

## Notable results

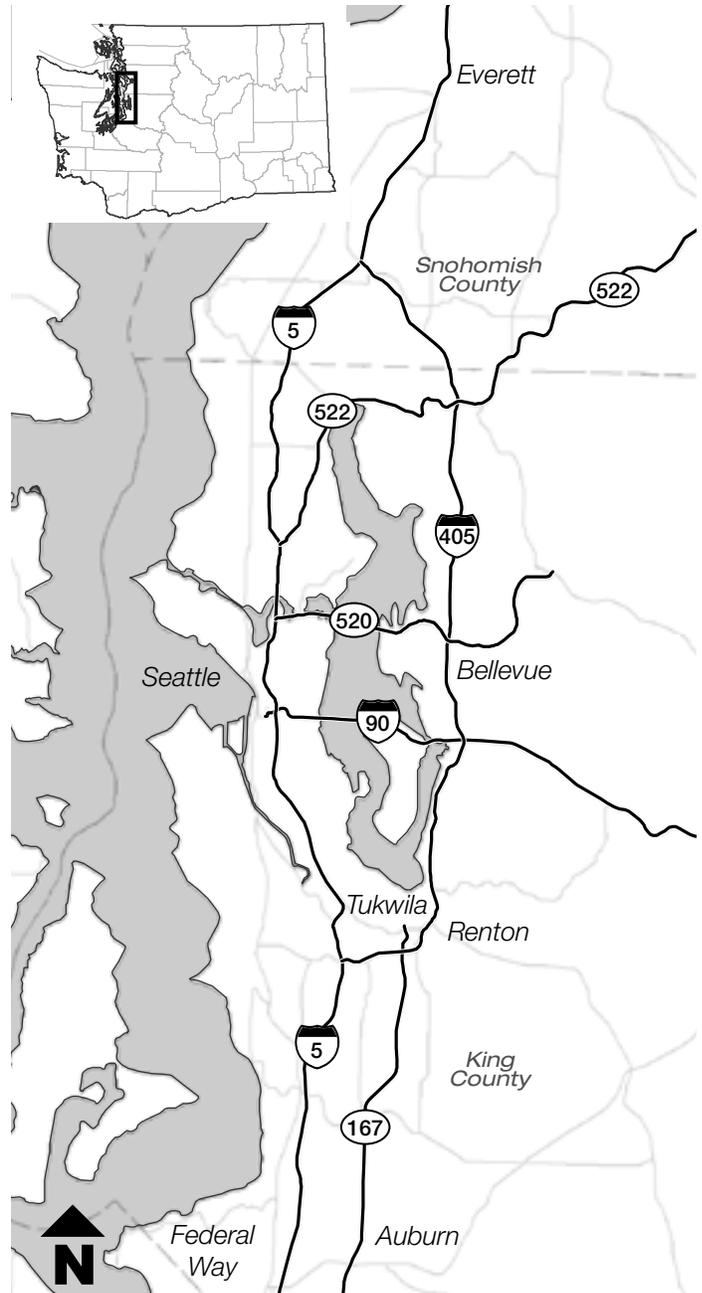
- *Tolling on SR 520 resulted in a reduction of more than 14,000 vehicles and a three- to six-minute improvement in travel times*
- *Commuters on I-90 eastbound saw a two- to three-minute improvement while westbound saw a two- to three-minute decline*

## Puget Sound commutes see changes

Tolling on State Route 520 (SR 520) has changed Puget Sound area commute travel trends. Key findings in WSDOT's analysis for the second half of 2012, which compares data to the last six months (July through December) of 2011 and 2010, include:

### SR 520 tolling led to decreased overall bridge commuter traffic (2012 vs. 2011)

- Tolling resulted in a reduction of more than 14,000 vehicles on SR 520 during weekday commutes. Slightly more than half of these vehicles diverted to Interstate 90 (I-90), while others chose alternate routes, shifted trip mode to such alternatives as transit, vanpool or carpool or chose a new destination for, or eliminated, discretionary trips.
- Commuters using SR 520 saw a three- to six-minute (14 to 28 percent) improvement in travel times despite being negatively impacted by major construction activities east of the SR 520 floating bridge. These travel time improvements coincide with traffic volume reductions of 18 to 36 percent.
- Commuters using I-90 eastbound saw their travel times improve by two- to three-minutes, despite 10 and 12 percent increases in eastbound commute traffic. This is due in part to WSDOT's completion of a construction project that created an eastbound High Occupancy Vehicle (HOV) lane from Mercer Island to Bellevue.
- Commuters using I-90 westbound experienced travel times worsening by two- to three-minutes, which reflects the 5 and 9 percent increases in westbound commute traffic.



