nor major changes in the ferry system routes or levels of service. • Does not provide information about weekday versus weekend travel patterns, nor intra-day and directional travel patterns. • Provides only very limited travel mode information, and no mode of access/egress information about walk-on boardings.	• Does not capture monthly or seasonal variation in travel and relies on external expansion factors to predict annual demand.
Consultant Observations and Recommendations	• Very accurate. • Includes auto operating costs/frequently updated. • Used for performance measurement. • Recommend using for legislature's capital decisions until models are reconciled	• Accuracy not tracked, but has changed substantially since last developed in 1999. • Infrequently updated. • Extrapolates from peak to non-peak which may have changed with fare increases and service reductions. • Overstates ridership by understating vehicle use of Tacoma Narrows Bridge. • Add performance measurement.
Both Models/Consultants Observations & Recommendations	• Neither model provides information on recreational customers. • Recommend study to gather more information on recreational customers, particularly for the Keystone-Port Townsend and San Juan routes. • Recommend additional marketing study on vehicle customers with analysis of traffic demand and operational strategies.	

Source: WSF Planning/Consultants

APPENDIX A
TACOMA NARROWS BRIDGE
TECHNICAL MEMORANDUM

MEMORANDUM

To: Kathy Scanlan

From: Bob Sicko, Mirai Transportation Planning and Engineering

Subject: Estimate of 2030 Cross Sound Ridership

Date: October 25, 2006

This memo summarizes the issues discussed with staff from WSF, the House Transportation Committee, the Senate Transportation Committee, PSRC and the Cedar River Group and reviews the methodology used to estimate future cross sound travel using the PSRC E_05 travel demand modeling suite. In question, are the inputs and assumptions used to develop a reasonable estimate of cross sound growth from 2004 to 2030.

I have reviewed the PSRC model outputs and developed ridership estimates that, while very generic, estimate growth rates that address the methodological issues inherent in the model and the resulting demand estimation. In this memo I will show how the growth rate may change when the estimates for the cross sound growth for ferry traffic and vehicular demand across the Tacoma Narrow Bridges take into account these issues that have been raised.

A review of the methodology used by the WSF consultants combined with input and clarification from PSRC staff identified two distinct issues. The first issue deals with the development of the PSRC model and its usability; the second focuses on the procedures used to estimate cross sound demand.

Travel Demand Models Used

The PSRC model was continually updated throughout 2005. While there had been problems with the earlier versions of the PSRC model, it was deemed functional enough to use for project analysis. This meant that the analyst using the model would need to very carefully review the outputs for any illogical results. The model was updated throughout 2005 as follows.

- Two versions of the PSRC multimodal transportation demand model were used in the development of the Long Range Plan. The output from the models was used as input to the WSF model.
    a. The PSRC B_05 (4/15/5) model had several inconsistencies in the modeling structure and issues with the representation of network and

transit attributes. A Technical Modeling Group was formed to support improvements to the model.

b. The PSRC E_05 (6/1/5) model incorporated suggested enhancements, but core issues with the modeling structure continued to provide illogical results. A national expert panel was formed to provide further guidance. The modeling structure was extensively modified and re-released in late 2005.

- The current WSF Model requires inputs similar to those used in running the PSRC model. A key input to the WSF model is the estimate of cross sound growth forecast by the PSRC model. The WSF model is a mature model and has a solid foundation to develop reasonable estimates of demand.

Cross Sound Demand

The process, used to estimate cross sound demand, examined the growth in cross sound person trips in the four county region and subtracted the trips using the Tacoma Narrows Bridge (TNB). While this is a straight forward and completely logical approach, when comparing the model output with previous estimates of future vehicular demand on the TNB, inconsistencies are found.

To be consistent with the State's planning paradigm, other sources of data should be used as comparison to check the logic of the results. For instance, the WSDOT web page states that by the year 2020, almost 120,000 vehicles a day will cross the TNB. This estimate of demand is what drives the revised estimate of cross sound demand based on the PSRC E_05 model output.

