



MOBILITY 21

TRANSPORTATION PLAN

FULL REPORT JANUARY 18, 2016

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EXECUTIVE SUMMARY

THE PROBLEM

The quality of life and prosperity of all of the citizens of the Puget Sound region are threatened by a dysfunctional transportation system that worsens by the year. Some examples:

- 2015 Urban Mobility Scorecard: Of the 15 very large urban areas in the U.S., only 2 had worse peak period excess travel time than Seattle.¹ Worst was Los Angeles, San Francisco was 2nd and Seattle was tied with San Jose for 3rd.
Puget Sound Regional Council (PSRC): Between 2010 and 2014, delay on regional freeways increased by more than 50%. Even more striking is the 25% increase in the single year between 2013 and 2014.²
- Washington State Department of Transportation (WSDOT): In 3 Puget Sound Counties (King, Pierce, and Snohomish), delay on State highways increased by almost 4% per year between 2009 and 2013. In 2013, the Puget Sound area accounted for **97.8% of statewide delay** [emphasis added]³

PSRC's ADOPTED PLAN

To deal with this crisis, the PRSC has adopted a \$174 billion, far-reaching transportation plan for the next 25 years that will restrict travel, and change the way we live. That's a required public investment of \$45,000 for every man, woman and child of today's regional population. Here are some critical aspects of the adopted plan.

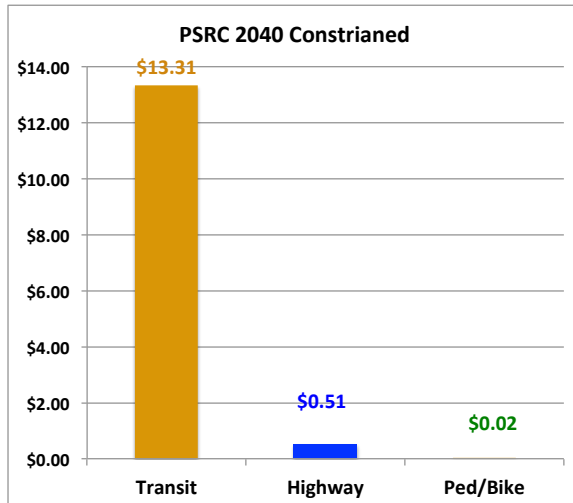
- **50% of total funding for 4% Market Share.** The plan projects a 4% share of daily travel for transit in 2040, but allocates 50% of all public funding through 2040.
- **High Cost of Transit Trips.** The result of this imbalance is a high cost for each trip served by transit between 2010 and 2040. In fact the public investment per person-trip served by transit is 26 times higher than that for the highway system. See Figure 1.

¹ "2015 Urban Mobility Scorecard", Texas Transportation Institute, August 2015, Table 1.

² "Stuck in Traffic: 2015 Report", PSRC, March 2015.

³ "The 2014 Corridor Capacity Report", WSDOT, October 2014, p. 7.

Figure 1. Public Investment for Each 2010-2040 Person-Trip



- **Higher Population Density.** In 2010, only 16% of 2010 regional population lived at densities above 5,000 persons per square mile. In contrast, the PSRC projections would put 77% of 2010 to 2040 growth at densities above 5,000. This would mean that the portion of population living at densities above 5,000 would have nearly doubled to 31%.
- **Revenue Needed Grows Faster than Trips.** Between 2010 and 2040, PSRC's plan would serve a 28% increase in person-trips, but would require a 56% increase in revenue. (Costs are all in 2008 dollars, so this doubling is not a result of inflation.)
- **More Pay Parking.** In 2010, pay parking was in the region's 11 parking districts comprising 281 traffic analysis zones. For 2040, PSRC assumed an increase to 41 pay parking districts for a total of 700 zones. Local locations have not necessarily agreed to this, nor does PSRC have the power to force this.
- **City of Seattle Dominates Transportation Decisions.** Current transportation planning and investment has been dominated by the City of Seattle, where many elected and non-elected thought-leaders express animosity toward the automobile and a love affair with bicycles. This is reflected in projects that are consuming the bulk of our governmental transportation dollars and are reducing lane capacity for cars and trucks.

PROJECTED TRAVEL IN 2040

Three levels on 2040 person-trips are considered in addition to the 2010 Existing Base (see Table 1). M21 and M21-Plus will be defined in the following sections.

Table 1 . Daily Regional Person-Trips

	YEAR	DAILY REGIONAL PERSON-TRIPS	% ABOVE PSRC Adopted	% ABOVE EXISITING BASE
Existing Base	2010	15,434,816		0%
PSRC Adopted Plan	2040	19,807,09	0%	28%
M21 Alternatives	2040	20,996,390	6%	36%
M21-Plus Alternatives	2040	22,741.726	15%	47%

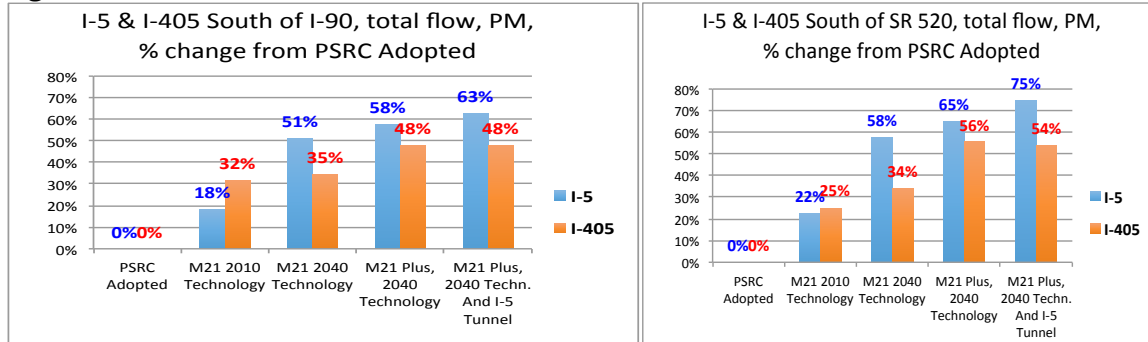
MOBILITY 21

In response to what is clearly an inadequate, but costly solution, Mobility 21 has created an alternative transportation plan for the Puget Sound region that will provide greater benefits at lower costs, while providing our citizens with the cost-effective mobility choices that they want, not what the experts think they should have.

- Mobility21 provides two highway options:
 - **M21 2010 Technology.** This alternative added 6% to the total daily person-trips of the PSRC Adopted Plan to bring travel per person to 2010 levels. Adds 395 freeway lane-miles to those in PSRC's Adopted Plan.
 - **M21 2040 Technology.** This is the same as M21 2010 Technology, except that it includes the Automated Driver Assistance System (ADAS) package. Adds 223 freeway lane-miles to those in PSRC's Adopted Plan. M21 2040 Technology assumes a 50% increase in freeway lane capacity and a 20% increase for arterials due to ADAS. These are not assumed to be self-driving cars.
 - Automatic braking
 - Lane keeping assistance
 - Adaptive cruise control (able to change speed in response to traffic ahead)
- Mobility21-Plus provides two additional highway options:
 - **M21-Plus 2040 Technology.** This alternative added 15% to the total daily person-trips of the PSRC Adopted Plan. It includes ADAS and adds 213 freeway lane-miles to those in PSRC's Adopted Plan.
 - **M21-Plus 2040 Technology + I-5 Tunnel.** This alternative added 15% to the total daily person-trips of the PSRC Adopted Plan, includes ADAS and an I-5 Seattle tunnel. The tunnel would extend from south of the I-90 interchange to north of the SR 520 interchange. Adds 230 freeway lane-miles to those in PSRC's Adopted Plan. M21 2040 Technology assumes a 50% increase in freeway lane capacity.

- **Other Highway Changes and Results**
 - **Tolls.** Flat rate toll on all freeways
 - **Volumes served at screen lines on I-5 and I-405 near I-90 and SR 520** increase as shown in the figures below. These are changes from the 2040 PSRC Adopted Plan and show a major improvement over the PSRC Adopted Plan. Note that the I-5 tunnel increases volumes at the I-5 screenline, but not at I-405.

Figure 2. Traffic Volumes Screen-lines on I-5 and I-405



- **Transit. Mobility21 transit changes include:**
 - **Raise transit fares** to about 65% of operating and maintenance costs. This raises fare box recovery to about the same level as Washington State Ferries. This reduces ridership and raises more revenue. However, the discount for low-income transit riders would be maintained.
 - **Focus on work trips** and commute hours. Work trips are about 58% of daily transit trips⁴. During the AM peak period in 2010, 64% of transit rides were work trips.
 - **Retain high-volume bus routes** for about 23% of 2040 bus riders. Generally, these are routes with projected AM ridership between traffic analysis zones exceeding 200 person-trips.
 - **For the remaining 77%**, provide a privately operated Alternative Mobility Service (AMS). These would use small vehicles (fewer than 8 passengers) operating on-demand with door-to-door service. It would eventually be passenger operated in the majority of cases, following the model of vanpools. For Elderly and handicapped, system personnel would assist and drive.
 - **Significant computerized optimal routing assumed.** In order to keep down cost and price to customers, Mobility21 plans for multiple, competitive providers, evolving from a combination of today's taxicabs and the less regulated Internet-requested competitors like Uber and Lyft.

⁴ Source, Transportation 2040 FEIS. Mar. 2006, p 4-66

- **Eliminate Sounder Commuter rail.** All Sounder commuter rail service would be eliminated as less cost-effective than bus service.
- **Limit Link Light rail** to track and service connecting Northgate, S. 200th St., and Overlake. Within these limits, LRT is either complete, under construction or covered by a Record of Decision.
- **Re-organize bus transit agencies** to reduce costs and dominance of the City of Seattle.

Transit results are summarized in Table 2 below.

Table 2. Mobility21 Transit Ridership, Fares and Fare Revenue

Scenario	Year	Weekday Riders	Avg. AM Fare	Annual Net Fare Revenue, \$millions
PSRC Existing	2010	461,194	\$2.00	\$212.47
PSRC Adopted	2040	838,665	\$2.14	\$410.11
M21 2010 Technology	2040	471,595	\$4.66	\$510.12
M21 2040 Technology	2040	468,674	\$4.68	\$508.86
M21-Plus 2040 Technology	2040	530,579	\$4.72	\$578.50
M21-Plus 2040 Techn. + I-5 Tunnel	2040	528,913	\$4.72	\$576.50

:TDA PRODUCTIS:[PSRC Trends 9Aug14.xlsx]Summary of 5 to 7 Alts, cell T88

- **Pedestrians/bikes.** A \$2 billion increase in funding is assumed, with highest priority to projects that separate pedestrians and bikes from motor vehicle traffic.
- **Costs.** Total costs for Mobility21 are 80% of the costs for PSRC's Adopted plan. Unlike PSRC's Adopted Plan, both Mobility21 alternatives increase person-trips by more than the increase in revenue needed. The PSRC Adopted plan requires a revenue increase double the increase in person-trips. Both of the M21 alternatives require revenue increases less than the increase in person-trips.

INTRODUCTION

Mobility21 is a privately sponsored transportation plan for the central Puget Sound region of Washington State. Why bother, isn't that government's role? Yes, it should be, but after several decades of talk, congestion is worse and worse, and costs are higher and higher.

The simple truth is that we are stuck in traffic. Some examples:

- 2015 Urban Mobility Scorecard: Of the 15 very large urban areas in the U.S., only 2 had worse peak period excess travel time than Seattle.⁵ Worst was Los Angeles, San Francisco was 2nd and Seattle was tied with San Jose for 3rd.
- Puget Sound Regional Council (PSRC): Between 2010 and 2014, delay on regional freeways increased by more than 50%. Even more striking is the 25% increase in the single year between 2013 and 2014.⁶
- Washington State Department of Transportation (WSDOT): In 3 Puget Sound Counties (King, Pierce, and Snohomish), delay on State highways increased by almost 4% per year between 2009 and 2013. In 2013, the Puget Sound area accounted for **97.8% of statewide delay** [emphasis added]⁷

This report describes two approaches: first PSRC's Adopted Transportation 2040 Update 2014 and then the Mobility21 alternatives. This is a technical document summarizing the work that has been done. A separate effort will provide a document for wider distribution to the public.

REGIONAL CHARACTERISTICS

Population, Employment and Travel Growth.

Regional population is expected to reach 5 million by 2040. Employment growth between 2010 and 2040 is expected to be almost double the population growth, and person-trip growth by all modes less than either population or employment. See Table 3, on the next page.

⁵ "2015 Urban Mobility Scorecard", Texas Transportation Institute, August 2015, Table 1.

⁶ "Stuck in Traffic: 2015 Report", PSRC, March 2015.

⁷ "The 2014 Corridor Capacity Report", WSDOT, October 2014, p. 7.

Table 3. Regional Population, Employment, & Person-Trips, 2010 & 2040

	2010	2040	Growth,%
Population	3,690,942	5,037,633	36%
Employment	1,865,414	3,170,502	70%
Person-trips	15,434,816	19,807,909	28%

This PSRC 2040 population projection is 5.4% above the state's growth management projection for the four PSRC counties in 2040.⁸ The impact of this on travel projections is unknown. We are surprised by the 70% projected growth in employment, but do not have a better figure.

Regional Travel

Regional travel is dominated by the private vehicle/highway system. This system is used by:

- 100% of bus transit, including school buses
- 100% of police cars and fire trucks
- 100% of aid units and ambulances
- 100% of goods distribution and local commerce

And:

- Serves 98% of all person-trips and almost 100% of all person-miles.
- Provides connections to virtually all employment and residential locations.

Population by Location

PSRC's projected population by location is shown in Table 4, below.

Table 4. Population by Location, 2010 and 2040

	2010	2040	% of Regional Growth
City of Seattle	601,260	764,873	12%
Other West of Lk. Washington	282,685	361,964	6%
Suburban Crescent	2,806,997	3,910,796	82%
Region	3,690,942	5,037,633	100%

:2188 Century21 TRANSP PLAN:TDA PRODUCTS:[Popularion by Area 18Nov14.xlsx]Sheet1

These locations are defined as:

⁸ Wendell Cox, June 22, 2015, using growth management medium projections done in 2012.

- **City of Seattle:** within the corporate boundaries of the City
- **Other West of Lake Washington:** the area between Lake Washington and Puget Sound from I-405/I-5 in Tukwila north to I-405/I-5 in Lynnwood, excluding the City of Seattle.
- **Suburban Crescent:** the Regional population minus the City of Seattle and “West of Lake Washington.” This leaves Kitsap County in the Crescent. This is 82% of the Regional population. The Suburban Crescent includes the City of Bellevue, with a 2010 population of 111,922 growing to 151,863 in 2040.
- **Region:** King, Kitsap, Pierce and Snohomish Counties.