WSDOT's analysis of Puget Sound area travel time trends for the second half of 2012 looks at travel along 18 high demand commute routes in the Seattle area on interstates 5, 405 and 90, as well as state routes 167 and 520.

# Charting Puget Sound peak period and daily traffic changes

## SR 520 tolling contributed to increased commute travel times on north-south corridors (2012 vs. 2011)

- All 10 non-cross-lake (north-south) routes saw increased travel times while noticeable changes were observed in commute volumes, ranging from decreasing 7 percent to increasing 3 percent.
- WSDOT construction activities and a shift in traffic from SR 520 and I-90 due to tolling, changed where vehicles entered and exited I-5 and I-405. This influenced travel northbound and southbound through downtown Seattle and Bellevue.
- The use of SR 167 High Occupancy Toll (HOT) lane increased by 7 percent, which contributed to overall improved corridor performance.

The table below summarizes the travel time and vehicle

volume changes on the 18 key commute routes in the central Puget Sound region in the second half of 2012, compared to the same periods in 2010 and 2011.

## Cross-Lake Washington traffic decreases

**Daily volumes:** Routes that cross Lake Washington showed significant changes in traffic volumes. On SR 520, comparing

### Peak periods defined

WSDOT uses standard peak periods for congestion analysis. For the Puget Sound region, morning peak is from 5 a.m. to 10 a.m. while the afternoon peak is from 2 p.m. to 8 p.m. A notable difference will be seen in an upcoming annual report (to be published in summer 2013) on SR 520 tolling which defines peak toll periods as the times when the largest toll is charged to cross the SR 520 bridge. This difference is due to the variable time-of-day toll structure on SR 520.

## Travel time performance from July 1– December 31, 2010–2012, on a sample of 18 high demand commute routes

Morning peak between 5 a.m. and 10 a.m.; Evening peak between 2 p.m. and 8 p.m.; Monday through Friday

Route name (route length in miles)	Direction of travel	Average travel time in minutes during peak period			Peak average travel time change in minutes			Peak volume change		Daily volume change	
		2010	2011	2012	2011 vs. 2010	2012 vs. 2011	2012 vs. 2010	2011 vs. 2010	2012 vs. 2011	2011 vs. 2010	2012 vs. 2011
<b>Morning commutes</b>											
I-5 Federal Way to Seattle (22)	NB	40	44	47	4	3	7	1%	3%	-2%	2%
I-5 Everett to Seattle (24)	SB	47	39	50	-8	11	3	1%	2%	0%	1%
I-5/I-405 Everett to Bellevue (24)	SB	49	48	54	-1	6	5	1%	0%	1%	-1%
I-405 Tukwila to Bellevue (13)	NB	28	29	34	1	5	6	1%	-1%	2%	-1%
SR 167 Auburn to Renton (10)	NB	17	17	18	0	1	1	2%	-7%	4%	-3%
I-405/I-90/I-5 Bellevue — Seattle (10)	SB/WB/NB	14	15	18	1	3	4	2%	9%	1%	10%
I-405/SR 520/I-5 Bellevue — Seattle (10)	NB/WB/SB	19	20	15	1	-5	-4	-3%	-33%	-5%	-31%
I-5/I-90/I-405 Seattle — Bellevue (11)	SB/EB/NB	17	18	15	1	-3	-2	1%	12%	2%	12%
I-5/SR 520/I-405 Seattle — Bellevue (10)	NB/EB/SB	24	22	16	-2	-6	-8	-7%	-21%	-6%	-34%
<b>Evening commutes</b>											
I-5 Seattle to Federal Way (22)	SB	31	30	33	-1	3	2	0%	2%	-2%	3%
I-5 Seattle to Everett (23)	NB	41	37	40	-4	3	-1	2%	-1%	1%	0%
I-405/I-5 Bellevue to Everett (23)	NB	40	38	45	-2	7	5	2%	-3%	3%	-1%
I-405/I-5 Bellevue to Tukwila(13)	SB	31	33	35	2	2	4	1%	-2%	2%	0%
SR 167 Renton to Auburn (10)	SB	17	17	18	0	1	1	2%	-2%	3%	-1%
I-405/I-90/I-5 Bellevue — Seattle (10)	SB/WB/NB	27	27	29	0	2	2	0%	5%	1%	10%
I-405/SR 520/I-5 Bellevue — Seattle (10)	NB/WB/SB	31	31	25	0	-6	-6	-2%	-18%	-5%	-31%
I-5/I-90/I-405 Seattle — Bellevue (11)	SB/EB/NB	19	18	16	-1	-2	-3	1%	10%	2%	12%
I-5/SR 520/I-405 Seattle — Bellevue (10)	NB/EB/SB	24	21	18	-3	-3	-6	-4%	-36%	-6%	-34%

Data source: WSDOT Northwest Region and the Washington State Transportation Center (TRAC) at the University of Washington.