Table 1 presents the estimates of daily vehicular demand found in the E_05 model runs. Data used by PSRC for model validation shows the estimated daily vehicular demand in 2000 is 94,000. As seen in Table 1, the model estimate for 2000 is 82,835. The PSRC model underestimates the 2000 TNB demand by 13.5 percent.

Table 1. Estimates of Daily Vehicular Modeled Demand across the TNB

Year	Vehicles
2000	82,835
2010	62,000
2020	66,000
2030	85,765

Table 2 shows the growth assumed between 2000 and 2020, the absolute growth rate, the annualized growth rate and a estimate of 2030 vehicular demand. The TNB vehicular demand is estimated to grow by 27.6 percent for an annualized growth rate of 1.23 percent a year. A conservative estimate for growth from 2020 to 2030, annualized growth rate of 1.1 percent is used to created a 2030 vehicle demand

estimate. Using the 1.1 percent annualized growth rate, a demand of 132,500 vehicles was assumed for the TNB in 2030.

Table 2. Assumed Tacoma Narrows Bridge Growth

2000 Observed Volume	2020 TNB Volume	Percent Growth	Annualized Growth Rate	Assumed Annualized rate 2020 to 2030)	Estimated 2030 Vehicular Demand
94,000	120,000	27.6	1.23	1.10	132,555

Table 3 shows that there is a difference of 46,790 daily vehicles between the model and the estimate derived in Table 2 for 2030. Using an average vehicle occupancy of 1.2 (derived from PSRC model output), the 2030 estimate of daily person trips is 56,148 less than required.

Table 3. Estimate of Deficient Person Trips

2030 PSRC Model (vehicle)	2030 WSDOT Based (vehicles)	Difference (vehicles)	Average Vehicle Occupancy	2030 Person trips
85,765	132,555	46,790	1.2	56,148

Table 4 provides a summary of the analysis used to develop the annual cross sound ridership estimate. A significant portion of the "missing" person trips would be trips that would in all likelihood not use the ferry system. The analysis of the commute shed for the TNB shows that this would be approximately 75 percent of the daily person rips. Therefore 25 percent of the 56,148 person trips (approximately 14,000 person trips) would be drawn from the cross sound commute shed. In converting the daily person trip estimate to an annual estimate an annualization factor of 325 is used to account for seasonality variations in demand. It is estimated that about 4.5 million riders would be shifted from the cross sound shed to the Tacoma Narrows Bridge.

Table 4. Reduction in Cross Sound Trips

Person Trip Deficit	Percentage Non Ferry Trips	Person Trips Transferred from Cross Sound	Annualization Factor	Reduction in annual Cross Sound Riders
56,148	75%	14,037	325	4,562,025

The revised estimate of systemwide ridership would be 35.05 million, an 11 percent reduction in demand. The revised estimate of annualized growth, between 2003 and 2030, would be 1.4 percent versus the 1.9 percent shown in the Long Range Plan.