The City of Seattle has dominated Transportation Decisions

Current planning and investment has been dominated by the City of Seattle and its animosity toward the automobile and love affair with transit and bicycles. This is reflected in projects that are consuming the bulk of our transportation dollars and are reducing travel capacity.

- Link light rail was motivated by downtown Seattle interests.
- Taking of the I-90 center roadway for light rail is mostly to serve downtown Seattle.
- Seattle wanted the 4-lane Alaskan Way tunnel to replace the 6-lane viaduct
- The City of Seattle refused to allow expansion of SR 520 beyond the one HOV lane in each way.

FIVE CRITICAL REALITIES FOR THE REGION

- **Congestion is worsening, year by year.**
- **Government agencies are mostly making the problem worse, by reducing capacity**
 - Alaskan Way Viaduct replacement, I-90 loss of center roadway, SR 520, for example.
- **Roadway system serves 98% of daily trips**
 - All motor vehicle trips, including emergency vehicle, and trucks
 - All bus trips, which carry almost 95% of transit trips
 - Most bike and pedestrian trips.
- **PSRC’s Adopted Plan consumes 50% of funds for transit, serving only 4% of trips.**
- **Technology of vehicles and highways will revolutionize transportation by 2040.**

Two Plans. The following pages describe two competing plans:

- PSRC's Adopted Plan
- Mobility21 Alternative Plan

PSRC 2040 ADOPTED PLAN

The full description of the PSRC Adopted Plan is in “Transportation 2040 Update Report”, PSRC, May 2014 and its appendices. The following discussion focuses on important characteristics of the adopted plan.

PSRC’S PLAN HAS TWO OPTIONS

- The **Constrained** option is covered by the financial strategy – these projects and programs have identified sources of funding.
- The **Un-programmed** option includes additional investments that do not have identified sources of funding.

This Mobility21 report reviews only the Constrained option, with no further consideration of the Un-programmed option.

Even the financially constrained plan has raised financing questions. A letter from FHWA & FTA expressed concern about the realism of revenue assumptions. An excerpt from this letter is:

“Our fundamental concern is that without further near term actions, the aggregate revenue to support the cost of your ambitious series of transportation investments may not be reasonably expected to be made available to cover the vital system improvements and projects programmed in your plan. As you prepare for your adoption and work plan for the next update, you may need to significantly shift projects into the category of un-programmed investments unless the regional jurisdictions within PSRC's planning influence and the State of Washington demonstrate tangible progress toward committing resources to pay for your transportation solutions.”

(Letter from Dan Mathis of FHWA and Rich Krochalis of FTA to Josh Brown of PSRC, 23 April, 2014)

CHARACTERISTICS OF PSRC'S ADOPTED PLAN

Amount of travel

PSRC’s Adopted Plan is based upon concepts conceived by governmental planners and policy makers, including high-density development patterns, and light rail. And it apparently does so without regard to costs.

- Projected person-trips would not grow as fast as population. As a result, daily trips per person would decline, as would daily vehicle-miles/capita. These changes are contrary to centuries of increasing mobility and access to

opportunities. Less economic growth could be a consequence of these policies. See Table 5.

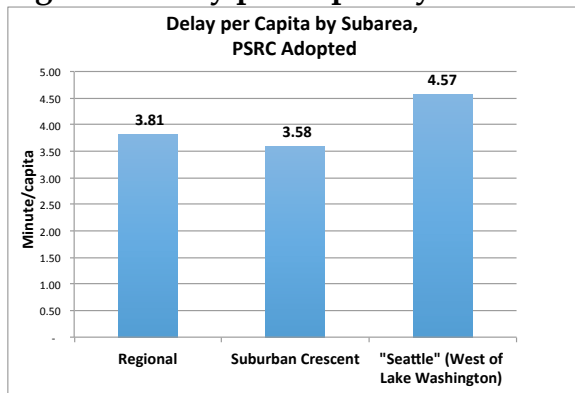
- Daily transit trips per capita would be up by 33% -- contrary to several decades of declines. As in previous PSRC plans, it simply declares higher transit ridership, without providing convincing evidence on how this long-term trend will be reversed. Projections appear to be based on policy-driven intentions that contrast sharply with market-place evidence.
- PSRC’s Adopted Plan does reduce delay per capita by 2040. Delay reduction is a worthwhile goal. However, it does this partly by reducing travel per person, assuming high-density development, increasing the areas subject to pay parking and slightly increasing parking rates. It’s questionable whether the public sees these as worthwhile goals.

Table 5. Travel and Delay per Capita

Scenario	Year	Tolls	Vehicle Technology	REGIONAL PER CAPITA:		
				Person-trips	VMT	Delay, min.
PSRC Existing	2010	limited	traditional	4.18	21.8	14.1
PSRC Constrained	2040	all fwys, variable	traditional	3.93	18.2	13.5

Delay per capita in “Seattle” is 28% more (worse) than in the Suburban Crescent. See Figure 3.

Figure 3. Delay per Capita by Subarea



Mode Of Travel

Tables 6 and 7 compare daily and AM peak period market shares. For the AM period, transit’s share would increase from 2010’s 6.0% to 8.9%. Bike and pedestrian travel increase by a small amount and auto/truck declines, but still serves nearly 80% of travel.

Table 6. PSRC's Adopted Plan Daily Mode of Travel (% of person-trips)

Scenario	Cars & Trucks	Transit	Walk	Bike	total
PSRC Existing	87.3%	3.0%	8.7%	1.0%	100.0%
PSRC Constrained	84.4%	4.2%	10.1%	1.2%	100.0%

Source: 2188 Century21 TRANSP PLAN: TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Summary of 5 to 7 Alts

Table 7. PSRC's Adopted Plan AM Peak Period Mode of Travel (% of person-trips)

Scenario	Cars & Trucks	Transit	Walk	Bike	total
PSRC Existing	83.1%	6.0%	9.3%	1.5%	100.0%
PSRC Constrained	79.2%	8.9%	10.1%	1.9%	100.0%

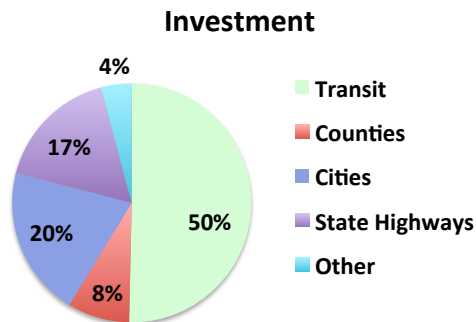
Investment & Mode Share

PSRC's 2040 Adopted Plan would invest \$173.6 billion through 2040 (2008\$). This includes both capital costs and operating and maintenance costs. Figure 4 shows the distribution of that investment. PSRC's "transit" includes Sound Transit, local transit, and ferries.

PSRC, in their "state of good repair" approach⁹, used an operating and maintenance cost per lane-mile of highways several times higher than typical WSDOT costs¹⁰. This was explained as needed after years of deferred maintenance and boosted provisions for drainage, pavement and traffic operations.

Figure 4. Investment for PSRC's 2040 Constrained

(TDA:[Estimated Person-mi & INVEST by mode .xlsx]Pie Charts, mode & \$)

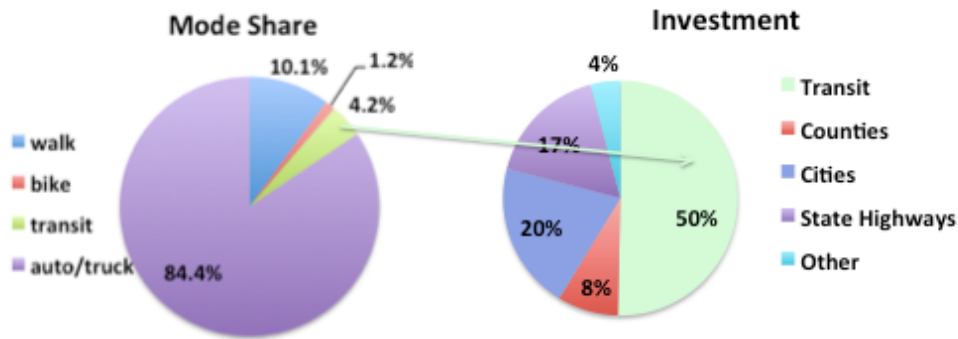


For PSRC's 2040 Adopted plan, Figure 5 compares investment by mode with mode share. With about 4% of daily travel, transit would receive 50% of regional 2010-2040 funding.

⁹ See "Transportation 2040 Update", Appendix S, 2014

¹⁰ See Eastside Corridor Express Toll Lane Operating and Maintenance Costs, WSDOT

Figure 5. Unbalanced Mode Share and Investment



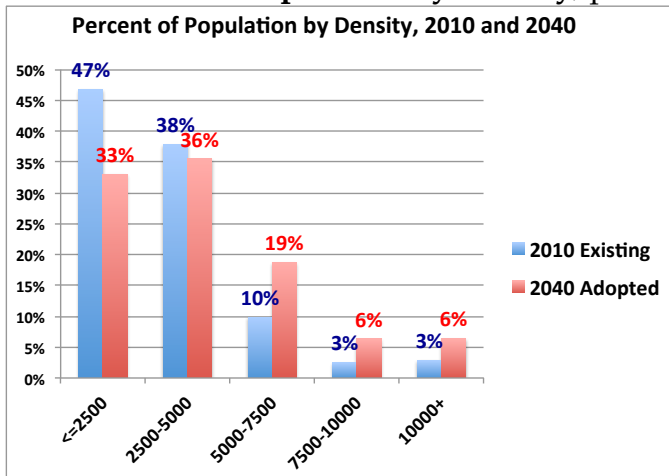
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High Density Population Growth

PSRC's 2040 Adopted Plan assumes 2010 to 2040 population growth at higher densities. In 2010, the distribution of population by density is shown on the blue columns of Figure 6. It shows 16% of 2010 regional population living at densities above 5,000 persons per square mile. In contrast, the PSRC projections would put three-quarters of 2010 to 2040 growth at densities above 5,000. As shown by the red bars on Fig. 3, this would mean that the portion of population living at densities above 5,000 would have nearly doubled to 31%. Typically, increased congestion traffic congestion is associated with increased population density. For perspective, the 2010 density of:

- Region = 536 persons/sq. mi.
- City of Seattle = 4,255 persons/sq. mi.
- Eastside King County = 1,986 persons/sq. mi.
- Everett = 1,371 persons/sq. mi.

Figure 6. 2010 and 2040 Population by Density, persons/sq. mi.



:DENSITY:[PopEmpDensity-updated 28Jan2015 - for 2040(2).xls.xls]Growth Allocations

High Density Employment Growth

PSRC's 2040 Adopted Plan allocation of employment growth is similar with about 72% of growth at densities greater than 5,000 employees per square mile. In 2010, employment at these densities was only 27% of the regional total.

Parking

Changes in parking assumptions are significant contributors to results of the PSRC Adopted Plan. In 2010, pay parking was in the region's 11 parking districts comprising 281 traffic analysis zones. For 2040, PSRC assumed an additional 30 parking districts comprising another 419 zones for a total of 700 zones. The dramatic increase in parking zones would have a significant impact on choice of travel mode.¹¹

HOV And HOT Lanes

PSRC's Adopted Plan includes expansion of high occupancy toll (HOT) lanes. By 2025, all HOV lanes would be converted to HOT lanes on: I-5, SR 167, I-405, SR 520 east of Lake Washington, and I-90 east of I-405¹².

Notable examples include:

- On about 62¹³ miles of I-5, two HOT lanes in each direction would be created by converting the existing HOV lane to a HOT lane and using the shoulder for the 2nd HOT lane. This would be done at a cost of \$455 million, or about \$4 million per lane-mile, not including the cost of shoulder preparation¹⁴.
- About \$2.2 billion of interchange improvements would include some separate HOV and/or HOT lanes.

How Would PSRC's Adopted Plan Be Funded?

Figure 7 "...illustrates the key components of the Transportation 2040 financial strategy. Revenues above and beyond those generated through existing sources are assumed to be generated through new taxes or user fees and are necessary to implement planned programs and projects included in Transportation 2040. Of those new revenues, approximately 53% are generated through new user fees such as tolled facilities and road usage charges." (Transportation 2040 Update Final Report, PSRC, 2014, p. 33).

¹¹ Appendix F, Transportation 2040 Update, makes it clear that higher parking taxes are part of the plan, but the amounts were lumped in with other cost items.

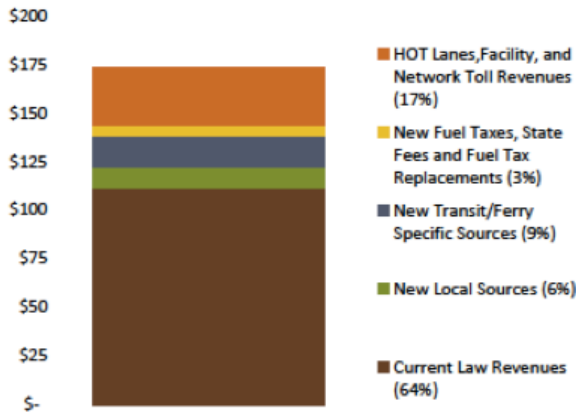
¹² From Robin Mayhew, PSRC, 8-June-2015

¹³ From SR 16 in Pierce County to US 2 in Snohomish County

¹⁴ Appendix N, Transportation 2040 Update, for MTP #'s 5424, 5425, 5426, and 5427

PSRC's Adopted Plan would increase regional transportation costs by 56% (2010-2040 in 2008\$). This is double the growth in person-trips at 28%. Stated another way, between 2010 and 2040, PSRC's Adopted Plan would increase the cost per person-trip by 22%. This cannot be blamed on inflation because all of the costs are in 2008\$.

Figure 7. PSRC's Adopted Plan Financial Strategy (revenues by source in billions of 2008\$)

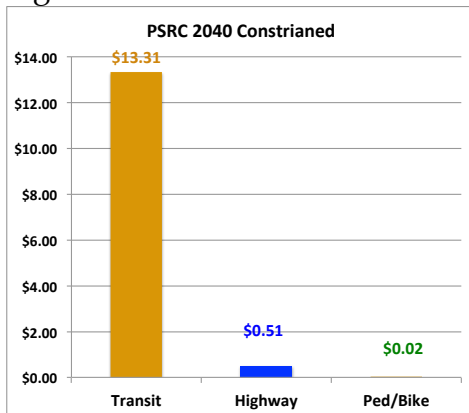


Investment By Mode For 30 Years Of Travel

Figure 8 shows the 2010-2040 investment for a mode divided by the total number of person-trips 2010-2040 served by that mode.¹⁵ For example:

- Transit investment 2010-2040 = \$79.18 billion¹⁶
- Total transit person-trips 2010-2040 = 5.947 billion
- $\$79.18 / 5.947 = \13.31 per transit trip

Figure 8. Public Investment to Serve 2010-2040 Person-Trips (\$ per person-trip).



TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Invest per P-T

¹⁵ Person-trips assume a straight-line growth between 2010 and 2040.

¹⁶ Not including state ferries

This shows that the public investment for transit would be 26 times the investment required for the highway system.¹⁷

Freeway Tolls

The PSRC Adopted PSRC's Adopted Plan assumes tolls on all lanes of freeways and expressways at rates that vary by time of day. Below are weekday rates (in 2008\$) used in PSRC's financial plan.¹⁸

- AM Peak Period: \$0.44 per vehicle-mile
- Mid-day Period: \$0.36 per vehicle-mile
- PM Peak Period: \$0.45 per vehicle-mile
- Evening Period: \$0.14 per vehicle-mile
- Night: \$0.05 per vehicle-mile

The average toll would be about \$0.27 per vehicle-mile¹⁹

TRANSIT

Transit-Oriented Land Use

To benefit transit, PSRC 's Adopted Plan includes their Growing Transit Communities Program 2040 Update ²⁰. Here's the theory:

"Over the coming years, Sound Transit will invest \$25 billion in regional rapid transit. The Growing Transit Communities program is designed to help make the most of this investment by locating housing, jobs, and services close to transit, making transit a viable travel option for many people. If done right, more people will have a faster and more convenient way to travel. The Growing Transit Communities Program is focused on three key corridors linking Downtown Seattle with Redmond, Everett, and Tacoma. This program is included in the Transportation 2040 Update to highlight the importance of linking transportation and land use, and in this case the investment in regional rapid transit to serve and support vibrant communities where people live, work, and play."

This may be a politically correct concept, as illustrated in the transit growth centers on the left map of Figure 9. Unfortunately, growth does not fit neatly into transit-oriented zones.

¹⁷ Highway costs include state highway costs and county and city costs.

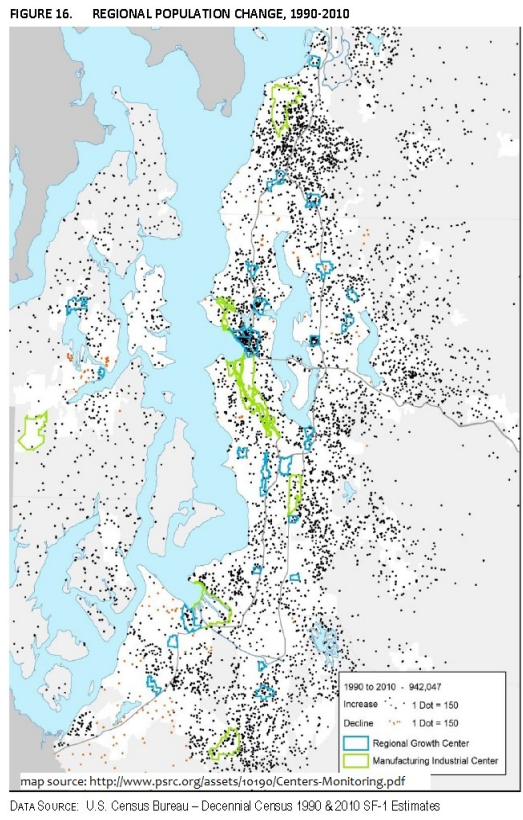
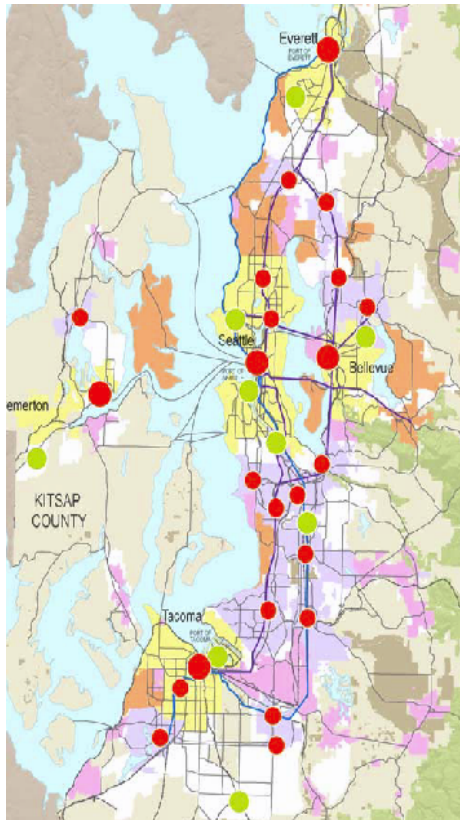
¹⁸ Derived from M21's "PSRC_4K_MOE_Analysis_17 ALTS 18 & 19" for PSRC's Adopted Plan.

¹⁹ For the PSRC Adopted Plan, 2040 toll revenues for freeways + expressways divided by the vehicle-miles for the same highways.

²⁰ Transportation 2040 Update, PSRC, May 2014, p. 9pss

See the map on the right illustrating regional growth between 1990 and 2010, not concentrated in a few centers.

Figure 9. Regional Growth Pattern



Map Sources: PSRC Destination 2040

Transit Load Factors

Results for PSRC’s Adopted Plan show a 2040 AM peak period load factor (passengers per seat) of:

- Bus: 183% of seats filled
- Rail: 21% of seats filled

To fill buses to 183% of seated capacity (therefore, 83% of riders are standees) for an entire 3 hour AM peak is not possible. Even if it were, conditions at bus stops and during the trip would be very unpleasant. If the 21% for rail turned out to be true, it would indicate a very low utilization of an expensive investment. These results may illustrate the weakness of the PSRC model in estimating transit ridership. **At the minimum, the bus and rail results call the transit aspects of PSRC's Adopted Plan into serious question.**

Access to Jobs Via Public Transit

According to the PSRC model, only about 5% of jobs in the region were within 30 minutes of the average household by transit in 2010. **Nearly all of jobs are reachable by car within 30 minutes.** Evidence in other studies of all U.S. urban areas by the Brookings Institution and University of Minnesota²¹ indicates this small transit fraction is likely to prevail as the years go by.

Park-And-Ride

PSRC's Adopted Plan would increase the capacity of Park-and-ride lots from 44,141 parking spaces in 2010 to 53,535 in 2040, an increase of 9,394 spaces. There is no policy thrust toward private provision of more parking for transit riders paid for with user fees, an important option always on the table.

PEDESTRIANS & BIKES

Projects and Mode Share

Appendix N of the PSRC Adopted Plan includes 120 Bicycle and Pedestrian projects that are identified as "Candidate," "Approved" or "Right-Of-Way Conditionally Approved". These projects have an estimated cost of \$845 million (\$ 2008), or approximately three times the recommended funding level of the original Transportation 2040 level (\$300 million). These are stand-alone Bicycle/Pedestrian projects, many of which are trails on separate rights of way. In addition, many, if not most Roadway Capacity projects have a pedestrian and/or bicycle component included but not separately identified. Table 8 shows mode shares by mode measured by person-trips and by person-miles. This shows the effect of shorter trips for pedestrians and bikes

Table 8. Mode Share by Trips & Miles, 2010

Mode	% of Pers-trips	% of Pers-miles
walk	10.1%	1.5%
bike	1.2%	0.7%
transit	4.2%	2.2%
auto/truck	84.4%	95.5%
total	100%	100%

TDA, Estim. Person-miles & Invest

Appendix N also includes 33 Bicycle/Pedestrian projects that have been completed since the Transportation 2040 plan was produced, for a total of \$101 million.

²¹ <http://www.brookings.edu/research/reports/2011/05/12-jobs-and-transit> and <http://www.cts.umn.edu/Publications/ResearchReports/reportdetail.html?id=2380>.

Table 9 shows the breakout by subarea of the proposed projects in the constrained PSRC's Adopted Plan the completed projects reported in 2014.

Table 9. Bicycle/Pedestrian Projects

Bicycle/Pedestrian Projects by Subarea				
Source: Transportation 2040 Update, Appendix N				
Transportation 2040 Constrained Bicycle/Pedestrian Projects				
Subarea	# of Projects	'08 Estimated Cost	% of Costs	
East King Co.	32	\$ 320,760,000	38%	
SR-520 Trail	5	\$ 17,940,000	2%	
West King Co.	9	\$ 36,610,000	4%	
South King Co.	38	\$ 292,510,000	35%	
Kitsap Co.	10	\$ 44,460,000	5%	
Pierce Co.	16	\$ 70,760,000	8%	
Snohomish Co.	10	\$ 61,710,000	7%	
Sub Total	120	\$ 844,750,000	100%	

Special Case of SR 520

A significant regional investment in Bicycle and Pedestrian facilities is currently being constructed on the SR 520 corridor between I-5 and I-405. A 14 ft. wide multipurpose trail is included on the new SR 520 floating bridge with connections on both ends of the corridor from Montlake Blvd. in Seattle to 108th Ave. NE in Bellevue. There are 5 individual projects in Appendix N relating to the SR 520 corridor summarized above. The listed 2008 cost estimate for these projects total \$18 million.

The 14 ft. wide SR 520 Bicycle/Pedestrian trail has a 1 ft. 4 inch barrier between the trail and the roadway on the bridge, which is 113 ft. 4 inches wide. The trail represents 13.5% of the total bridge width. The current SR 520 corridor cost estimate from I-5 to I-405 is \$4.3 billion. Using the bridge width ratio, the Bicycle/Pedestrian trail would represent \$580 million, significantly more than the recommended non-motorized investment in the Transportation 2040 Plan.

CITY & COUNTY COST ALLOCATIONS

Of the \$174 billion budget for the PSRC Adopted Plan, 29% (\$49.9 billion) is allocated for the region's cities and counties. The breakdown is:²²

- State of good repair (maintenance and preservation): 52.7%
- Programmatic system improvements (expenditures not identified): 36.5%
- Listed projects for system improvements: 10.8%

²² Cost Summary with Book 1, PSRC 25-Oct-14

With little information in the PSRC Adopted Plan report, Mobility21 has taken no position on these expenditures. However, we hope that expenditures will reduce traffic congestion, using programs such as dynamic signal timing.

PROJECTED TRAVEL IN 2040

This report considers three levels on 2040 person-trips. These are shown in Table 1 below. M21 and M21-Plus will be defined in the following sections.

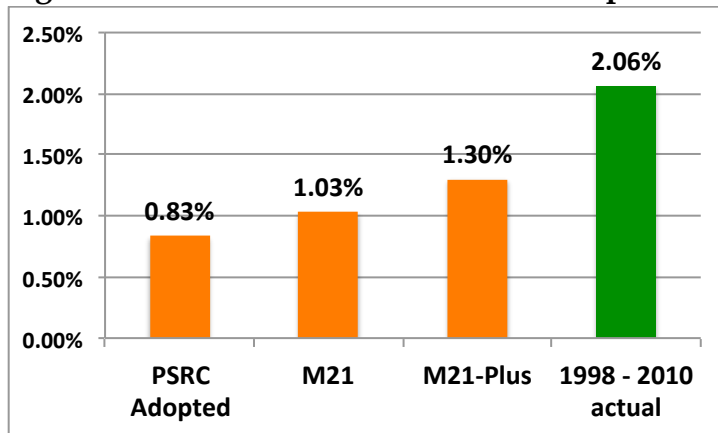
Table 1 . Daily Regional Person-Trips

Growth Option	Year	Daily Person-Trips, millions	% Above PSRC Adopted	% Above 2010 Base	Person-Trips per Capita
2010 Base	2010	15.43	n.a.	0%	4.2
PSRC Adopted Plan	2040	19.81	0%	28%	3.9
M21 Alternatives	2040	21.00	6%	36%	4.2
M21-Plus Alternatives	2040	22.74	15%	47%	4.5

TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Summary of 5 to 7 Alts, AO5

The decline in per capita person-trips for PSRC's Adopted Plan is probably unrealistic. Generally, this measure has been increasing. Figure 10 compares the 2010 to 2040 growth rates with the reported growth between 1998 and 2010.²³ It shows that 1998-2010 trips grew at a rate roughly double the rate for 2040 options. Changes in PSRC's traffic model and changes in what is included in "person-trips" make it impossible to track history of the number of person-trips. For example, the 1998-2010 figures included only those person-trips in motor vehicles, while the 2010 to 2040 figures also include pedestrians and bikes. However, these differences in the number of trips would have only minor effect on the growth rates.

Figure 10. Annual Growth of Person-Trips



:TDA:[PSRC Trends 9Aug14.xlsx]Alt Summary 25Sep14, H118

²³ Source: Destination 2030 FEIS, PSRC, p. 16

MOBILITY21

WHAT IS MOBILITY21?

Mobility21 is a privately-sponsored transportation plan for the central Puget Sound region of Washington State. Here are a dozen key principles:

1. **Focus on planning for the Eastside and the Suburban Crescent** (defined on page 12). This will include highway expansion, bus rapid transit improvements and added facilities for pedestrians and bikes.
2. **Serve everyone and all modes**
3. **Public investments should be approximately in line with market share**
4. **Comply with legally-required “least cost planning”**
5. **Build more of what works, less of what doesn’t work.**
6. **Recognize that our road system serves 100% of bus transit, emergency vehicles and goods distribution.**
7. **Assume and support per person travel at 2010 levels or higher.**
8. **Employ the best of technology for mobility available now and in the future**
9. **Change transit from a 19th century model to a 21st century approach.**
10. **Improve the decision-making process for our regional transportation.**
11. **Don’t use highway user fees to subsidize other modes such as transit.**
12. **Seattle’s wish to limit highway expansion.** Mostly M21 includes only those highways in the City of Seattle that are in PSRC's Adopted Plan. However, the City of Seattle should be a participating partner in regional transportation issues. For that reason, M21 includes an alternative with an I-5 tunnel in the City of Seattle.

MOBILITY21 RESPONDS TO KEY NATIONAL ISSUES

Some tough issues face the nation and the Puget Sound Region. There is a transportation connection to these issues, including:

Income inequality and Access to Jobs

For workers who depend on transit for access to a job, the choices are limited. A University of Minnesota study looked at 50 large metropolitan areas.²⁴ For the Seattle Metropolitan area, they found that only 1.7% of jobs were could be reached by transit within 30 minutes. Census Bureau figures show an average work trip time by all modes is 25 minutes. If we want the poor to be richer then we need to get them access to more jobs, a service that transit fails to provide. From a Brookings report, “ The typical

²⁴ Owen and Levinson, “Access Across America: Transit 2014”, University of Minnesota, September 2014

metropolitan resident can reach about 30 percent of jobs in their metropolitan area via transit in 90 minutes.”²⁵

Housing Affordability

The Wendell Cox annual housing affordability survey reveals that the Seattle area is “severely unaffordable”, and this is largely due to land use restrictions in the area, notably the King County urban growth boundary.²⁶ PRSC’s plan for the future is to use such mechanisms to coerce greater densification of the area’s population, create more traffic congestion, and force people onto transit and bicycles. This has been the New Urbanist/Smart Growth strategy for the last two decades, and the chief result will be fewer, but costlier housing services, further making living in the region less affordable.

