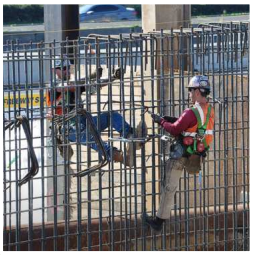
SR 520 BRIDGE

Investment Grade Traffic and Revenue Study Update



SR 520 Bridge and the Eastside plus West Approach Bridge Project

April 22, 2016

Photographs Courtesy of WSDOT

CDM Smith

Washington State Department of Transportation

Table of Contents

List of Figures

List of Tables

This page intentionally left blank to allow for double-sided printing.

Executive Summary

The Washington State Department of Transportation (WSDOT) has utilized toll financing as part of a broader finance package to implement the SR 520 Floating Bridge and HOV Program. WSDOT began tolling the bridge in December 2011, prior to the construction of the replacement floating bridge. The U.S. Department of Transportation's Transportation Infrastructure Finance and Innovation Act (TIFIA) program provided financial support to the SR 520 Program via a direct loan in October 2012. WSDOT continues to collect tolls during construction and toll collection is expected to continue after construction is completed.

In order to satisfy TIFIA requirements and meet current and future bond requirements, the SR 520 Bridge Investment Grade Traffic and Revenue Study was updated to address changes in project scope, additional actual tolling experience, changes in toll rates, updated construction schedules, and revisions to the underlying economic forecast. Revised transactions and gross revenue forecasts were developed for FY 2016 through FY 2056.

Project Description

The SR 520 corridor stretches nearly 13 miles between I-5 in Seattle to the west and SR 202 to the east, crossing I-405 at about the halfway point, and serving various Eastside communities, including Bellevue, Kirkland, and Redmond. The main SR 520 bridge span across Lake Washington (the Evergreen Point Floating Bridge) is currently 1.42 miles long, making it the longest floating bridge span in the world. From December 2011 through January 2016, tolls were being collected at the east high-rise section of the SR 520 bridge via all electronic tolling. After January 2016, tolls are collected on land east of the bridge via all electronic tolling.

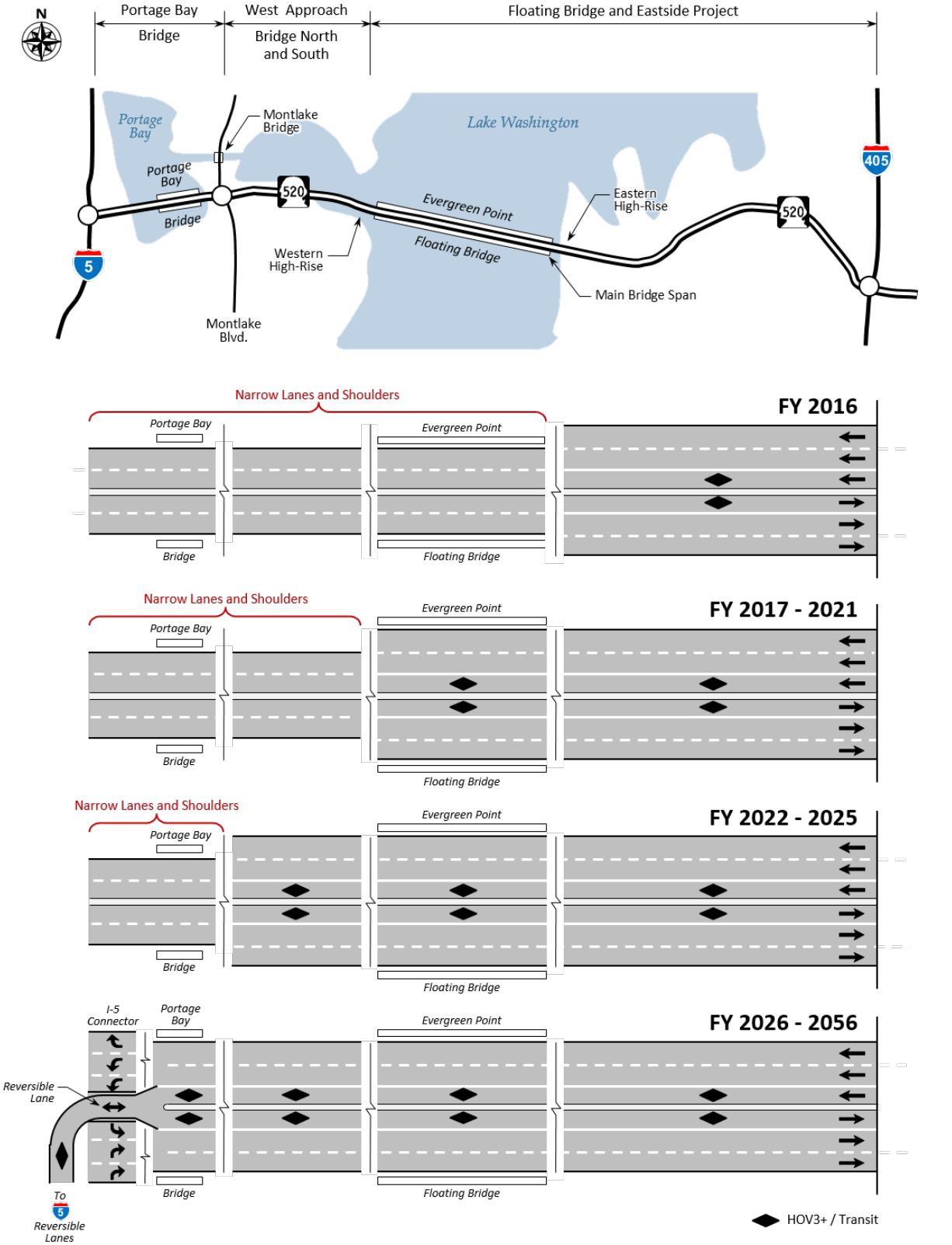
The SR 520 Bridge Replacement and HOV Program includes the portion of the corridor between I-5 and I-405 and is comprised of five major components:

- Pontoon Construction
- Eastside Transit and HOV Project
- Floating Bridge and Landings (FB&L) Project
- West Approach Bridge North
- I-5 to Lake Washington ("Rest of the West"), including the West Approach Bridge South, new Portage Bay Bridge, and second bascule bridge across the Montlake Cut

The $4.56 billion in SR 520 funding authorized by the Legislature pays for: a new, safer, six-lane floating bridge, with a cross-lake bicycle and pedestrian path; 77 bridge pontoons built at facilities in Grays Harbor and Tacoma; the corridor's Eastside transit and HOV improvements between Lake Washington and I-405; the north (westbound) half of a new west approach bridge connecting Seattle to the new floating bridge; a replacement West Approach Bridge South for eastbound traffic connecting Seattle to the new floating bridge; a second bascule bridge over the Montlake Cut; a new, six-lane Portage Bay Bridge; an extension of the regional bicycle and pedestrian path from Montlake to I-5; and mitigation of the program's environmental impacts.

Figure ES-1 shows the assumed lane configurations for this study with four phases discussed below.

Figure ES-1: Assumed SR 520 Lane Configuration



FY 2016 – Current Lane Configuration

For FY 2016 (ending on June 30, 2016), the configuration assumed in the forecast consists of:

- I-5 to east side of Lake Washington (including the main bridge span): two general-purpose lanes in each direction. Tolls will be collected at the eastern high rise.
- East side of Lake Washington to I-405: Three lanes in each direction including two general-purpose lanes and one inside transit/high occupancy vehicle lane with a 3+ occupancy requirement (HOV3+)

FY 2017 through FY 2021 – Main Bridge Span Replaced

For purposes of this study, the configuration assumed from FY 2017 through FY 2021 consists of:

- I-5 to west end of main span: No effective changes from current (FY 2016) configuration. Traffic will be shifted from the current West Approach Bridge South to the new West Approach Bridge North, but with the same overall two lane per direction capacity.
- Lake Washington: Replacement of the main span by a six-lane main span (two general-purpose and one inside transit/HOV 3+ lane in each direction) from west end of main span, across Lake Washington to the eastern shore. Tolls will be collected at a location on land east of Lake Washington.

FY 2022 through FY 2025 – West Approach Bridge North and South

For purposes of this study, the configuration assumed from FY 2022 through FY 2025 consists of:

- I-5 to Montlake Boulevard: no changes from current (FY 2016) configuration
- Montlake Boulevard to west end of new floating bridge: new West Approach Bridge North (WABN) connector and new West Approach Bridge South (WABS) connector resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction). The WABS connector is a new element since the 2014 T&R study, which was added after the 2015 State Legislature approved funding for SR 520's planned improvements from I-5 to Lake Washington – the "Rest of the West."
- Lake Washington: no changes from FY 2017-2021 configuration

FY 2026 through FY 2056 – Portage Bay Bridge Replaced

For purposes of this study, the configuration assumed from FY 2026 forward consists of:

- I-5 to Montlake Boulevard: new Portage Bay Bridge resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction) plus a one-lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes. The Portage Bay Bridge replacement is a new element since the 2014 T&R study, which was added after the 2015 State Legislature approved funding for SR 520's planned improvements from I-5 to Lake Washington – the "Rest of the West."
- Montlake Boulevard to west end of new floating bridge: no changes from FY 2022-2025 configuration
- Lake Washington: no changes from FY 2017-2021 configuration

Traffic and Revenue Forecasting History

CDM Smith conducted the initial investment grade study for SR 520, completed in late summer 2011. This study developed annual gross revenue estimates from the assumed start of tolling (January 1, 2012) through 2056. The study was conducted at a level of detail sufficient for use in support of project financing and resulted in the September 2011 Investment Grade traffic and revenue forecast.[1] The estimates were prepared based on a study work program which included:

- **Traffic count data collection** – including review of WSDOT annual traffic reports, as well as independent traffic count data collection.
- **Travel pattern surveys** – Mail-back surveys were sent to SR 520 users in the fall of 2009. The survey requested information on origin and destination travel, trip frequency, travel time of day, trip purpose, vehicle occupancy, vehicle class, and SR 520 entrance and exit points.
- **Travel time surveys** – Travel time surveys were performed along SR 520 and on important routes that could be potential alternatives.
- **Stated preference surveys** – Stated preference surveys were conducted in the fall of 2009 to measure the responses of current bridge users to tolling of SR 520. The results were used to develop a travel choice model which was used to forecast future travel behavior under tolled conditions including values of time, trip suppression, and mode shift.
- **Independent corridor growth analysis** – An independent review was conducted to update the Puget Sound Regional Council (PSRC) forecast. This review utilized independent regional forecasts which account for the major recession and overall economic downturn, data on economic and real estate activity, and a review of area development plans as the basis for revised population and employment forecasts for the region.
- **Tolling analysis model development** – The model development process included compiling and converting the PSRC regional model data sets to the toll forecast model. The model was calibrated to match existing observed conditions based on traffic counts and speeds. Once calibrated, the traffic assignment model was developed, incorporating tolling algorithms with the assignment process. CDM Smith also incorporated the results of the travel patterns surveys, the stated preference survey, independent corridor growth review, and travel time surveys.
- **Traffic and revenue analysis** – CDM Smith utilized the tolling analysis model to analyze several preliminary toll structures, as requested by WSDOT. The final investment grade traffic and revenue scenario was based on the FY 2012 adopted tolling structure and the future year tolling structure in the financing plan reviewed by the Washington State Transportation Commission (WSTC).
- **Sensitivity tests** – Several sensitivity tests were performed to determine the revenue impacts associated with variations in the following parameters and assumptions: regional growth, values of time, account-based participation rate, motor fuel cost, trip suppression and mode shift, and possible tolling of the I-90 bridge.

[1] The report containing the September 2011 traffic and revenue forecast was dated August 29, 2011. It was prepared in conjunction with other financing reports that are collectively referred to as the September 2011 forecast.

Tolling started on the SR 520 bridge on December 29, 2011. In September 2012, CDM Smith provided an updated forecast based on tolling experience over the first six months of 2012, a revised socio-economic basis, and revised project construction schedule. The resulting updated revenue forecast differed only modestly from the September 2011 forecast.

In late 2012 and early 2013, CDM Smith provided analysis of a series of alternative toll rate scenarios requested by the Washington State Transportation Commission (WSTC). A traffic and revenue forecast was produced for the nickel rounding alternative ultimately adopted by WSTC in May 2013. In this alternative, toll rates for account-based (*Good To Go!)* and Pay By Mail transactions in FY 2014 through FY 2016 were rounded to the nearest $0.05 resulting in slight forecast changes through FY 2016. (Toll rates from FY 2017 onward were rounded to the nearest $0.05 in the original 2011 study and continued to be so in the later studies.)

In October 2013, CDM Smith provided a revised forecast based on detailed information on tolling experience from January 1, 2012 to December 31, 2012, preliminary tolling experience from January 1, 2013 to June 30, 2013, revised closure schedule, assumed toll rate schedule, and revised economic forecasts prepared in July 2013. The updated traffic and gross toll revenue forecast was documented in the April 4, 2014 investment grade study update.[2]

In November 2014, CDM Smith provided a revised forecast based on detailed information on tolling experience through December 31, 2013, preliminary tolling experience from January 1, 2014 to June 30, 2014, slightly revised bridge configuration with the addition of the West Approach Bridge North connection from the Montlake interchange to the western high-rise and reconfiguration of the existing west approach bridge, revised closure schedule, assumed toll rate schedule, and revised economic forecasts completed in October 2014. The updated traffic and gross toll revenue forecast was documented in the January 29, 2015 investment grade study update.[3]

Review of Tolling Performance

For purposes of generating this November 2015 SR 520 forecast, CDM Smith analyzed traffic and tolling performance data provided by WSDOT covering January 2014 through June 2015. Recent performance data for the period July 2015 through February 2016 is also presented in this report. These results of actual tolling experience provided valuable information to help evaluate and adjust the traffic and revenue estimates.

The traffic performance review examined the traffic impacts as a result of tolling; the focus was on comparing how traffic conditions, including travel times, have evolved from January 2014 through December 2015. Figure ES-2 shows the actual traffic volumes and the forecast traffic based on the 2011 Investment Grade study (referred to as the September 2011 forecast) and the November 2014 forecast. Note that on this figure, the annual average daily traffic includes all traffic (non-revenue vehicles, overnight traffic, and weekend traffic) and is adjusted to exclude weekend closures due to construction.

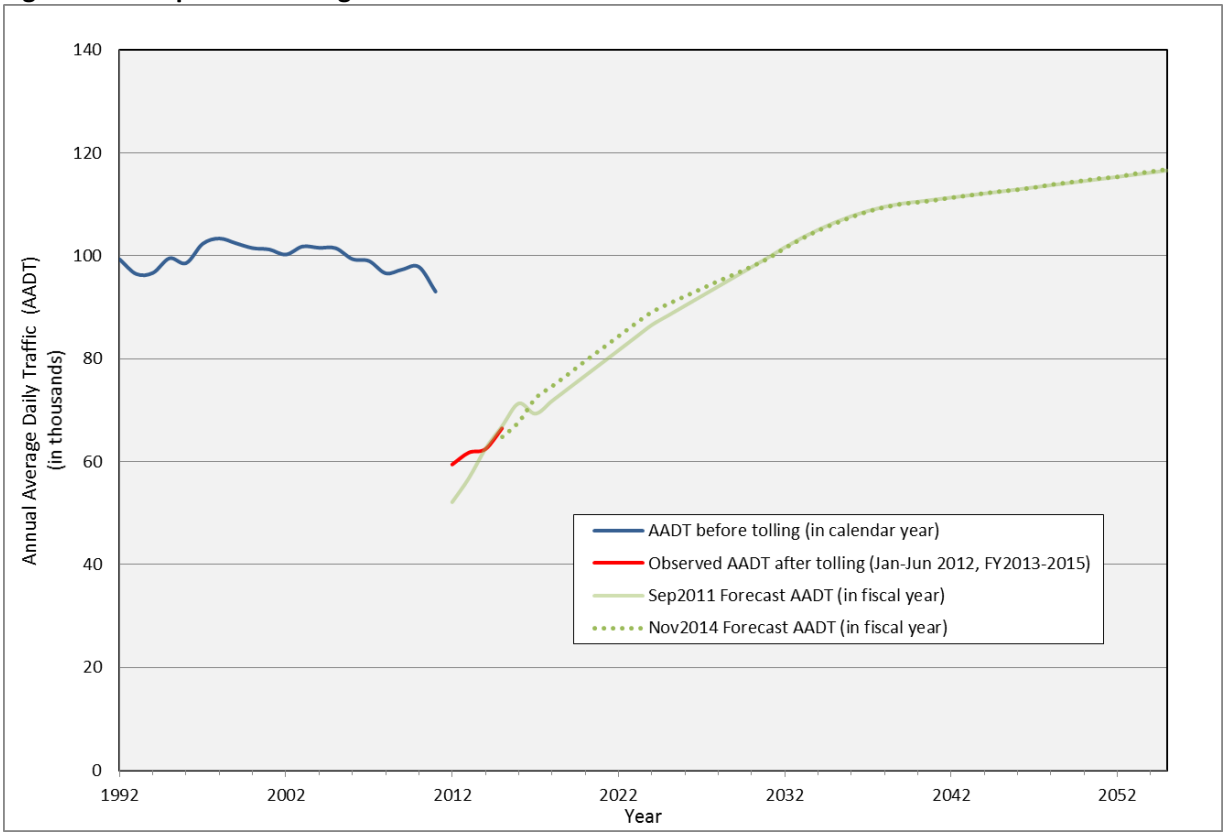
---

[2] The forecast presented in the April 2014 report was generated and reviewed in the summer and fall of 2013. It was prepared in conjunction with other financing reports that are collectively referred to as the October 2013 forecast.

[3] The forecast documented in the January 2015 report was prepared in conjunction with other financing reports that are collectively referred to as the November 2014 forecast.

As illustrated by Figure ES-2, the overall average daily traffic on SR 520 dropped by about 36 percent when tolling began from 93,100 in 2011 to 59,500 in the first six months of 2012. The September 2011 forecast had anticipated a drop of about 44 percent. The average daily traffic increased to 61,800 vehicles in FY 2013, 62,500 in FY 2014, and 66,500 in FY 2015. The November 2014 forecast had anticipated a traffic volume of 64,800 for FY 2015.

Figure ES-2: Impacts of Tolling on Traffic



The tolling performance review covers the following elements: transactions, gross toll revenue potential, method of payment, average weekday and weekend day transactions, and vehicle classification. When applicable, the performance data (actuals) for FY 2015 are compared to the prior IG forecasts prepared by CDM Smith (September 2011 and November 2014 forecasts) in the information that follows.

Table ES-1 presents the difference between total annual forecast transactions and actual results. Overall, the actual transactions in FY 2015 were 1.9 percent below the September 2011 forecast, and exceeded the November 2014 forecast by 0.6 percent.

Table ES-1: FY 2015 Transactions vs. Forecasts

Transactions	Sep2011 Forecast[1]	Nov2014 Forecast[2]	Actuals[3,4]	*Variance vs 2011 Forecast*	*Variance vs 2014 Forecast*
Jul 2014-Dec 2014	11,158,000	10,709,000	10,717,566	*-3.9%*	*0.1%*
Jan 2015-Jun 2015	11,297,000	11,173,000	11,302,204	*0.0%*	*1.2%*
FY 2015	**22,455,000**	**21,882,000**	**22,019,770**	***-1.9%***	***0.6%***

1. Based on CDM Smith September 2011 forecast
2. Based on CDM Smith November 2014 forecast
3. For CY 2014, actuals are based on WSDOT toll transaction data provided to CDM Smith on 5/8/15
4. For CY 2015, actuals are based on WSDOT monthly lane equipment data adjusted by CDM Smith

Table ES-2 presents the difference between total annual forecast gross toll revenue potential and actual results available for FY 2015. The revenue potential reflects the toll rate increase implemented on July 1, 2014. Overall, the actual revenue potential was about 8 percent lower than the September 2011 forecast and exceeded the November 2014 forecast by 0.6 percent.

Table ES-2: FY 2015 Gross Toll Revenue Potential vs. Forecasts

Gross Toll Revenue Potential	Sep2011 Forecast[1]	Nov2014 Forecast[2]	Actuals[3,4]	*Variance vs 2011 Forecast*	*Variance vs 2014 Forecast*
Jul 2014-Dec 2014	$37,520,000	$33,904,000	$33,942,376	*-9.5%*	*0.1%*
Jan 2015-Jun 2015	$37,990,000	$35,091,000	$35,440,833	*-6.7%*	*1.0%*
FY 2015	**$75,510,000**	**$68,995,000**	**$69,383,209**	***-8.1%***	***0.6%***

1. Based on CDM Smith September 2011 forecast
2. Based on CDM Smith November 2014 forecast
3. For CY 2014, actuals are based on WSDOT toll transaction data provided to CDM Smith on 5/8/15
4. For CY 2015, actuals are based on preliminary financial reporting system results and adjustments

Regional Demographics & Economic Trends

In July 2015, the CDM Smith team developed an independent revised economic forecast of population and employment based on estimates of current socioeconomic variables and forecasts of future socioeconomic activity. These forecasts reflect newly available economic performance estimates, current regional economic forecasts, projected development in Seattle and Eastside King County communities, and current market conditions such as office occupancy rates and housing unit absorption trends.

The team produced base year traffic analysis zone (TAZ) estimates for 2014 drawing from current data published by State and regional government agencies and data providers. Forecasts include employment and population forecasts for 2015, 2016, 2017, 2018, 2020, 2030 and 2040.

Overall, when compared to the prior economic forecast, the population forecasts were adjusted slightly upwards for King County and for the region as a whole. Because the slight upward adjustments were consistent in all forecast years, the population growth rates remain virtually unchanged for the region and for King County. Within King County, the total population forecast

among the four major cities along the SR 520 corridor (Seattle, Kirkland, Bellevue, and Redmond) has been adjusted upwards, primarily driven by more growth expected in Seattle and to a lesser extent in Bellevue.

