

Highway Congestion: What Is To Be Done?

*Briefing to the Washington State Senate
Transportation Committee
Presented on January 17, 2006*

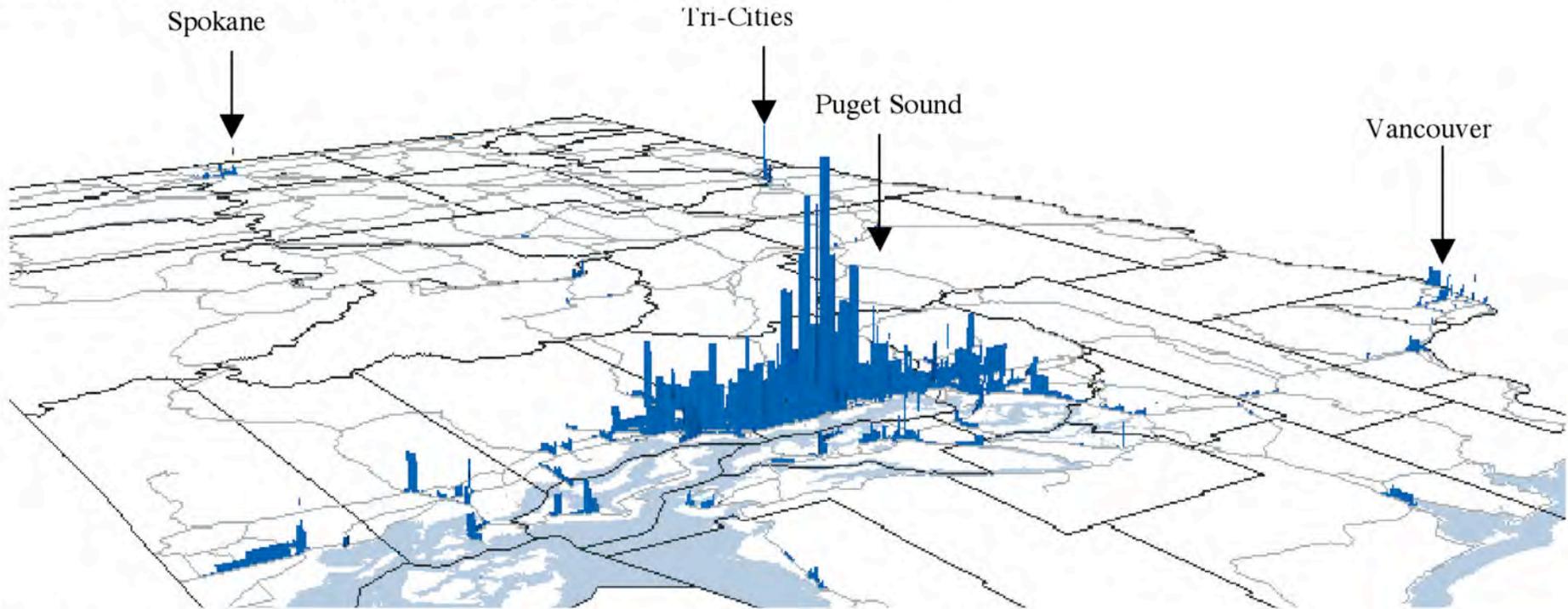
Douglas B. MacDonald
Secretary of Transportation
Washington State Department of Transportation

This presentation available at:
<http://www.wsdot.wa.gov/secretary/>
For information please contact Doug MacDonald
360-705-7054 MacDond@wsdot.wa.gov



Highway Congestion - Delay - Aggravation - Cost - Risk

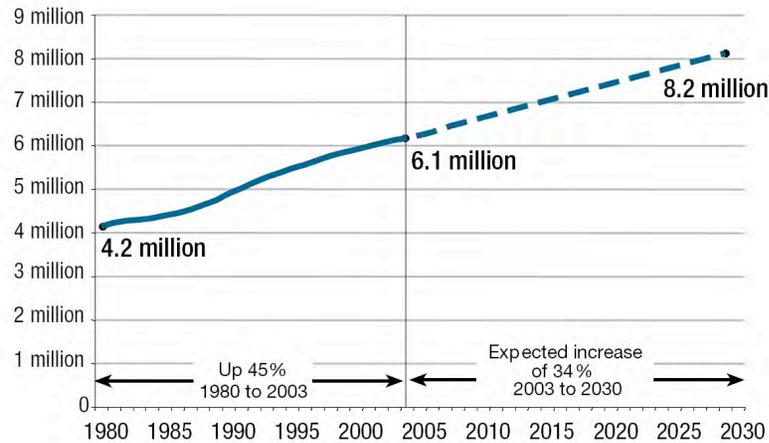
Annual hours of vehicle delay on state highway segments in urban areas



- 370,000 vehicle hours (520,000 person hours) daily delay (2004)
- Chiefly affecting urban areas and especially the Puget Sound region
- Lost productivity, economic inefficiency and personal opportunity costs
- Estimates: billions of dollars per year
- High accident rates accompany congestion and every accident in congestion makes congestion worse!