Climate change

These new urbanist transportation and housing strategies are more energy intensive than the status quo. The US Department of Energy department reports that, on a square foot basis, multifamily housing uses more energy than single-family detached housing.²⁷ Claims that light rail saves energy are not true. The average of US light rails systems consume more energy per passenger-mile than cars per passenger-mile.²⁸ The car advantage will increase as more new cars enter the fleet. and none are as efficient as a Prius. Use of an electric AMS could be superior to busses as much of the region’s electricity is generated by hydropower.

Mobility21 does a better job of addressing these issues than PSRC’s Adopted Plan.

WHY IS ANOTHER TRANSPORTATION PLAN NEEDED?

It’s because PSRC’s Adopted Transportation 2040 does not solve our congestion problems, involves significantly higher costs, and misallocates revenues. Its main provisions may be politically correct, but:

1. PSRC’s Adopted Plan would increase regional transportation costs by 56% (2010-2040 in 2008\$). This is double the growth in person-trips at 28%. Inflation can’t be blamed because all of the costs are in constant 2008\$.

²⁵ Source: “Missed Opportunity, Transit and Jobs in Metropolitan America”, Brookings, May 12, 2011

²⁶ Wendell Cox, 10th Annual Demographia International Housing Affordability Survey: 2014

²⁷ Source: 2008 Buildings Energy Data Book, US Department of Energy

²⁸ Source: Transportation Energy Data Book, Edition 33, USDOE, pp. 2-15 and 2-17.

2. It assumes trips per person would be reduced by 6% from 2010 levels, contrary to long-established public desire for more mobility. Vehicle-miles per person would also be reduced.
3. Transit is important for small segments of travel, but current services are exceedingly inefficient and expensive.
4. Transit, with 50% of the \$174 billion budget, would only increase the 2010 3.0% share of daily person-trips to about 4.2% in 2040. In other words, PSRC's plan would have us spend about \$87 billion to increase transit's market-share by barely over 1%.
5. Transit's public investment to serve 2010 - 2040 trips, would be about \$13 per trip, 26 times more than for a highway person-trip.
6. Current transportation planning and investment has been dominated by the City of Seattle, where many elected and non-elected thought-leaders express animosity toward the automobile and a love affair with bicycles. This is reflected in projects that are consuming the bulk of our governmental transportation dollars and are reducing lane capacity travel capacity for cars and trucks.
7. PSRC's population assignments would place about 77% of growth at densities greater than 5,000 persons per square mile. For comparison, the region's average density in 2010 was 538 persons per square mile.
8. Investments for pedestrian/bicycle improvements would garner only about 0.2% of the \$173 billion yet have a market-share higher than transit.
9. PSRC's financing plan may not be achievable per a 23 April, 2014 letter from Dan Mathis of FHWA and Rich Krochalis of FTA to Josh Brown of PSRC.

ANALYTICAL APPROACH FOR MOBILITY21

Alternatives were evaluated using the PSRC EMME 4K transportation model used by and supplied by PSRC. Due to employment confidentiality requirements, PSRC could not provide population and employment data. As a result, we could not make adjustments to these values to test alternative land use allocations. We were forced to use the model with the numbers of trips already generated using built-in PSRC assumptions. We created more than 25 alternatives with adjustments to the generated trips as well as alternatives testing different network, transit, and pricing/tolling strategies.

MODE ELEMENTS OF MOBILITY21

- **Highways.**
- **Transit**
- **Pedestrian/Bike improvements**

Highways

Mobility21 will build on the role cars and trucks play in providing affordable mobility that would have been only a dream in previous centuries.

Definition of Alternatives

Alternatives were tested in a process of continuing refinement. The four shown in Table 10 were selected as representative with the PSRC Adopted Plan used as a baseline. Other alternatives are listed in Appendix E.

Table 10. Definition of Selected Highway Alternatives

Scenario	Year	Vehicle Technology	Add to PSRC Adopted		Daily Person-Trips, millions
			Freeway Lane-Miles	Arterial Lane-miles	
2010 Base (Existing)	2010	2010	n.a.	n.a.	15.40
PSRC Adopted Plan	2040	2010	0	0	19.80
M21 2010 Technology	2040	2010	395	119	21.00
M21 2040 Technology	2040	2040	223	119	21.00
M21-Plus, 2040 Technology	2040	2040	213	79	22.70
M21-Plus, 2040 Techn. & I-5 Tunnel	2040	2040	230	79	22.70

2188 Century21 TRANSP PLAN:TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Summary of 5 to 7 Alts. E89

Some explanation of Table 10:

- **Tolls.** The PSRC Adopted Plan used tolls that varied by time of day. The Mobility21 alternatives used a flat \$0.25, 24 hours per day, 7 days per week. See Tolling in the Finance section for estimated revenues and issues with tolling (page 48)
- **Vehicle Technology.** “Traditional” refers to highway operations the same as today. “Advanced” assumes driver-assist technology including radar-activated automatic braking, lane keeping systems, and adaptive cruise control. These are available today as an option or standard on cars at all price levels. **These are not self-driving cars;** there still would be a driver behind the wheel.
- **Added Lane-miles.** These are added to the lane-miles in PSRC’s Adopted Plan.
- **Tolled Lane-miles.** These are freeway/expressway lane-miles.
- **M21 2010 Technology.** This alternative added 6% to the total daily person-trips of the PSRC Adopted Plan to bring travel per person to 2010 levels. Existing HOV lanes on I-405 and SR 167 were converted to general-purpose (GP) lanes. It assumes a direct connection between I-405 and SR 167. It would not include WSDOT’s concept of direct HOV/HOT ramps added to the interchange. In most locations, M21 2010 Technology would add 2 more lanes in each direction on I-405/SR 167 to the lanes in the PSRC Adopted Plan. All of the 2040 alternatives included pay parking in an expanded portion of the region, but at lower rates than in PSRC’s Adopted Plan. All freeway lanes would be tolled at a flat rate 24/7.

- **M21 2040 Technology.** This is the same as M21 2010 Technology, except that it includes the Automated Driver Assistance System (ADAS) package. M21 2040 Technology would reduce the lane-mile count of M21 2010 Technology because of the increased lane capacity.
- **I-5 Tunnel.** One of the original ground rules for Mobility21 was to respect the City of Seattle’s wish to limit roadway expansion in the City. As a result, our initial analyses included only those roadway improvements for the City of Seattle that were already in the PSRC Adopted Plan. After reviewing a draft, a recommendation from the Expert Review Panel was that the ground rule be dropped, because the City of Seattle also should share responsibility for regional problems within their boundaries. An I-5 Seattle tunnel was added in one alternative to recognize that congestion on I-5 through the City was a regional problem. The 4-lane tunnel would start on I-5 south of the I-90 interchange and reconnect to I-5 to north of the SR 520 interchange. Also , there would be connections to and from the east on both I-90 and I-405.

More on the Automated Driver Assistance System (ADAS) package.

M21 2040 Technology assumes a 50% increase in freeway lane capacity and a 20% increase for arterials due to ADAS. It also assumes that by 2040, about 80% of the operating car and light truck fleet will have:

- Automatic braking
- Lane keeping assistance
- Blind spot monitoring
- Adaptive cruise control (ACC)

All of these capabilities are available today from most car companies. This does not assume self-driving cars – there still will be a driver behind the wheel. In addition, GM has announced it will introduce vehicle-to-vehicle wireless communication features in the 2017 Cadillac. PSRC reports it will take automated driving into account in its next plan update. A number of vehicle automation testing and demonstration programs are underway or planned, in Michigan, Virginia, California, Nevada, Florida, and Washington State (in support of mobility at Joint Base Lewis McCord). Some sources expect all new cars to have ADAS by 2020. AAA says that limited research show that ACC systems may help prevent 13,000 crashes per year. Surveys suggest that most drivers are very satisfied with these systems.²⁹

²⁹ AAA Foundation for Traffic Safety, 2014.

M21 Results for Highways

Per Capita Delay and Vehicle-miles. At the regional scale, changes in delay and vehicle-miles are not dramatic (see Table 11). However, the three M21 alternatives using 2040 Technology have less delay than 2010 Existing and PSRC Adopted. PSRC's Adopted plan did show less delay than existing. However, this PSRC result was achieved by reducing travel per person, assuming high-density development and increasing the areas subject to pay parking and high parking rates. None of the alternatives provided more vehicle-miles (VMT) per capita than PSRC Existing (2010). This is at least partly a result of tolling freeway lanes. Reducing VMT per capita is a goal for government planners and policy makers, but, from our standpoint, it reduces the range of opportunity available to the public.

Reduction in delay per person is difficult while preserving the freedom to travel more. A large portion of regional delay is within the area west of Lake Washington³⁰. As a result, respecting Seattle's decisions to reduce roadway capacity makes it difficult to reduce regional delay.

Table 11. Daily Delay and VMT per Capita

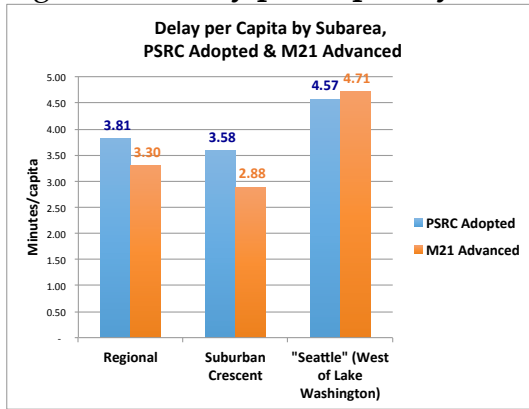
Scenario	Delay per Capita, min.	VMT per Capita	Trips per Capita
PSRC Existing	14.1	22.1	4.2
PSRC Adopted	13.5	19.9	3.9
M21 2010 Technology	14.6	19.8	4.2
M21 2040 Technology	11.2	20.7	4.2
M21-Plus, 2040 Technology	12.0	21.8	4.5
M21-Plus, 2040 Techn. And I-5 Tunnel	12.0	21.9	4.5

TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Summary of 5 to 7 Alts, AB57

Figure 11 compares delay per capita by subarea for PSRC's Adopted Plan with M21 2040 Technology. For M21 2040 Technology, it shows that "Seattle" delay is 64% more (worse) than in the Suburban Crescent. Delay comparison for PSRC Adopted Plan was also shown previously in Figure 12. M21 shows less delay than PSRC Adopted in the Region and Suburban Crescent; and a probably insignificant increase in "Seattle".

³⁰ Defined to include areas west of Lake Washington, east of Elliot Bay and between the two I-405 intersections with I-5.

Figure 11. Delay per Capita by Subarea, PSRC Adopted & M21 2040 Technology



:2188 Century21 TRANSP PLAN:SHULL ERMSI:[Estimated Delay per Capita excl. Seattle - Updated Shull 12Jun2015.xlsx]DelayPerCap Summary

Daily Toll Revenue

The Mobility21 alternatives have higher toll revenues because of the increased person-trips, and flat rate tolls. See Table 12.

Table 12. Daily Toll Revenue

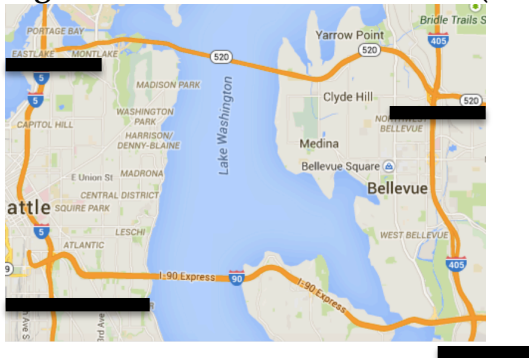
Scenario	Year	Tolls	Vehicle Technology	Toll Revenue, \$m
PSRC Existing	2010	limited	2010 Technology	\$0.6
PSRC Adopted Plan	2040	toll all fwys	2010 Technology	\$12.2
M21 2010 Technology	2040	toll all fwys	2010 Technology	\$14.0
M21 2040 Technology	2040	toll all fwys	2040 Technology	\$14.6
M21-Plus, 2040 Technology	2040	toll all fwys	2040 Technology	\$13.0
M21-Plus, 2040 Techn. & I-5 tunnel	2040	toll all fwys	2040 Technology	\$12.9

Source :2188 Century21 TRANSP PLAN:TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Summary of 5 Alts, E30

Impact on I-5 and I-405 Screenlines

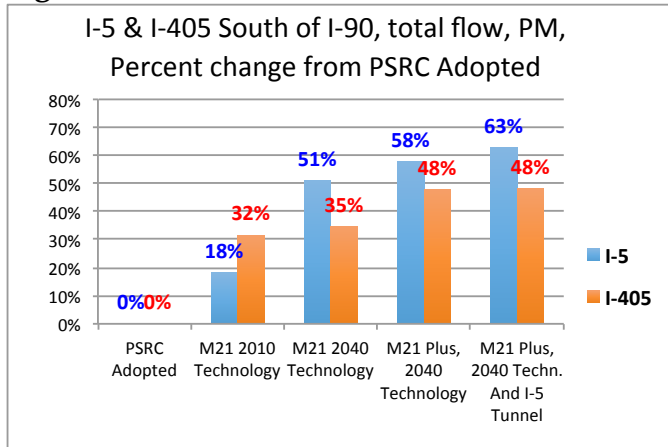
Volumes of vehicles were checked for traffic crossing 4 screen lines shown in Figure 12.

Figure 12. Screen-line Locations (shown in black)



Screen-lines South of I-90. See Figure 13, below. For both the I-5 and I-405 screen lines, each of the Mobility21 alternatives serve more volume than PSRC's Adopted Plan. I-5 volume changes are highly sensitive to the assumptions, with a range 3,520 to 16,966. M21 2040 Technology suggests a large latent demand for I-5 enabled by the capacity increase of ADAS.