Notes: General purpose lane volumes only; HOV/HOT lane volumes not included. Trips on I-90 and SR 520 are shown for both directions, in both AM and PM periods; daily volumes are duplicates in both the AM and PM routes. A negative change in travel times indicates faster travel times. NB/SB/EB/WB are acronyms for northbound, southbound, eastbound and westbound, respectively. Beginning with the semi-annual report published in February 2012, peak period definitions match the definitions used in the annual *Congestion Report*. Travel time and volume data for older comparison years were adjusted accordingly; therefore, values in this table are not directly comparable to those published in previous semi-annual reports. Analysis methodology for the six-month travel times report is consistent with the annual *Congestion Report*.

# State Route 520 tolling impacts cross-Lake Washington commutes

the second halves of 2012 and 2011, daily traffic volumes dropped between 31 percent (westbound) and 34 percent (eastbound). Daily volumes on I-90 increased between 10 percent (westbound) and 12 percent (eastbound). The daily traffic volumes on the sampled routes that do not cross Lake Washington (north-south corridors) changed by up to 3 percent, some increasing and others decreasing.

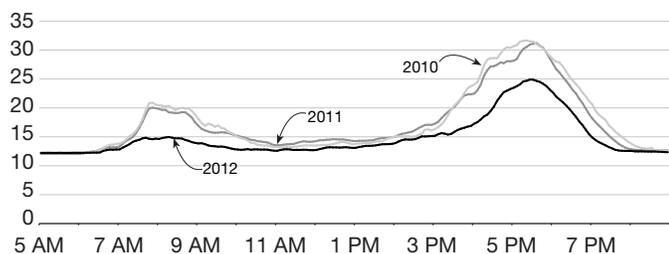
**Peak period volumes:** The peak period vehicle volume on cross-lake routes along SR 520 decreased between 18 and 36 percent while the peak period volumes on I-90 increased between 5 and 12 percent. Changes in peak period volumes on north-south corridor routes ranging from decreasing 7 percent to increasing 3 percent.

The net daily vehicle travel on the cross-lake bridges (SR 520 and I-90) decreased by 14,000 vehicles in 2012; morning and afternoon peak travel times saw volume reductions of 6,900 vehicles (49 percent). Congestion-based variable time-of-day tolls began on SR 520 December 29, 2011. Traffic patterns observed during the first half of 2012 (January through June) continued into the second half of 2012 (July through December).

**SR 520 commute routes (2012 vs. 2011):** Travel time improvements for trips using SR 520 ranged from three to six minutes (14 to 28 percent) during the morning and afternoon commutes in 2012 compared to 2011. These travel time improvements coincide with traffic volume reductions of 18 to 36 percent. These travel time savings occurred despite being negatively impacted by major construction activities east of the SR 520 floating bridge.

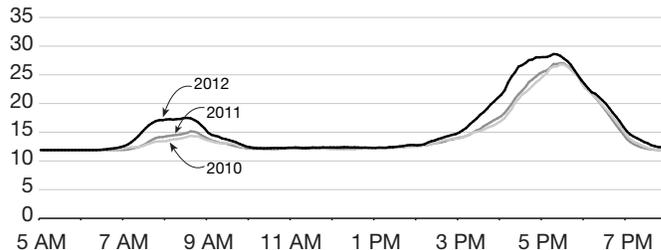
The graph below shows that the SR 520 commute time westbound from Bellevue to Seattle decreased by 25 percent in the morning and 20 percent in the

**SR 520 travel times decrease from Bellevue to Seattle**  
July 1 – December 31, 2010-2012; Westbound travel time in minutes



Data source: WSDOT Northwest Region Traffic Office, Washington State Transportation Center (TRAC).

**I-90 travel times increase from Bellevue to Seattle**  
July 1 – December 31, 2010-2012; Westbound travel time in minutes



Data source: WSDOT Northwest Region Traffic Office, Washington State Transportation Center (TRAC).