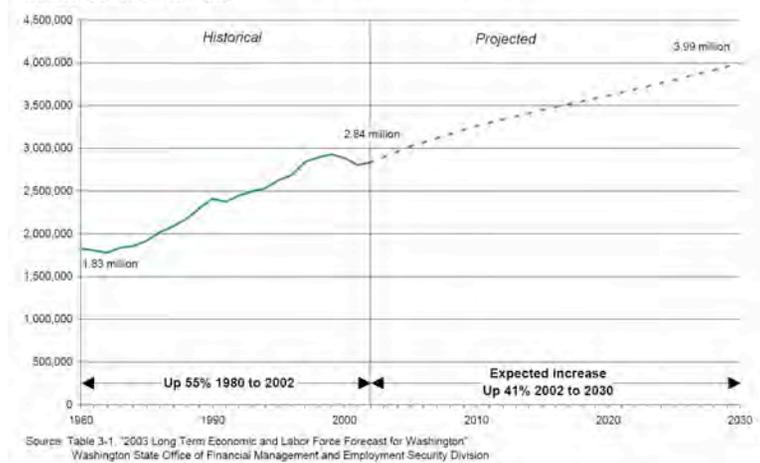
Highway congestion results from growth and prosperity creating a demand/capacity imbalance as a result of infrastructure under investment.

Population

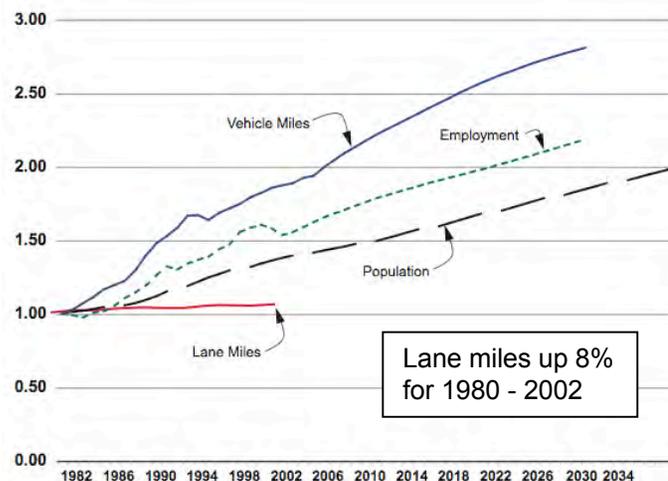


Employment

Historical and Projected Growth in Employment in Washington
1980 to 2030 (Projected from 2003 to 2030)