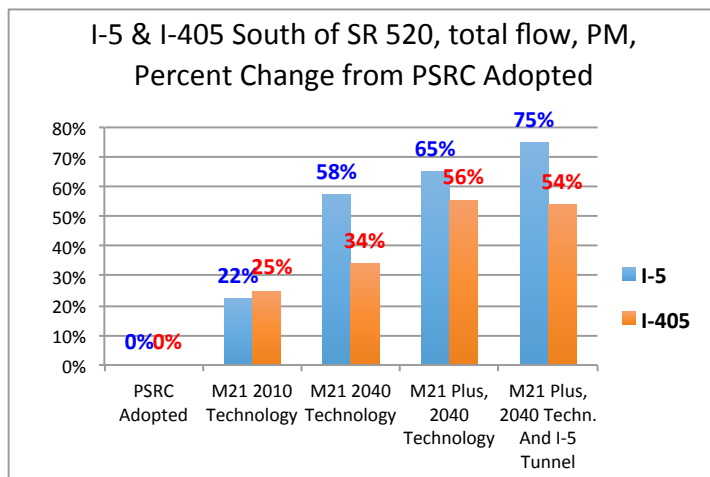
Figure 13. Screen lines South of I-90



ERMSI:[Selected Screen line Comparisons Charts 22Dec14.xlsx]Summary

Screen-lines South of SR 520. See Figure 14, below. For both the I-5 and I-405 screen lines, all of the Mobility21 alternatives serve more volume than PSRC's 2040 Adopted. I-5 volume changes are highly sensitive to the assumptions. M21 2040 Technology suggests a large latent demand for I-5 enabled by the capacity increase of ADAS.

Figure 14. Screen-lines South of SR 520



ERMSI:[Selected Screenline Comparisons Charts 22Dec14.xlsx]Summary

Table 13 shows the change from the PSRC 2010 Base (Figures 13 and 14 showed the change from the PSRC 2040 Adopted Plan). Note that the PSRC Adopted Plan shows small or negative volume changes on both I-5 and I-405.

Table 13. Summary of Screen-line Volumes (% change from 2010 Base)

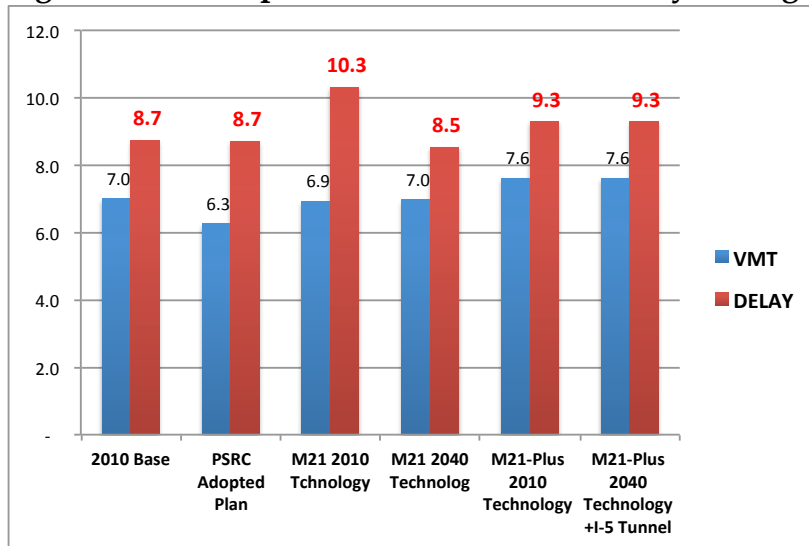
2040 Alternative	South of SR520		South of I-90		Average
	On I-5	On I-405	On I-5	On I-405	
PSRC Adopted	1%	-2%	-9%	18%	2.1%
M21 2010 Technology	23%	23%	8%	55%	27%
M21 2040 Technology	59%	32%	38%	59%	47%
M21 Plus, 2040 Technology	66%	53%	44%	74%	59%
M21 Plus, 2040 Techn. And I-5 Tunnel	76%	51%	49%	75%	63%

ERMSI:SCREENLINES, I-5 and I-405:[Selected Screenline Comparisons Charts 14-Nov-15 .xlsx]Summary

Impact on Arterials

See Figure 15. VMT/capita was about the same for all alternatives except PSRC’s Adopted Plan, which was about 11% lower. Delay per capita was about 18% higher for M21 2010 Technology and slightly lower for M21 2040 Technology compared to PSRC’s Adopted Plan.

Figure 15. Per Capita Vehicle-Miles and Delay on Regional Urban Arterials



Freight

Increase in highway capacity, as described above, will help both cars and trucks. M21 alternatives with 2040 Technology will help most. As will described in the following transit section, elimination of Sounder commuter rail will free-up rail capacity for the Ports of Seattle and Tacoma

TRANSIT

Puget Sound Transit Has Not Been Cost-Effective

Seven public agencies spend a billion dollars each year collectively on operations. Capital expenditures average about the same, bringing the annual total to about two billion dollars per year on buses & trains. Although in the top ten nationally for transit market share in work commuting, our region's transit ridership is a very small portion of regional daily travel volumes.

Overall operational cost per boarding in 2012 was \$5.53, and the average fare per boarding was only \$1.49 (27% fare box recovery). In 2007, the Rice-Stanton Commission³¹ recommended consolidation and streamlining the transit agencies. This was not implemented.

Guiding Principles For Mobility21 Transit

Key changes include (more details will follow):

- **Raise transit fares** to about 65% of operating and maintenance costs. This raises fare box recovery to about the same level as Washington State Ferries. This reduces ridership and raises more revenue. However, discounted fares would still be available for low-income riders.
- **Focus on work trips** and commute hours. Work trips are about 58% of daily transit trips³². During the AM peak period in 2010, 64% of transit rides were work trips
- **Retain high-volume bus routes** for about 23% of 2040 bus riders. Generally, these are routes where AM peak trips between forecast analysis zones (FAZ) exceed 200 person-trips in the modeling. These could be private sector buses.
- **For the remaining 77%**, provide a privately operated Alternative Mobility Service (AMS). These would be small vehicles (fewer than 8 passengers) operating on-demand with door-to-door service. It would eventually be passenger operated in the majority of cases, following the model of vanpools. For Elderly and handicapped, system personnel would assist and drive.
- **Significant computerized optimal routing assumed.** In order to keep down cost and price to customers, we plan for multiple, competitive providers, evolving from a combination of today's taxicabs and the less regulated Internet-requested competitors like Uber and Lyft.

³¹ Regional Transportation Commission, Final Report, 31-Dec-2006.

<http://www.bettertransport.info/pitf/psrtc-report.pdf>

³² Source, Transportation 2040 FEIS. Mar. 2006, p 4-66

- **Eliminate Sounder Commuter rail.** All Sounder commuter rail service would be eliminated as less cost-effective than bus service.
- **Limit Link Light rail** to track and service extending to Northgate in the north, to S. 200th St. in the south, and to Overlake in the east. Within these limits, LRT is either complete, under construction or covered by a Record of Decision. This limitation is consistent with capacity constraints on the Downtown Seattle Transit Tunnel.
- **Re-organize bus transit agencies** to reduce costs and dominance of the City of Seattle.

More Details On Mobility21's Transit Elements

This provides more detail on:

- Alternative Mobility Services (AMS)
- High-Volume Bus Service
- Commuter Rail
- Financial Aspects of Mobility21 Transit
- Bus Rapid Transit for the Eastside and Suburban Crescent.

Alternative Mobility Service. M21's alternative mobility service (AMS) for short trips would use shared vehicles, travelers as drivers as the service evolves, and a capped government subsidy. These would be small vehicles (fewer than 8 passengers), operating on-demand with door-to-door service (see Figure 16). It may be passenger operated. For Elderly and handicapped, system personnel would assist and drive. Significant computerized optimal routing is assumed. There may be multiple, competitive providers, evolving from a combination of today's taxicabs and the less regulated competitors like Uber and Lyft. As with M21 2040 Technology Highways, AMS is an application of technology that will continue to evolve over the next 25 years. AMS is a long-run response to rising costs at Metro and other public transit operations, and to the business opportunity revealed by companies like Uber and Lyft, attracting private investment capital by offering Internet-dispatched, on-demand, quickly-available rides. Nationally, 25 percent of the rides provided by Lyft were to and from transit.³³

The AMS goal for M21 is to develop service over the next two decades to serve 77% of travelers who would otherwise ride the bus, leaving 23% assumed to still be riding on a reduced number of high performance bus routes leading to major employment centers. The target market is short trips under 5 miles.

It is expected that such Alternative Mobility Services will be available via the private market. However, AMS would be a program that would require modest government financial support for the flexible services that the private market cannot meet profitably

³³ NJ.com, 27 Oct, 2015

without government subsidy. Our estimate is that a governmental subsidy of about \$1.6 billion would be required through 2040 to motivate a growing private on-call mobility industry to build a subsidized system that would carry 77% of transit customers. The subsidy to the remaining traditional bus transit would be \$10.6 billion over the same period, through the tax funding of the existing transit agencies: King County Metro, Pierce Transit, Community Transit, Kitsap Transit, Everett Transit, and Sound Transit Regional Express.

In the ongoing system envisioned in the M21 Plan, \$64 million per year for AMS would support 160 million annual rides as of 2040, that is, about 524,000 rides per day.

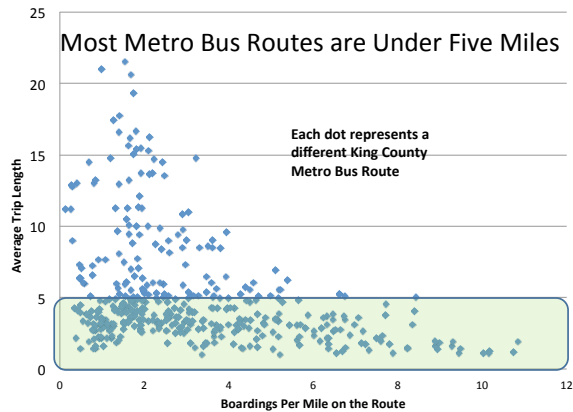
This alternative concept could be tested modestly in the near future on a small scale in a few suburban sub-regions with existing technology. It could be accomplished in cooperation with existing private firms like Yellow Cab and Uber, and with existing vanpool programs. Eventually, parts of the starter system with paid drivers would evolve toward shared vehicles with automated assistance features for non-paid drivers, including high-tech navigation to support efficient pick up of ridesharing passengers.

Figure 16. A Potential AMS Vehicle Type: Small Electric Vans



High-Volume Bus Routes for the Remaining 23% of the Transit Market. High-volume, peak bus routes would be kept. About half of these would serve the City of Seattle. The other half would be allocated to serve Bellevue CBD, Tacoma CBD, U of Washington, and limited service for Everett and Bremerton. Sound Transit would no longer provide express bus transit service. A companion effort would improve cooperation among local, county-level transit agencies, with the intent of reducing overall transit costs. The cost of bus operations would be forced down to the equivalent of Minneapolis bus transit. Generally the remaining bus routes show up in the M21 modeling as those where AM peak FAZ zone to FAZ zone exceeded 200 person trips. High-use bus routes such as the Metro RapidRide and Community Transit Swift; limited by a budget cap would be included. Routes focused on short local trips and yielding low-use bus routes would be eliminated and replaced by the Alternative Mobility Service (AMS). Figure 17, below, shows that the majority of King County Metro routes have average trips lengths shorter than 5 miles.

Figure 17. Length of Average Trips on King County Metro routes



These high volume routes would evolve to headways of 15 minutes or less in peak periods, higher speeds and stops more than ¼ mile apart. There would be no evening or night bus service. After evening peak and until the next morning peak, service would be provided by the AMS, as well as most weekend service.

Commuter Rail. All Sounder commuter rail service would be eliminated as insufficiently cost-effective, compared to buses -- and thus illegal under RCW 81.104.120, which allows Sound Transit to provide commuter rail service only when: *“costs per mile, including costs of trackage, equipment, maintenance, operations, and administration are equal to or less than comparable bus...”*

Furthermore, Sounder operates on freight rail tracks that are expected to see large increases in freight volume by 2040, according to the State Rail Plan. Quoting page 39 of that plan, *“Washington’s rail system is expected to handle more than 260 million tons of cargo by 2035 – more than double the volume carried on the system in 2010. This represents a compound annual growth rate of 3.4 percent for all commodities carried on the rail system.”*

Commuter trains are demonstrably expensive. Table 14, below, shows that Sounder Commuter rail costs are twice those of Sound Transit regional express buses.

Table 14. Commuter Rail Costs Compared to Regional Express Buses

	Daily Passengers in 2013	Cost per Passenger Mile, Net of Fares	Cost per Boarding, Net of Fares
ST Regional Express Bus (public agencies)	45,766	32 cents	\$4.67
ST Regional Express Bus (Veolia)	11,384	20 cents	\$3.42
Sounder Commuter Rail	11,321	45 cents	\$9.81

Financial Aspects of Mobility21 Transit.

- Mobility21 reduces transit spending by 60%. Transit spending can be reduced as a result of transit provisions described above. See Table 15, below.

Table 15. 2010-2040 Mobility21 Transit Spending

2010-2040 Spending	PSRC Adopted (Plan A)	Reduction	Mobility21
Local Transit			
Maintenance & Rehab.	\$27.3	-\$15.1	\$12.2
System Expansion	\$19.5	-\$19.5	\$0.0
Sound Transit			
Maintenance & Rehab.	\$10.2	-\$6.1	\$4.1
System Expansion	\$22.1	-\$6.6	\$15.5
Total Public Transit	79.1	-47.3	31.8

2188 Century21 TRANSP PLAN:TRANSIT:[M21 Transit Cost Reduction 27Oct14.xlsx]Sheet1

- Table 16 shows projected daily ridership, average fare and Net Annual Fare Revenue³⁴. With M21 2010 Technology and Advanced, 2040 annual net fare revenue is 24% higher than for PSRC's Adopted Plan (2008\$).

Table 16. Mobility21 Transit Ridership, Fares, and Fare Revenue

Scenario	Year	Weekday Riders	Avg. AM Fare	Annual Net Fare Revenue. \$millions.
PSRC Existing	2010	461,194	\$2.00	\$205.40
PSRC Constrained	2040	838,665	\$2.14	\$396.46
M21 Traditional (Alt-18)	2040	471,595	\$4.66	\$493.15
M21 Advanced (Alt-19)	2040	468,674	\$4.68	\$491.93

:TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Summary of 5 to 7 Alts, cell T83

- Financing for ineffective transit alternatives, such as streetcars, should be from sources other than regional public transportation funds.
- Total transit expenditures should be capped at a level that more closely reflects transit's share of person-trips. See Table 15.

By 2040, evolving advances in technology will alter transit. Private automobile use over the next two decades will become more popular relative to transit as cars become more computerized, less prone to accidents, less polluting, more energy efficient, less costly to own and operate, and more comfortable to operate in peak congestion.

Bus Rapid Transit (BRT) for East King County & the Suburban Crescent

BRT can cover a range of techniques from simple signal priority to entirely separate guideway, and can be *incrementally developed*. Frequent service in peak hours (every 10 to

³⁴ Net revenue was assumed to be 80% of gross revenue. Evening and night fares were not included.