For employment, the regional and King County growth rates were adjusted upwards in the immediate short term. Starting in 2016, regional and King County employment growth rates are virtually unchanged from the November 2014 forecast. The employment estimates for the combined four cities are slightly reduced in the short term, and are revised upwards starting in 2017. This is primarily driven by an increase in the expected amount of commercial space and employment in Seattle, and to a lesser extent in Kirkland.

The revised economic forecasts were incorporated into the tolling analysis model by changing overall trip demand between those geographic areas which heavily influence travel demand on SR 520 and in the cross Lake Washington corridor.

Tolling Operations

Tolling commenced on the existing SR 520 bridge on December 29, 2011. Overall, the toll rates assumed in the 2011 study before the start of tolling were implemented. The Washington State Transportation Commission (WSTC) has since raised the tolls approximately 2.5 percent on July 1, 2012, July 1, 2013, July 1, 2014 and July 1, 2015. These toll rate increases are consistent with the original 2011 study assumptions. However, in May 2013, WSTC adopted a nickel rounding strategy which resulted in slight changes in toll rates compared to the 2011 assumptions.

For FY 2016, the resultant rates are:

- The maximum *Good To Go!* toll rate for 2-axle vehicles is $3.90 on weekdays and $2.40 on weekends in FY 2016. The toll rates have been rounded to the nearest $0.05.
- In FY 2016, Pay By Mail customers pay approximately $1.66 above the *Good To Go!* toll rates on average. The Pay By Mail rates are rounded to the nearest $0.05.
- Tolls for multi-axle vehicles (those with more than two axles on the ground) are generally determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles using the same payment method. However, the WSTC set each FY 2016 class rate based on a 2.5 percent increase from the FY 2015 class rate then rounded to $0.05, resulting in slight differences than the axle multiplier method. The maximum rate is the six-axle rate, regardless of additional axles.

Future toll rates and policies assumed in this study are consistent with the latest toll rate schedule anticipated to be formally adopted by the Washington State Transportation Commission in May 2016. For FY 2017, the assumed toll rates are as follows:

- The maximum *Good To Go!* toll rate for 2-axle vehicles will be $4.10 on weekdays and $2.50 on weekends.
- Pay By Mail customers will pay exactly $2.00 above the *Good To Go!* toll rates for 2-axle vehicles. The previous studies assumed a differential of $1.70.
- Weekday *Good To Go!* account-based tolls will increase approximately 4.8 percent on average from FY 2016 to FY 2017 (i.e. on July 1, 2016). The previous studies assumed an increase of approximately 15 percent.

- Weekend account-based tolls will increase approximately 4.5 percent on average from FY 2016 to FY 2017. The previous studies assumed an increase of approximately 1.6 percent.
- All toll rates will continue to be rounded to the nearest $0.05.
- Tolls will be only be charged between 5:00 am and 11:00 pm in FY 2017. Previous studies assumed that night time tolling (11:00 pm – 5:00 am) would start in FY 2017.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type.

For FY 2018 and beyond, the assumed toll rates are as follows:

- The maximum *Good To Go!* toll rate for 2-axle vehicles will be $4.30 on weekdays and $2.65 on weekends.
- Pay By Mail customers will pay exactly $2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- Weekday *Good To Go!* account-based tolls will increase approximately 5.2 percent on average from FY 2017 to FY 2018 (i.e. on July 1, 2017).
- Weekend account-based tolls will increase approximately 6.2 percent on average from FY 2017 to FY 2018.
- All toll rates will continue to be rounded to the nearest $0.05.
- No toll rate escalation is assumed after FY 2018.
- Tolls will be charged during all 24 hours starting in FY 2018. The night time (11:00 pm – 5:00 am) account-based toll rate for 2-axle vehicles is $1.25 on both weekdays and weekend days.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type.

For FY 2017 and beyond, the assumed toll exemption policies are as follows:

- Toll exemptions currently in place (public/private buses, registered vanpools, State Police vehicles, bridge maintenance vehicles, emergency vehicles, tow trucks while responding to SR 520 calls, and vehicles owned and maintained by a foreign government) are continued.
- Carpools with three or more occupants (3+ carpools) will not be exempt from toll, and will continue to pay the same toll as single occupant vehicles (SOVs). Previous studies assumed that all 3+ carpools would be exempt from toll.

Tolling Analysis Model Update

As part of the 2011 study, CDM Smith developed a tolling analysis model specific to the SR 520 corridor. A detailed description of the model structure and primary input is provided in the 2011 IG report. Specific toll model and forecasting revisions incorporated in the revised forecast include:

- **Model trip table calibration –** The SR 520 toll model trip tables were calibrated to toll transactions derived from the toll performance analysis and to traffic volumes on SR 520, I-90, SR 522, I-5, and I-405.
- **Growth performance review –** Short-term traffic and revenue revised forecasts (FY 2016 and FY 2017) were partly informed by actual results for FY 2014 and FY 2015, as well as recent

growth patterns revealed by the tolling performance review. Average weekday and average weekend transactions for FY 2016 and FY 2017 were adjusted accordingly.

- **Time of day profile –** Updated information on distribution of transactions by hour on an average weekday were incorporated into the model.
- **Roadway configuration –** Changes in roadway configuration assumptions are related to the newly funded SR 520 West Side improvements, and an updated completion date for the I-90 Two-Way Transit & HOV Operations project.
- **Socioeconomic growth –** The revised socioeconomic growth review was incorporated into the new forecast.
- **Gas price forecast change –** Compared to the gas price forecast used in the November 2014 forecast, the new forecast assumes a lower gas price during both pre-completion and post-completion periods.
- **Proportion of payment –** The shares of *Good To Go!* account-based transactions (weekday, weekend, and overall) have been revised based on performance through the end of FY 2015.
- **Payment type refinements –** The model was refined by introducing hourly account-based proportions and truck account-based proportions separate from car proportions.
- **Truck proportions** – The proportions of trucks (weekday, weekend, and overall) have been revised based on the performance review.
- **Truck toll rate multipliers** – The approach to derive truck toll rates was refined by using multipliers based on recent vehicle classification counts, and varying by time of day, day of the week, and payment type.
- **3+ carpools proportions** – The proportion of 3+ carpools in the model was revised to better reflect recent vehicle counts conducted by CDM Smith in May 2015.
- **SR 520 closures due to construction –** Planned closure assumptions have been revised to account for progress on SR 520 reconstruction work and additional closures related to newly funded improvements between I-5 and the floating bridge.

Summary of Assumptions

A summary of the assumptions used for the updated forecast is shown in Table ES-3. [4]

[4] The forecast presented in this report was prepared in conjunction with other financing reports that are collectively referred to as the November 2015 forecast.

Table ES-3: November 2015 Traffic and Gross Revenue Forecast Assumptions

General Assumptions
Improvements in the Puget Sound Regional Council's current regional transportation plan, *Transportation 2040*, will be implemented as planned. No new competitive toll-free facilities or additional capacity will be constructed during the projection period other than those assumed in the plan.
The percentage of payment types will be consistent with the ranges assumed for this study. The percentage of potential bridge users in the *Good To Go!* account-based program is assumed to increase from 85% in FY 2016 to 88% in FY 2031.
Economic growth in the project study area will occur as forecasted herein based in part on the 2013 PSRC Land Use Baseline Forecast from the Puget Sound Regional Council, Conway Pedersen 2015 forecasts, and the independent socioeconomic consultant.
The facility will continue to be well maintained, efficiently operated, effectively signed, and promoted to encourage maximum usage.
Inflation will average 2.5% annually over the forecast horizon. This figure is based on historic CPI up to 2015. While current inflation forecasts are somewhat lower for the state overall (2.1% long term), the greater Seattle region and the SR 520 primary market corridor are growing at a significant pace implying the assumption of 2.5% inflation throughout the SR 520 forecasts should be kept.
Motor fuel will remain in adequate supply and no national or regional emergency will arise that would abnormally restrict the use of motor vehicles. The per gallon price for passenger car gasoline is assumed to be $3.07 in FY 2015, $2.94 in FY 2017, $4.40 in FY 2024, and $5.37 in FY 2031, resulting in a long term annual growth assumption of 3.6%. These values are consistent with TRFC's June 2015 long term forecast of gas price and also incorporate the tax rate increases included in the 2015 transportation revenue package.
The value of time for work trips ranges from $9.60 per hour for the lowest income group to $22.80 per hour for the highest income group. The value of time for non-work passenger car trips is $13.80 per hour. Truck trip value of time reaches $36.00 per hour for heavy trucks. All values are in 2010 dollars.
SR 520 Corridor Lane Configuration
FY 2016: Bridge configuration is two narrow general-purpose lanes and shoulders in each direction.
FY 2017 through FY 2021: Floating bridge replacement with two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction. West of the replacement span, SR 520 will remain in its current two-lane per direction configuration.
FY 2022 through FY 2025: Two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction on replacement span. New west approach bridge north and south connections from the western high rise to Montlake Blvd. interchange such that three standard lanes and full shoulders are provided between the floating span and Montlake Blvd. West of Montlake Blvd., SR 520 will remain in its current two-lane per direction configuration.
FY 2026 and onward: On replacement span, west approach bridge north and south connections, and new Portage Bay bridge between I-5 and the Montlake Blvd, roadway configuration includes two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction. Also includes a one-lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes.
SR 520 Configuration East of Bridge to I-405, FY 2016 and onward: Two general-purpose lanes in each direction and one inside HOV/transit lane in each direction (with three person occupancy requirement HOV3+).

(table continued)

Table ES-3: November 2015 Traffic and Gross Revenue Forecast Assumptions (Continued)

Construction Closures	
Weekend closures of SR 520 from the Montlake Interchange to I-405 including the tolled section will occur an equivalent of 10.4 days in FY 2016, 2 days in FY 2017, 12 days in FY 2018, 17 days in FY 2019, 16 days in FY 2020, 17 days in FY 2021, and 13 days in FY 2022. Since night time (11pm - 5am) tolling is assumed from FY 2018 forward, weekday night time closures from FY 2018 forward are also considered. Weekday night time closures will occur an equivalent of 22.5 nights in FY 2018, 29.5 nights in FY 2019, 29 nights in FY 2020, 29.5 nights in FY 2021, and 23 nights in FY 2022.	
Construction of the new Portage Bay bridge will start in FY 2020 and will require closures of SR 520 between I-5 and the Montlake interchange. During these closures, traffic will still be allowed on the tolled section between the Montlake interchange and I-405. Portage Bay bridge weekend closures will occur an equivalent of 7 days in FY 2020, 10 days in FY 2021, 10 days in FY 2022, 5 days in FY 2023, 3 days in FY 2024, 3 days in FY 2025, and 7 days in FY 2026. Weekday night time closures will occur an equivalent of 12 nights in FY 2020, 17.5 nights in FY 2021, 17.5 nights in FY 2022, 15 nights in FY 2023, 10 nights in FY 2024, 10 nights in FY 2025, and 12 nights in FY 2026.	
Toll Collection	
Tolls were collected at a single point on the eastern high-rise of the main span through January 2016. After January 2016, tolls are collected on land east of the bridge.	
Toll rates will be the same for either direction on the bridge.	
The toll collection is all electronic; there will be no manual toll collection.	
FY 2016 and FY 2017: no night time tolling (11pm - 5am). FY 2018 and beyond: tolls will be charged during all 24 hours.	
Toll Rates	
FY 2016	
	The maximum *Good To Go!* toll rate for 2-axle vehicles is $3.90 on weekdays and $2.40 on weekends in FY 2016 as adopted by the Washington State Transportation Commission. The toll rates have been rounded to the nearest $0.05.
	In FY 2016, Pay By Mail customers pay approximately $1.66 above the *Good To Go!* toll rates on average. The Pay By Mail rates are rounded to the nearest $0.05.
	Tolls for multi-axle vehicles (those with more than two axles on the ground) are generally determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles using the same payment method. However, the Washington State Transportation Commission set the FY 2016 class rates based on a 2.5% increase from the FY 2015 class rates then rounded to $0.05. The maximum rate is the six-axle rate, regarless of additional axles.

(table continued)

Table ES-3: November 2015 Traffic and Gross Revenue Forecast Assumptions (Continued)

Toll Rates	
FY 2017	
	The maximum *Good To Go!* toll rate for 2-axle vehicles is $4.10 on weekdays, and $2.50 on weekends in FY 2017.
	In FY 2017, Pay By Mail customers pay exactly $2.00 above the *Good To Go!* toll rates.
	Weekday *Good To Go!* account-based tolls will increase approximately 4.8% on average from FY 2016 to FY 2017 (i.e. on July 1, 2016).
	Weekend *Good To Go!* account-based tolls will increase approximately 4.5% from FY 2016 to FY 2017 (i.e. on July 1, 2016).
	All toll rates will be rounded to the nearest $0.05.
	Tolls for multi-axle vehicles (three or more axles) will be set to the axle multiple of the per-axle rates for two-axle vehicles using the same payment method.
FY 2018 and beyond	
	The maximum *Good To Go!* toll rate for 2-axle vehicles is $4.30 on weekdays, and $2.65 on weekends in FY 2018
	In FY 2018 and beyond, Pay By Mail customers pay exactly $2.00 above the *Good To Go!* toll rates.
	Weekday *Good To Go!* account-based tolls will increase approximately 5.2% on average from FY 2017 to FY 2018 (i.e. on July 1, 2017).
	Weekend *Good To Go!* account-based tolls will increase approximately 6.2% from FY 2017 to FY 2018 (i.e. on July 1, 2017).
	All toll rates will be rounded to the nearest $0.05.
	Night time tolling (11pm - 5am) will be introduced starting in FY 2018. The night time account-based toll rate for 2-axle vehicles is $1.25 on both weekdays and weekend days
	Tolls for multi-axle vehicles (three or more axles) will be set to the axle multiple of the per-axle rates for two-axle vehicles using the same payment method.
	No toll rate escalation is assumed after FY 2018.
Toll Exemptions	
	Toll exemptions currently in place (public/private buses, registered vanpools, State Police vehicles, bridge maintenance vehicles, emergency vehicles, tow trucks while responding to SR 520 calls, and vehicles owned and maintained by a foreign government) are continued.
	Two-person carpools pay the same toll as single occupant vehicles (SOVs).
	3+ carpools pay the same toll as single-occupant vehicles (SOVs).

Updated Transactions and Gross Toll Revenue Potential

Taking into account the tolling experience to date, revised independent economic forecast, and revised bridge configuration assumptions including closures, updated baseline estimates of toll transactions and gross toll revenue potential were developed for FY 2016 through FY 2056, shown in Table ES-4.

Initially, annual growth in transactions and revenue is expected to generally follow recent trends. Revenue grows somewhat faster than transactions due to the toll increase in FY 2016. In FY 2017, the transaction growth increases in part due to the increased capacity on the SR 520 main span (with two general-purpose and one inside transit/HOV 3+ lane in each direction) and fewer closures compared to FY 2016. With the 5 percent toll rate increase, revenue grows significantly faster than transactions in FY 2017. In FY 2018, the growth rate of transactions decline in part due to more closure days and another 5 percent toll rate increase, even though night time tolling (11:00 pm to 5:00 am) brings additional transactions. After FY 2018, toll rates are assumed not to change, which makes the real value of the toll decline due to inflation. From FY 2019 through 2036, average transactions are expected to grow at a rate varying between approximately 1 and 6 percent annually, while growth

rates of revenue vary between approximately 1 and 5 percent. Strong growth in FY 2022 and FY 2023 can be attributed to much fewer assumed closures and the opening of three operational lanes in each direction to the Montlake interchange. Throughout the remainder of the forecast horizon, the growth rates of both transactions and revenue declines to well below 1 percent annually.

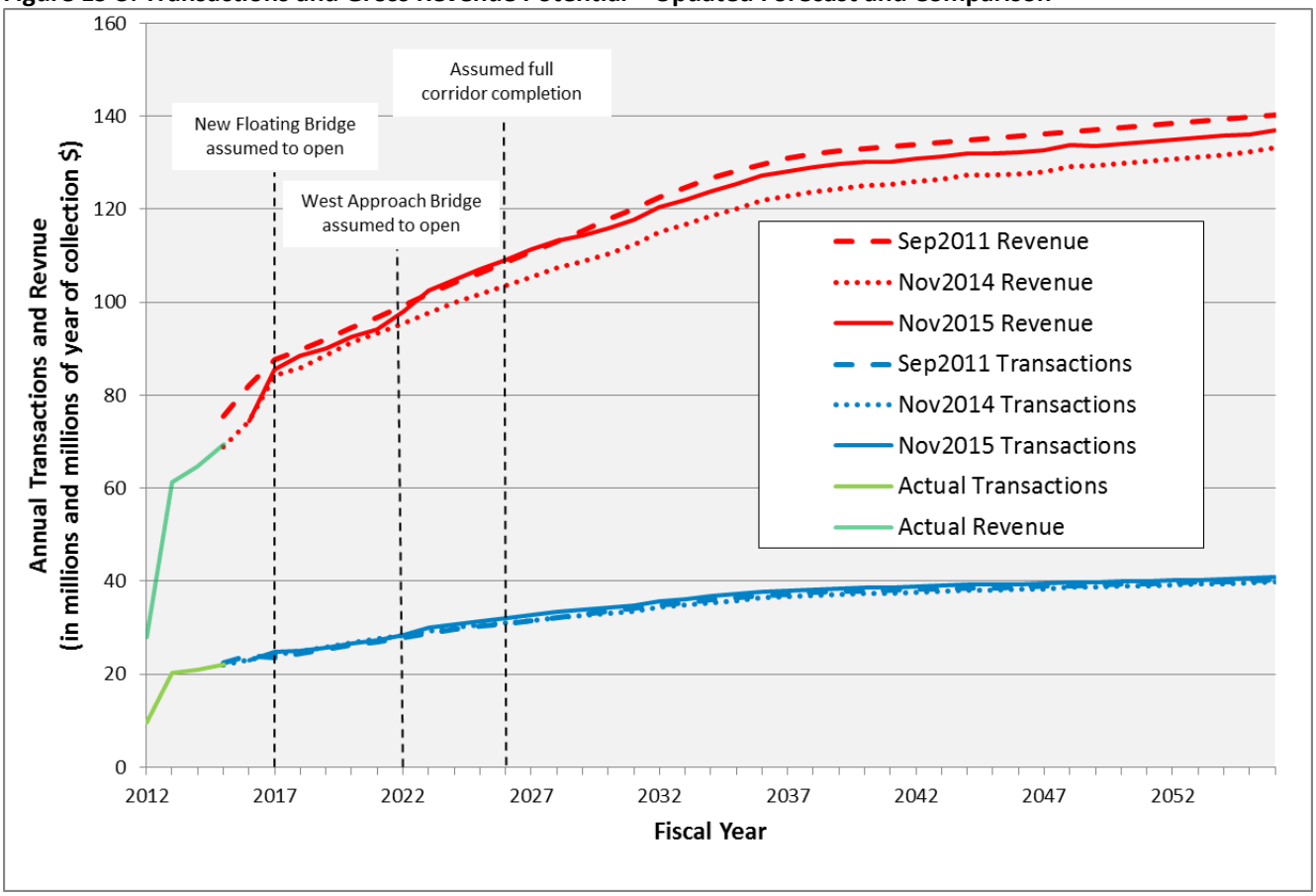
Figure ES-3 shows the comparison of the September 2011, November 2014, and November 2015 forecasts over the entire study period. In the long term, transactions are up 2 to 4 percent in FY 2023 and thereafter in the November 2015 forecast compared to the November 2014 forecast, primarily due to the 3+ carpools no longer being exempted. In the short term (FY 2016 through FY 2022), transactions in the November 2015 forecast versus those in the November 2014 forecasts vary between -1 and +2 percent, and are primarily driven by: removal of the 3+carpool exemptions, changes in toll rate increase assumptions with a two-step increase (FY 2017 and FY 2018) resulting in approximately 10 percent increase in toll rates (compared to the 15 percent increase previously assumed), and increased number of closures.

For revenue, the changes between forecasts are more pronounced than transactions. In general, the revenue per transaction increased in the November 2015 forecast, due to the combination of several factors: increase of Pay By Mail toll differential, higher share of forecasted traffic during the peak periods with higher toll rates, and slightly higher Pay By Mail share of transactions. In comparing the November 2015 revenue forecast to the November 2014 revenue forecast, forecasted gross toll revenue potential is higher in all years. In the short term (FY 2016 through FY 2022), gross toll revenue potential in the November 2015 forecast exceeds the November 2014 forecast by 0.1 to 3 percent. The forecasted gross toll revenue potential from FY 2022 and beyond is consistently higher than the November 2014 forecast, with changes varying between 3 and almost 6 percent.