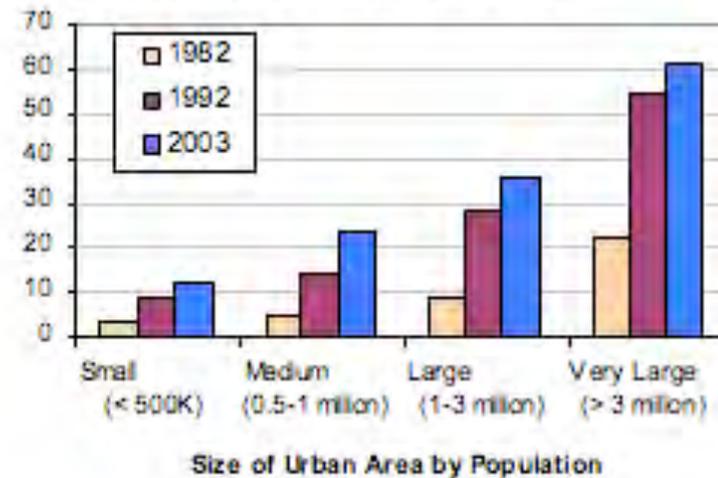


Vehicle Miles Traveled



Growth in travel delay in 1982 to 2003

Urban Area Congestion Growth Trend

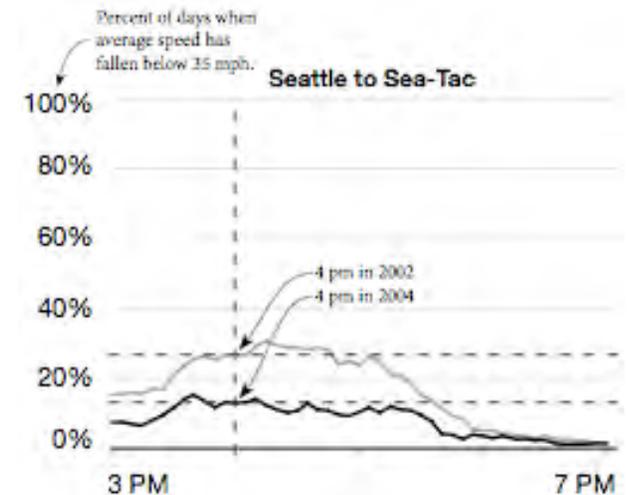
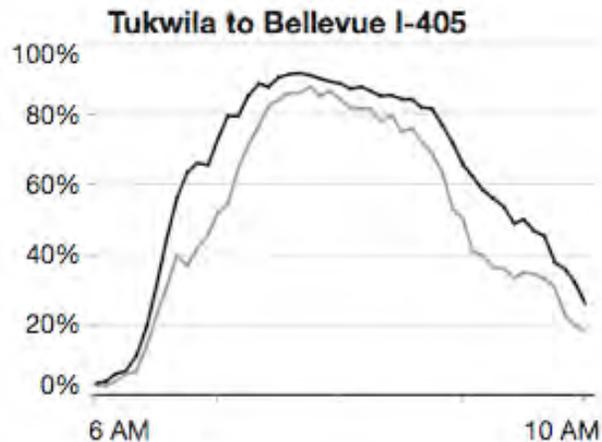
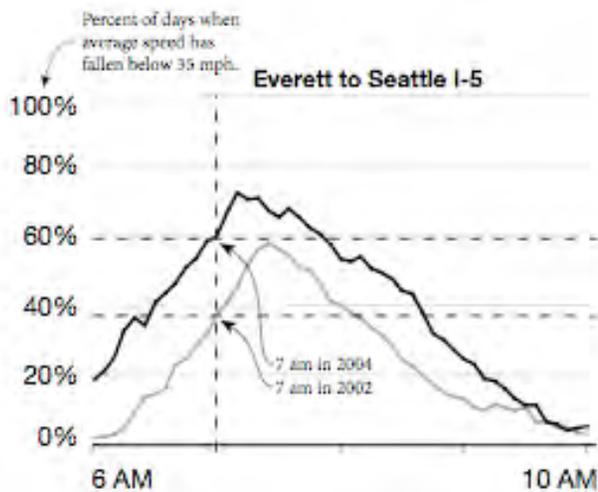


WSDOT and the University of Washington TRAC measure congestion changes on 20 key corridors

Gray Notebook congestion measurement report for 2004 (9/15/05)

Results for 2004 compared to 2002 as base year, for example:

| | Peak Time | Length | 2004 average travel time at peak <i>and change from 2002</i> | Volume In 2004 | 2004 % "slow days" <i>and change from 2002</i> | 2004 "reliable" travel time <i>and change from 2002</i> |
|---------------------------------|-----------|----------|--|----------------|--|---|
| Tukwila to Bellevue (AM) | 7:45 AM | 13.5 mi. | 36 min. <i>4 min. worse</i> | Down 1% | 80% <i>Up from 73%</i> | 52 min. <i>Down from 53 min.</i> |
| Everett to Seattle (AM) | 7:20 AM | 23.7 mi. | 48 min. <i>4 min. worse</i> | Up 1% | 52% <i>Up from 35%</i> | 74 min. <i>Up from 66 min.</i> |

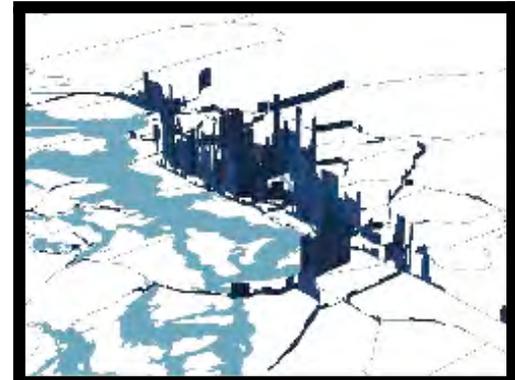
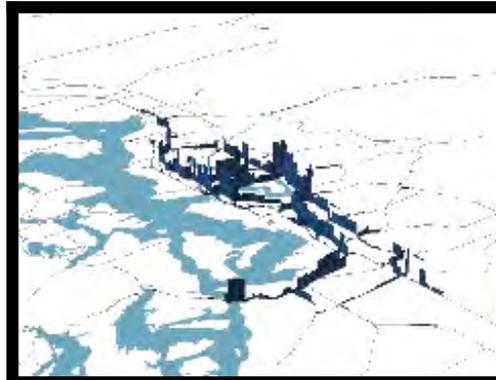