APPENDIX B
ROUTE PROJECTIONS

	Econometric Model (9/06 Forecast)			Travel Demand Model			Difference (Econometric vs. Travel Demand)					
	2007											
Route	Forecasted Passenger Ridership	Forecasted Vehicle Ridership	Forecasted Fiscal Year Ridership	Forecasted Passenger Ridership	Forecasted Vehicle Ridership	Forecasted Fiscal Year Ridership	Passenger	%	Vehicle	%	Total	%
PT. DEFIANCE—TAHLEQUAH	299,233	391,017	690,250	315,128	430,081	745,210	(15,896)	-5%	(39,064)	-10%	(54,960)	-8%
SOUTH PUGET SOUND												
VASHON—SOUTHWORTH	87,841	125,407	213,248	84,227	128,003	212,230	3,614	4%	(2,597)	-2%	1,018	0%
FAUNTLEROY—VASHON	952,432	1,128,809	2,081,241	829,972	1,127,231	1,957,203	122,460	13%	1,578	0%	124,037	6%
FAUNTLEROY—SOUTHWORTH	448,832	552,756	1,001,588	354,643	508,481	863,124	94,189	21%	44,275	8%	138,464	14%
SOUTH PUGET SOUND TOTAL	*1,489,105*	*1,806,972*	*3,296,076*	*1,268,842*	*1,763,716*	*3,032,558*	*220,263*	*15%*	*43,256*	*2%*	*263,519*	*8%*
CENTRAL PUGET SOUND												
SEATTLE—BREMERTON	1,677,026	693,243	2,370,269	2,008,417	671,561	2,679,979	(331,392)	-20%	21,682	3%	(309,710)	-13%
SEATTLE—BAINBRIDGE ISLAND	4,558,353	2,057,197	6,615,550	4,597,257	2,353,069	6,950,326	(38,904)	-1%	(295,872)	-14%	(334,776)	-5%
EDMONDS—KINGSTON	2,046,049	2,262,996	4,309,045	1,823,689	2,140,285	3,963,974	222,360	11%	122,711	5%	345,071	8%
CENTRAL PUGET SOUND TOTAL	*8,281,428*	*5,013,436*	*13,294,863*	*8,429,364*	*5,164,915*	*13,594,279*	*(147,936)*	*-2%*	*(151,479)*	*-3%*	*(299,415)*	*-2%*
MUKILTEO—CLINTON	1,903,872	2,169,473	4,073,346	1,812,661	2,205,559	4,018,220	91,212	5%	(36,085)	-2%	55,126	1%
PORT TOWNSEND—KEYSTONE	403,640	361,761	765,401	419,920	372,336	792,256	(16,280)	-4%	(10,575)	-3%	(26,855)	-4%
ANACORTES—SAN JUAN ISLAND	918,138	852,907	1,771,045	941,009	769,133	1,710,142	(22,871)	-2%	83,774	10%	60,903	3%
ANACORTES/ISLAND—SIDNEY	84,949	41,358	126,308	65,930	34,536	100,466	19,019	22%	6,822	16%	25,842	20%
System Totals	13,380,365	10,636,924	24,017,289	13,252,854	10,740,275	23,993,129	127,511	1%	(103,351)	-1%	24,160	0%
	2010											
Route	Forecasted Passenger Ridership	Forecasted Vehicle Ridership	Forecasted Fiscal Year Ridership	Forecasted Passenger Ridership	Forecasted Vehicle Ridership	Forecasted Fiscal Year Ridership	Passenger	%	Vehicle	%	Total	%
PT. DEFIANCE—TAHLEQUAH	332,603	430,769	763,372	318,286	435,513	753,799	14,316	4%	(4,744)	-1%	9,573	1%
SOUTH PUGET SOUND												
VASHON—SOUTHWORTH	91,708	137,076	228,784	87,526	135,067	222,593	4,183	5%	2,009	1%	6,191	3%
FAUNTLEROY—VASHON	994,363	1,233,845	2,228,208	850,711	1,182,101	2,032,812	143,652	14%	51,745	4%	195,396	9%
FAUNTLEROY—SOUTHWORTH	459,723	627,362	1,087,085	382,162	582,408	964,570	77,561	17%	44,955	7%	122,515	11%
SOUTH PUGET SOUND TOTAL	*1,545,794*	*1,998,283*	*3,544,077*	*1,320,399*	*1,899,576*	*3,219,974*	*225,395*	*15%*	*98,708*	*5%*	*324,103*	*9%*
CENTRAL PUGET SOUND												
SEATTLE—BREMERTON	1,807,974	731,383	2,539,356	2,161,367	771,040	2,932,407	(353,393)	-20%	(39,657)	-5%	(393,051)	-15%
SEATTLE—BAINBRIDGE ISLAND	4,961,401	2,186,996	7,148,397	4,634,420	2,370,977	7,005,397	326,981	7%	(183,981)	-8%	143,000	2%
EDMONDS—KINGSTON	2,179,554	2,566,612	4,746,166	1,926,041	2,302,357	4,228,399	253,513	12%	264,254	10%	517,767	11%
CENTRAL PUGET SOUND TOTAL	*8,948,929*	*5,484,990*	*14,433,919*	*8,721,829*	*5,444,374*	*14,166,203*	*227,101*	*3%*	*40,615*	*1%*	*267,716*	*2%*
MUKILTEO—CLINTON	2,034,511	2,359,289	4,393,801	1,864,431	2,293,054	4,157,485	170,080	8%	66,236	3%	236,316	5%
PORT TOWNSEND—KEYSTONE	429,701	385,229	814,929	431,167	385,281	816,448	(1,466)	0%	(53)	0%	(1,519)	0%
ANACORTES—SAN JUAN ISLAND TOTALS	989,653	957,651	1,947,304	980,013	813,514	1,793,527	9,640	1%	144,137	15%	153,777	8%
ANACORTES/ISLAND—SIDNEY	85,143	40,704	125,847	71,255	37,987	109,242	13,888	16%	2,717	7%	16,605	13%
System Totals	14,366,334	11,656,915	26,023,249	13,707,379	11,309,299	25,016,678	658,954	5%	347,617	3%	1,006,571	4%