Table ES-4: SR 520 Annual Transactions and Gross Revenue -- November 2015 Forecast

Fiscal Year	Transactions (millions)	Annual Growth	Gross Toll Revenue Potential (millions of year of collection $)	Annual Growth
2016	22.886	--	$74.492	--
2017	24.715	8.0%	85.459	14.7%
2018	25.065	1.4%	88.517	3.6%
2019	25.679	2.4%	90.090	1.8%
2020	26.531	3.3%	92.503	2.7%
2021	27.187	2.5%	94.098	1.7%
2022	28.390	4.4%	97.949	4.1%
2023	30.012	5.7%	102.527	4.7%
2024	30.803	2.6%	104.913	2.3%
2025	31.483	2.2%	107.173	2.2%
2026	32.101	2.0%	109.223	1.9%
2027	32.798	2.2%	111.286	1.9%
2028	33.424	1.9%	113.278	1.8%
2029	33.797	1.1%	114.309	0.9%
2030	34.318	1.5%	115.926	1.4%
2031	34.884	1.6%	117.764	1.6%
2032	35.679	2.3%	120.434	2.3%
2033	36.189	1.4%	122.103	1.4%
2034	36.746	1.5%	123.951	1.5%
2035	37.188	1.2%	125.336	1.1%
2036	37.725	1.4%	127.138	1.4%
2037	38.005	0.7%	128.100	0.8%
2038	38.281	0.7%	128.999	0.7%
2039	38.484	0.5%	129.649	0.5%
2040	38.683	0.5%	130.235	0.5%
2041	38.691	0.0%	130.206	0.0%
2042	38.870	0.5%	130.850	0.5%
2043	39.000	0.3%	131.253	0.3%
2044	39.252	0.6%	132.092	0.6%
2045	39.260	0.0%	132.063	0.0%
2046	39.341	0.2%	132.224	0.1%
2047	39.473	0.3%	132.632	0.3%
2048	39.779	0.8%	133.728	0.8%
2049	39.788	0.0%	133.700	0.0%
2050	39.921	0.3%	134.112	0.3%
2051	40.054	0.3%	134.527	0.3%
2052	40.211	0.4%	134.887	0.3%
2053	40.323	0.3%	135.359	0.3%
2054	40.457	0.3%	135.776	0.3%
2055	40.593	0.3%	136.196	0.3%
2056	40.855	0.6%	137.067	0.6%

Figure ES-3: Transactions and Gross Revenue Potential – Updated Forecast and Comparison



Sensitivity Tests

In order to evaluate the impact of possible changes in input parameters and their effect on transactions and revenue, several sensitivity tests were performed, involving variations in the following parameters and assumptions:

- Toll rate sensitivity
- Regional growth
- Account-based participation rate

Toll Rate Sensitivity

A range of toll rates from $2.00 to $9.00 peak hours and from $1.50 to $5.00 midday was modeled using the tolling analysis model for FY 2017. For each toll rate, the corresponding revenue was computed to develop toll sensitivity curves for AM peak, midday, and PM peak periods.

The FY 2017 selected peak period toll rate of $4.10 is estimated to generate 81 and 79 percent of the maximum revenue during the AM and PM peak periods, respectively. During the off-peak (midday) period in FY 2017, the selected toll rate of $2.55 is estimated to generate 92 percent of the maximum revenue.

Regional Growth

Using a downside economic forecast generated by the CDM Smith team, the tolling analysis model was run to estimate transactions and gross toll revenue potential under lower economic growth conditions. For FY 2018, under an approximately 2 and 3 percent economic downside scenario for regional population and employment respectively, transactions and revenue are expected to be about 3 percent lower. For FY 2022, under an approximately 4 and 5 percent economic downside scenario for regional population and employment respectively, transactions and revenue are expected to be about 6 percent lower. For FY 2031, under an approximately 9 percent economic downside scenario for regional population and employment, transactions and revenue are expected to be about 10 percent lower.

Account-based Participation Rate

This test examined the difference in transactions and revenue for account-based participation rates differing from those assumed in the baseline scenario. The overall transaction *Good To Go!* share for the baseline scenario is 85 percent in FY 2018, 86 percent in FY 2022, and 88 percent in FY 2031. In the sensitivity test, these rates were raised to 87 percent in FY 2018, 90 percent in FY 2022, and 93 percent in FY 2031.

The higher account-based participation rate results in transactions increasing by 1.1 percent in FY 2018, 1.4 percent in FY 2022, and 0.9 percent in FY 2031. Under this scenario, gross toll revenue potential would be expected to decline by 0.4 percent in FY 2018, by 1.2 percent in FY 2022, and by 2.2 percent in FY 2031.

This page intentionally left blank to allow for double-sided printing.

Chapter 1
Introduction

The Washington State Department of Transportation (WSDOT) has utilized toll financing as part of a broader package to finance the implementation of the SR 520 Floating Bridge and HOV Program. WSDOT began tolling the bridge in December 2011, prior to the construction of the replacement floating bridge. The U.S. Department of Transportation's Transportation Infrastructure Finance and Innovation Act (TIFIA) program provided financial support to the SR 520 Program via a direct loan in October 2012. WSDOT continues to collect tolls during construction and toll collection is expected to continue after construction is completed.

In order to satisfy TIFIA requirements and meet current and future bond requirements, the SR 520 Bridge Investment Grade Traffic and Revenue Study (T&R Study) was updated to address changes in project scope, additional actual tolling experience, changes in toll rates, updated construction schedules, and revisions to the underlying economic forecasting. Revised transactions and gross revenue forecasts were developed for FY 2016 through FY 2056.

Project Description

The SR 520 corridor stretches nearly 13 miles between I-5 in Seattle to the west and SR 202 to the east, crossing I-405 at about the halfway point, and serving various Eastside communities, including Bellevue, Kirkland, and Redmond. Figure 1-1 shows the corridor location. The main SR 520 bridge span (the Evergreen Point Floating Bridge) across Lake Washington is currently 1.42 miles long, making it the longest floating bridge span in the world From December 2011 through January 2016, tolls were being collected at the east high-rise section of the SR 520 bridge via all electronic tolling. After January 2016, tolls are collected on land east of the bridge via all electronic tolling.

The SR 520 Bridge Replacement and HOV Program includes the portion of the corridor between I-5 and I-405 and is comprised of five major components:

- Pontoon Construction
- Eastside Transit and HOV Project
- Floating Bridge and Landings (FB&L) Project
- West Approach Bridge North
- I-5 to Lake Washington ("Rest of the West"), including the West Approach Bridge South, new Portage Bay Bridge, and second bascule bridge across the Montlake Cut

The $4.56 billion in SR 520 funding authorized by the Legislature pays for: a new, safer, six-lane floating bridge, with a cross-lake bicycle and pedestrian path; 77 bridge pontoons built at facilities in Grays Harbor and Tacoma; the corridor's Eastside transit and HOV improvements between Lake Washington and I-405; the north (westbound) half of a new west approach bridge connecting Seattle to the new floating bridge; a replacement West Approach Bridge South for eastbound traffic connecting Seattle to the new floating bridge; a second bascule bridge over the Montlake Cut; a new, six-lane Portage Bay Bridge; an extension of a regional bicycle and pedestrian path from Montlake to I-5; and mitigation of the program's environmental impacts.

Figure 1-1: SR 520 Corridor Location

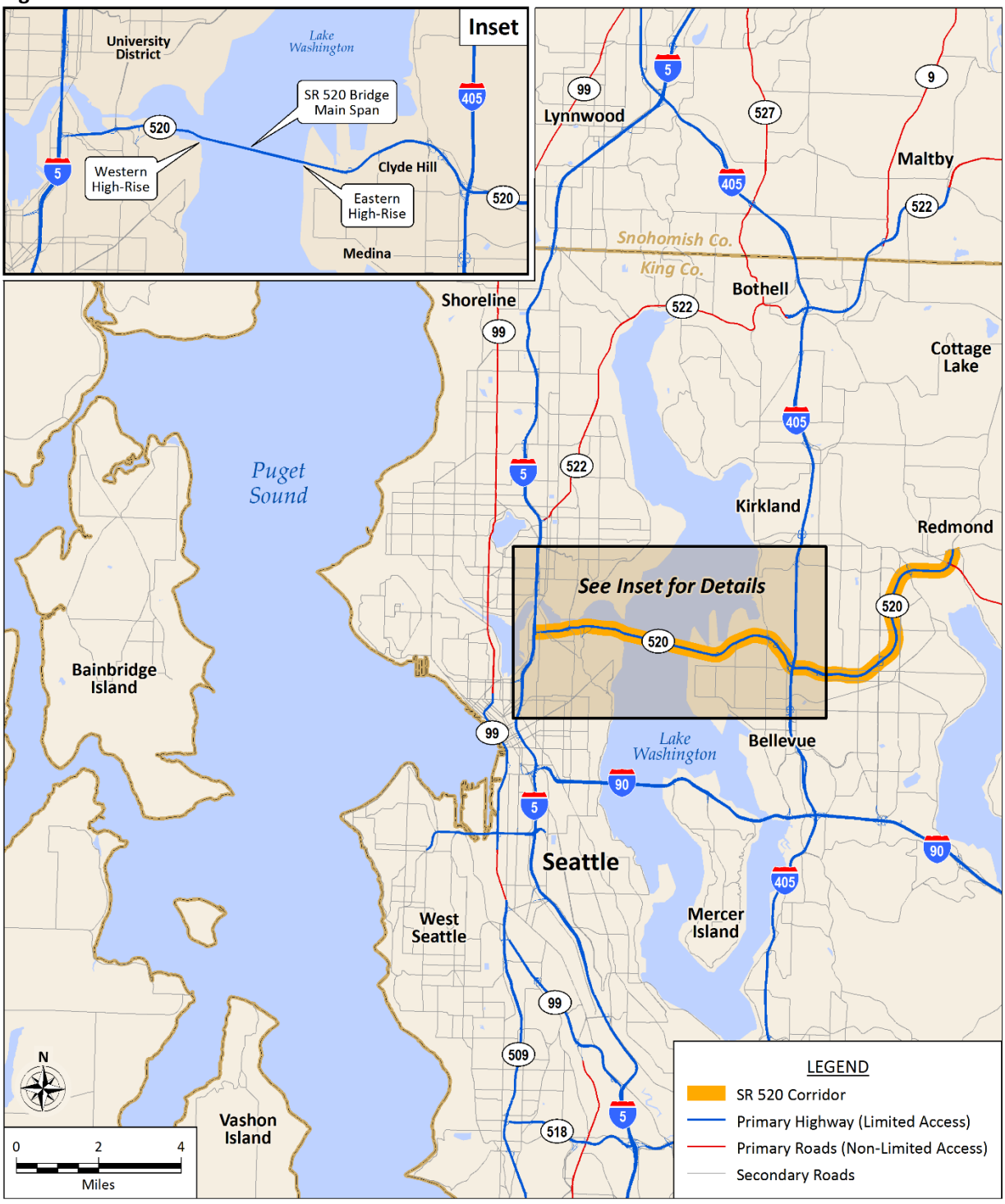


Figure 1-2 shows the assumed lane configurations for this study with four phases that are discussed below.

FY 2016 – Current Lane Configuration

For FY 2016 (ending on June 30, 2016), the configuration assumed in the forecast consists of:

- I-5 to east side of Lake Washington (including the main bridge span): two general-purpose lanes in each direction. Tolls will be collected at the eastern high rise until February 2016 and then on lane east of the bridge after that.
- East side of Lake Washington to I-405: Three lanes in each direction including two general-purpose lanes and one inside transit/high occupancy vehicle lane with a 3+ occupancy requirement (HOV3+)

FY 2017 through FY 2021 – Main Bridge Span Replaced

For purposes of this study, the configuration assumed from FY 2017 through FY 2021 consists of:

- I-5 to west end of main span: No effective changes from current (FY 2016) configuration. Traffic will be shifted from the current West Approach Bridge South to the new West Approach Bridge North, but with the same overall two lane per direction capacity.
- Lake Washington: Replacement of the main span by a six-lane main span (two general-purpose and one inside transit/HOV 3+ lane in each direction) from west end of main span, across Lake Washington to the eastern shore. Tolls will be collected at a location on land east of Lake Washington.

FY 2022 through FY 2025 – West Approach Bridge North and South

For purposes of this study, the configuration assumed from FY 2022 through FY 2025 consists of:

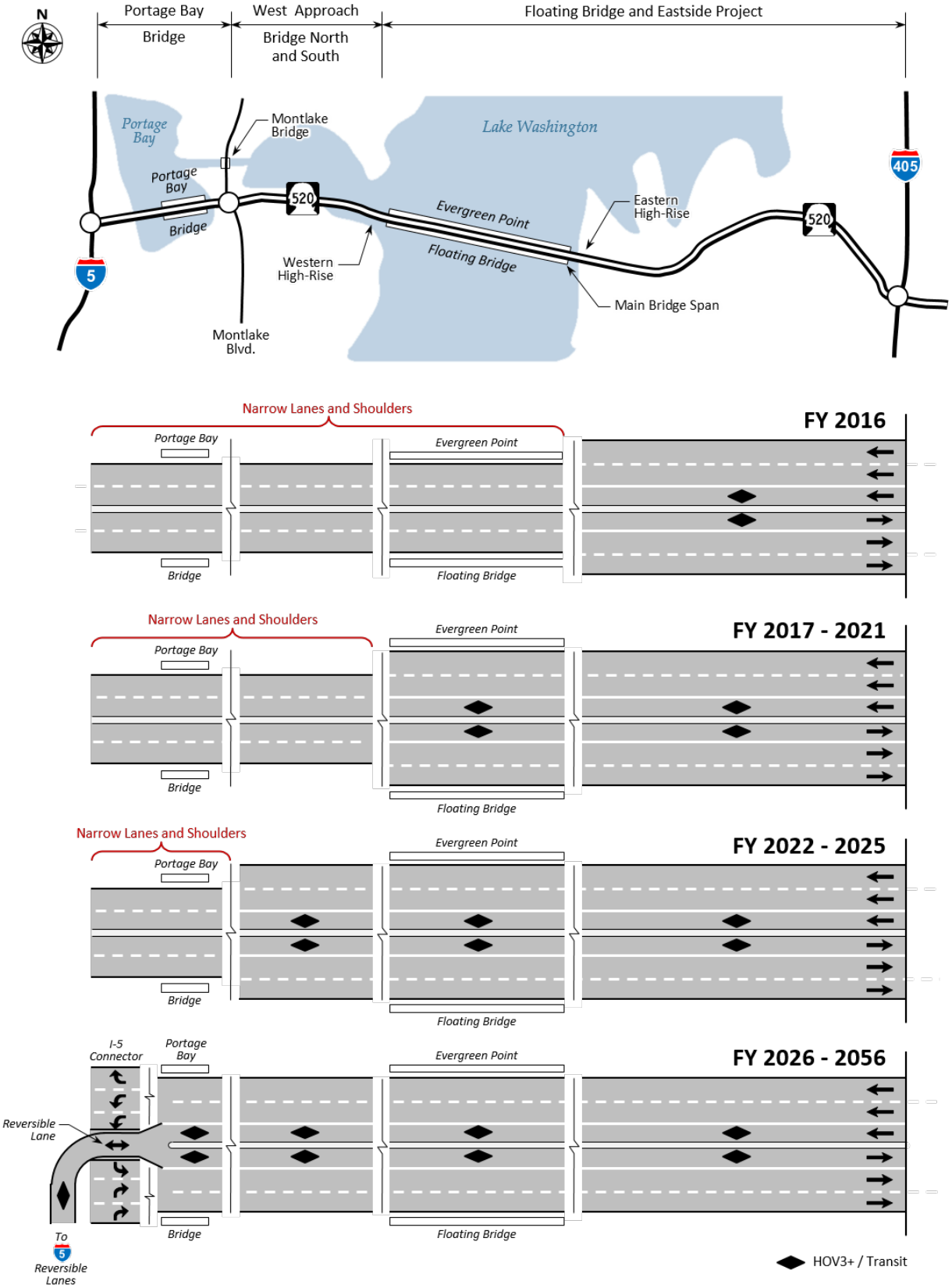
- I-5 to Montlake Boulevard: no changes from current (FY 2016) configuration
- Montlake Boulevard to west end of new floating bridge: new West Approach Bridge North (WABN) connector and new West Approach Bridge South (WABS) connector resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction). The WABS connector is a new element since the 2014 T&R study, which was added after the 2015 State Legislature approved funding for SR 520's planned improvements from I-5 to Lake Washington – the "Rest of the West."
- Lake Washington: no changes from FY 2017-2021 configuration

FY 2026 through FY 2056 – Portage Bay Bridge Replaced

For purposes of this study, the configuration assumed from FY 2026 forward consists of:

- I-5 to Montlake Boulevard: new Portage Bay Bridge resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction) plus a one-lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes. The Portage Bay Bridge replacement is a new element since the 2014 T&R study, which was added after the 2015 State Legislature approved funding for SR 520's planned improvements from I-5 to Lake Washington – the "Rest of the West."

Figure 1-2: Assumed SR 520 Lane Configuration



- Montlake Boulevard to west end of new floating bridge: no changes from FY 2022-2025 configuration
- Lake Washington: no changes from FY 2017-2021 configuration

Bond Financing Context

Several different debt instruments are being used to finance the SR 520 Corridor program. A combination of triple pledge bonds (backed by toll revenue, fuel tax, and the full faith and credit of the State), Federal Highway Grant Anticipation Revenue (GARVEE) bonds, and a loan from the Transportation Infrastructure Finance and Innovation Act (TIFIA) are being considered to finance the program.

To date, four bonds have been issued under the two master bond resolutions that govern the municipal financing provided to the project, including: (1) triple pledge bonds in October 2011; (2) GARVEE bonds in June 2012; (3) TIFIA bond in the form of a draw down loan in October 2012; and (4) GARVEE bonds in September 2013.

Traffic and Revenue Forecasting History

CDM Smith conducted the initial investment grade study for SR 520, completed in late summer 2011. This study developed annual gross revenue estimates from the assumed start of tolling (January 1, 2012) through 2056. The study was conducted with sufficient detail for use in support of project financing and resulted in the September 2011 Investment Grade traffic and revenue forecast.[5] The estimates were prepared based on a study work program which included:

- **Traffic count data collection** – including review of WSDOT annual traffic reports, as well as independent traffic count data collection.
- **Travel pattern surveys** – Mail-back surveys were sent to SR 520 users in the fall of 2009. The survey requested information on origin and destination travel, trip frequency, travel time of day, trip purpose, vehicle occupancy, vehicle class, and SR 520 entrance and exit points.
- **Travel time surveys** – Travel time surveys were performed along SR 520 and on important routes that could be potential alternatives.
- **Stated preference surveys** – Stated preference surveys were conducted in the fall of 2009 to measure the responses of current bridge users to tolling of SR 520. The results were used to develop a travel choice model which was used to forecast future travel behavior under tolled conditions including consideration of values of time, trip suppression, and mode shift.
- **Independent corridor growth analysis** – An independent review was conducted to update the Puget Sound Regional Council (PSRC) data. This review utilized independent regional forecasts which account for the major recession and overall economic downturn, data on economic and real estate activity, and a review of area development plans as the basis for revised population and employment forecasts for the region.

[5] The report containing the September 2011 traffic and revenue forecast was dated August 29, 2011. It was prepared in conjunction with other financing reports that are collectively referred to as the September 2011 forecast.

- **Tolling analysis model development** – The model development process included compiling and converting the PSRC regional model data sets to the toll forecast model. The model was calibrated to match existing observed conditions based on traffic counts and speeds. Once calibrated, the traffic assignment model was developed, incorporating tolling algorithms with the assignment process. CDM Smith also incorporated the results of the travel patterns surveys, the stated preference survey, independent corridor growth review, and travel time surveys.
- **Traffic and revenue analysis** – CDM Smith utilized the tolling analysis model to analyze several preliminary toll structures, as requested by WSDOT. The final investment grade traffic and revenue scenario was based on the FY 2012 adopted tolling structure and the future year tolling structure in the financing plan reviewed by the Washington State Transportation Commission (WSTC).
- **Sensitivity tests** – Several sensitivity tests were performed to determine the revenue impacts associated with variations in the following parameters and assumptions: regional growth, values of time, account-based participation rate, motor fuel cost, trip suppression and mode shift, and possible tolling of the I-90 bridge.

Tolling started on the SR 520 bridge on December 29, 2011. In September 2012, CDM Smith provided an updated forecast based on tolling experience over the first six months of 2012, a revised socio-economic basis, and revised project construction schedule. The resulting updated revenue forecast differed only modestly from the September 2011 forecast.

In late 2012 and early 2013, CDM Smith provided analysis of a series of alternative toll rate scenarios requested by the Washington State Transportation Commission (WSTC). A traffic and revenue forecast was produced for the nickel rounding alternative ultimately adopted by WSTC in May 2013. In this alternative, toll rates for account-based (*Good To Go!)* and Pay By Mail transactions in FY 2014 through FY 2016 were rounded to the nearest $0.05 resulting in slight forecast changes through FY 2016. (Toll rates from FY 2017 onward were rounded to the nearest $0.05 in the original 2011 study and continued to be so in the later studies.)

In October 2013, CDM Smith provided a revised forecast based on detailed information on tolling experience from January 1, 2012 to December 31, 2012, preliminary tolling experience from January 1, 2013 to June 30, 2013, revised closure schedule, assumed toll rate schedule, and revised economic forecasts prepared in July 2013. The updated traffic and gross toll revenue forecast was documented in the April 4, 2014 investment grade study update.[6]

In November 2014, CDM Smith provided a revised forecast based on detailed information on tolling experience through December 31, 2013, preliminary tolling experience from January 1, 2014 to June 30, 2014, slightly revised bridge configuration with the addition of the West Approach Bridge North connection from the Montlake interchange to the western high-rise and reconfiguration of the existing west approach bridge, revised closure schedule, assumed toll rate schedule, and revised economic

[6] The forecast presented in the April 2014 report was generated and reviewed in the summer and fall of 2013. It was prepared in conjunction with other financing reports that are collectively referred to as the October 2013 forecast.

forecasts completed in October 2014. The updated traffic and gross toll revenue forecast was documented in the January 29, 2015 investment grade study update.[7]

Traffic and Revenue Study Approach

The primary tasks leading to the development of this report and the revised forecast are summarized in this section. The approach essentially followed the same process as the October 2013 and November 2014 forecast updates. These tasks are described in detail in subsequent chapters of the report.

Review of Tolling Performance

CDM Smith analyzed data provided by WSDOT to examine the traffic, transactions, and tolling performance of the SR 520 bridge between January 2014 and June 2015 (18-month period). Recent performance data for the period July 2015 through February 2016 is also presented in this report. The results of actual tolling experience provide valuable information to help evaluate and adjust the transactions and revenue forecast.

The traffic performance review examines the traffic impacts as a result of tolling; the focus is on comparing how traffic conditions, including travel times, have evolved from January 2014 through December 2015.

The tolling performance review covers the following elements: transactions; gross toll revenue potential; method of payment; average weekday and weekend day transactions; vehicle classification; SR 520 and I-90 bridge closures; and transactions by home zip code. When applicable, the performance data (actuals) for FY 2015 are compared to the prior IG forecast prepared by CDM Smith (November 2014 forecast).