What's coming could be much worse unless we continue to make progress on both system investment and management

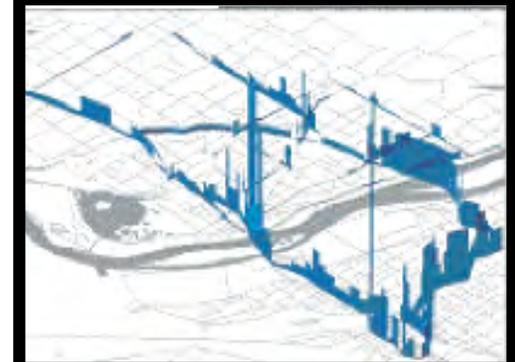
Vehicle delay today

Vehicle delay "2025 baseline"

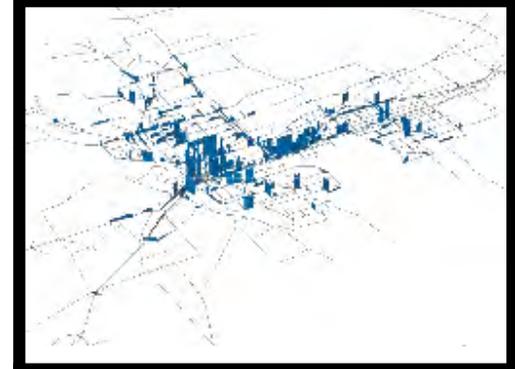
Central Puget Sound



Vancouver/Portland



Spokane



To fight congestion, what are we committed to building?

- Highway projects to maintain and better use existing facilities
Alaskan Way Viaduct, SR 520 Bridge
- Highway projects to combat bottlenecks and chokepoints
I-405 improvements
I-5 48th to Pacific (Tacoma)
- Highway projects adding point-to-point capacity
 - Completing the central Puget Sound HOV lane system
I-5 Everett HOV, Tacoma Vicinity HOV, I-5 Fife HOV
 - Other point-to-point improvements
I-90 improvements in Spokane
SR 522, SR 202
- Transit facility investments to improve transit's appeal to current and future trip makers and build ridership
Link light rail from Seattle to SeaTac Airport,
Regional express direct access ramps

2003 “Nickel” and 2005 “TPA” include 330 new general purpose lane miles and 85 new HOV lane miles.

In the Puget Sound Region, we need more than just state investments to fight congestion

- Additional road investments requiring regional funding
 - SR 509/I-5 Corridor Completion
 - SR 167 Green River Valley HOV, Bottlenecks and Chokepoints
 - SR 167 Puyallup to Port of Tacoma Corridor Completion
 - I-405 – North Renton to Bellevue – Additional Lanes
 - SR 520 HOV Lanes
 - SR 9 Corridor Widening and Improvements
 - SR 162 Corridor Widening
 - SR 704 Cross-Base Highway

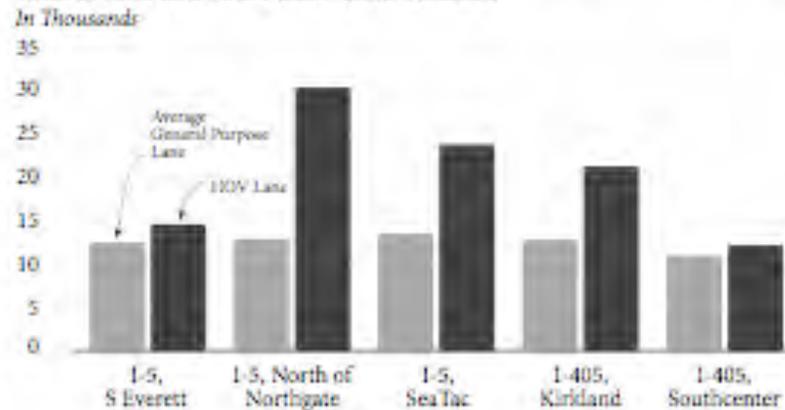
- Additional transit investments requiring regional and local funding
 - Light Rail Transit (LRT) Extension to Northgate
 - High Capacity Transit (HCT) Bellevue to Seattle
 - Expanded Regional Express Bus Service
 - Additional HOV Direct Access Ramps/Freeway-to-Freeway Connections

HOV lanes in the right places are highly efficient, enhance the speed and reliability of multi-passenger vehicles and ease congestion in adjacent general purpose lanes.