15 minute) is a common characteristic. They may operate on HOV lanes and on arterials with some semi-dedicated lanes. Sound Transit Regional Express, KC Metro Rapid Ride, and Community Transit Swift are existing local varieties of BRT.

Incremental BRT as embraced by M21 is a concept that breaks down BRT into its performance-enhancing features, selecting the most important and cost-effective for overall network performance, and deploying them across the entire network, rather than creating a gold-plated, higher level of quality on a few routes.³⁵

The five KC Metro RapidRide lines now carry 16 million boardings annually, compared to Seattle Link Light Rail at 11 million. ST Regional Express bus ridership, at about 18 million annually exceeds all ST rail commuter and light rail ridership combined. Metro peak-only express routes are not considered BRT, even though their route speed is often greater than that of Metro RapidRide.

The 2002 approved I-405 Corridor Master Plan, studied a range of alternative service concepts. Bus Transit was found to be superior to rail. Trans-Lake-Washington light rail and East Link did not show up in the modeling as necessary.

Results of the Mobility21 Transit Plan.

Taxpayer transit costs for 2010-2040 would be cut by 60%, but transit service would be maintained for the larger urban centers. “Public transportation” would be defined to include privatized, internet-enabled, partially automated, ride-shared taxi-like services.

Along with road improvements specified in the Plan, the M21 modeling revealed that reduction of transit’s market share to the 2010 level would not increase travel delay. Eliminating Sounder will increase freight rail capacity in support of international trade.

Pedestrians & Bikes

Bicycle/Pedestrian Plan

The Mobility21 assumes the SR 520 Bicycle/Pedestrian trail is a sunk cost and is not a part of the additional Bicycle/Pedestrian investments through 2040. Therefore, determining the real cost of the SR-520 Bicycle/Pedestrian trail project is not relevant to the future investments.

WSDOT has 8 new projects listed for a total of \$43.5 million plus three of the five SR-520 projects. The other 109 projects are listed by local agency sponsors.

³⁵Developed by John Niles and colleagues in research funded by the Mineta Transportation Institute and Federal Transit Administration.

Mobility21 Recommends:

1. An investment of \$2 billion in Bicycle/Pedestrian projects selected from the Transportation 2040 Update Bicycle/Pedestrian project list, consistent with Transportation 2040. This would put the investment more in line with mode share. See Table 17. However, projects that separate bikes and pedestrian from motor vehicle traffic should be given the highest priority.

Table 17. Mode Share by Trips & Miles, 2010.

Mode	% of Pers-trips	% of Pers-miles
walk	10.1%	1.5%
bike	1.2%	0.7%
transit	4.2%	2.2%
auto/truck	84.4%	95.5%
total	100%	100%

2. Consistent with PSRC's Adopted Plan, the selection of specific Bicycle/Pedestrian projects for funding in the Mobility21 Transportation Plan is left to the local and regional agencies to determine, depending on their budget priorities. PSRC allocates a portion of federal transportation funds received to Bicycle and Pedestrian projects on a competitive basis to local agencies. The cities and counties allocate their local budgets through their respective Capital Investment Programs (CIP).
3. On a regional basis, long distance, separated trails serve a variety of users. The existing Sammamish River/Burke Gilman Trail from Marymoor Park in Redmond through Bothell, Kenmore, Lake Forest Park and Seattle to the University of Washington Bothell and Seattle campuses and on to Golden Gate Park on Puget Sound in Seattle is a good example. Commuter and recreational bicyclists and pedestrians use the trail to get to work and wide range of other personal and recreational trips.
4. The Mountain to Sound Greenway Trail along the I-90 corridor and the Eastside Rail Corridor are examples of trails being planned and constructed in East King County that will serve a similar purpose. The completion of the Interurban Trail in South King County and Snohomish County is another example.
5. Why should bikes get a free ride? Bike riders should pay some of the costs for trails and bikeways. This could be or licenses. San Francisco is again considering bike/pedestrian tolls on the Golden Gate Bridge.

These and other proposed projects on the Bicycle/Pedestrian regional projects list would provide rational long distance corridors for bicycle transportation.

MOBILITY21 RESULTS FOR ALL MODES

Mode Share did not Change Much

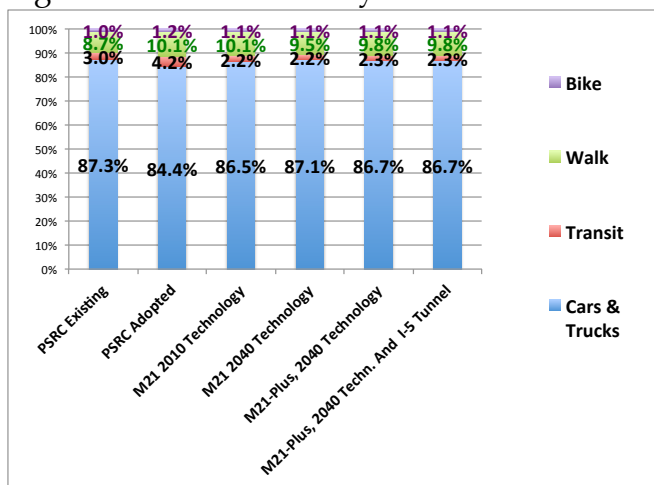
See Table 18. The same results are shown graphically on Figure 18, following. For transit, the Mobility21 alternatives drop to a mode share of 2.2% from the PSRC Adopted Plan's 4.2% will be dramatic to some transit advocates. However, between 1965 and 2003, transit's share of regional travel dropped almost 1% per decade and through 2010 appears to have stabilized at about 3%. History suggests that it is unlikely the 4.2% will be achieved. In spite of Sound Transit's dreams, light rail is unlikely to reverse this ridership trend. In a sample of 11 U.S. metropolitan areas with light rail, that mode carried an average of less than 0.5% of daily trips. For 2040, the PSRC Adopted Plan's results are similar at 0.6% of the region's daily person-trips

Table 18. Mode Share by Alternative (% of daily person-trips)

Scenario	Cars & Trucks	Transit	Walk	Bike	total
PSRC Existing	87.3%	3.0%	8.7%	1.0%	100.0%
PSRC Adopted	84.4%	4.2%	10.1%	1.2%	100.0%
M21 2010 Technology	86.5%	2.2%	10.1%	1.1%	100.0%
M21 2040 Technology	87.1%	2.2%	9.5%	1.1%	100.0%
M21-Plus, 2040 Technology	86.7%	2.3%	9.8%	1.1%	100.0%
M21-Plus, 2040 Techn. And I-5 Tunnel	86.7%	2.3%	9.8%	1.1%	100.0%

Source: 2188 Century21 TRANSP PLAN:TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Summary of 5 to 7 Alts, T57

Figure 18. Mode Share by Alternative



:[TDA: PSRC Trends 9Aug14.xlsx]Summary of 5 to 7 Alts, L30

Costs

Highways

Highway costs are summarized in Table 19. City and county costs are unchanged. State highway costs for M21 2010 Technology are higher than PSRC's Adopted Plan by about 23%. Because of the increased lane-capacity, M21 2040 Technology cost is lower than M21 2010 Technology and about 15% higher than PSRC's Adopted Plan

Table 19. Highway Costs for M21 and M21-Plus Alternatives

	2010-2040 Spending (billions of 2008\$)	PSRC Adopted Plan	Mobility21 Change	Mobility21 Total
M21 2010 Technology	State Highways			
	capital	\$18.4	\$12.0	\$30.4
	O&M + Preserv	\$10.8	\$0.17	\$11.0
	sub-total	\$29.2	\$12.2	\$41.4
	City & County Roads	\$50.1	\$0.0	\$50.1
TOTAL	\$79.3	\$12.2	\$91.5	
M21 2040 Technology	State Highways			
	capital	\$18.4	\$8.2	\$26.7
	O&M + Preserv	\$10.8	\$0.19	\$11.0
	sub-total	\$29.2	\$8.4	\$37.6
	City & County Roads	\$50.1	\$0.0	\$50.1
TOTAL	\$79.3	\$8.4	\$87.7	
M21-Plus 2040 Technology	State Highways			
	capital	\$18.4	\$8.2	\$26.7
	O&M + Preserv	\$10.8	\$0.18	\$11.0
	sub-total	\$29.2	\$8.4	\$37.6
	City & County Roads	\$50.1	\$0.0	\$50.1
TOTAL	\$79.3	\$8.4	\$87.7	
M21-Plus 2040 Techn. & I-5 Tunnel	State Highways			
	capital	\$18.4	\$11.8	\$30.2
	O&M + Preserv	\$10.8	\$0.19	\$11.0
	sub-total	\$29.2	\$12.0	\$41.2
	City & County Roads	\$50.1	\$0.0	\$50.1
TOTAL	\$79.3	\$12.0	\$91.3	

BENEFIT & COST:HIGHWAY COST:[Highway Cost Table 4 Alts 29Nov15.xlsx]Nov 2015

Transit Costs

Mobility21 would reduce transit spending by 60%. See Table 20.

Table 20. Mobility21 Transit Spending

2010-2040 Spending (\$billions)	PSRC Adopted (Plan A)	Reduction	Mobility21
Local Transit			
State of Good Repair	\$27.3	-\$15.1	\$12.2
System Expansion	\$19.5	-\$19.5	\$0.0
Sound Transit			
State of Good Repair	\$10.2	-\$6.1	\$4.1
System Expansion	\$22.1	-\$6.6	\$15.5
Total Public Transit	79.1	-47.3	31.8

Total Regional Transit Costs Reduced

Estimated total costs for all modes are shown in Table 21. City and County costs are assumed to be 100% for transportation purposes. PSRC's Adopted Plan's total cost is 56% higher than Current Law Revenue. Mobility21's total cost is only 25% higher. This Mobility21 cost grows at a rate less than the projected 36% growth in person-trips between 2010 and 2040. Mobility21's cost is a 20% reduction from PSRC's Adopted Plan. These costs include capital, operating and maintenance and preservation.

Table 21. Total Regional Costs

2010-2040 Spending (billions of 2008\$)		PSRC Adopted Plan	M21 Change	Mobility21 Total
Mobility21 2010 Technology	Counties	\$14.6	\$0.0	\$14.6
	Cities	\$35.3	\$0.0	\$35.3
	Local Transit	\$46.8	-\$34.6	\$12.2
	Sound Transit	\$32.4	-\$12.7	\$19.7
	State Ferries	\$8.2	\$0.0	\$8.2
	State Highways	\$29.2	\$12.2	\$41.4
	Other Regional	\$7.2	\$0.0	\$7.2
	TOTAL	\$173.7	-\$35.1	\$138.6

2010-2040 Spending (billions of 2008\$)		PSRC Adopted Plan	M21 Change	Mobility21 Total
Mobility21 2040 Technology	Counties	\$14.6	\$0.0	\$14.6
	Cities	\$35.3	\$0.0	\$35.3
	Local Transit	\$46.9	-\$34.6	\$12.3
	Sound Transit	\$32.4	-\$12.7	\$19.7
	State Ferries	\$8.2	\$0.0	\$8.2
	State Highways	\$29.2	\$8.4	\$37.6
	Other Regional	\$7.2	\$0.0	\$7.2
	TOTAL	\$173.8	-\$38.9	\$134.9

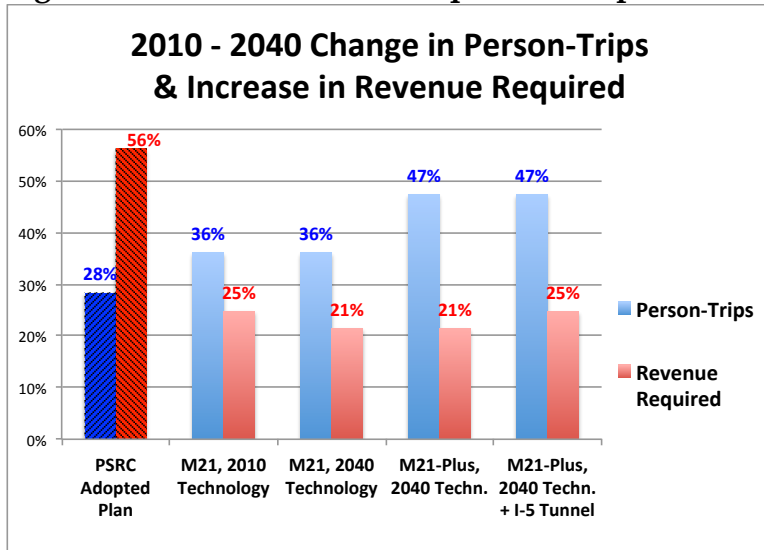
2010-2040 Spending (billions of 2008\$)		PSRC Adopted Plan	M21 Change	Mobility21 Total
M21-Plus 2040 Technology	Counties	\$14.6	\$0.0	\$14.6
	Cities	\$35.3	\$0.0	\$35.3
	Local Transit	\$46.9	-\$34.6	\$12.3
	Sound Transit	\$32.4	-\$12.7	\$19.7
	State Ferries	\$8.2	\$0.0	\$8.2
	State Highways	\$29.2	\$8.4	\$37.6
	Other Regional	\$7.2	\$0.0	\$7.2
	TOTAL	\$173.8	-\$38.9	\$134.9

2010-2040 Spending (billions of 2008\$)		PSRC Adopted Plan	M21 Change	Mobility21 Total
M21 Plus, 2040 Technology + I-5 Tunnel	Counties	\$14.6	\$0.0	\$14.6
	Cities	\$35.3	\$0.0	\$35.3
	Local Transit	\$46.9	-\$34.6	\$12.3
	Sound Transit	\$32.4	-\$12.7	\$19.7
	State Ferries	\$8.2	\$0.0	\$8.2
	State Highways	\$29.2	\$11.4	\$40.6
	Other Regional	\$7.2	\$0.0	\$7.2
	TOTAL	\$173.8	-\$35.9	\$137.9

:2188:BENEFIT & COST:[M21 Total Costs 27Oct14.xlsx]Report Table

Unlike PSRC's Adopted Plan, Mobility21 alternatives increase person-trips by more than the increase in revenue needed. Figure 19 shows that the PSRC Adopted plan requires revenue increase double the increase in person-trips. All of the M21 alternatives require revenue increases less than the increase in person-trips.