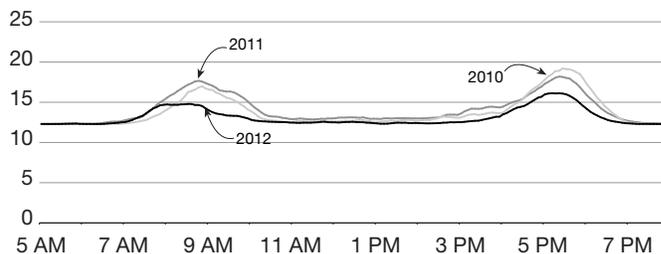
afternoon. One reason congestion was much lighter in the morning was that there are more reliable transit options for travelers inbound to Seattle during the morning commute than there are during the afternoon commute.

**I-90 commute routes (2012 vs. 2011):** Although both directions of I-90 experienced traffic volume increases, those increases resulted in greater travel times only on westbound I-90. Travel times increased by three minutes (16 percent) during the morning commute and by two minutes (6 percent) during the afternoon commute.

The graph at the top of this column shows that for westbound I-90, the larger changes in travel time happened at the beginning of the peak commute. The increased traffic volume, due to diversion from the tolled SR 520, caused congestion to form earlier in each commute period, but only marginally extended the duration of each commute. The Bellevue to Seattle graph also shows that I-90 travel times did not change significantly during the middle of the day, when free-flow conditions remained the norm.

As shown in the graph below, unlike westbound I-90, the eastbound commute travel times on I-90 between Seattle and Bellevue decreased by three minutes (16 percent) in the morning and by two minutes (11 percent) in the

**I-90 travel times decrease from Seattle to Bellevue**  
July 1 – December 31, 2010-2012; Eastbound travel time in minutes



Data source: WSDOT Northwest Region Traffic Office, Washington State Transportation Center (TRAC).

## Interstate 5 congestion results in increased commute travel times



Peak-period travel times increased for several major commute routes along I-5 in the Puget Sound region.

in the afternoon. These travel time improvements occurred despite increased traffic volumes. The main reason for this improvement was the completion of the Two-Way Transit and High Occupancy Vehicle (HOV) Operations project in March 2012; this created a direct access HOV ramp from 80th Avenue NE on Mercer Island, and a full HOV lane on I-90 from 80th Avenue NE to Bellevue Way. By completing this project, WSDOT added capacity, removed a construction distraction, and shifted transit buses, vanpools, motorcycles and carpools from the general purpose (GP) to HOV lanes on the eastern half of Mercer Island.

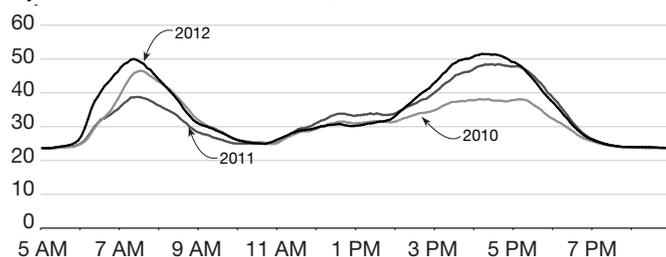
### All 10 non-cross lake commute routes saw increased travel times (2012 vs. 2011)

**Interstate 5 commute routes:** The shift in traffic from SR 520 to I-90 changed where many vehicles enter and exit I-5 and I-405, influencing travel northbound and southbound through both downtown Seattle and Bellevue.

Additional construction activities between 2010 and 2012 also impacted I-5 traffic, including: the I-5 – 196th Street (Lynnwood) Braided Ramp project, the I-5 – Mountlake Terrace Freeway Station project, the Alaskan Way Viaduct Replacement Program and the Spokane Street Viaduct Widening project. The travel time changes presented in the table on page 19 show that these construction activities caused travel times to increase considerably.

**Everett to Seattle:** Travel times on I-5 southbound between Everett and Seattle were highly variable during morning and afternoon commutes between 2010 and 2012. The table on page 19 shows that morning commuters spent an additional 11 minutes in traffic during 2012

### I-5 travel times up significantly from Everett to Seattle July 1 – December 31, 2010–2012; Southbound travel time in minutes



Data source: WSDOT Northwest Region Traffic Office, Washington State Transportation Center (TRAC).

compared to 2011; 2012 travel times were only three minutes longer than in 2010. Congestion also formed much earlier in the day in 2012 and 2011 than it did in 2010. The growing delays experienced in 2012 were mostly caused by increases in congestion in Mill Creek and Lynnwood. Also contributing was an increase in congestion south of SR 520 as vehicles entered and passed through downtown Seattle.