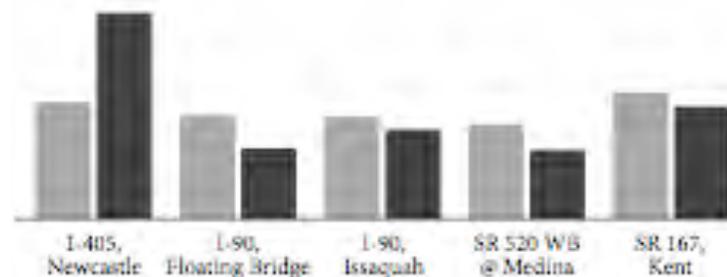
Central Puget Sound HOV lanes completed and to be completed



2004 HOV Lane and General Purpose Lane Person Throughput Comparison
Total of A.M. and P.M. Peak Period Volumes



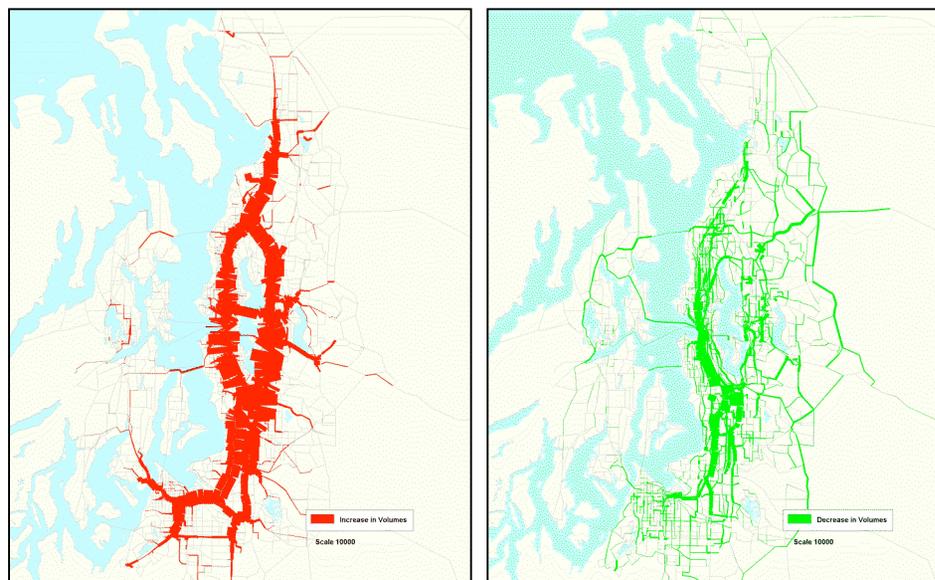
Note: Volumes are for peak period direction only.



Building as the *only* solution for congestion relief turns out to present significant challenges and a very unrealistic transportation vision.

Additional lanes needed to meet unconstrained highway demand

Changes in daily vehicle volumes in the unconstrained highway demand analysis



The crucial relationship between flow conditions and throughput

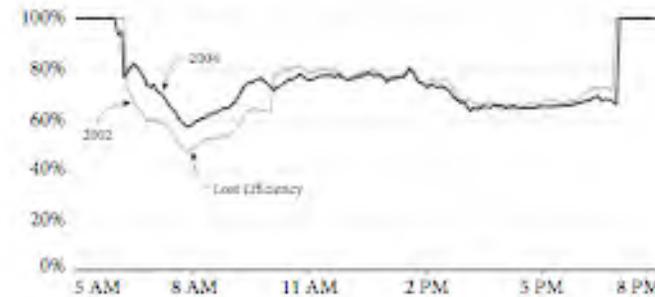
- When congestion builds, speeds drop, drivers bunch up and per lane throughput plummets. “The amazing shrinking freeway.”
- At 45-50 mph optimal speed, highways typically see 2000 vehicles per lane per hour throughput. The highway is “productive.”

Here’s the view of lost productivity for highways in central Puget Sound.