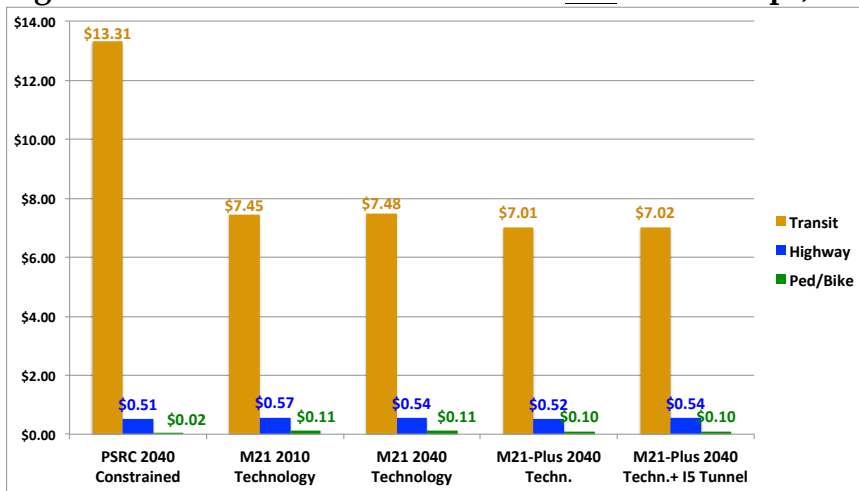
Figure 19. Public Revenue Required Compared to Person-Trips



2188:TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Growth P-T & %, A19

Mobility21 cuts the investment to serve transit trips almost in half. Figure 20 shows the 2010-2040 investment for each mode divided by the total number of person-trips 2010-2040 for that mode (includes the trips of 2010, continuing to 2040 plus the new trips). Mobility21 alternatives cut the transit public investment in half though it is still high.

Figure 20. Public Investment to Serve All Person Trips, 2010-2040



2188/TDA PRODUCTS:[PSRC Trends 9Aug14.xlsx]Invest per TOTAL P-T

FINANCE

Freeway Tolls. The Mobility21 concept assumes a flat 25¢ toll per vehicle-mile on freeways, every day, all day. At an average vehicle trip length of about 8 miles, the average trip toll would be about \$2. At 25¢ per vehicle mile, tolls would more than fund the M21 freeway alternatives on a pay-as-you-go basis. See Table 22 below. The PSRC Adopted plan would use tolls that vary by hour or traffic volume; the 21¢ shown in the table is the estimated hourly figure. Note that for the PSRC Adopted Plan, tolls would not pay the entire freeway costs.

Table 22. Tolling by Alternative

Characteristic (tolls and costs are in 2008\$)	PSRC Adopted Plan	M21 2010 Technology	M21 2040 Technology	M21-Plus 2040 Technology	M21-Plus 2040 Technology + I-5 Tunnel
Freeway Lane-Miles	3,143	3,538	3,366	3355.537	3,373
Tolling Scheme	variable	flat 24/7	flat 24/7	flat 24/8	flat 24/9
Toll Needed per Vehicle-Mile in 2040	0.21	0.23	19¢	19¢	0.21
Start Year for Tolling	2030	2023	2023	2023	2023
2010-2040 Tolls Present Value, \$B	\$29.4	\$41.4	\$37.6	\$37.6	\$41.2
State Highway Cost, 2010-2040, \$B	\$41.2	\$41.4	\$37.6	\$37.6	\$41.2
2010-2040 Tolls as % of Freeway Cost	71%	100%	100%	100%	100%

:2188:FINANCE:[M21 Toll Estim 8Dec15.xlsx]Tables

Imposition of tolls is not without some problems, including:

- Under current Federal law tolling interstate highways is not legal, except under certain, specific conditions.
- In spite of Washington State's 18th Amendment requiring revenues levied on highway users to be used only for highway purposes, toll revenues are seen by some politicians and organizations as an attractive source for other, unrelated purposes, including public transit.
- Tolls imposed on highways built with fuel taxes can be perceived as paying twice, although tolls are also directed toward operations support, road maintenance and rehabilitation.

Total Revenue by Alternative

Table 23 summarizes total revenue, 2010 to 2040. For all four of M21 alternatives, revenue needed is reduced by 20% or more from the PSRC Adopted Plan.

Table 23. Total Revenue Scenario, Millions of 2008\$

Category	PSRC Adopted Plan	M21 2010 Technology	M21 2040 Technology	M21-Plus 2040 Technology	M21-Plus 2040 Technology + I-5 Tunnel
Local Sources					
Road Levy (Property tax)	\$2,100	\$2,100	\$2,100	\$2,100	\$2,100
Other local (fees, licenses)	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000
MVET (cities and counties)	\$3,100	\$3,100	\$3,100	\$3,100	\$3,100
Transit Specific					
MVET (transit)	\$4,600	\$0	\$0	\$0	\$0
sales tax increase , local	\$3,900	\$0	\$0	\$0	\$0
sales tax increase ,Sound Transit	\$6,600	\$0	\$0	\$0	\$0
tax increase for Pass.Only Ferry	\$300	\$300	\$300	\$300	\$300
Increase in transit, ferry fares	\$900	\$100	\$100	\$100	\$100
State Sources					
Fuel tax and bonded net proceeds	\$4,200	\$4,200	\$4,200	\$4,200	\$4,200
Other State sources (Nat resource, F&W)	\$700	\$700	\$700	\$700	\$700
HOT Lanes and facility tolls					
HOT and facility toll proceeds	\$6,600	\$4,550	\$4,470	\$4,550	\$4,550
Highway system tolls	\$22,800	41,369	\$37,582	\$37,629	\$41,188
fuel tax replacement	\$5,900	\$5,900	\$5,900	\$5,900	\$5,900
Offsetting Fuel Tax	-\$5,200	-\$5,200	-\$5,200	-\$5,200	-\$5,200
Total New Revenue	\$62,500	\$63,119	\$59,252	\$59,379	\$62,938
Current Law Revenue	\$111,200	75,481	75,548	75,421	74,962
Total	\$173,700	138,600	134,800	134,800	137,900
Reduction from PSRC Adopted Plan	0%	-20%	-22%	-22%	-21%

:2188 :FINANCE:[General Revenue Projection 10-Dec-2015.xlsx] Table, p 36 psrc final

IMPLEMENTATION

Responsible Agency.

It is too early to be specific about the agency to implement an alternative regional transportation program. At the minimum, the agency should:

1. Include all surface regional modes of travel.
2. Allocate funding in approximate proportion to mode share.
3. Follow the principles of least-cost planning, as described in RCW 47.80.030.
4. Be committed to the use of the best technology suited to real-world development patterns.
5. Focus on real market forces, not plans to achieve planners' and policy-makers' visions of how the public should behave.
6. Work to reduce duplication of services. There is unnecessary waste resulting from duplication of services with so many transit agencies, for example. However, some diversity should remain and this should not lead to a super agency that might be dominated by the city of Seattle.
7. If, for social objectives, a mode is to have a significantly larger share of funding than its mode share, then the excess should not be funded from transportation dollars, especially not transportation user fees (tolls or gas tax, for example).
8. Monitor the potential limitations resulting from Washington's Greenhouse Gas Emissions Act of 2008. It mandates a 25% reduction from 1990 levels by 2020, 35% reduction by 2035 and a 50% reduction by 2050.

Issue of Non-Elected Boards

Currently major transportation decisions are being made by non-elected boards. Board members for PSRC and Sound Transit are serving only by virtue of having been elected to an unrelated office. Decision makers for the Washington State Transportation Commission are non-elected appointees. As a result, there is only a weak connection between voters and the decision makers. There must be a better way. Experience elsewhere suggests that a direct election of members for a transportation board may not be effective (Denver's RTD, Portland's Metro, and Oakland's AC Transit may be examples). This issue will be a political challenge.

RECOMMENDATIONS

Mobility21 must focus on 2 big issues:

- **Roadway/motor-vehicle system serves 98% of daily travel in the region.**
- **PSRC's transit plan requires 50% of funding for 4% of travel.**

Highways

- **Move forward with the advanced technology approach.** Benefits of lower cost and greater safety are compelling.
- **Keep person-trips per capita at 2010 level or more.**
- **Increase lane-miles by:**
 - **223 freeway lane-miles (7% more than in PSRC Adopted)**
 - **119 arterial lane miles (2% more than in PSRC Adopted)**
- **Toll all freeway lanes at a flat 25¢ per vehicle-mile or at a variable rate yielding the same net revenue.**
- **Maintain 2010 pay-parking zones at 2010 levels, and increase rates only to keep up with inflation.**

Transit

- **Reduce the public investment by 60% by:**
 - **Reducing big bus service to serve only the major routes**
 - **Introducing small vehicle, advance mobility service for lower volume, shorter transit routes**
- **Increase transit fares to 65% of operating costs, but continue discount for low-income riders.**
- **Focus on work trips, which are almost 60% of daily transit trips**
- **Expand East King County & the Suburban Crescent transit with bus rapid transit, with much lower costs and faster implementation.**

- Undertake a pilot program of small vehicle transit, using a service such as Uber or Lyft
- Expand vanpool programs, which require little public subsidy

Ped/bike

- Invest up to \$2 billion in Bicycle/Pedestrian projects. Priority should be given to projects that separate bikes and pedestrian from motor vehicle traffic.

Finance

- Reduce the public funding required for transit
- Maintain PSRC's funding plan for the other elements of their adopted plan
- Use freeway tolls for M21 highway additions
- Use PSRC's programmatic allocations to cities and counties for funding of pedestrian and bike projects

Implementation

- Investigate alternatives for a responsible transportation agency with stronger ties to voters.
- Allocate funding in approximate proportion to mode share. This will be a continuing challenge for transit with funding 17 times its mode share in 2010 and declining to 14 times in 2040 with M21 2040 Technology

APPENDICES

- A. Expert Review Panel
- B. Authors and Contributors
- C. Highway Projects & Costs
- D. Modeling and List of Runs
- E. East Link Capacity

Appendix A. Expert Review Panel

An early draft of this report was reviewed by our Expert Review Panel. All five of the Panel members responded with insightful comments that have improved the report greatly. Most of the comments have been incorporated and improved the product. The Panel members are:

- **Wendell Cox.** He is principal of Demographia (Wendell Cox Consultancy) in the St. Louis metropolitan area. He specializes in urban policy, transport and demographics and is author of [Demographia World Urban Areas](#) and co-author of [Demographia International Housing Affordability Survey](#). He is also author of [Toward More Prosperous Cities](#), a framing essay on urban areas, urban planning, urban transport and sustainability.
- **Randal O'Toole.** He is a Cato Institute Senior Fellow working on urban growth, public land, and transportation issues. He is the author of five books on the follies of government planning. The majority of O'Toole's work has focused on private land rights, particularly against public land use regulations and light rail. Before working for Cato, he taught environmental economics at Yale, the University of California (Berkeley), and Utah State University.
- **Alan Pisarski.** Alan is a writer, analyst, consultant in the fields of transportation research, policy and investment. As an expert in transportation public policy, travel behavior analysis and statistics, his work related to transportation, particularly commuting and travel behavior, has been reviewed, discussed and quoted in all of the major national news magazines, and newspapers.)
- **Robert Poole.** Bob is director of transportation policy and Searle Freedom Trust Transportation Fellow at the Reason Foundation. Poole, an MIT-trained engineer, has advised the Federal Highway Administration, the Federal Transit Administration, the White House Office of Policy Development, National Economic Council, Government Accountability Office, and state DOTs in numerous states.
- **Ronald D. Utt, Ph.D.** Ron is an independent economic consultant and the author of a recently published book on the war of 1812: [Ships of Oak, Guns of Iron: The War of 1812 and the Forging of the American Navy](#). Previously Dr. Utt was a Senior Research Fellow at the Heritage foundation where he wrote on housing, transportation, privatization, urban revitalization land use, and growth management. In 1987, Utt was appointed by President Reagan to lead the Office of Management and Budget where he helped the president present a variety of privatization proposals in the 1988 budget. Utt has written for several national publications, including the *Wall Street Journal*, *National Review*, the *Washington Post*, the *Houston Chronicle*, *USA Today* and *Newsday*. He has also appeared for commentary on Fox Business, Fox News and C-SPAN's *Washington Journal*.

Appendix B. Authors and Contributors

All of the below contributed to multiple parts of the plan, but their primarily responsibilities were:

- **Bill Eager** - project manager, highways, costs and revenue, report
- **Bruce Nurse** - team administration
- **John Niles** - transit and vanpools
- **Bob Shull** - modeling and highways
- **Robert Tung** - modeling
- **Vic Bishop** - pedestrians and bikes
- **Bill Popp** - Sound Transit capacity issues
- **Jim MacIsaac** - was to help with M21 financing, but unfortunately died before he could provide what would have been a valuable contribution.

Appendix D. Highway Projects & Capital Costs. (See the next page for details of Projects #2 and #4) Costs are influenced by “area types” which are: 1 = central city, 2 = urban, 3 = suburban, and T= tunnel.