### Morning commute travel times increased considerably along Interstate 5 from Everett through Seattle

Additional delays occurred during the morning commute as more vehicles accessed the ramps to I-90 eastbound.

Similarly, afternoon commute travel times significantly increased in 2011 and 2012, compared to 2010. The 2012 afternoon travel times were three minutes and 13 minutes longer, compared to 2011 and 2010, respectively. While some additional delay occurs in downtown Seattle, most of this increase in congestion happens between the northern Express Lanes entrance and the southern end of the Ship Canal Bridge. Congestion on this stretch of roadway consistently formed during weekdays throughout 2012. This congestion bottleneck started forming regularly in late summer 2011 and worsened in late October 2011, when construction closed a stretch of SR 99 for two weeks.

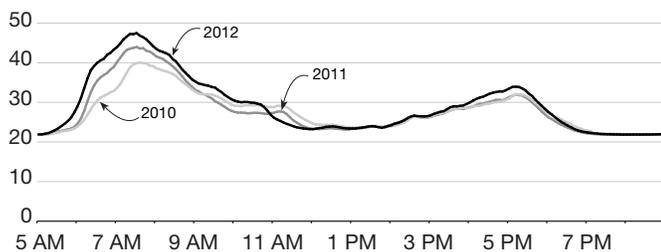
**Seattle to Everett:** Growth in congestion on the northbound commute between Seattle and Everett was less significant than seen with the Everett to Seattle route. Little congestion occurred on this route during morning commutes. In the afternoon, congestion decreased between 2010 and 2011, but increased in 2012. Afternoon commute travel times in 2012 were three minutes longer than in 2011, but one minute shorter than in 2010. The majority of the increase in 2012 occurred

## Interstate 405 between Everett and Bellevue sees increased travel times

from the Ship Canal Bridge to Northgate, the latter being where the I-5 Express Lanes re-enter the I-5 mainline.

**Federal Way to Seattle:** Congestion on I-5 northbound from Federal Way to Seattle has grown both in the morning and afternoon commute periods. The graph below shows that increases in travel times during the morning commute have been consistent since 2010. The morning commute in 2012 took three and seven minutes longer than 2011 and 2010, respectively. This rise in travel times was caused by increasing intensity in the two major congestion locations on this trip from Federal Way through Des Moines in southern King County and then approaching downtown Seattle. The graph also shows that between 2010 and 2012, congestion has routinely formed earlier in the morning and has taken longer to dissipate at the end of the commute period, as travelers have adjusted their travel behavior to avoid the increasing congestion. During the northbound afternoon trip, travel times increased by two minutes, the vast majority of that increase occurring as a result of worsening congestion approaching the I-90 interchange just south of downtown Seattle.

**I-5 travel times increase Federal Way to Seattle**  
July 1 – December 31, 2010–2012; Northbound travel time in minutes



Data source: WSDOT Northwest Region Traffic Office, Washington State Transportation Center (TRAC).

**Seattle to Federal Way:** I-5 southbound from Seattle to Federal Way did not experience significant congestion in 2012 during the morning (not shown in the table on page 19). In the afternoon, the average 2012 commute travel time increased by three and two minutes compared to 2011 and 2010, respectively. These added delays resulted from increases in congestion stretching from SR 599 and the top of the Southcenter Hill.

**Interstate 405 Commute Routes:** While the Puget Sound corridor was significantly influenced by SR 520 tolling, the I-405 NE 8th Street to SR 520 Braided Ramps Interchange Improvement project, completed in May 2012, greatly improved I-405 northbound travel



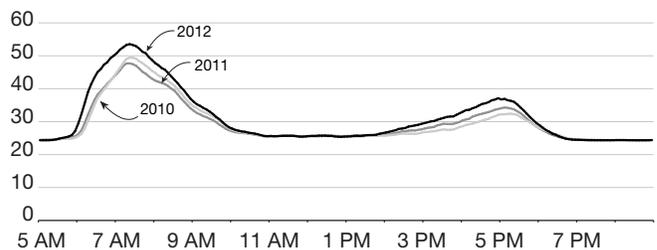
Multi-level "braided" ramps to separate vehicles entering and exiting northbound I-405 between NE 8th Street and SR 520 in Bellevue are under construction in this 2010 photo. WSDOT cut the ribbon marking the opening of the new ramps in May 2012, months ahead of schedule, improving the commute.

through Bellevue (see the 2012 *Congestion Report*, p. 79). This project helped mitigate additional northbound traffic flow through downtown Bellevue due to SR 520 tolling. However, the performance of an already congested southbound section of I-405 worsened.