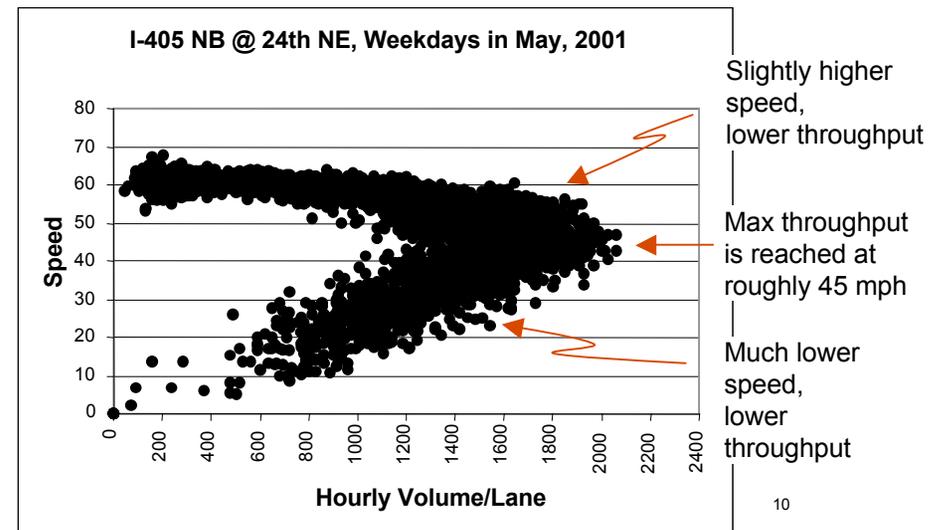


Here’s how the productivity of a freeway is degraded by congestion

I-405 at SR 169 in Renton



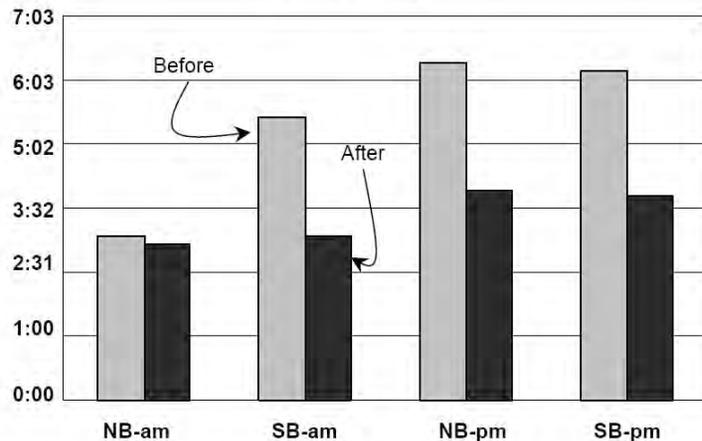
Here is the highway “sweet spot” graph.



We must also better manage highways and highway system operations to successfully fight congestion.

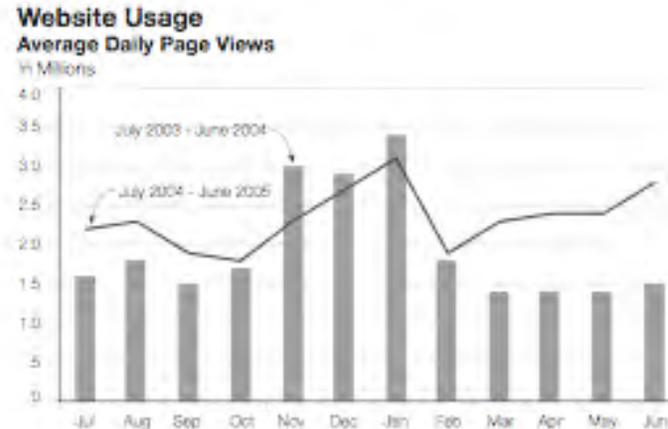
- Re-time and synchronize traffic signals
- Operate ramp meters to smooth traffic merges
- More progress on traveler information
- Incident response improvements

Traffic light re-timing probably has the best cost/benefit ratio of any dollar spent (min.sec)

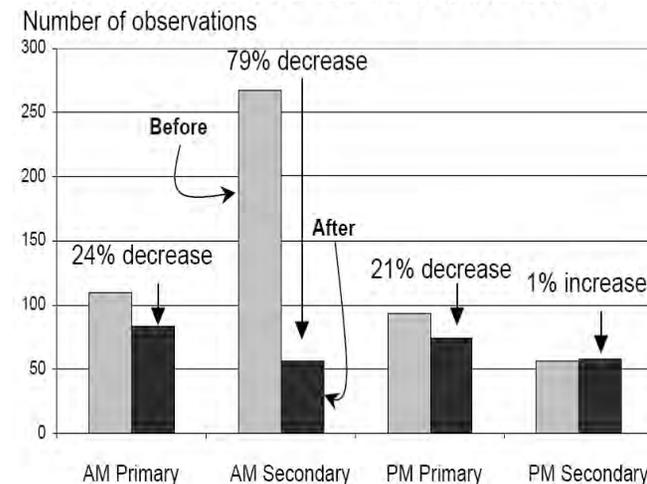


Before and after peak hour travel times

Study conducted by the City of Bothell on re-timing traffic signals on SR 527 between 228th Street SE and SR 524.