M21 Alts.18,19, 23, and 26 Highway Project List & Capital Costs										
Project No.	Project Description	Miles per direction	Added Lane-miles				Capital \$, millions 2008\$			HIGHWAY TYPE
			ALT 18	ALTS 19 & 23	ALT 26	Area Type	ALT 18	ALTS 19 & 23	ALT 26	
1	I-5 from SR-512 in Lakewood to SR-16	5	10	10	10.0	3	\$218	\$218	\$218	Fwy
	I-5 from SR-16 to S.320th in Federal Way	13	50	50	50.0	3	\$1,090	\$1,090	\$1,090	Fwy
2	SR-167 (Valley Freeway) from SR-512 in Puyallup to I-405 in Renton	21	121	45	45.2		\$2,631	\$984	\$984	Fwy
3	SR-509 from its current terminus in SeaTac to I-5 in the vicinity of S 210th Street (add HOV lane)	3	0	0	0.0	3	\$0	\$0	\$0	Fwy
4	I-405 from I-5 in Tukwila to I-5 in Lynnwood	31	91	9	8.5		\$2,374	\$269	\$269	Fwy
5	I-5 from I-405 in Lynnwood to SR-2 in Everett	12	23	23	23.0	3	\$501	\$501	\$501	Fwy
6	SR-512 from SR-167 to Meridian (SR-161)/94th Avenue S. interchanges	5	9	9	9.0	3	\$196	\$196	\$196	Fwy
7	SR-161 (Meridian Avenue) from SR-512 S. to 176th Street E. (Thun Field)	5	18	18	18.0	3	\$392	\$392	\$392	Fwy
8	SR-202 from Woodinville to Sahalee Way	7	14	14	13.6	3	\$296	\$296	\$296	Fwy
9	SR-908 from I-405 to downtown Redmond	3	5	5	5.0	3	\$109	\$109	\$109	Fwy
10	SR-525 from I-405 to SR-526 near Mukilteo	9	17	17	17.0	3	\$371	\$371	\$371	Fwy
11	SR-9 from SR-522 to Skagit County line	30	0	0	0.0	3	\$0	\$0	\$0	Fwy
13	I-90 from Eastgate to the new Sunset Interchange (add 1 lane each direction)	5	10	10	9.6	3	\$209	\$209	\$209	Fwy
14	I-5 from SR-512 to Thurston County Line	12	23	23	23.0	3	\$501	\$501	\$501	Fwy
15	SR-16: add 1 lane each direction from north end of Tacoma Narrows Bridge north to Bergen Blvd I/C	7	13	13	13.0	3	\$283	\$283	\$283	Fwy
16	SR 410: add 1 lane each direction from SR 167 to 234th Ave. E	8	15	15	15.0	3	\$327	\$327	\$327	3.8 Mi Fwy, 3.7 Mi Hwy
17	SR3 from SR 16 to vicinity of Evans St (Kitsap County): add 1 lane each direction	3	5	5	5.0	3	\$109	\$109	\$109	Hwy
18	Pacific Highway from S 25th Street in Tacoma south to SR 507 – add 1 lane each direction. Extend the SR7 project south down SR507 from SR 7 to 8th Ave S in Pierce County to add 1 lane each direction.	13	26	26	25.6	3	\$558	\$558	\$558	Art
19	SR 16 Interchange to I-5 North add 1 lane each direction to ramps	1	2	2	2.4	3	\$52	\$52	\$52	Fwy Ramps
20	SR 522 from I-5 to SR 9 absolutely needs 1 add lane ea way; v/c .96 to 1.09. Bernie Talmas (ETP) will love it.	9	17	17	17.0	3	\$371	\$371	\$371	4.75 Mi Art, 3.72 Mi Fwy
21	Widen SR 18 from I-5 to SR 164 by 1 lane ea way except thru IC's; v/c .87 to 1.03.	4	8	8	8.0	3	\$174	\$174	\$174	Fwy
22	Widen SR 900 from NW Talus Dr in Issaquah to May Valley Rd, 1 lane ea way with expressway capacity, v/c .94 to 1.04. (605 surrogate)	4	8	8	7.5	3	\$164	\$164	\$164	Hwy
23	Widen SR 900 from May Valley Rd to Duvall Ave with highest arterial capacity, 1 lane ea way, v/c .34 to .62. (605 surrogate)	4	7	7	7.0	3	\$153	\$153	\$153	Art
24	Widen 156th Ave SE from SE 128th St to SE 42nd Pl, 1 lane ea way, v/c .67 to .88. (605 surrogate)	2	4	4	3.5	3	\$76	\$76	\$76	Art
25	Widen SR 169 from 154th Pl SE to I-405, v/c .67 to 1.08. (605 surrogate)	3	6	6	5.5	3	\$120	\$120	\$120	Hwy
28	Add Canyon Road in Pierce County from 104th St E (just north of SR 512) south to 176th St. E to add 1 lane each direction.	5	9	9	9.0	3	\$196	\$196	\$196	Art
29	Extend SR520 project northeast to the Alt 2 Novelty Hill Road project to add 1 lane each direction and grade separate up Avondale Road.	4	8	8	8.0	3	\$174	\$174	\$174	Fwy
30	Add West Lake Sammamish Parkway NE from Redmond Way south to SR 520 to add 1 lane each direction.	1	2	2	1.6	3	\$35	\$35	\$35	arterial
31	Add 148th Ave NE in Bellevue from SR520 south to I-90 to add 1 lane each direction.	4	7	7	7.0	art	\$97	\$97	\$97	arterial
32	NE 2nd, downtown Bellevue, Bellevue Way to I-405 and ramps to and from south on I-405	1	1	1	1.4	ART	\$136	\$136	\$136	arterial + 50% IC
33	NE 6th Subsurface arterial from west of 112th NE to between 105th NE and Bellevue Way	0.41	0.8	0.8	0.8	T	\$85	\$85	\$85	tunnel
34	I-5 Tunnel, I-90 to SR 520	3.30	0.0	0.0	13.2	T	\$0	\$0	\$2,775	tunnel
35	North and south extensions to I-5 Tunnel	2.27	0.0	0.0	9.1	1	\$0	\$0	\$777	Fwy
TOTALS			528	369	391		\$12,000	\$8,249	\$11,801	

** Alts.18, 19, 23 and 26 differ by ADAS assumptions and I-405/SR-167 Lanes
 Compiled 9 Dec, 2015
 :2188 Century21 TRANSP PLAN:BENEFIT & COST:HIGHWAY COST:[M21 Alt18 Alt19 Project List - 25Sep2015.xlsx]Project Listing

I-405 DETAILS	Added Lane-Miles		Area Type	Alt 18	Alts 19, 23, 26
	Alt 18 lane-mi	Alts 19, 23, 26 lane mi			
NB to SB					
Exit 26 - SR 527/Bothell-Everett Hwy	7.475	1.495	3	\$163	\$33
Exit 24 - NE 195th St	2.72	0	3	\$59	\$0
Exit 23 - West Side of SR 522 Interchange	1.7	0	3	\$37	\$0
Exit 23 - SR 522	1.72	0	3	\$37	\$0
Exit 22 - Juanita-Woodinville Way NE	5.24	0	3	\$114	\$0
Exit 20B - North Side of NE 124th St/NE 128th St Interchange	7.02	2.34	3	\$153	\$51
Exit 20B - South Side of NE 124th St/NE 128th St Interchange	2.22	0.74	3	\$48	\$16
Exit 20A - NE 116th St	8.22	0	3	\$179	\$0
Exit 18 - NE 85th St	6.84	0	3	\$149	\$0
Exit 17 - NE 70th/72nd Place/116th Ave NE	13.68	0	3	\$298	\$0
Exit 14 - SR 520/Northup Way	1.2	0	2	\$51	\$0
Exit 13 - NE 12th	0.3	0	2	\$13	\$0
Exit 13 - NE 6th St/NE 8th St/NE 10th St	0.4	0	2	\$17	\$0
Exit 13 - NE 4th St	2.68	0	2	\$115	\$0
Exit 12 - SE 8th St	3.62	0	3	\$79	\$0
Exit 11 - I-90	1.32	0	3	\$29	\$0
Exit 10 - Coal Creek Pkwy	1.96	0	3	\$43	\$0
Exit 9 - 112th Ave SE	3.56	0	3	\$78	\$0
Exit 7 - NE 44th St	1.78	0	3	\$39	\$0
Exit 6 - NE 30th St	1.26	0	3	\$27	\$0
Exit 5 - SR 900/N Park Ave/Sunset Blvd	3.06	0	3	\$67	\$0
Exit 4 - SR 900/Sunset Blvd	1.04	0	2	\$45	\$0
Exit 4 - SR 169/SR 900	3.44	1.72	2	\$147	\$74
Exit 3 - SR 515	4.48	2.24	2	\$192	\$96
Exit 2 - SR 167/Rainier Ave	2.44	0	2	\$105	\$0
Exit 1 - SR 181/Interurban Ave	2.08	0	2	\$89	\$0
	91.46	8.54		\$2,374	\$269

:2188: BENEFIT & COST:HIGHWAY COST:[M21 Alt 18, 19 COST List 28Sep15.xlsx]I-405

SR 167 DETAILS	Added Lane-miles		Area Type	Alt 18 Capital \$, millions	Alts 19, 23, 26
	Alt 18	Alts 19, 23, 26			
	lane-mi	lane mi			
NB to SB					
I-405	12.98	3.54	3	\$283	\$77
43rd Street	5.1	1.7	3	\$111	\$37
S 212th	12.78	4.26	3	\$279	\$93
84th Ave/Central Ave	11.82	3.94	3	\$258	\$86
SR 516	5.48	0	3	\$119	\$0
S 277th	5.39	1.47	3	\$118	\$32
15th St. NW	6.64	0	3	\$145	\$0
SR 18	1.92	0.96	3	\$42	\$21
15th St SW	6.08	3.04	3	\$133	\$66
Ellingsen Road	3.44	1.72	3	\$75	\$37
Jovita Blvd/8th	5.4	2.7	3	\$118	\$59
24th St SE	20.84	10.42	3	\$454	\$227
SR 512	22.8	11.4	3	\$497	\$249
Connection Tacoma to Edgewood					
TOTALS	120.67	45.15		\$2,631	\$984
http://www.wsdot.wa.gov/Projects/SR167/TacomaToEdgewood/map.htm					

APPENDIX D. MODELING AND LIST OF RUNS

Modeling of the alternatives was conducted with the PSRC 4K model data set with the Emme 4 software. Puget Sound Regional Council used a version of this model set for the Transportation 2040 Plan update. The first version of the model that we used for this study was made available in 2014. Subsequent efforts (starting with Alt.20) have used the April 2015 version.

Mobility 21 alternative testing involved first replicating PSRC results to insure that all procedures were operating correctly. The model has a complex set of macros and data inputs that combined with changes in software update versions can impact the model operation.

Scenario	Description
PSRC 2010	Test replication of PSRC 2010 Base Model
PSRC 2040	Test replication of PSRC 2040 Constrained (Adopted Plan) model
Alt.1	PSRC 2040 plus highway improvement projects
Alt.2	Alt.1 plus parking costs reset to 2010 level, tolls set to \$0.25/mile for SOV and light truck, passenger rail lines truncated, bus fares reset to \$3.50 if less, 26 highway improvement projects included.
Alt.3	Similar to Alt.2 but 2040 trips were assumed to be 2010 trips factored by 1.35 uniformly to represent population growth using current trends. Transit fares factored by 2.4 uniformly.
Alt.4	Impact of ADAS (Automated Driver Assistance Systems) Similar to Alt.3 with freeway capacity factored by 2.0 and arterial capacity factored by 1.5.
Alt.5	Update of Alt.3 with highway project adjusted.
Alt.6	Alt.5 highway projects with PSRC 2040 trip generation increased by 10% to estimate using same rates trip generation rates as 2010, LRT truncated at Northgate and S 200 th Street stations. Transit fare factored by 2.4. Tolls fixed at \$0.25/mile. Parking same as 2010.
Alt.7	Same as Alt.6 with PSRC 2040 trip generation increased by only 6%. Projects refined in Kitsap County.
Alt.8	Alt.7 with roadway projects refined.
Alt.9	Alt.8 with I-90 bridge center lane restored to HOV (from LRT) as in existing. Remove LRT segment on I-90 but retain LRT segments on both ends.
Alt.9A	Alt.9 but make HOV segments on I-90 as GP (General Purpose)
Alt.10	Alt.7 with test of adding one GP lane per direction between Montlake and I-405
Alt.11	Alt.10 with conversion of Eastlink LRT to BRT
Alt.12	Alt.7 with test of 30% increase in capacity on all links.
Alt.13	Alt.7 with test of \$0.25 flat toll on all highways for SOV, HOV, and light trucks
Alt.14	Alt.7 with no tolls for any vehicles
Alt.15	Alt.7 with increased number of lanes on I-405 from I-5 in the north to I-5 in the south to 9.9 lanes.

Scenario	Description
Alt.16	Alt.7 with combining I-405 and SR-167 into a new freeway and adding two lanes per direction, convert HOV to GP, \$0.25 flat toll on I-405/SR-167 only.
Alt.17	Alt.16 with ADAS increase of 50% capacity on freeways and 30% on arterials.
Alt.18	Alt.16 with tolls on all freeways. . 21.0k trips, Alt 16 network.
Alt.19	Alt.17 (includes ADAS) with tolls on all freeways. 21.0k trips, ADAS, reduced Alt 16 network.
Alt.20	Alt.18 with Unsuppressed trip generation and updated PSRC 2040 model. 22.7k trips, Alt 18 network
Alt.21	Alt.20 with Seattle Tunnel at 2 lanes per direction between I-90 and SR-520. 22.7k trips, Alt 18 network + I-56tunnel, original tunnel interchanges
Alt.22	Alt.21 (includes Seattle Tunnel) with ADAS. 22.7k trips, Alt 18 network + I-5 tunnel, original tunnel interchanges, ADAS.
Alt.23	Alt.22 (includes ADAS) and adjusted lanes on I-405 and SR-167. 22.7k trips, Alt 19 network + I-5 tunnel, original tunnel interchanges, ADAS.
Alt.24	Alt.21 (includes ADAS and Seattle Tunnel) and adjusted lanes on I-405 and SR-167. . 22.7k trips, I-5 tunnel, ADAS, Alt 19 network, original tunnel intershnages
Alt 25	Alt 21, but improved interchanges. 22.7k trips, I-5 tunnel, No ADAS, Alt 18 network.
Alt 26	Alt 22 with improved interchanges. 22.7k trips, I-5 tunnel, ADAS, Alt 19 network.

APPENDIX E. EAST LINK CAPACITY

These summary perspectives are excerpted from Bill Popp's October 3, 2015, memo: "M21 Puget Sound Region Transportation Plan -- East Link Headway Limitations and East Link's Ability to Accommodate an Extension to Issaquah.

- The M21 proposal to limit light rail to Northgate, S.200th, and Overlake is supported by ST's forecast of overload operations in the DSTT with Lynnwood Link Extension implementation.
- The peak hour rail passenger demand for the Redmond segment of E. Link and the rail extension to Issaquah could each be readily accommodated with 15 articulated busses with all patrons seated.
- The projected peak hour rail patrons on I-90 could be carried in the HOV lane by slightly more than one articulated bus per minute with only a handful of those riders standing and there would still be space left for at least 1300 other HOV's and buy in SOV's. Just a hopeful reflection should the track bridge etc. not work.
- Given the now acknowledged 3.0 minute light rail train headway limitation in the DSTT, articulated busses operating at an average of Metro's estimates of the number of busses possible would have provided significantly more DSTT passenger capacity than Link.
- Truncating I-90 bus routes at rail stations is an existing transit rider disservice that begs for continuation of direct HOV lane bus service from Issaquah and Eastgate Park and Ride to Seattle. This would not only improve transit patron comfort and level of service, it would reduce rail demand in the DSTT and would be especially effective for riders if one assumes a new downtown Seattle bus tunnel per paragraph 7. above.
- Truncating regional express bus service at light rail stations has been justified based on the rationale that HOV lane speeds will continue to degrade and rail thus offers the only reliable option. This politically constrained thinking obviously precludes truly effective mass transportation planning and solutions. E.g., the ST3 Priority Projects List does not have any north-south BRT or bus HOV lane projects in the entire I-5 corridor from Everett to Lakewood.
- There is no effective bus and/or car/van pool alternatives planning in this region because of ST's dominant political role and rail focus which subjugates the bus operators and WSDOT to support roles. Thus the truly cost effective solutions that can best come from those agencies are suppressed. And similarly key PSRC policy bodies are dominated by ST Board members thus PSRC's constrained plan has an expensive rail system that doesn't work well and there are no financially constrained alternatives proposed to remedy that.

ST sidestepped the DSTT capacity issue in their Lynnwood Link extension study and the issue has not been directly discussed in the 2040 LRP SDEIS from this consultant's perusal. If so this has to be an intentional omission. Their refusal to provide 2040 rail forecasts supports this notion. Somehow independent oversight of this agency needs to occur.