Regional Demographics & Economic Trends

The CDM Smith team conducted a review of recent trends in economic activity and growth in the region, and developed independent economic forecasts of population and employment based on estimates of current socioeconomic variables and forecasts of future socioeconomic activity. These forecasts were updated in July 2015 by CDM Smith team member Community Attributes Inc. (CAI) to reflect newly available economic performance estimates, current regional economic forecasts, projected development in Seattle and Eastside King County communities, and current market conditions such as office occupancy rates and housing unit absorption trends.

The team produced base year traffic analysis zone (TAZ) estimates for 2014 drawing from current data published by State and regional government agencies and data providers. Forecasts include employment and population forecasts for 2015, 2016, 2017, 2018, 2020, 2030 and 2040, driven by data and published forecasts. The revised economic forecasts were incorporated into the tolling analysis model by changing overall trip demand in those geographic areas which heavily influence travel demand on SR 520 and in the cross Lake Washington corridor.

For comparative purposes, the updated economic forecasts are compared to forecasts used in the previous November 2014 SR 520 traffic and revenue forecast.

[7] The forecast documented in the January 2015 report was prepared in conjunction with other financing reports that are collectively referred to as the November 2014 forecast.

Tolling Operations

Tolling commenced on the existing SR 520 bridge on December 29, 2011. Overall, the toll rates assumed in the 2011 study before the start of tolling were implemented. The Washington State Transportation Commission (WSTC) has since raised the tolls approximately 2.5 percent on July 1, 2012, July 1, 2013, July 1, 2014 and July 1, 2015. These toll rate increases are consistent with the original 2011 study assumptions. However, in May 2013, WSTC adopted a nickel rounding strategy which resulted in slight changes in toll rates compared to the 2011 assumptions.

For FY 2016, the resultant rates are:

- The maximum *Good To Go!* toll rate for 2-axle vehicles is $3.90 on weekdays and $2.40 on weekends in FY 2016. The toll rates have been rounded to the nearest $0.05.
- In FY 2016, Pay By Mail customers pay approximately $1.66 above the *Good To Go!* toll rates on average. The Pay By Mail rates are rounded to the nearest $0.05.
- Tolls for multi-axle vehicles (those with more than two axles on the ground) are generally determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles using the same payment method and rounded to the nearest $0.05. However, the WSTC set the FY 2016 rates based on raising the FY 2015 rates 2.5 percent and rounding to the nearest $0.05 which results in somewhat different multipliers. The maximum rate is the six-axle rate, regardless of additional axles.

Future toll rates and policies assumed in this study are consistent with the latest toll rate schedule anticipated to be formally adopted by the Washington State Transportation Commission in May 2016. For FY 2017, the assumed toll rates are as follows:

- The maximum *Good To Go!* toll rate for 2-axle vehicles will be $4.10 on weekdays and $2.50 on weekends.
- Pay By Mail customers will pay exactly $2.00 above the *Good To Go!* toll rates for 2-axle vehicles. The previous studies assumed a differential of $1.70.
- Weekday *Good To Go!* account-based tolls will increase approximately 4.8 percent on average from FY 2016 to FY 2017 (i.e. on July 1, 2016). The previous studies assumed an increase of approximately 15 percent.
- Weekend account-based tolls will increase approximately 4.5 percent on average from FY 2016 to FY 2017. The previous studies assumed an increase of approximately 1.6 percent.
- All toll rates will continue to be rounded to the nearest $0.05.
- Tolls will be only be charged between 5:00 am and 11:00 pm in FY 2017. Previous studies assumed that night time tolling (11:00 pm to 5:00 am) would start in FY 2017.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type. The maximum rate is the six-axle rate, regardless of additional axles.

For FY 2018 and beyond, the assumed toll rates are as follows:

- The maximum *Good To Go!* toll rate for 2-axle vehicles will be $4.30 on weekdays and $2.65 on weekends.

- Pay By Mail customers will pay exactly $2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- Weekday *Good To Go!* account-based tolls will increase approximately 5.2 percent on average from FY 2017 to FY 2018 (i.e. on July 1, 2017).
- Weekend account-based tolls will increase approximately 6.2 percent on average from FY 2017 to FY 2018.
- All toll rates will continue to be rounded to the nearest $0.05.
- No toll rate escalation is assumed after FY 2018.
- Tolls will be charged during all 24 hours starting in FY 2018. The night time (11:00 pm – 5:00 am) account-based toll rate for 2-axle vehicles is $1.25 on both weekdays and weekend days.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type. The maximum rate is the six-axle rate, regardless of additional axles.

For FY 2017 and beyond, the assumed toll exemption policies are as follows:

- Toll exemptions currently in place (public/private buses, registered vanpools, State Police vehicles, bridge maintenance vehicles, emergency vehicles, tow trucks while responding to SR 520 calls, and vehicles owned and maintained by a foreign government) are continued.
- Carpools with three or more occupants (3+ carpools) will not be exempt from tolls, and will continue to pay the same toll as single occupant vehicles (SOVs). Previous studies assumed that all 3+ carpools would be exempt from toll.

Toll Model Update

As part of the 2011 study, CDM Smith developed a tolling analysis model specific to the SR 520 corridor. A detailed description of the model structure and primary input is provided in the 2011 IG report. Specific toll model and forecasting revisions incorporated in the revised forecast include:

- **Model trip table calibration –** The SR 520 toll model trip tables were calibrated to toll transactions derived from the toll performance analysis and to traffic volumes on SR 520, I-90, SR 522, I-5, and I-405.
- **Growth performance review –** Short-term traffic and revenue revised forecasts (FY 2016 and FY 2017) were partly informed by actual results for FY 2014 and FY 2015, as well as recent growth patterns revealed by the tolling performance review. Average weekday and average weekend transactions for FY 2016 and FY 2017 were adjusted accordingly.
- **Time of day profile –** Updated information on distribution of transactions by hour on an average weekday were incorporated into the model.
- **Roadway configuration –** Changes in roadway configuration assumptions are related to the newly funded SR 520 West Side improvements, and an updated completion date for the I-90 Two-Way Transit & HOV Operations project.
- **Socioeconomic growth –** The revised socioeconomic growth review was incorporated into the new forecast.

- **Gas price forecast change –** Compared to the gas price forecast used in the November 2014 forecast, the new forecast assumes a lower gas price during both pre-completion and post-completion periods.
- **Proportion of payment –** The shares of *Good To Go!* account-based transactions (weekday, weekend, and overall) have been revised based on the performance review.
- **Payment type refinements –** The model was refined by introducing hourly account-based proportions and truck account-based proportions separate from car proportions.
- **Truck proportions** – The proportions of trucks (weekday, weekend, and overall) have been revised based on the performance review.
- **Truck toll rate multipliers** – The approach to derive truck toll rates was refined by using multipliers based on recent vehicle classification counts, and varying by time of day, day of the week, and payment type.
- **3+ carpools proportions** – The proportion of 3+ carpools in the model was revised to better reflect recent vehicle counts conducted in May 2015.
- **SR 520 closures due to construction –** Planned closure assumptions have been revised to account for progress on SR 520 reconstruction work and additional closures related to newly funded improvements between I-5 and the floating bridge.

Transactions and Revenue Analysis

The revised tolling analysis model was used to generate new transaction and gross revenue forecasts. The first step was to run the model to evaluate transactions and revenue impacts on an average weekday for key analysis years: FY 2016, FY 2017, FY 2018, FY 2021, FY 2022, FY 2024, FY 2025, FY 2026, and FY 2031. The selection of model analysis years was determined primarily based on changes in roadway lane configurations.

The weekday results for years between model years were determined by interpolation. The model results were then annualized taking into account weekend traffic and toll rates. The process generated a baseline transaction and gross revenue forecast from FY 2016 to FY 2056.

Sensitivity Tests

In order to evaluate the impact of possible changes in input parameters and their effect on transactions and revenue, several sensitivity tests were performed, involving variations in the following parameters and assumptions:

- Toll rate sensitivity
- Regional growth
- Account-based participation rate

Report Structure

The remainder of this report is organized as follows:

- Chapter 2 presents a review of traffic and tolling performance including comparisons to the November 2014 forecast.

- Chapter 3 covers the economic growth analysis and revised economic forecast. It includes comparisons to the 2014 study economic forecast.
- Chapter 4 discusses the assumptions related to toll structure and toll rates including vehicle classes and toll exemptions, methods of payment, and estimated market shares by payment type.
- Chapter 5 presents the traffic and revenue forecasting approach. It includes an overview of the tolling analysis model, a description of the revisions made to the model and forecasting process, and a summary of major forecasting assumptions.
- Chapter 6 includes the results of traffic and gross revenue analysis in the form of estimated annual transactions and gross toll revenue potential stream for the period from FY 2016 through FY 2056.[8]
- Chapter 7 contains the results of sensitivity testing of key model parameters and assumptions.

[8] The forecast presented in this report was prepared in conjunction with other financing reports that are collectively referred to as the November 2015 forecast.

This page intentionally left blank to allow for double-sided printing.

Chapter 2

Review of Tolling Performance

CDM Smith analyzed data provided by WSDOT to examine the SR 520 traffic and tolling performance between January 2014 and February 2016. The results of actual tolling experience provide valuable information to refine the traffic and revenue forecast.

This chapter provides a general overview of the traffic and toll performance reviews performed by CDM Smith as part of this investment grade (IG) study update. The traffic performance review examines the traffic impacts as a result of tolling; the focus is on comparing how traffic conditions, including travel times, have evolved from January 2014 through February 2016. The tolling performance review covers the following elements: transactions; gross toll revenue potential; method of payment; average weekday and weekend day transactions; vehicle classification; SR 520 and I-90 bridge closures; and transactions by home zip code. When applicable, the performance data (actuals) for FY 2015 are compared to the prior IG forecast prepared by CDM Smith (November 2014 forecast).

The results presented here are based on transaction resolution as of May 2015, the latest dataset available at the time the report was prepared. Consequently, the results presented may show some variation versus official values reported previously. Also, not all of the transactions had reached final resolution[9] by the time of this analysis; therefore, additional adjustments to transactions and revenue are likely over time, as more transactions reach final resolution. In particular, the analysis of tolling experience since January 2015 has been adjusted based on experience with resolved transactions in 2013. **The analysis in this assessment was prepared to help inform the update of the SR 520 forecast and does not represent a change in officially reported values.**

Traffic Impacts as a Result of Tolling

Traffic data provided by WSDOT were used to review traffic variations on SR 520 prior to and after tolling started.

Traffic Volumes

Figure 2-1 shows the observed traffic volumes and the November 2014 forecast traffic. Note that on this figure, the annual average daily traffic includes all traffic (non-revenue vehicles, overnight traffic, and weekend traffic) and is adjusted to exclude weekend bridge closures due to construction on SR 520 and I-90. As illustrated by Figure 2-1, the overall average daily traffic on SR 520 dropped by about 36 percent when tolling began from 93,100 in 2011 to 59,500 in the first six months of 2012. The September 2011 forecast had anticipated a drop of about 44 percent. The average daily traffic increased to 61,800 in FY 2013, 62,500 vehicles in FY 2014, and 66,500 vehicles in FY 2015. The November 2014 forecast had anticipated a traffic volume of 64,800 vehicles for FY 2015.

[9] A transaction is considered resolved when it has reached final disposition.

Figure 2-1: Impacts of Tolling on SR 520 Bridge Traffic

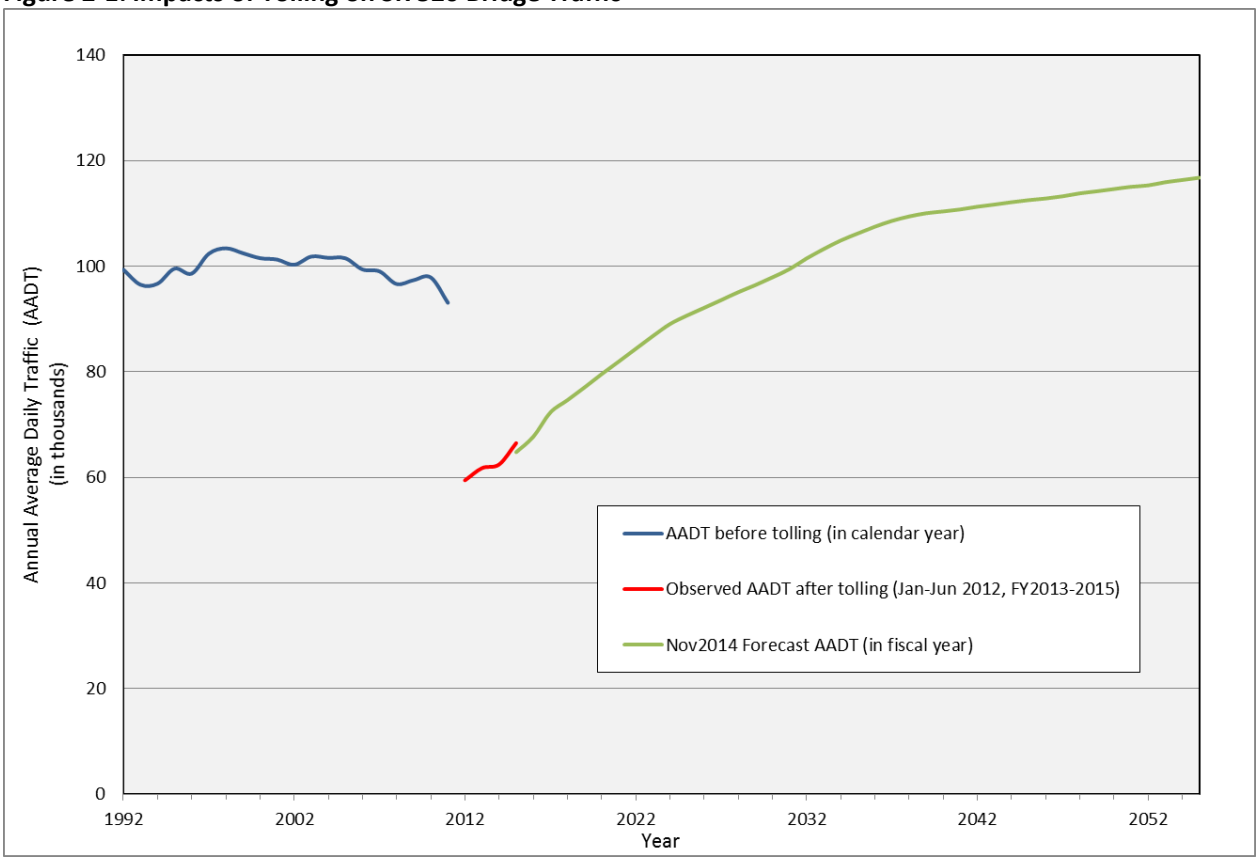


Table 2-1 shows the average weekday traffic volumes on SR 520 and I-90 by fiscal year since tolling started. Weekday data shows the average weekday traffic volume on SR 520 increased by 4.8 percent in January-June 2013 compared to the same period in 2012. In FY 2014, the average weekday traffic on SR 520 increased by 1.2 percent compared to FY 2013. In FY 2015, the average weekday traffic on SR 520 increased by 5.9 percent compared to FY 2014. The average weekday traffic volume on the SR 520 bridge was 73,800 vehicles in FY 2015 compared to 69,800 vehicles in FY 2014. For the first 6 months of FY 2016, the average weekday traffic volume on SR 520 increased by 4.8 percent compared to the same period in FY 2015.

I-90 is the main alternative route across Lake Washington. I-90 average weekday traffic increased by 2.4 percent in January-June 2013 compared to the same period in 2012, and by 2.3 percent in FY 2014 compared to FY 2013. In FY 2015, the average weekday traffic on I-90 slightly decreased by 0.6 percent. The average weekday traffic volume on the I-90 bridge was 158,300 vehicles in FY 2015 compared to 159,200 vehicles in FY 2014. For the first 6 months of FY 2016, the average weekday traffic volume on I-90 slightly decreased by 0.1 percent compared to the same period in FY 2015.

The average weekday cross lake traffic (combining SR 520 and I-90 traffic volumes) increased by 3.1 percent in January-June 2013 compared to the same period in 2012. The upward trend continued but slowed in FY 2014 (2.0 percent increase), FY 2015 (1.4 percent increase) and FY 2016 to-date (1.5 percent increase).

Table 2-1: Average Weekday Traffic – Comparison of SR 520 and I-90 Cross-lake Travel

	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
SR 520[1,2]					
July		67,354	69,652	75,061	80,250
August		70,345	70,415	73,241	77,419
September		69,182	69,702	73,827	76,422
October		68,681	69,413	73,403	76,925
November		66,696	68,558	71,230	73,729
December		64,426	65,495	69,639	72,400
January	58,835[3]	66,450	68,415	71,650	
February	65,461	70,239	67,379	71,964	
March	67,672	73,735	69,651	74,722	
April	66,321	67,166	70,927	74,883	
May	69,875	71,557	73,718	77,924	
June	71,118	71,384	73,725	78,610	
Annual Average	**66,832[4]**	**68,938**	**69,767**	**73,869**	**76,218[4]**
Annual % Change		**4.8%[5]**	**1.2%**	**5.9%**	**4.8%[5]**
I-90[1,2]					
July		154,823	164,342	155,305	161,843
August		158,094	162,766	162,190	160,811
September		151,469	161,093	159,482	159,477
October		153,143	159,847	158,583	158,353
November		149,314	154,683	152,901	152,320
December		146,471	149,855	151,043	146,114
January	146,655[3]	152,302	154,493	155,128	
February	154,936	155,154	154,379	156,735	
March	155,698	158,797	158,947	160,402	
April	156,352	159,225	159,482	159,725	
May	156,965	162,949	164,253	163,097	
June	159,038	165,609	166,060	164,966	
Annual Average	**155,230[4]**	**155,674**	**159,235**	**158,328**	**156,495[4]**
Annual % Change		**2.4%[5]**	**2.3%**	**-0.6%**	**-0.1%[5]**
Total Cross-lake[1,2]					
July		222,177	233,994	230,366	242,093
August		228,439	233,181	235,431	238,231
September		220,651	230,795	233,308	235,899
October		221,824	229,260	231,986	235,278
November		216,010	223,241	224,132	226,049
December		210,898	215,351	220,682	218,514
January	205,490[3]	218,752	222,908	226,779	
February	220,397	225,392	221,757	228,700	
March	223,370	232,532	228,598	235,124	
April	222,673	226,391	230,410	234,608	
May	226,840	234,505	237,972	241,021	
June	230,157	236,993	239,785	243,576	
Annual Average	**222,062[4]**	**224,612**	**229,002**	**232,197**	**232,712[4]**
Annual % Change		**3.1%[5]**	**2.0%**	**1.4%**	**1.5%[5]**

Notes:
1. All major holidays falling on weekdays were removed
2. Data includes all traffic crossing the bridges. For SR 520, it includes non-revenue and overnight vehicles
3. January 2012 snow storm days were removed
4. For FY 2012 and FY 2016, annual average values are based on 6 months of data
5. For FY 2013 and FY 2016, the annual percent change is calculated over similar 6-month periods

Source: WSDOT data and CDM Smith analysis

Hourly Traffic Variations on Weekdays

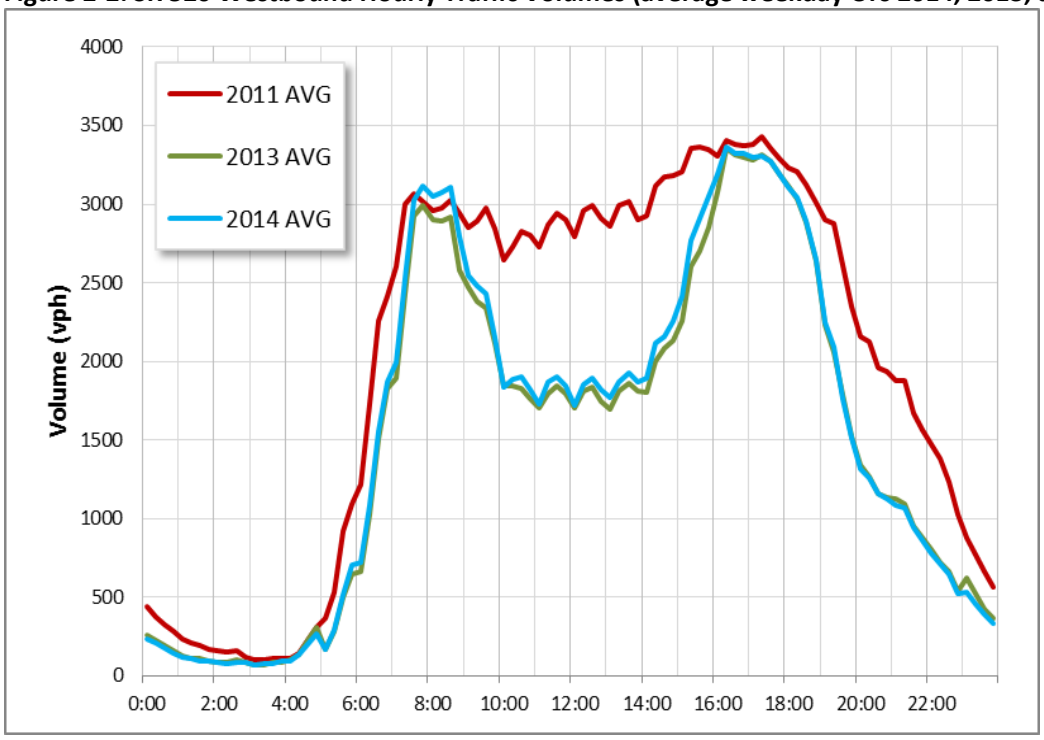
Figure 2-2 shows hourly variations of average weekday traffic volumes for SR 520 westbound in calendar years 2011 (prior to tolling), 2013, and 2014. The figure shows that 2014 average hourly volumes were slightly higher than 2013 values, with a more pronounced growth occurring during the AM peak period. Compared to the 2011 level, AM and PM peak period traffic volumes in 2014 were similar to pre-tolling values, while midday and evening traffic volumes remain significantly lower.