Ramp meters improve traffic flow



Conflict results at S 212th St. to NB SR 167

Primary conflicts: when either the merging Behind or the adjacent mainline vehicle brake to avoid each other.

Secondary conflicts: mainline drivers behind a primary conflict that also must brake.

Fact: The traffic congestion you experience as intolerable is often caused by “incidents,” not by inherent demand/capacity imbalance.

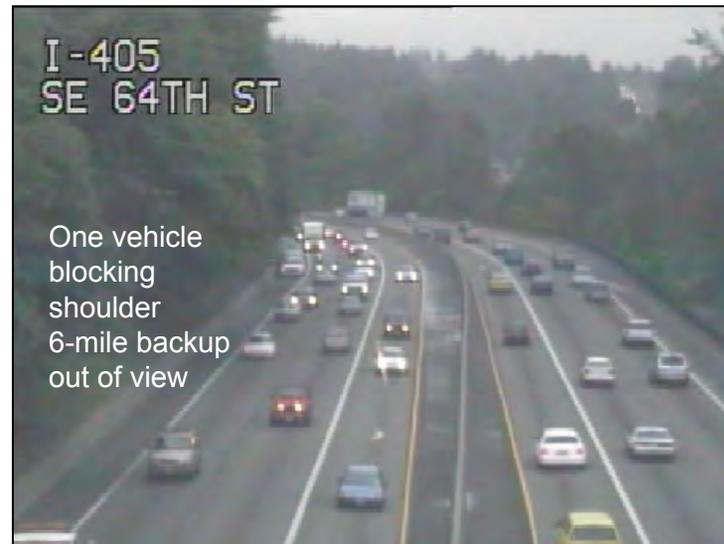
Accidents

Disabled Vehicles

“Secondary” Accidents

Bad Weather

Construction/
Maintenance Zone



On a three-lane wide divided freeway:

- A car out of gas on the shoulder can reduce total throughput by 20%.
- A disabled car blocking one lane can reduce total throughput by 50%.
- An accident blocking two lanes can reduce total throughput by 85%

The bane of most travelers traffic experience: The intolerable backup that defeats their expectation of “reliable travel time.”

In 2003, the total cost of traffic congestion in the greater Seattle area was over \$1.2 billion. Savings due to traffic operations, including Incident response were estimated at \$107 million*.

* Texas Transportation Institute 2005 Urban Mobility Study

A short digression to fundamental questions too little discussed in the congestion arena:

- How will housing and job growth be distributed?
- How will energy supply affect the future of transportation demand and transportation systems?
- How will freight movement and freight logistics change?
- How will technology of highways and vehicles change?

Investing more and operating smarter will help address congestion but will not solve it. A more dramatic remedy “Value Pricing” will eventually be necessary.

- Free market economies use the law of supply and demand to assure the right level of goods and supplies at the right price.
- Where demand exceeds supply, price goes up, demand adjusts downward and supply adjusts upward. And the price constantly adjusts itself to make the market efficient.
- The time will come when the benefits of a market mechanism will have to be used to better match transportation demand and capacity.

How pricing will help

- Restores lost productivity. The price for using highways will fluctuate to keep the highways moving.
- Assures speed and reliability for multi-passenger vehicles-buses or vanpools.
- Encourages shifts in today’s capacity-wasting transportation paradigm: everyone wants to drive on the same roads and the at the same time, after all, why wouldn't they? It’s always “free”.

Pricing for the value of consuming capacity of a HOT lane, or a freeway segment, or eventually the highway network

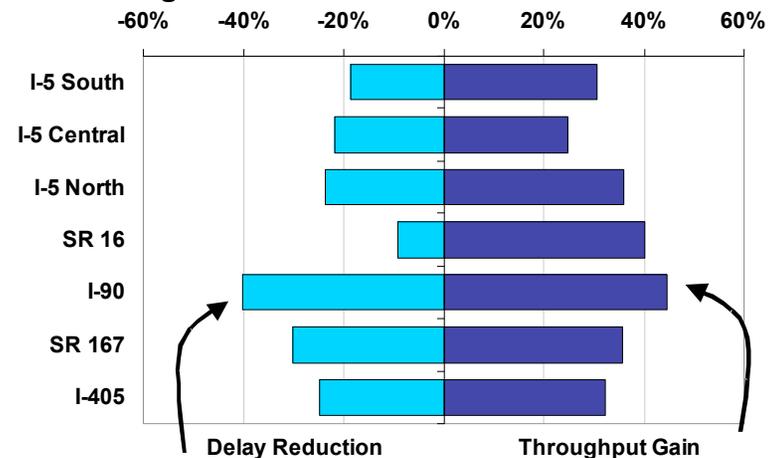
WSDOT's SR 167 HOT lane pilot project is a capacity management application of value pricing.