Interstate 405 was less impacted by the Alaskan Way Viaduct Replacement Program and the Spokane Street Viaduct Widening project. Completed in 2010, the I-405 – I-5 to SR 169 Stage 2 Widening project resulted in improved travel times in 2010 and 2011 along the southern end of I-405. These improvements were sustained in 2012 for the southbound direction; northbound congestion worsened in 2012 from the SR 167 interchange through Renton.

**Everett to Bellevue:** The graph below shows the changing congestion patterns (intensity and duration) on the Everett to Bellevue southbound commute. In the morning, the six-minute increase in travel time is attributed to longer delays on the northern end of the

**I-405 travel times increase from Everett to Bellevue**  
July 1 - December 31, 2010-2012; Southbound travel time in minutes



Data source: WSDOT Northwest Region Traffic Office, Washington State Transportation Center (TRAC).

## High Occupancy Toll lane use improves overall corridor performance

I-405 corridor along with worsening congestion in the vicinity of the SR 522 interchange. Conversely, conditions improved approaching the SR 520 interchange on the southern end of the corridor. The longer afternoon travel times are due to the increasing delays north of the SR 522 interchange, and the increasingly congested segment approaching downtown Bellevue.

**Bellevue to Everett:** The commute northbound from Bellevue to Everett experienced only one congestion peak, in the afternoon. While the braided ramps improvement project greatly reduced congestion in 2012 through downtown Bellevue, increased congestion extending from SR 520 ramps to the SR 522 interchange resulted in longer afternoon commute travel times of up to seven minutes.

**Tukwila to Bellevue:** The northern section of I-405 experienced congestion in both peak commute periods. However, the southern section of I-405 experienced congestion only in the dominant direction of the commute – northbound toward Bellevue in the morning and southbound to Tukwila in the afternoon. The duration of the peak period did not increase in either direction. Northbound travel times grew longer in the morning by five to six minutes, caused by the increased delays in Renton.

**Bellevue to Tukwila:** The Bellevue to Tukwila southbound afternoon commute saw an increase in congestion in 2012 south of the I-90 interchange between SR 520 and Coal Creek Parkway. The duration of the afternoon peak period is lasting longer, but these changes have relatively modest impacts on average commute travel time. The bigger changes in travel time (a two- to four-minute increase) are caused by the growing intensity of congestion around 5 p.m. from downtown Bellevue to just south of the I-90 interchange. Traffic on this corridor was already heavily congested in 2011, but speeds have dropped even further. With speeds ranging between 5 to 15 mph, even modest further decreases will add considerable delay to southbound trips.

**State Route 167 Auburn to Renton:** There was little or no change in congestion at the beginning and end of the commute periods along the SR 167 corridor from SR 18 in Auburn to I-405 in Renton. This was true for both peak direction commutes, northbound in the morning and southbound in the evening. Travel times increased just one minute on both these commutes.



*During the morning commute on SR 167, the number of vehicles using the High Occupancy Toll lane increased by 7 percent while general purpose lane volumes decreased by 7 percent, due to a rise in congestion.*

Congestion formed in the morning at the northern end of the corridor more frequently in 2012 than in 2011. As a result of that increase in congestion, during the morning commute, 250 (7 percent) additional vehicles moved to High Occupancy Toll (HOT) lanes from the general purpose (GP) lanes while the GP lanes volume decreased by about 850 (7 percent) vehicles. The rest of the commuters might have chosen alternate routes or trip modes such as transit, vanpool or carpool. This accounted for roughly one-third of the decrease in peak period general purpose lane traffic volumes observed on SR 167.

### New federal law aims to improve system performance and travel reliability

The federal transportation legislation Moving Ahead for Progress in the 21st Century (MAP-21) outlines several performance goals (see p. vii, one of which focuses on system reliability to improve the efficiency of the surface transportation system. WSDOT is a national leader in evaluating congestion and travel time reliability, and is engaged with the United States Department of Transportation and other state and national partners to support the development of a comprehensive mobility measurement program that involves trip- and corridor-based analysis.

*Contributors include Matt Beaulieu, Mark Hallenbeck, John Ishimaru, Trevor Skelton and Sreenath Gangula*