	Econometric Model (Sept. 06 Forecast)			Travel Demand Model			Difference (Econometric vs. Travel Demand)					
	2015											
Route	*Forecasted Passenger Ridership*	*Forecasted Vehicle Ridership*	*Forecasted Fiscal Year Ridership*	*Forecasted Passenger Ridership*	*Forecasted Vehicle Ridership*	*Forecasted Fiscal Year Ridership*	*Passenger*	*%*	*Vehicle*	*%*	*Total*	*%*
PT. DEFIANCE—TAHLEQUAH	346,692	489,694	836,387	354,020	444,514	798,535	(7,328)	-2%	45,180	9%	37,852	5%
SOUTH PUGET SOUND												
VASHON—SOUTHWORTH	92,247	148,095	240,341	126,628	147,104	273,732	(34,381)	-37%	991	1%	(33,390)	-14%
FAUNTLEROY—VASHON	1,000,201	1,333,031	2,333,231	1,010,957	1,275,618	2,286,575	(10,756)	-1%	57,413	4%	46,657	2%
FAUNTLEROY—SOUTHWORTH	485,626	651,568	1,137,194	741,977	718,928	1,460,905	(256,351)	-53%	(67,361)	-10%	(323,711)	-28%
SOUTH PUGET SOUND TOTAL	*1,578,074*	*2,132,693*	*3,710,767*	*1,879,561*	*2,141,650*	*4,021,212*	*(301,488)*	*-19%*	*(8,957)*	*0%*	*(310,445)*	*-8%*
CENTRAL PUGET SOUND												
SEATTLE—BREMERTON	1,823,606	768,978	2,592,584	3,281,149	954,396	4,235,545	(1,457,543)	-80%	(185,419)	-24%	(1,642,961)	-63%
SEATTLE—BAINBRIDGE ISLAND	5,238,819	2,323,308	7,562,127	5,972,868	2,421,259	8,394,127	(734,049)	-14%	(97,952)	-4%	(832,000)	-11%
EDMONDS—KINGSTON	2,380,828	2,835,731	5,216,559	2,815,507	2,586,268	5,401,776	(434,679)	-18%	249,462	9%	(185,217)	-4%
CENTRAL PUGET SOUND TOTAL	*9,443,254*	*5,928,016*	*15,371,270*	*12,069,524*	*5,961,924*	*18,031,448*	*(2,626,270)*	*-28%*	*(33,908)*	*-1%*	*(2,660,178)*	*-17%*
MUKILTEO—CLINTON	2,114,877	2,475,827	4,590,704	2,295,434	2,439,797	4,735,230	(180,557)	-9%	36,030	1%	(144,527)	-3%
PORT TOWNSEND—KEYSTONE	452,656	414,805	867,461	430,116	406,933	837,049	22,540	5%	7,872	2%	30,411	4%
ANACORTES—SAN JUAN ISLAND TOTALS	1,042,131	1,020,792	2,062,922	1,176,559	889,174	2,065,732	(134,428)	-13%	131,618	13%	(2,810)	0%
ANACORTES/ISLAND—SIDNEY TOTALS	86,024	39,902	125,926	89,608	44,092	133,700	(3,584)	-4%	(4,190)	-11%	(7,773)	-6%
System Totals	15,063,707	12,501,729	27,565,436	18,294,822	12,328,083	30,622,905	(3,231,115)	-21%	173,645	1%	(3,057,469)	-11%