- The four-year pilot project will convert 9 miles of SR 167's HOV lanes to HOT lanes - likely to open in 2007 or 2008.
- The HOT lanes will maximize use of SR 167's existing capacity – with up to 13% increase in vehicles using the corridor and up to 56% increase in use of the HOV lanes when they become HOT lanes.
- Solo drivers will be charged a toll to use the HOT lanes. The price of the toll will be based on the congestion level in the lane and set to ensure speed and reliability in the HOT lane.
- Access to the HOT lanes by transit, car pools, van pools, and motorcycles will remain free.

HOT lane projects are sprouting up and around the country because its time to make the laws of market economics help solve the traffic congestion problem

- California
- Colorado
- Texas
- Washington
- Minnesota
- D.C. Beltway

Potential peak period percent delay reaction and efficiency gains with HOT lanes in the Central Puget Sound Region

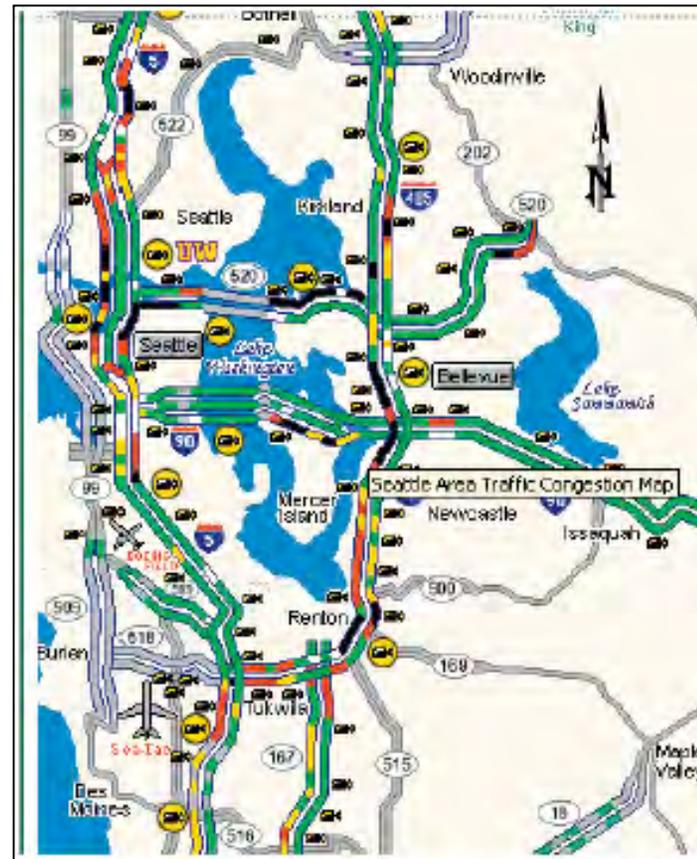


Value pricing will come to pay economic dividends far in excess of the receipt of the tolling revenues.

- Revenues will be used to help finance transportation system investments and operations
- Dollar investments already made in highways will recapture full value from making highways productive at full capacity once again
- Dollar value savings will be realized from cutting loss of time, money and fuel when people and goods are stuck in traffic
- Safety related savings will be realized from fewer fatalities, injuries and accidents on congested freeways

Value pricing also applies long-standing rule that price-induced conservation of capacity is generally cheaper than building new capacity

Traffic congestion is largely a “peaking” issue on a capacity constrained roadway “transmission” system. Just like time-of-day (or seasonal) electricity send-out peaking on the electric transmission grid. Charging a price to drivers varying as the cost of the demand burden they place on the system will shift demand away from the peaks.



Seattle City Light (Western Grid)

Traffic Grid

Electric Grid

The power company charges you extra for using electricity in peak times, e.g. so you will do the laundry at 8:00pm instead of at 5:00pm. Value pricing for highways will work on the same principle.

Action Strategies: Balanced - Broad-based - Short, Medium and Long Term

- Continuous improvement of highway management and efficiency
- On-going support for investments and programs to reduce the grip of automobile/highway dependency.
- Continued investment in existing transportation assets to extend their useful lives
- Effective delivery of investment projects now in the pipeline: chokepoint improvements *and* corridor expansion
- Continuing steps towards system planning and public acceptance for value pricing
- Good choice of additional highway and transit investments to get best value for dollar and integrate with tomorrow's transportation needs. Expanded rule for regional funding.