For the eastbound direction of SR 520, Figure 2-3 shows that 2014 average hourly volumes were slightly higher than 2013 values between 7:00 am and 8:00 pm. Compared to the 2011 level, AM peak period traffic volumes in 2014 were similar to pre-tolling values, while midday and PM peak period traffic volumes remain significantly lower.

Figure 2-4 shows hourly variations of average weekday traffic volumes for I-90 westbound in calendar years 2011, 2013, and 2014. The figure shows that 2014 hourly traffic volumes were very similar to those observed in 2013, with a very slight decrease during the AM and PM peak periods. Compared to 2011, AM and PM peak period traffic levels in 2014 were similar to pre-tolling conditions, although the AM peak hour has shifted slightly earlier. In the midday and evening periods, 2014 traffic volumes were higher than 2011 levels.

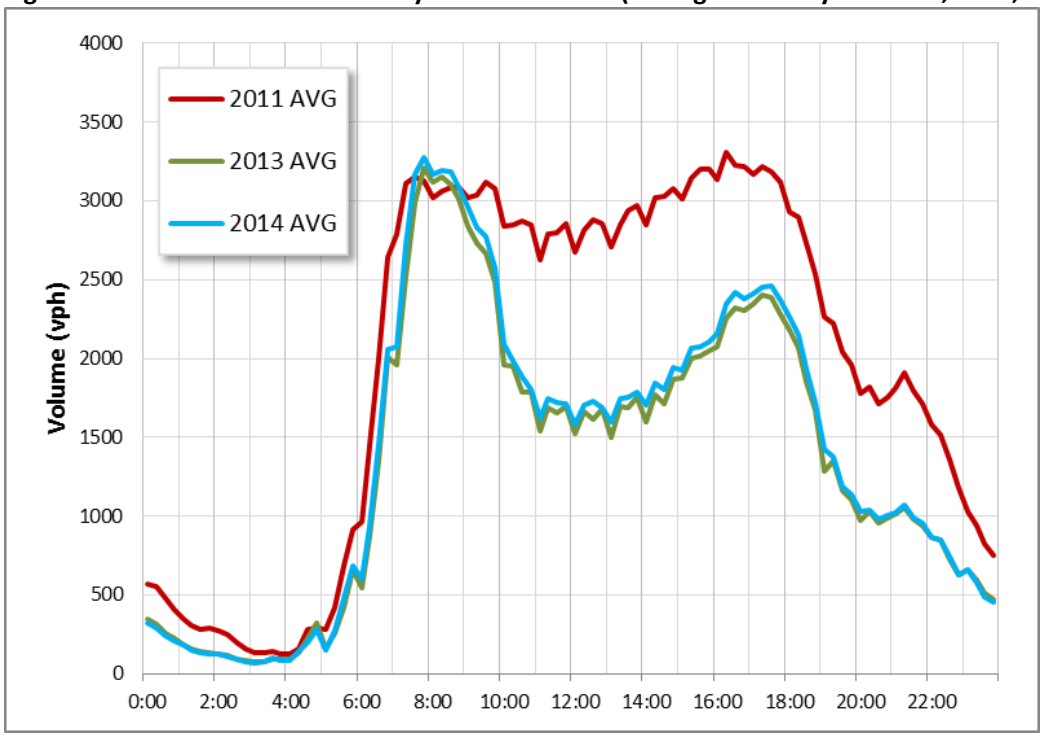
For the eastbound direction of I-90, Figure 2-5 shows that the 2014 hourly traffic profile was nearly identical to the 2013 level. Compared to the 2011 level, AM and PM peak period traffic volumes in 2014 were similar to pre-tolling values, while midday and evening traffic volumes are higher.

Figure 2-2: SR 520 Westbound Hourly Traffic Volumes (average weekday CYs 2014, 2013, and 2011)



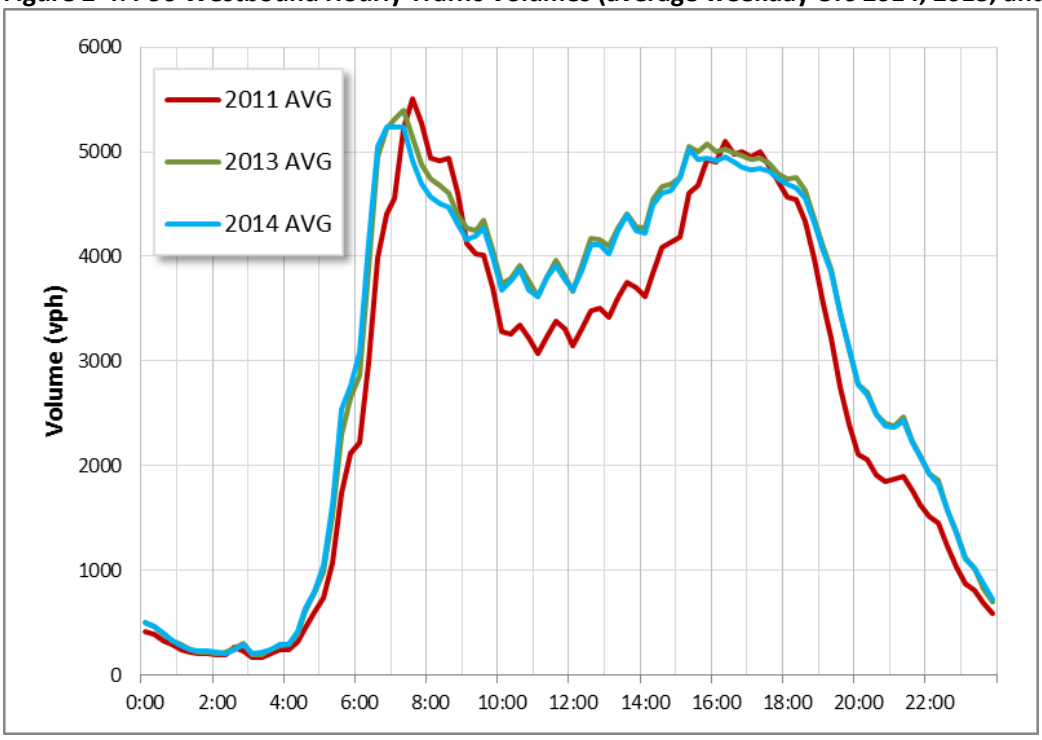
Source: WSDOT

Figure 2-3: SR 520 Eastbound Hourly Traffic Volumes (average weekday CYs 2014, 2013, and 2011)



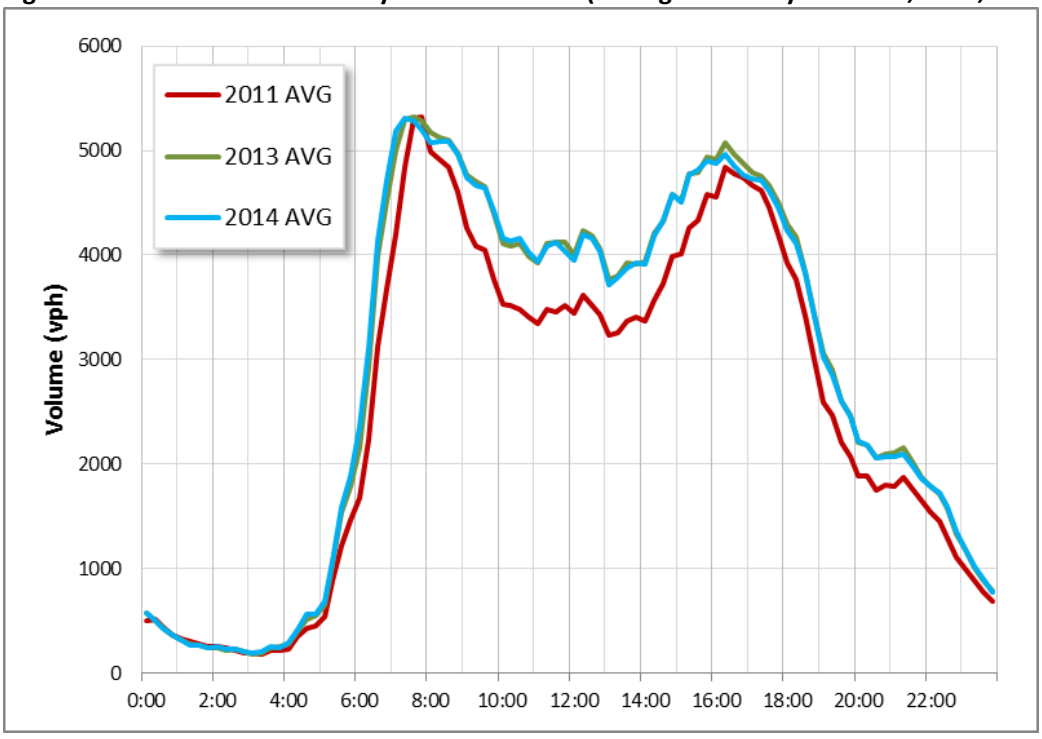
Source: WSDOT

Figure 2-4: I-90 Westbound Hourly Traffic Volumes (average weekday CYs 2014, 2013, and 2011)



Source: WSDOT

Figure 2-5: I-90 Eastbound Hourly Traffic Volumes (average weekday CYs 2014, 2013, and 2011)



Source: WSDOT

Travel Times

Travel time information available for review came from WSDOT. The information is based on data from loop detectors (for SR 520 and I-90) and from license matching using video detection (for SR 522).

Table 2-2 summarizes the average travel time difference between 2014 and 2013 (full calendar years) as well as between 2015 and 2014 (for the first three months of calendar years), for the three routes across Lake Washington, for the AM and PM peak periods.

On SR 520, the average travel times during peak periods have generally increased in 2014. Travel time differences vary significantly by direction and month. The more substantial travel time increases in 2014 have been observed during the PM peak, in the westbound direction, with an average increase of 3.5 minutes. For the eastbound movement during the PM peak, the average travel time in 2014 was unchanged from the 2013 level. During the AM peak, both directions of SR 520 experienced a year-to-year average travel time increase of less than one minute.

On I-90, average travel times during peak periods have been nearly stable (with changes of 0.3 minute or less), except for the westbound PM peak for which average travel times increased by slightly more than one minute in 2014.

On SR 522, average travel times have generally increased in 2014 except for the eastbound morning direction where travel times have decreased. There is substantial variation in month-to-month travel time changes, likely due to effects of adverse weather, traffic signal operations, traffic collisions, construction, and traffic patterns.

When comparing 2015 vs. 2014 results for January through March, similar westbound PM peak travel time increases of 6 percent appear for SR 520 (1.7 minutes), and SR 522 (2.8 minutes).

Table 2-2: Changes in Average Weekday Peak Period Travel Times (in minutes and percent change)

Calendar Years		Redmond/Seattle via SR 520		Issaquah/Seattle via I-90		Woodinville/Seattle via SR 522	
		WB	EB	WB	EB	WB	EB
AM Peak 7am-9am							
2014 vs. 2013	minutes	0.6	0.4	0.2	0.1	2.4	-1.3
	% change	(+3%)	(+2%)	(+1%)	(+1%)	(+6%)	(-5%)
2015 vs. 2014*	minutes	0.0	-0.2	-0.4	0.4	0.1	0.9
	% change	(+0%)	(-1%)	(-1%)	(+2%)	(+0%)	(+3%)
PM Peak 3pm-6pm							
2014 vs. 2013	minutes	3.5	0.0	1.1	-0.3	1.6	1.3
	% change	(+12%)	(0%)	(+4%)	(-2%)	(+3%)	(+3%)
2015 vs. 2014*	minutes	1.7	-1.0	0.5	0.2	2.8	2.1
	% change	(+6%)	(-5%)	(+2%)	(+1%)	(+6%)	(+5%)

*Based on January through March data

Source: WSDOT data and CDM Smith analysis

Vehicle Occupancy

CDM Smith conducted a survey on May 12 through 14, 2015 to obtain vehicle occupancy data on SR 520 at the Evergreen Point Freeway Transit Station and at the 84th Avenue interchange. All counts were conducted over three consecutive weekdays. The results were aggregated to produce average values per day for each count period: AM peak (7-10 am); midday (11:30 am-1:30 pm); and PM peak (3:30-6:30 pm).

Table 2-3 shows a summary of the results for the SR 520 mainline lanes. The highest proportion of 2 occupants and 3+ occupants were observed during the PM peak period, and represented respectively 12.6 percent and 2.3 percent of the overall traffic.

Table 2-3: SR 520 Mainline May 2015 Occupancy Counts

Time Period	Proportion of Traffic Flow					
	1 Occupant	2 Occupants	3+ Occupants	Trucks	Transit	Total
7:00 - 10:00 AM	88.4%	7.5%	0.9%	0.9%	2.2%	100%
11:30 AM-1:30 PM	84.9%	12.3%	0.7%	1.1%	1.0%	100%
3:30-6:30 PM	82.9%	12.6%	2.3%	0.4%	1.9%	100%
All Periods Counted	**85.5%**	**10.4%**	**1.5%**	**0.7%**	**1.9%**	**100%**

Source: CDM Smith vendor counts, May 12-13-14, 2015

Toll Transactions and Gross Toll Revenue Potential

The primary tolling data available for review from WSDOT are reports from transactions processed by the Customer Service Center (CSC). The dataset provided to CDM Smith on May 8, 2015 contains toll transaction information broken down by date, hour, class and type of toll transaction. The breakout of *Good To Go!* (GTG) account-based vs. Pay By Mail (PBM) proportions reflects the transaction payment type as each transaction proceeds from lane equipment through processing within the CSC. The dataset reflects any adjustments that occur such as a license plate read transaction later changed to Pay By Plate. The data is generally thought to be at a level appropriate to derive the actual gross toll revenue potential comparable to CDM Smith's forecasts.

For January 2015 through February 2016, the CSC dataset was not available.[10] Instead, the actual transactions were estimated based on WSDOT's data from the toll lane equipment system as reported in the Monthly Trips Reports (MTR). The MTR provides an aggregated summary of toll transactions. Transactions are subsequently processed and reconciled with toll accounts by the CSC. In order to provide a more reliable comparison with the forecast transactions and revenue, the number of transactions from the lane equipment system was adjusted based on the experience gained from analyzing the CY 2013 and CY 2014 CSC datasets[11] and MTRs. Available information on the number of duplicate transactions was used to adjust the MTR results downward. The second adjustment focused

[10] To get an accurate estimate of transaction resolution, prior analysis has indicated the CSC data pull for a given period cannot start until 90 days after the end of the analysis period to give most of the transactions time to reach final status. Also, the analysis of the CSC data set takes many weeks after this 90 day period. In order to meet the timeframe for delivery of this forecast, it was necessary to estimate the CY 2015 results as described in the text above.

[11] The CY 2013 CSC dataset was used for adjusting January 2015 through June 2015 monthly transactions; the CY 2014 CSC dataset was used for adjusting July 2015 through February 2016 monthly transactions.

on estimating and removing the likely amount of non-revenue transactions. Then, the number of post-CSC process transactions was estimated by applying a factor derived from the comparison of pre- and post-CSC processing results. The resulting "estimated actual" number of monthly transactions is what is considered the best estimate at the date this report was produced; the values will be revised as more information becomes available and as the transactions are resolved.

Transactions

Table 2-4 shows the actual number of transactions by month for the period from January 2012 through February 2016. Overall, transactions increased by 3.7 percent in FY 2014, by 5.1 percent in FY 2015, and by 7.4 percent in FY 2016 to-date.

Table 2-4: Monthly Actual Transactions

Actual Transactions	FY 2012[1]	FY 2013[1]	% Change	FY 2014[1]	% Change	FY 2015[2,3]	% Change	FY 2016 YTD[3]	% Change[4]
July		1,634,862		1,714,340	*4.9%*	1,845,510	*7.7%*	2,048,217	*11.0%*
August		1,748,279		1,843,593	*5.5%*	1,785,013	*-3.2%*	1,931,808	*8.2%*
September		1,605,673		1,672,627	*4.2%*	1,796,980	*7.4%*	1,902,320	*5.9%*
October		1,780,703		1,891,073	*6.2%*	1,853,706	*-2.0%*	2,052,569	*10.7%*
November		1,595,208		1,698,416	*6.5%*	1,632,066	*-3.9%*	1,752,932	*7.4%*
December	101,620	1,627,330		1,692,471	*4.0%*	1,804,291	*6.6%*	1,852,481	*2.7%*
January	1,275,306	1,697,451	*33.1%*	1,782,226	*5.0%*	1,804,665	*1.3%*	1,901,672	*5.4%*
February	1,505,263	1,537,817	*2.2%*	1,555,759	*1.2%*	1,714,604	*10.2%*	1,849,759	*7.9%*
March	1,667,299	1,794,438	*7.6%*	1,871,405	*4.3%*	1,949,255	*4.2%*	NA	NA
April	1,579,205	1,651,778	*4.6%*	1,848,497	*11.9%*	1,940,953	*5.0%*	NA	NA
May	1,800,544	1,843,724	*2.4%*	1,816,370	*-1.5%*	2,021,484	*11.3%*	NA	NA
June	1,679,936	1,703,339	*1.4%*	1,572,796	*-7.7%*	1,871,243	*19.0%*	NA	NA
Annual Total	**9,609,173**	**20,220,601**		**20,959,574**	***3.7%***	**22,019,770**	***5.1%***	**15,291,758**	***7.4%***

1. For data through June 2014, actuals are based on WSDOT reported toll traffic and revenue
2. For July-December 2014, actuals are based on WSDOT toll transaction data provided to CDM Smith on 5/8/15
3. For January 2015 - February 2016, actuals are based on WSDOT monthly lane equipment data and adjustments by CDM Smith
4. The annual percent change for FY 2016 is based on July-February data only

Table 2-5 presents the difference between total annual forecast transactions and actual results available. Overall, the actual transactions exceeded the forecast by 0.6 percent in FY 2015.

Table 2-5: FY 2015 Transactions vs. Forecast

Transactions	Forecast[1]	Actuals[2,3]	*Variance*
Jul 2014-Dec 2014	10,709,000	10,717,566	*0.1%*
Jan 2015-Jun 2015	11,173,000	11,302,204	*1.2%*
FY 2015	**21,882,000**	**22,019,770**	***0.6%***

1. Based on CDM Smith November 2014 forecast
2. For July-December 2014, actuals are based on WSDOT toll transaction data provided to CDM Smith on 5/8/15
3. For CY 2015, actuals are based on WSDOT monthly lane equipment data and adjustments by CDM Smith

Gross Toll Revenue Potential

For purposes of this analysis, the gross toll revenue potential is defined as the revenue that would be collected if every vehicle crossing the bridge paid exactly the published toll rate based on time of crossing, vehicle class, payment method, and applicable exemptions. The gross toll revenue potential does not include any fee revenue (including pay by plate fees), short term account discounts, Notice of Civil Penalty fines, nor any amounts attributed to non-revenue vehicles.

Table 2-6 shows the actual gross toll revenue potential by month for the period from January 2012 through February 2016. Overall, the gross toll revenue potential increased by 5.4 percent in FY 2014, by 7.4 percent in FY 2015, and by 9.8 percent in FY 2016 to-date.

Table 2-6: Monthly Actual Gross Toll Revenue Potential

Actual Gross Toll Revenue Potential	FY 2012[1]	FY 2013[1]	% Change	FY 2014[1]	% Change	FY 2015[1,2]	% Change	FY 2016 YTD[2]	% Change[3]
July		$4,976,772		$5,359,491	*7.7%*	$5,911,195	*10.3%*	$6,645,846	*12.4%*
August		5,398,814		5,693,623	*5.5%*	5,682,554	*-0.2%*	6,273,471	*10.4%*
September		4,836,775		5,149,693	*6.5%*	5,695,356	*10.6%*	6,168,971	*8.3%*
October		5,459,692		5,827,248	*6.7%*	5,937,936	*1.9%*	6,590,492	*11.0%*
November		4,853,751		5,138,744	*5.9%*	5,084,915	*-1.0%*	5,656,778	*11.2%*
December	$325,281	4,797,087		5,108,936	*6.5%*	5,630,420	*10.2%*	5,971,444	*6.1%*
January	3,753,917	5,138,969	*36.9%*	5,458,848	*6.2%*	5,624,088	*3.0%*	6,038,102	*7.4%*
February	4,462,654	4,686,538	*5.0%*	4,821,340	*2.9%*	5,361,470	*11.2%*	5,963,796	*11.2%*
March	4,887,942	5,364,149	*9.7%*	5,726,176	*6.7%*	6,123,337	*6.9%*	NA	NA
April	4,596,628	5,075,045	*10.4%*	5,683,192	*12.0%*	6,103,275	*7.4%*	NA	*NA*
May	5,172,209	5,574,437	*7.8%*	5,598,529	*0.4%*	6,218,715	*11.1%*	NA	*NA*
June	4,857,006	5,139,682	*5.8%*	5,023,328	*-2.3%*	6,009,948	*19.6%*	NA	*NA*
Annual Total	**$28,055,637**	**$61,301,711**		**$64,589,147**	***5.4%***	**$69,383,209**	***7.4%***	**$49,308,901**	***9.8%***

1. For data through December 2014, actuals are based on WSDOT toll revenue data
2. For January 2015 -February 2016, actuals are based on preliminary financial reporting system results and adjustments
3. The annual percent change for FY 2016 is based on July-February data only.

Table 2-7 presents the difference between total annual forecast revenue potential and actual results available. The revenue potential reflects the toll rate increase implemented on July 1, 2014. Overall, the actual gross toll revenue potential for FY 2015 exceeded the forecast by 0.6 percent.

Table 2-7: FY 2015 Gross Toll Revenue Potential vs. Forecast

Gross Toll Revenue Potential	Forecast[1]	Actuals[2]	*Variance*
Jul 2014-Dec 2014	$33,904,000	$33,942,376	*0.1%*
Jan 2015-Jun 2015	$35,091,000	$35,440,833	*1.0%*
FY 2015	**$68,995,000**	**$69,383,209**	***0.6%***

1. Based on CDM Smith November 2014 forecast
2. Actuals through December 2014 are based on WSDOT toll revenue data. Actuals starting in January 2015 are based on preliminary financial reporting system results and adjustments.