	2020											
Route	*Forecasted Passenger Ridership*	*Forecasted Vehicle Ridership*	*Forecasted Fiscal Year Ridership*	*Forecasted Passenger Ridership*	*Forecasted Vehicle Ridership*	*Forecasted Fiscal Year Ridership*	*Passenger*	*%*	*Vehicle*	*%*	*Total*	*%*
PT. DEFIANCE—TAHLEQUAH	361,349	553,408	914,757	385,068	452,075	837,143	(23,720)	-7%	101,333	18%	77,614	8%
SOUTH PUGET SOUND												
VASHON—SOUTHWORTH	93,111	158,049	251,160	167,755	157,636	325,391	(74,644)	-80%	412	0%	(74,231)	-30%
FAUNTLEROY—VASHON	1,009,572	1,422,628	2,432,199	1,133,960	1,357,506	2,491,466	(124,388)	-12%	65,121	5%	(59,266)	-2%
FAUNTLEROY—SOUTHWORTH	515,348	651,568	1,166,915	1,157,090	852,972	2,010,063	(641,742)	-125%	(201,405)	-31%	(843,147)	-72%
SOUTH PUGET SOUND TOTAL	*1,618,031*	*2,232,244*	*3,850,275*	*2,458,805*	*2,368,115*	*4,826,919*	*(840,774)*	*-52%*	*(135,871)*	*-6%*	*(976,645)*	*-25%*
CENTRAL PUGET SOUND												
SEATTLE—BREMERTON	1,822,688	807,770	2,630,457	4,287,891	1,133,808	5,421,699	(2,465,203)	-135%	(326,038)	-40%	(2,791,241)	-106%
SEATTLE—BAINBRIDGE ISLAND	5,498,641	2,427,746	7,926,387	7,145,229	2,486,988	9,632,217	(1,646,588)	-30%	(59,242)	-2%	(1,705,830)	-22%
EDMONDS—KINGSTON	2,603,390	2,880,245	5,483,635	3,749,362	2,844,912	6,594,274	(1,145,973)	-44%	35,333	1%	(1,110,639)	-20%
CENTRAL PUGET SOUND TOTAL	*9,924,718*	*6,115,761*	*16,040,479*	*15,182,482*	*6,465,708*	*21,648,190*	*(5,257,764)*	*-53%*	*(349,947)*	*-6%*	*(5,607,711)*	*-35%*
MUKILTEO—CLINTON	2,206,725	2,505,864	4,712,589	2,654,535	2,565,254	5,219,789	(447,810)	-20%	(59,390)	-2%	(507,200)	-11%
PORT TOWNSEND—KEYSTONE	473,723	435,872	909,595	513,086	425,372	938,458	(39,363)	-8%	10,500	2%	(28,863)	-3%
ANACORTES—SAN JUAN ISLAND TOTALS	1,090,951	1,032,382	2,123,333	1,333,451	955,408	2,288,859	(242,499)	-22%	76,974	7%	(165,526)	-8%
ANACORTES/ISLAND—SIDNEY TOTALS	86,797	38,965	125,762	52,821	24,864	77,685	33,976	39%		0%		0%
System Totals	15,762,294	12,914,496	28,676,790	22,580,248	13,256,795	35,837,043	(6,817,953)	-43%	(356,401)	-3%	(7,208,331)	-25%