Payment Share

Table 2-8 presents the breakdown of CY 2014 transactions and gross toll revenue potential by payment type, based on the CSC-processed transactions. In this table, the Pay By Mail category includes transactions in-process, billed, and paid. The unbillable category includes unreadable transponder/license plate, inability to identify owner, and dismissals for business rules. NOCP (Notice of Civil Penalty) toll refers to all transactions that have gone to the NOCP process, whether the bills have been paid or not.

The proportion of *Good To Go!* (i.e., account-based) transactions was 84.4 percent for calendar year 2014, with 66.7 percent of the transactions using a transponder and 17.7 percent using the Pay By Plate payment option. The share of Pay By Plate transactions increased noticeably compared to 2013 when they represented 15.4 percent of the overall transactions.

Table 2-8: CY 2014 Actual Method of Payment

Payment Type	Transactions		Gross Toll Revenue Potential	
	Total	Proportion	Total	Proportion
Good To Go! – Tag	14,098,722	66.7%	$41,100,050	62.1%
Good To Go! – Pay By Plate	3,747,195	17.7%	$10,608,940	16.0%
Pay By Mail[1]	2,303,977	10.9%	$9,985,301	15.1%
Unbillable[2]	444,482	2.1%	$2,038,583	3.1%
NOCP Tolls	558,591	2.6%	$2,433,483	3.7%
Total CY 2014	**21,152,967**	**100.0%**	**$66,166,357**	**100.0%**

1. Includes transactions in process, billed, and paid

2. Unbillable includes unreadable transponder/license plate, inability to identify owner, and business rule dismissals
Source: WSDOT toll transaction data provided to CDM Smith on 5/8/15
Note that later resolution of transactions is possible and could affect all breakout slightly.

Table 2-9 shows how the share of payment type has evolved over time. The share of *Good To Go!* transactions, which had been increasing since tolling started, dropped slightly in FY 2015 from 84.5 percent to 83.7 percent. Among account-based transactions, Pay By Plate transactions have substantially increased, rising from 14 percent of all transactions in FY 2013 to 19 percent in FY 2015. Conversely, the share of *Good To Go!* transponder transactions has generally decreased over time. In terms of number of transactions, all payment types have seen increases in FY 2015, but transponder transactions have increased modestly (approximately 50,000 annually) while Pay By Plate and Pay By Mail transactions have increased more substantially (approximately 683,000 and 339,000 respectively).

Table 2-9: Trends in Actual Method of Payment

Share of Transactions[1,2]	*Good To Go!*			PBM
	Transponder	PBP	All GTG	
Jan-Jun 2012	71.2%	11.6%	82.8%	17.2%
FY 2012	**71.2%**	**11.6%**	**82.8%**	**17.2%**
Jul-Dec 2013	69.7%	13.1%	82.8%	17.2%
Jan-Jun 2013	69.7%	14.8%	84.6%	15.4%
FY 2013	**69.7%**	**14.0%**	**83.7%**	**16.3%**
Jul-Dec 2013	67.9%	16.0%	83.9%	16.1%
Jan-Jun 2014	67.7%	17.4%	85.1%	14.9%
FY 2014	**67.8%**	**16.7%**	**84.5%**	**15.5%**
Jul-Dec 2014	65.6%	18.1%	83.7%	16.3%
Jan-Jun 2015	64.0%	19.8%	83.8%	16.2%
FY 2015	**64.8%**	**19.0%**	**83.7%**	**16.3%**

1. For CYs 2012, 2013 and 2014, values are based on WSDOT toll transaction data provided to CDM Smith on May 20, 2013; July 9, 2013; August 25, 2014; and May 8, 2015. These values may slightly differ from reported values and do not represent a change in officially reported values. They are used for informing future forecasts only.

2. For CY 2015, values are based on preliminary financial reporting system results and adjustments

Note that later resolution of transactions is possible and could affect above breakout slightly.

Average Weekday and Weekend Day Transactions

Table 2-10 shows a comparison of observed average weekday and average weekend day transactions to the forecast for FY 2015. Adjustments were made to account for bridge closure weekends on SR 520 and I-90, and major holidays (when WSDOT charged weekend toll rates) to provide comparable data. For FY 2015, weekday transactions were 0.4 percent below forecasts, while weekend transactions were 2.2 percent below forecasts.

Table 2-10: FY 2015 Average Weekday and Average Weekend Transactions vs. Forecast

Average Daily Transactions	Forecast[1]	Actuals[2,3]	*Variance*
Weekdays			
Jul 2014-Dec 2014	69,825	69,106	*-1.0%*
Jan 2015-Jun 2015	71,090	71,248	*0.2%*
FY 2015	**70,455**	**70,173**	***-0.4%***
Weekend Days[4]			
Jul 2014-Dec 2014	40,715	39,574	*-2.8%*
Jan 2015-Jun 2015	42,055	41,568	*-1.2%*
FY 2015	**41,438**	**40,523**	***-2.2%***

1. Forecast based on CDM Smith November 2014 forecast

2. For CY 2014, actuals are based on WSDOT toll transaction data provided to CDM Smith on 5/8/15

3. For CY 2015, actuals are based on WSDOT monthly lane equipment data and adjustments by CDM Smith

4. Weekend bridge closure days were removed; includes holidays on weekdays (weekend rates)

Table 2-11 shows how the average weekday and weekend transactions have evolved over time. Average weekday transactions have continuously increased since tolling started, with annual increases of 2.9 percent in FY 2013, 3.4 percent in FY 2014, 4.1 percent in FY 2015, and 4.2 percent in FY 2016 to-date. Average weekend transactions have followed a similar pattern than weekday transactions, although the growth rates have been lower in FYs 2014-2015, and higher in FY 2016 to-date. Average weekend transactions have increased by 3.3 percent in FY 2013, by 3.0 percent in FY 2014, by 3.1 percent in FY 2015, and by 5.9 percent in FY 2016 to-date.

Table 2-11: Trends in Actual Average Weekday and Average Weekend Transactions

Average Daily Transactions	Weekday	Weekend
Jan-Jun 2012	63,303	36,920
FY 2012	**63,303**	**36,920**
Jul-Dec 2012	64,616	37,469
Jan Jun 2013	65,715	38,802
FY 2013	**65,165** ***(+ 2.9%)***	**38,142** ***(+ 3.3%)***
Jul-Dec 2013	66,294	38,485
Jan-Jun 2014	68,479	40,285
FY 2014	**67,382** ***(+ 3.4%)***	**39,289** ***(+ 3.0%)***
Jul-Dec 2014	69,106	39,574
Jan-Jun 2015[1]	71,248	41,568
FY 2015[1]	**70,173** ***(+ 4.1%)***	**40,523** ***(+ 3.1%)***
Jul-Dec 2015[1]	72,061	42,200
Jan-Feb 2016[1]	70,805	40,075
FY 2016 YTD[1,2]	**71,756** ***(+ 4.2%)***	**41,697** ***(+ 5.9%)***

1. Based on preliminary data
2. Based on data through February 2016. The annual percent change is based on July-February data

Transactions by Time Period

Observed transactions by time period for average weekdays in CY 2014 were examined and compared to forecasts. The time periods used in this analysis correspond to the time periods of the toll rates (which are different on weekdays and weekends). Table 2-12 shows the number of actual transactions per weekday toll period, the payment method proportion, and the share of transactions by time period (observed versus assumed in the November 2014 forecast).

The share of *Good To Go!* transactions tend to be higher during the morning commute peak period, with a ratio of 90 percent or more between 5:00 am and 9:00 am. The share of weekday transactions by toll period in CY 2014 has followed the IG forecast amounts very closely.

Table 2-12: CY 2014 Average Weekday Toll Period Transactions and Payment Shares

Toll Period	Actual Transactions	Good To Go![1] (% of Txns)	Pay By Mail[2] (% of Txns)	2014 Observed % of Day[3]	2014 IG Forecast % of Day[4]
05:00-05:59	799	90%	10%	1%	1%
06:00-06:59	2,520	90%	10%	4%	4%
07:00-08:59	11,749	90%	10%	17%	16%
09:00-09:59	5,308	88%	12%	8%	7%
10:00-13:59	14,622	82%	18%	21%	21%
14:00-14:59	3,943	82%	18%	6%	6%
15:00-17:59	16,076	86%	14%	23%	24%
18:00-18:59	4,924	86%	14%	7%	7%
19:00-20:59	5,394	85%	15%	8%	8%
21:00-22:59	3,458	82%	18%	5%	5%
Total	**68,794**	**86%**	**14%**	**100%**	**100%**

1. Includes Pay By Plate and transponders
2. Includes NOCP Toll and leakage
3. Observed proportion of CY 2014 transactions by time period
4. Proportion of transactions by time period in the November 2014 forecast

Source: WSDOT toll transaction data provided to CDM Smith on 5/8/15, CDM Smith November 2014 forecast
Note that later resolution of transactions is possible and could affect above breakout slightly.

Vehicle Classification

Table 2-13 indicates how the FY 2015 observed proportion of trucks compared to the forecast, in terms of share of transactions and share of gross toll revenue potential.

The table shows that the actual truck percentages were very close to the November 2014 forecast, both in terms of share of transactions and share of gross toll revenue potential.

Table 2-13: FY 2015 Truck Percentages – Actuals vs. Forecast

Trucks	Forecast[1]	Actuals[2,3]
Truck Share of Transactions[4]		
Jul 2014-Dec 2014	0.7%	0.6%
Jan 2015-Jun 2015	0.7%	0.7%
FY 2015	**0.7%**	**0.7%**
Truck Share of Potential Revenue[4]		
Jul 2014-Dec 2014	1.5%	1.3%
Jan 2015-Jun 2015	1.5%	1.4%
FY 2015	**1.5%**	**1.3%**

1. Forecast based on November 2014 forecast
2. For CY 2014, actuals are based on WSDOT toll transaction data provided to CDM Smith on 5/8/15
3. For CY 2015, actuals are based on WSDOT monthly lane equipment data and adjustments by CDM Smith
4. Trucks defined as three or more axles

Table 2-14 shows how the truck share of transactions and the truck share of gross toll revenue potential have evolved over time. The proportion of trucks among toll transactions started at a very low level (around 1.0 percent) and decreased by the beginning of CY 2013, but has been stable since. The contribution of trucks to overall gross revenue follows the same pattern.

Table 2-14: Trends in Actual Truck Shares

Trucks	Truck Share of Transactions	Truck Share of Revenue
Jan-Jun 2012	1.0%	2.2%
FY 2012	**1.0%**	**2.2%**
Jul-Dec 2012	1.0%	1.9%
Jan Jun 2013	0.7%	1.5%
FY 2013	**0.8%**	**1.7%**
Jul-Dec 2013	0.7%	1.3%
Jan-Jun 2014	0.6%	1.2%
FY 2014	**0.6%**	**1.3%**
Jul-Dec 2014	0.6%	1.3%
Jan-Jun 2015[1]	0.7%	1.4%
FY 2015[1]	**0.7%**	**1.3%**

1. Based on preliminary data

SR 520 and I-90 Bridge Closures

The number of closure days for the SR 520 bridge is calculated based on whether or not both directions are closed and the closure time frame during the tolling period. For instance, a day with the bridge closed in one direction only is counted as half-day, and a day with full closure during half of the tolling period is also counted as half-day. The traffic and revenue forecast (November 2014 forecast) had assumed 15.5 closure days on SR 520 in FY 2015. In reality, 13.1 closure days occurred in FY 2015 (2.4 days less than expected). This helped raise total actual transactions by approximately 100,000 and gross toll revenue potential by approximately $235,000.

In addition, the I-90 bridge also experienced lane closures related to construction of the I-90 Two-Way Transit and HOV Operations project. When the I-90 bridge is partially closed, traffic on SR 520 is significantly higher than usual. These I-90 closures are not accounted for in the forecast. During FY 2015, partial closures of I-90 happened for a total of twelve (12) weekend days. An analysis by CDM Smith determined that I-90 closures added an estimated 155,000 toll transactions and about $415,000 to the gross toll revenue potential in FY 2015.

Transactions by Home Zip Code

WSDOT provided a summary of SR 520 toll transactions that occurred in October 2014, with information about the Zip code of the drivers using the facility. The GTG! Zip codes are based upon their GTG! account registration in the system. The PBM customer Zip codes are from their vehicle registration. The transactions are summarized by *Good To Go!* and Pay By Mail categories.

The results are illustrated in Figure 2-6 and summarized in Table 2-15.

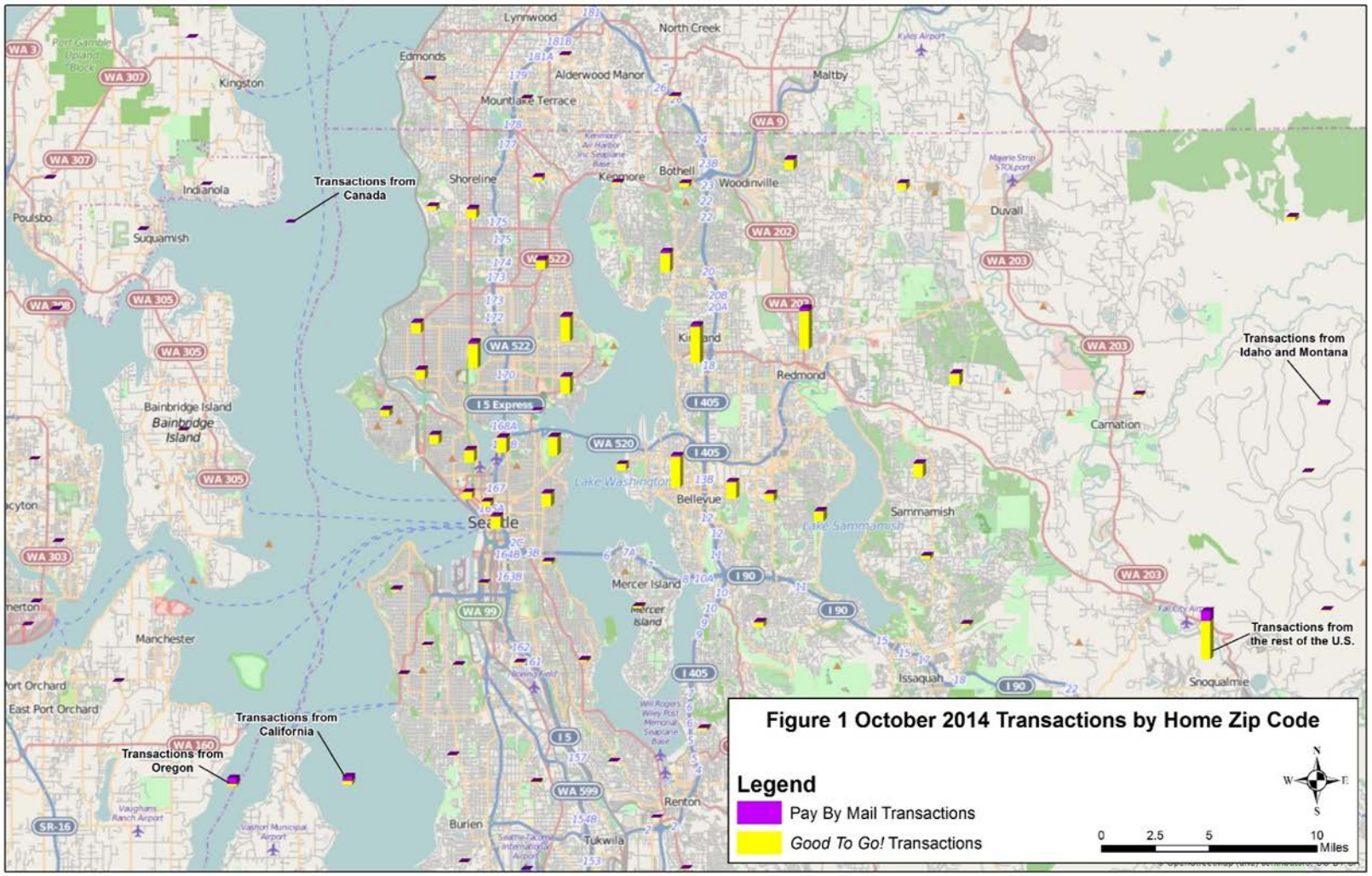
As expected, a vast majority of users reside in Seattle, Bellevue, Kirkland, and Redmond. Together, these four cities represent 68 percent of drivers. Only 3.3 percent of drivers do not reside in the state of Washington.

Table 2-15: Summary of October 2014 Transactions by Home Area

October 2014	*Good To Go!* Transactions	Pay By Mail Transactions	Total Transactions	Transaction Percentage
Bellevue	221,540	16,153	237,693	12.9%
East King County	204,713	26,996	231,709	12.6%
Kirkland	173,389	14,196	187,585	10.2%
Kitsap County	4,133	1,120	5,253	0.3%
Redmond	123,298	9,483	132,781	7.2%
Seattle North	294,396	26,316	320,712	17.4%
Seattle South	340,160	34,696	374,856	20.4%
South King County	45,610	19,967	65,577	3.6%
Rest of Washington	162,877	59,325	222,202	12.1%
Oregon	2,359	5,206	7,565	0.4%
California	3,433	4,044	7,477	0.4%
Rest of the US	35,282	10,478	45,760	2.5%
Canada	9	8	17	0.0%
Outside US and CAN	86	188	274	0.0%
Total	**1,611,285**	**228,176**	**1,839,461**	**100.0%**

Note: 50 records had no zip code and were listed as in the rest of the US.
Source: WSDOT and CDM Smith analysis

Figure 2-6: October 2014 Transactions by Home Zip Code



This page intentionally left blank to allow for double-sided printing.

Chapter 3

Regional Demographics & Economic Trends

Economic growth is an important factor in evaluating the expected revenue from a toll facility. CDM Smith retained Community Attributes Inc. (CAI) to conduct a review of recent trends in economic activity and growth in the region, and provide an updated independent economic forecast. CAI had provided the economic forecasts used in the original (2011) traffic and revenue investment grade forecast as well as the subsequent updates.

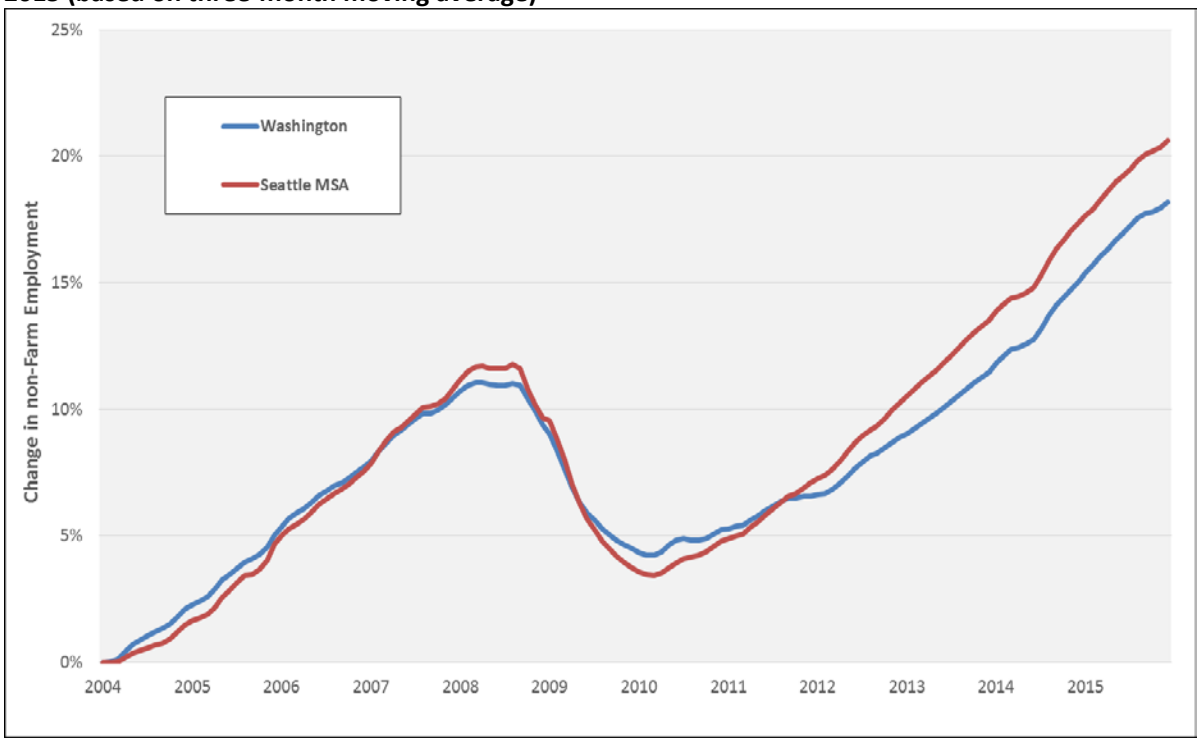
Measures of Economic Activity and Growth in the Region

This section details important recent economic growth, population, and housing and income trends in the region, with emphasis on King County and areas within the SR 520 travel shed.

Employment

Regional growth has been strong in recent years. The Seattle MSA—an area encompassing both King and Snohomish counties—experienced a cumulative employment growth of 21 percent between 2004 and 2015 (Figure 3-1). The region has now experienced five years of continuous employment growth, dating from the last recession in 2010.

Figure 3-1: Percent Cumulative Change in non-Farm Employment, Seattle MSA and Washington, 2004-2015 (based on three-month moving average)

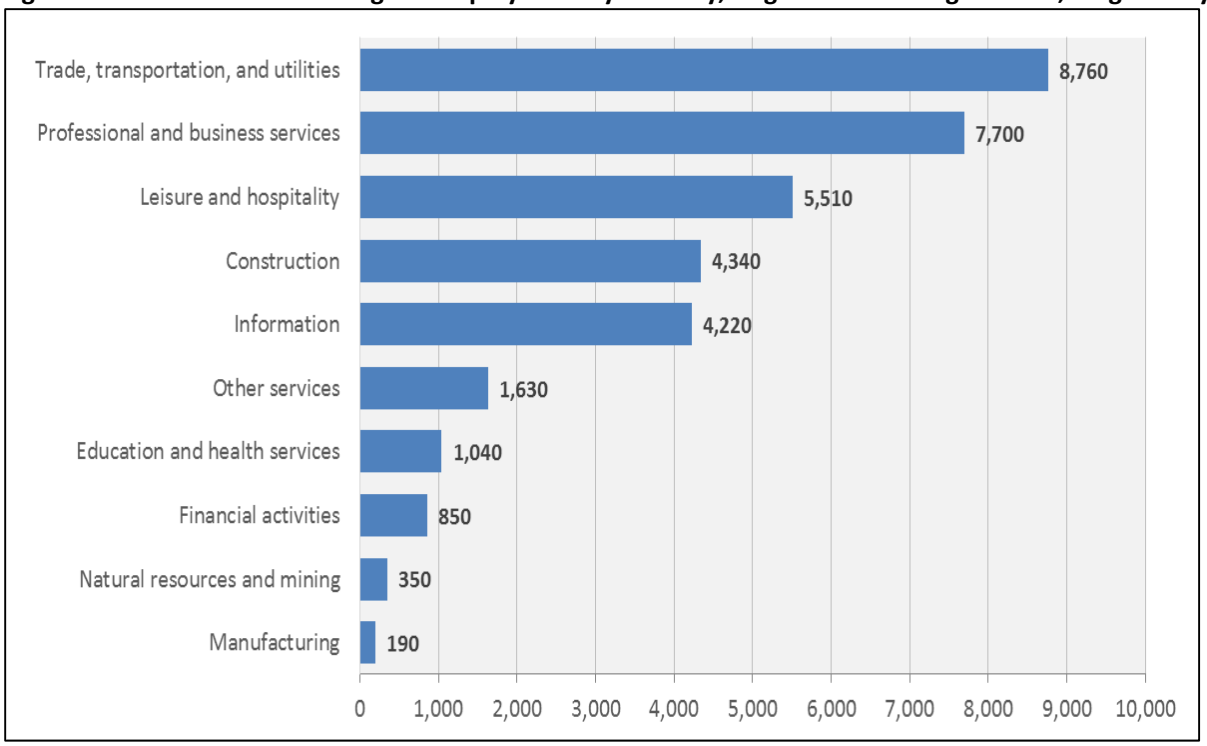


Source: Washington State Employment Security Department, 2016; Community Attributes Inc., 2016

King County is the largest labor market in Washington, with 1.3 million non-farm jobs in 2015, equal to 42 percent of all non-farm jobs in Washington. Between 2014 and 2015, King County added approximately 49,000 jobs, or 3.2 percent year-over-year growth. Washington State as a whole grew by 3.0 percent over this same period (addition of 91,000 jobs).

More recently, between August 2014 and August 2015, King County added 34,590 jobs, with the two largest year-over-year gains in trade, transportation, and utilities, and professional and business services, growing by 8,760 and 7,700 workers, respectively. Other significant sectors of growth were in leisure and hospitality, construction, and information. The manufacturing sector added 190 workers (Figure 3-2).

Figure 3-2: Year-over-Year Change in Employment by Industry, August 2014 to August 2015, King County



Source: Washington State Employment Security Department, 2016; Community Attributes Inc., 2016

Two important sources of recent growth in King County have been in aerospace and information & communication technology (ICT). The aerospace sector in 2015 employed an annual average of 88,700 across King and Snohomish Counties (Seattle MSA region); 2015 employment was slightly below 2014 levels in the region, but still 15.2 percent above the most recent low (in 2010). Of the 81,900 reported workers at the end of 2014, 30,400 were located in King County. Major locations in the county include Seattle (carbon fiber composites and testing), Auburn (fabrication), and Renton (final assembly of the 737 and Poseidon military aircraft).

In 2013, there were an estimated 176,000 ICT jobs across the state, the majority of these concentrated in Bellevue, Redmond, Kirkland, and Seattle. The Seattle MSA has 4.3 times the number of ICT workers as compared to the U.S. average. Software publishing, the largest single segment of the regional ICT cluster, experienced a modest decline in jobs in 2015, but remains nearly 16 percent above levels in 2007. Since 2001, industry employment has growth more than 50 percent. ICT is also an important source of broad-based economic development, primarily through the high wages paid among many

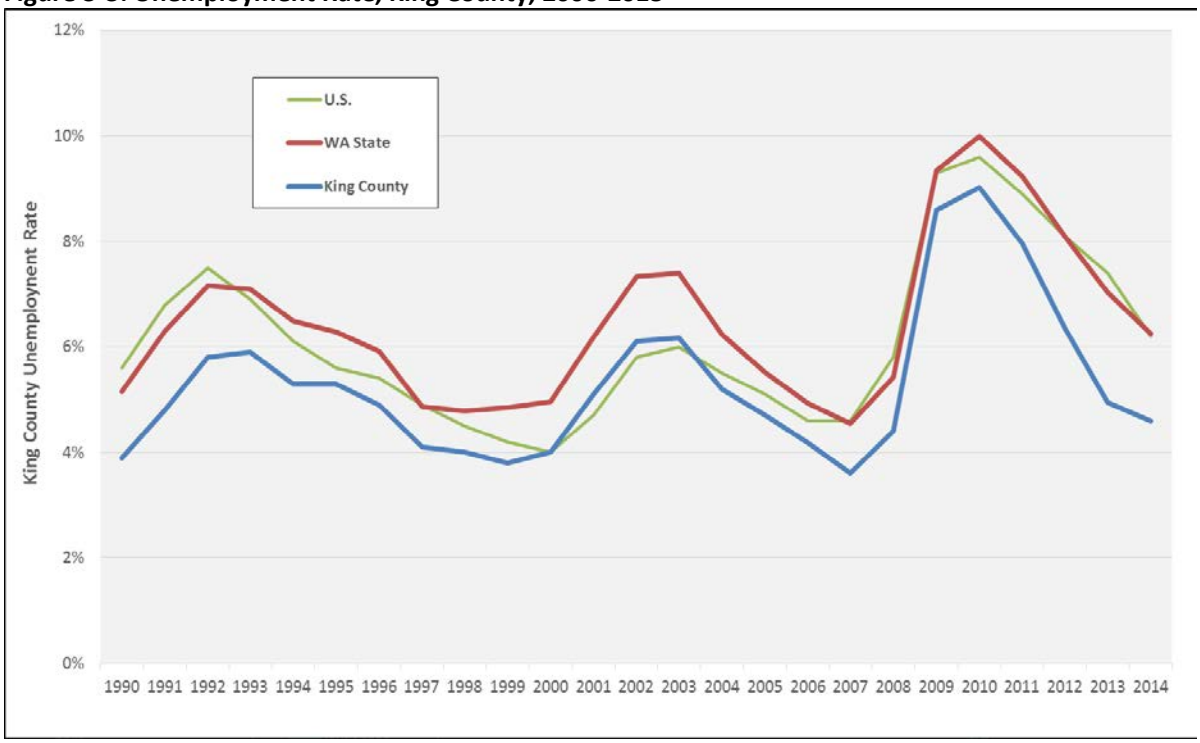
ICT positions across the county. Microsoft, headquartered in Redmond, WA, employs 43,000 workers across the county, primarily concentrated on the east side of the 520 bridge (Redmond and Bellevue).

Much of the recent growth in South Lake Union and the north end of the central business district in Seattle can be attributed to Amazon. The company employs approximately 24,000 workers at its South Lake Union headquarters in Seattle and is likely to continue hiring more employees as the company strives to continue its rapid growth in international markets. Other notable employers across the county include Starbucks (headquartered in the SoDo district of Seattle), Costco (headquartered in Issaquah), and the University of Washington (19,800 faculty and staff). King County government itself employs 13,400 workers to assist in a wide range of public services ranging from basic utilities to policy analysts helping to find solutions to issues of housing affordability and homelessness in the Seattle metro area.

Unemployment in King County has historically been lower than the rest of Washington and the United States since 2003. As of January 2016, the county-wide unemployment rate was 5.2 percent. For the Seattle MSA, including both King and Snohomish Counties, the average unemployment rate for 2015 was 4.6 percent, compared with the statewide unemployment rate of 5.7 percent and 5.3 percent nationally. The regional (MSA) unemployment rate has experienced a strong decline since a peak of 9.4 percent in 2010, and much faster than the statewide and national declines (Figure 3-3).

However, some areas of the county have experienced sustained high rates of unemployment. As of 2014 (most recently available data for cities), Kent and Auburn unemployment rates were 8 percent and 7 percent, respectively.[12]

Figure 3-3: Unemployment Rate, King County, 2000-2015



Source: U.S. Census Bureau, 2015; Community Attributes Inc., 2016

[12] U.S. Census Bureau, American Community Survey, 2016.

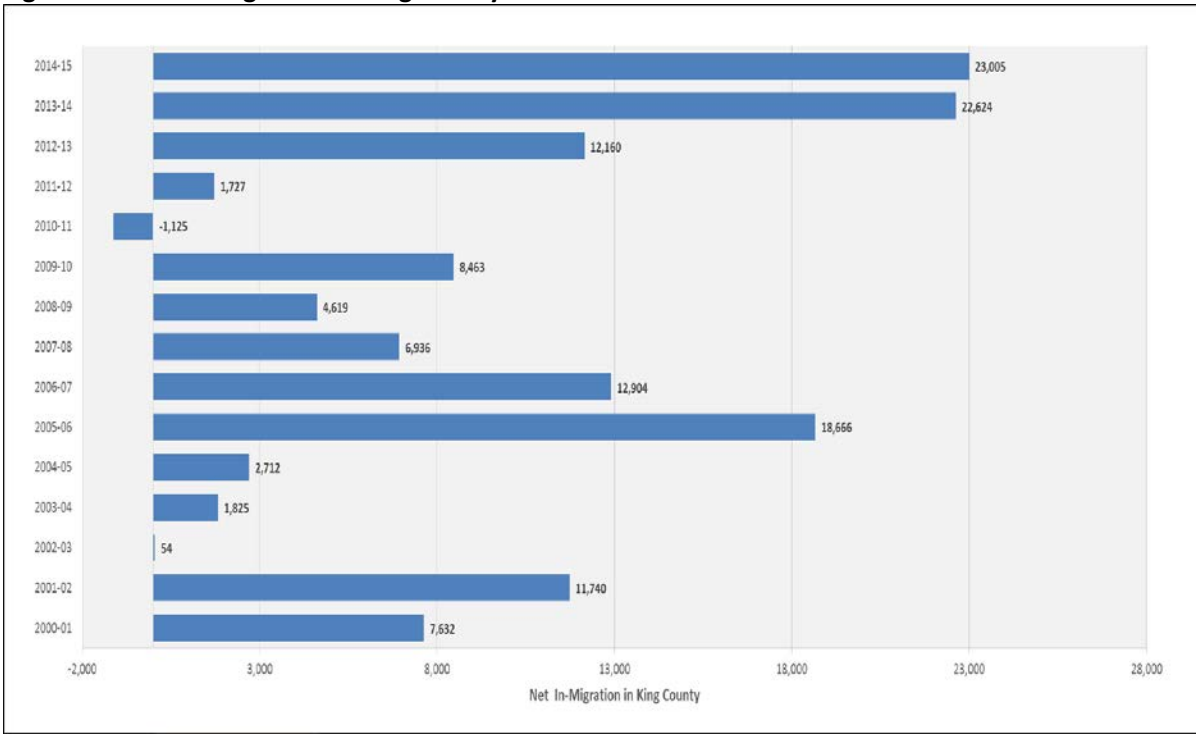
Population & Migration

King County's population in 2015 grew year-over-year 1.8 percent, compared with 1.3 percent for the state overall. This was above the ten-year county trend of approximately 1.2 percent per year, and 1.1 percent for the state; both are above the U.S. growth rate of 0.8 percent over this period.

There were an estimated 23,005 more new residents over out-migrants in the county between 2014 and 2015; this was more than double the net increase in 2012-2013 (12,160).[13] Net-migration in the previous period (2013-2014) was nearly as high (22,624); the last time there were consecutive years of similarly large net in-migration was from 1996 to 1998 (Figure 3-4).

Much of this recent net inflow of new residents reflects the pace of economic activity the county has experienced in recent years. A large number of new residents are moving to Seattle and Eastside cities either for an existing job opening or in anticipation of finding employment. This is particularly the case in the ICT sector; in 2014, 4,100 individuals relocated from the Bay Area to the region, attracted to more affordable housing and job growth in the technology industries.[14]

Figure 3-4: Net In-Migration in King County



Sources: U.S. Census Bureau, 2015; Community Attributes Inc., 2016

[13] Net-migration into King County has experienced a fairly cyclical pattern since 2000, with periods of peaks and valleys, with only one instance of negative net migration (-1,125 in 2010-2011). In spite of negative net migration, King County experienced natural growth of 12,476 people, resulting in a net population increase of 11,351, or 0.59% growth. In the past two years, net-in migration has been very high by historical standards.

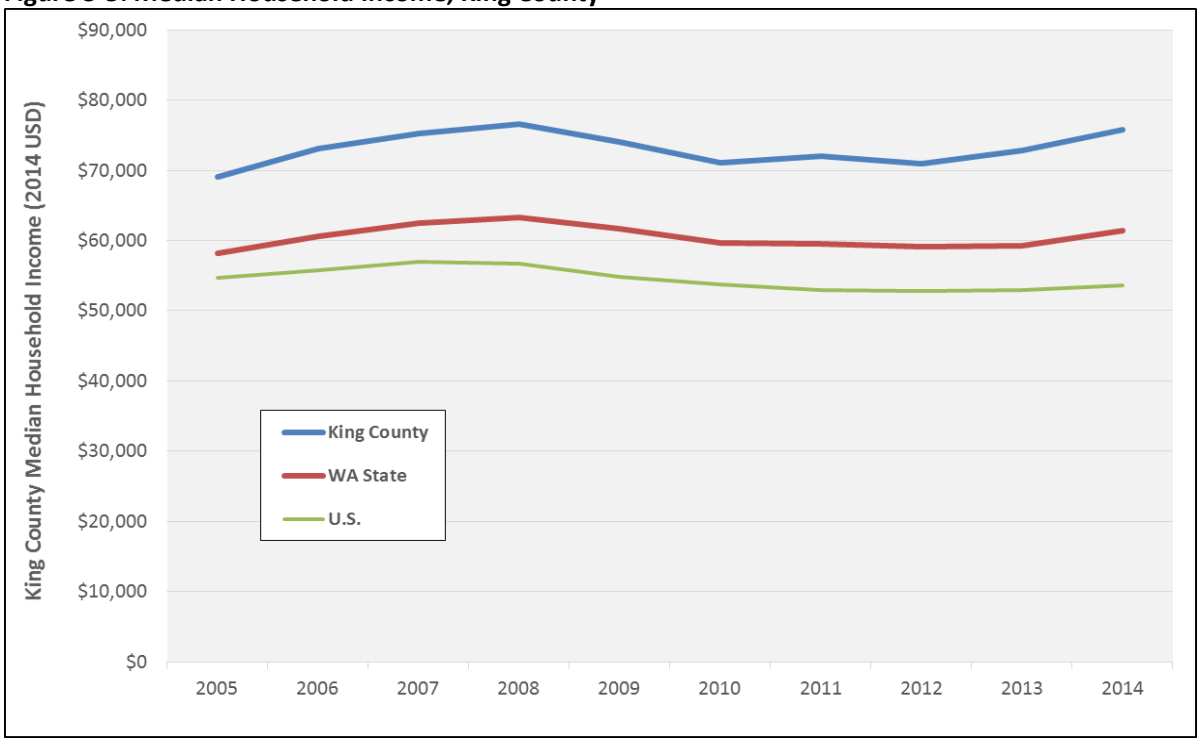
[14] Rascoff, S. (2016, February 25th). Seattle newcomers need to join the conversation on growth. Seattle Times.

The current inflow of workers has resulted in greater population density across neighborhoods in Seattle. Since 2010, Seattle has experienced a 9.8 percent growth in population density, reaching 7,962 residents per square mile in 2014. Some neighborhoods have experienced much greater densification, such as South Lake Union; between 2012 and 2014, population density has increased 12.6 percent. Some parts of Ballard have grown 6 percent over the same time period. Other parts of Seattle have experienced little or even negative changes in population density. Laurelhurst and Rainier Beach have both had large percentage decreases in population of -5.4 percent and -4.6 percent respectively.

Income & Housing Construction

King County's median household income has historically been significantly higher than the rest of Washington and the U.S. In 2014, the median household income in King County was $75,800, compared with $61,400 for Washington as a whole and $53,000 overall in the U.S.. Household incomes in King County have also started to reach their pre-recession levels, adjusted for inflation. Inflation-adjusted median household income in King County remains slightly below levels in 2008 (0.2 percent below), but is catching up much faster than Washington (0.5 percent below 2008 levels) and the U.S. (0.9 percent below) (Figure 3-5).

Figure 3-5: Median Household Income, King County

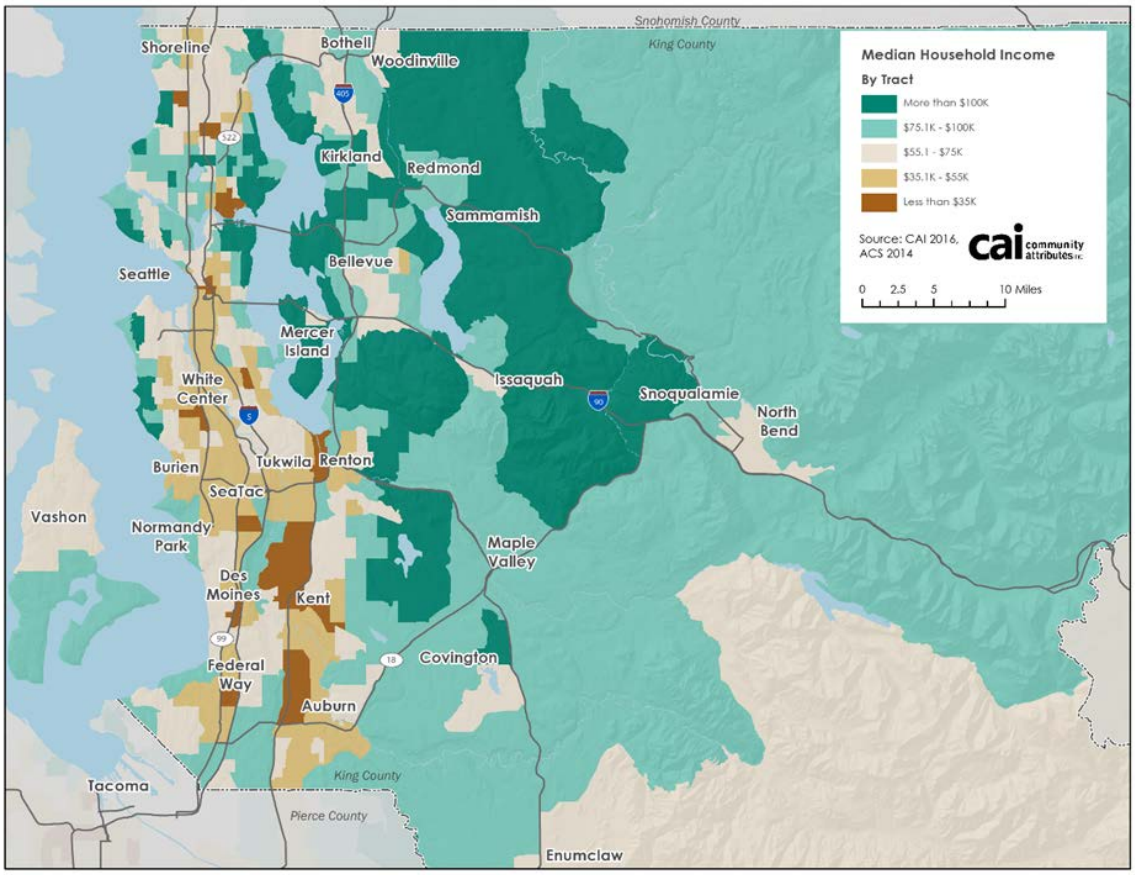


Source: U.S. Census Bureau, 2015; Community Attributes Inc., 2016

Figure 3-6 below illustrates median household income by census tract across King County. There are notable concentrations of wealth in north Seattle and the Eastside cities, such as Bellevue and Redmond. Lower incomes can be found in Kent, Auburn and Federal Way. In the Kent and Auburn area, approximately 44 percent of residents are below 200 percent of the federal poverty line. Similarly, the educational attainment level in these areas is generally lower than more affluent parts of

the county. There are some Kent and Auburn zip codes where 87 percent of residents do not have a college education.

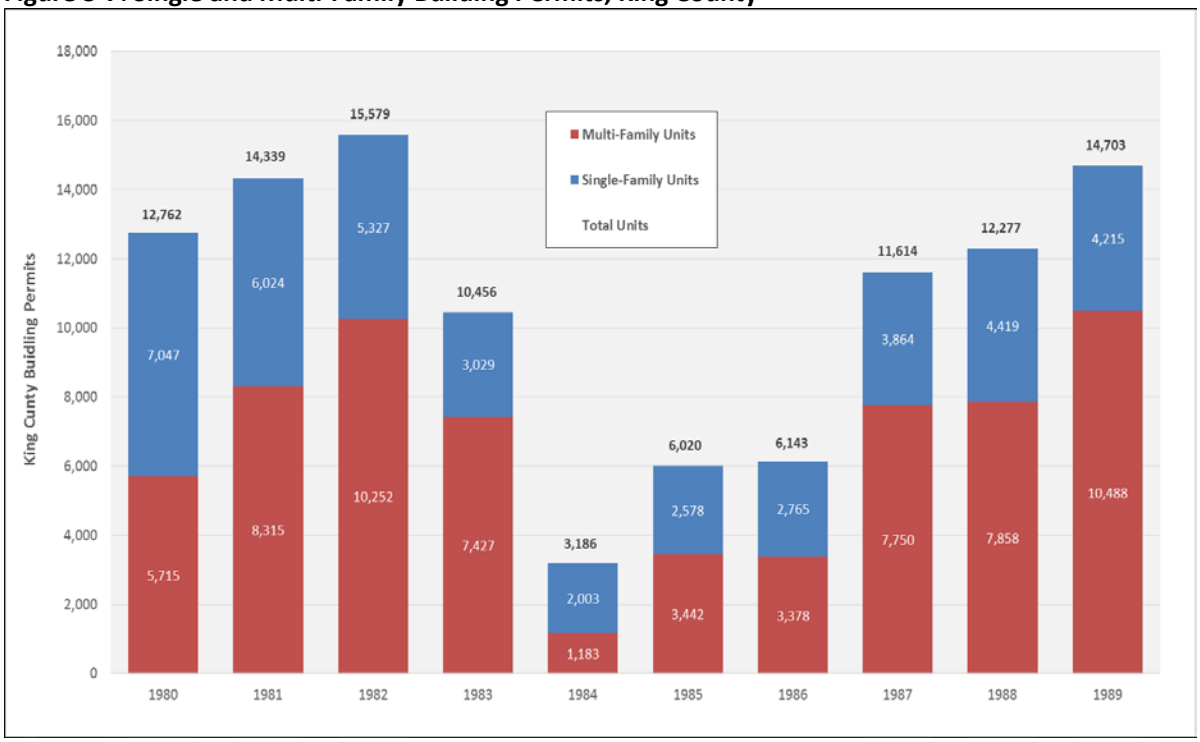
Figure 3-6: Map of Median Household Income by Census Tract, 2014



Source: American Community Survey, 2014; Community Attributes Inc., 2016

Historical trends in housing permits serve as a useful economic indicator. New construction often reflects growing wealth in a regional economy and resulting demand for housing and investment. Housing permits in King County have rebounded strongly from a post-recession nadir in 2009. Since a low of 3,186 total housing permits in 2009, building permits have increased at an annualized rate of 5.8 percent, to 14,703 new permits in 2014. Of total housing permits, 10,488 permits were for multi-family, with the remainder (4,215) for single family construction. Generally, multi-family housing permits have accounted for a larger share of total housing permits. The share of multi-family housing has steadily increased in recent years, from 37 percent of all new permits in 2009 to 71 percent in 2014 (Figure 3-7).

Figure 3-7: Single and Multi-Family Building Permits, King County



Sources: U.S. Census Bureau, 2015; Community Attributes Inc., 2016.

Updated Socioeconomic Forecasts

Future levels of population and employment in the bridge market area are important because they are an indication of cross-lake travel demand as well as a determinant of highway congestion levels influencing the attractiveness of alternatives to the SR 520 bridge. The CDM Smith team developed independent forecasts of population and employment based on estimates of current socioeconomic variables and forecasts of future socioeconomic activity. The forecasts were developed for the Seattle metropolitan planning region which includes King, Snohomish, Pierce, and Kitsap counties. These forecasts were updated in July 2015 to reflect current economic conditions, updated regional forecasts, projected development in Seattle and Eastside King County communities, and current market conditions, such as office occupancy rates and housing unit absorption trends.

The updated socioeconomic forecasts are compared to previous forecasts used in the November 2014 traffic and revenue forecast.

Methodology

CAI provided updated socioeconomic forecasts for use in the revised toll revenue forecast. The update benefited from newly released population and employment data from Washington State Office of Financial Management (OFM), the Puget Sound Regional Council (PSRC), and the U.S. Bureau of Labor Statistics.

The analysis followed methods similar to those used for the November 2014 forecast. The approach included reviewing current estimates and forecasts of socioeconomic measures for the overall region

and employment sectors, and sub-regional differences in estimated population and employment growth. From this, a Baseline Scenario for regional growth was developed covering the Central Puget Sound Region. Then, utilizing this baseline information along with other adjustments, such as estimates of new building growth absorption, detailed estimates and forecasts at a finer geographic scale were developed. This finer geographic scale was compatible with the main regional travel demand model developed by PSRC and the tolling analysis model developed for this study.

The methodology leveraged existing regional and national resources, along with primary data gathered expressly for this analysis, such as real estate development pipeline and market data. Population baseline data were collected from the Washington State Office of Financial Management, which provides Census-based estimates of population and households at the Traffic Analysis Zone (TAZ) level for the year 2015. In addition to these 2015 base estimates, PSRC's 2013 population estimates provide the most recent data available for income-based population distributions. PSRC data also provides estimates of the percent of population residing in multi-family dwellings. CAI's analysis used these PSRC estimates.

Employment baseline data were drawn from PSRC employment estimates at the TAZ level and total sector-based employment at the forecast analysis zone (FAZ) level. The PSRC's estimates include total employment for year 2014, thus capturing both covered employment—the vast majority of workers—and the self-employed.

The population forecasts relied heavily on Conway-Pedersen regional forecasts through 2024 released in March 2015, which cover the entire four-county region. Conway Pedersen reports are widely recognized to be one of the best regional forecasts in the greater Seattle area and have been used for many years. For the years 2030 and 2040, CAI employed trend line analysis based on a combination of historic estimates and Conway Pedersen forecasts.

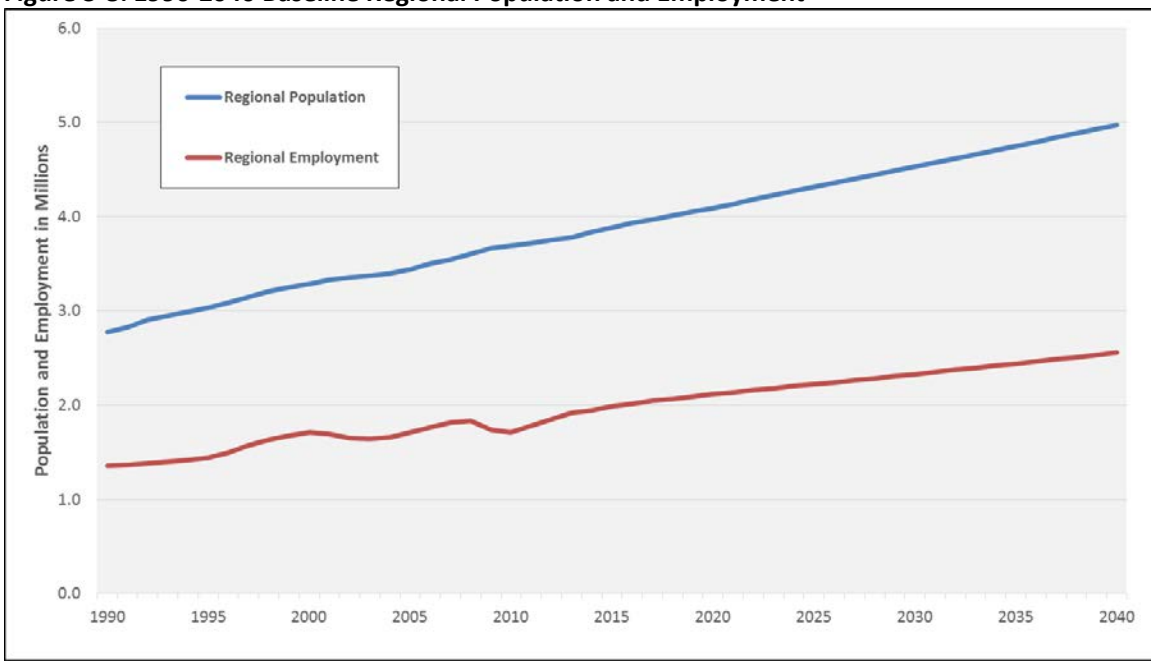
Employment forecasts by macro-sector were made based on a combination of PSRC and Conway Pedersen region and county-based forecasts. Once allocated to TAZs, additional development pipeline information was used to further refine the forecast. The resulting population and employment data by forecast years are used as direct input to the traffic forecasting process.

Regional Population and Employment Baseline Forecasts

Baseline population in the Central Puget Sound Region is expected to grow steadily from 3.8 million people in 2014 to almost 5 million by 2040, a compounded annual growth rate of 1.0 percent. Annual regional population growth is anticipated to be 1.1 percent from 2014 through 2020, then to slightly decrease to 1.0 percent through 2030. Figure 3-8 shows the population actuals and forecast, and Figure 3-9 shows the corresponding average annual changes.

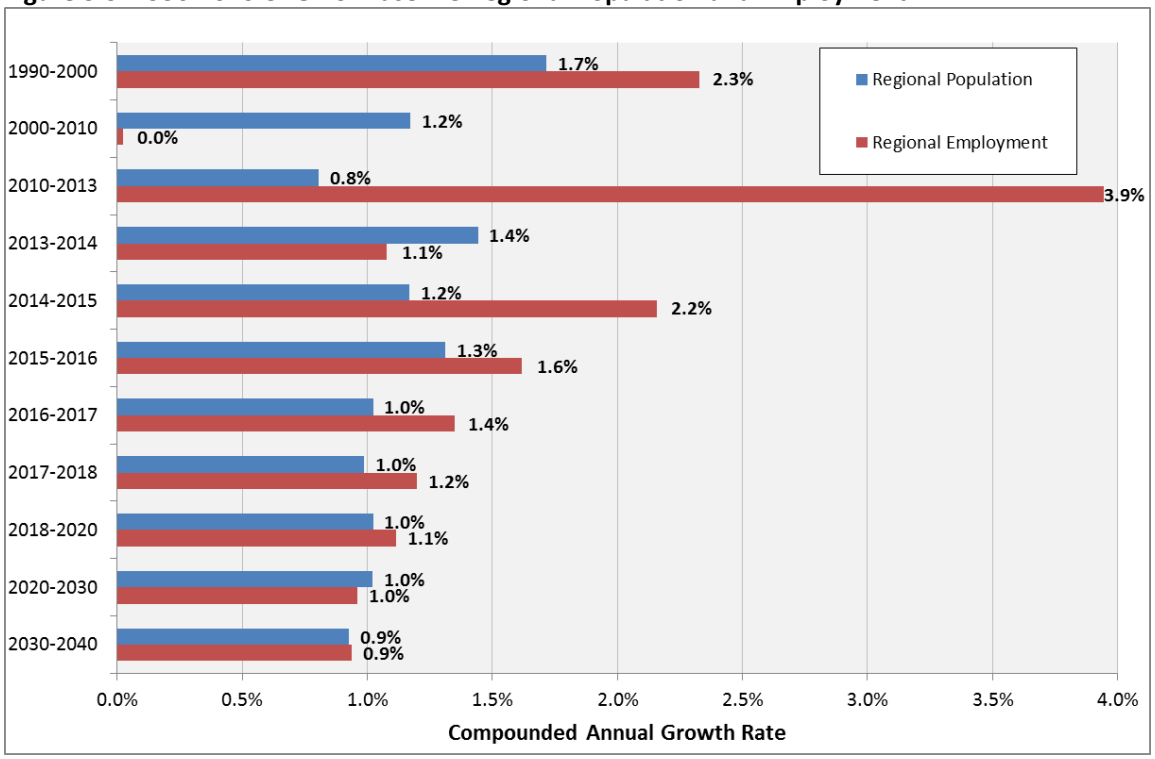
Regional employment is expected to grow from 1.9 million jobs in 2014 to 2.6 million in 2040, a compounded annual growth rate of 1.1 percent. Annual regional employment growth is anticipated to be 1.9 percent from 2014 through 2016, then decline to 1.4 percent from 2016 to 2017, and then decline to 1.1 percent from 2017 to 2020. Beyond 2020, the annual employment growth rate is anticipated to be 1.0 percent through 2030, then to slightly decrease to 0.9 percent. Figure 3-8 shows the employment actuals and forecast, and Figure 3-9 shows the corresponding average annual changes (compounded annual growth rate).

Figure 3-8: 1990-2040 Baseline Regional Population and Employment



Source: Conway Pedersen Economics, Community Attributes Inc., 2015

Figure 3-9: 1990-2040 CAGR of Baseline Regional Population and Employment



Source: Conway Pedersen Economics, Community Attributes Inc., 2015

Traffic Analysis Zone (TAZ) Level Analysis

The unit of analysis and projection in this study are Traffic Analysis Zones (TAZ). TAZ sizes range from a fraction of a square mile to several square miles based on the development density. Forecasts by TAZ are developed by allocation of the countywide forecasts. The allocations utilize core information from PSRC and data analyzed regarding real estate conditions (occupancy rates), development pipeline projections provided by private vendors and municipalities along the corridor, and economic events reported in local media such as Amazon -related construction in South Lake Union and development plans for the Bel-Red Road area in Bellevue.

An important difference compared with earlier studies is PSRC's adoption in 2013 of a new method for allocating its macroeconomic forecast by TAZ, based on a capacity-constraint approach for land use and demographic projections by TAZ. The UrbanSim model uses parcel data to determine where projected growth may occur, bringing a higher degree of precision over previous PSRC TAZ-level estimates. The TAZ-level forecasts in this report were based on the PSRC's updated 2015 TAZ-level projections which in turn is based on this capacity-constraint approach.

The near term projections were mainly driven by the Conway Pederson forecast through 2024. Average annual growth rates were calculated from this forecast and applied on a county-wide basis to baseline data. To arrive at TAZ level estimates, PSRC TAZ level distributions were applied to the Conway Pedersen county control totals. Growth forecasts by economic sector were integrated with real-estate development pipeline and absorption calculations and pertinent local economic news. Beyond 2020, trend line analysis was employed based on historic and Conway Pedersen forecast estimates to derive 2030 and 2040 estimates.

Near-Term Forecasts in Areas of Interest

Growth within the Central Puget Sound Region is not expected to be uniform, and the baseline forecast shows variations among the cities and neighborhoods that make up the area. Table 3-1 shows the near-term population and employment forecast by subareas, focusing on King County and the cities of Seattle, Bellevue, Kirkland, and Redmond.

King County population is expected to grow at a slower pace than the region during the 2014 to 2020 period, and to account for 43 percent of the regional population growth. The annual population growth in Seattle is forecasted to be 1.6 percent. On the Eastside, annual growth rates are expected to vary between 1.1 percent in Redmond and 1.8 percent in Bellevue. Overall, the cities of Seattle, Bellevue, Kirkland, and Redmond are expected to account for 79 percent of the population growth in King County population over the 2014-2020 period.

King County is expected to slightly outpace regional employment growth over the 2014 to 2020 period, and to account for 70 percent of the regional employment growth. The annual employment growth in Seattle is forecasted to be 2.9 percent; on the Eastside, Kirkland and Redmond are expected to grow at a lower rate of 2 percent, while the expected growth rate in Bellevue is 2.5 percent. Overall, the cities of Seattle, Bellevue, Kirkland and Redmond are expected to generate more jobs than the County as a whole over the period 2014 to 2020, meaning that the rest of the county is expected to experience a net decline in employment.

Table 3-1: Near-term Population and Employment Forecasts in Areas of Interest

	2014	2015	2016	2017	2018	2020	2014-2020 CAGR[1]
Population							
Four Major Cities	**890,700**	**906,300**	**927,200**	**946,400**	**958,600**	**977,800**	**1.6%**
Seattle	*640,300*	*651,400*	*667,700*	*683,900*	*692,600*	*704,200*	*1.6%*
Bellevue	*130,400*	*133,000*	*136,000*	*137,600*	*139,900*	*144,900*	*1.8%*
Kirkland	*52,600*	*53,500*	*53,900*	*54,500*	*55,100*	*56,600*	*1.2%*
Redmond	*67,400*	*68,400*	*69,600*	*70,400*	*71,000*	*72,100*	*1.1%*
King County	**2,017,200**	**2,035,900**	**2,056,200**	**2,073,900**	**2,091,300**	**2,127,400**	**0.9%**
Region	**3,835,500**	**3,880,300**	**3,931,300**	**3,971,500**	**4,010,800**	**4,093,300**	**1.1%**
Employment							
Four Major Cities	**782,000**	**809,400**	**832,300**	**855,900**	**877,800**	**919,200**	**2.7%**
Seattle	*535,300*	*554,400*	*570,000*	*586,700*	*602,500*	*637,300*	*2.9%*
Bellevue	*121,200*	*124,800*	*128,400*	*132,400*	*136,800*	*140,700*	*2.5%*
Kirkland	*35,700*	*36,500*	*36,800*	*38,100*	*39,100*	*40,100*	*2.0%*
Redmond	*89,800*	*93,700*	*97,100*	*98,700*	*99,400*	*101,100*	*2.0%*
King County	**1,250,800**	**1,283,700**	**1,305,500**	**1,323,800**	**1,340,100**	**1,371,000**	**1.5%**
Region	**1,942,800**	**1,984,700**	**2,016,800**	**2,044,100**	**2,068,600**	**2,115,000**	**1.4%**

1. Compounded annual growth rate

Source: Community Attributes Inc., 2015

Comparison with November 2014 Socioeconomic Forecasts

Comparison of the region and King County compound annual growth rates with the 2014 forecast are presented in Tables 3-2 and 3-4, respectively for population and employment. Comparison of the subarea forecasts with the 2014 forecasts are presented in Tables 3-3 and 3-5, respectively for population and employment. In both population and employment forecasts, differences with the prior forecast can be explained primarily by three important changes:

1. The new forecasts include an adjustment in the 2014 base year estimate compared with previous forecasts
2. Updates to the PSRC's UrbanSim model for TAZ-based allocations, which are reflected in the latest PSRC forecasts by TAZ
3. New developments, either underway or planned have shifted more growth to Seattle over the forecast period, especially in the Central Business District. These new projects in Seattle's CBD, including South Lake Union, largely reflect real estate demand and growth from Amazon and other tenants in this area.

Tables 3-2 and 3-3 show the November 2014 and revised November 2015 population forecast for the SR 520 corridor. Overall, when compared to the prior economic forecast, the population forecasts were adjusted slightly upwards for King County and for the region as a whole. The population growth rates remain virtually unchanged for the region and for King County.

Within King County, the total population forecast among the four major cities along the SR 520 corridor (Seattle, Kirkland, Bellevue, and Redmond) has been adjusted slightly upwards, primarily driven by more growth expected in Seattle and to a lesser extent in Bellevue. Projections for Kirkland have been reduced from the 2014 forecast.

Table 3-2: Comparison of Compound Annual Growth Rates for Population

Population CAGR	2014-2016	2016-2020	2020-2030	2030-2040
Region				
2015 Updated Forecast	1.2%	1.0%	1.0%	0.9%
2014 Forecast	1.1%	1.0%	1.0%	0.9%
King County				
2015 Updated Forecast	1.0%	0.9%	0.9%	0.8%
2014 Forecast	0.9%	0.8%	0.9%	0.8%

Source: Community Attributes Inc., 2015

Table 3-3: Population Forecast – Comparison with November 2014 Forecast

	2014	2015	2016	2017	2018	2020	2030	2040
2015 Updated Forecast								
Four Major Cities	**890,700**	**906,300**	**927,200**	**946,400**	**958,600**	**977,800**	**1,059,400**	**1,125,700**
Seattle	*640,300*	*651,400*	*667,700*	*683,900*	*692,600*	*704,200*	*747,800*	*789,700*
Bellevue	*130,400*	*133,000*	*136,000*	*137,600*	*139,900*	*144,900*	*171,100*	*180,100*
Kirkland	*52,600*	*53,500*	*53,900*	*54,500*	*55,100*	*56,600*	*59,500*	*64,100*
Redmond	*67,400*	*68,400*	*69,600*	*70,400*	*71,000*	*72,100*	*81,000*	*91,800*
King County	**2,017,200**	**2,035,900**	**2,056,200**	**2,073,900**	**2,091,300**	**2,127,400**	**2,331,900**	**2,533,600**
Region	**3,835,500**	**3,880,300**	**3,931,300**	**3,971,500**	**4,010,800**	**4,093,300**	**4,531,700**	**4,969,700**
2014 Forecast								
Four Major Cities	**884,900**	**905,000**	**919,200**	**928,900**	**937,500**	**955,200**	**1,032,800**	**1,096,900**
Seattle	*636,200*	*651,700*	*663,600*	*671,000*	*676,100*	*686,900*	*731,400*	*770,100*
Bellevue	*129,500*	*131,600*	*132,600*	*133,700*	*135,900*	*140,000*	*161,200*	*171,100*
Kirkland	*52,900*	*53,800*	*54,400*	*55,100*	*55,800*	*57,400*	*60,500*	*65,200*
Redmond	*66,300*	*67,900*	*68,600*	*69,100*	*69,700*	*70,900*	*79,700*	*90,500*
King County	**2,002,100**	**2,019,000**	**2,037,700**	**2,054,200**	**2,071,200**	**2,106,200**	**2,311,000**	**2,512,400**
Region	**3,834,900**	**3,875,200**	**3,922,500**	**3,960,700**	**3,999,700**	**4,080,700**	**4,517,100**	**4,951,900**
Absolute Difference								
Four Major Cities	**5,800**	**1,300**	**8,000**	**17,500**	**21,100**	**22,600**	**26,600**	**28,800**
Seattle	*4,100*	*(300)*	*4,100*	*12,900*	*16,500*	*17,300*	*16,400*	*19,600*
Bellevue	*900*	*1,400*	*3,400*	*3,900*	*4,000*	*4,900*	*9,900*	*9,000*
Kirkland	*(300)*	*(300)*	*(500)*	*(600)*	*(700)*	*(800)*	*(1,000)*	*(1,100)*
Redmond	*1,100*	*500*	*1,000*	*1,300*	*1,300*	*1,200*	*1,300*	*1,300*
King County	**15,100**	**16,900**	**18,500**	**19,700**	**20,100**	**21,200**	**20,900**	**21,200**
Region	**600**	**5,100**	**8,800**	**10,800**	**11,100**	**12,600**	**14,600**	**17,800**
Percentage Difference								
Four Major Cities	**0.7%**	**0.1%**	**0.9%**	**1.9%**	**2.3%**	**2.4%**	**2.6%**	**2.6%**
Seattle	*0.6%*	*0.0%*	*0.6%*	*1.9%*	*2.4%*	*2.5%*	*2.2%*	*2.5%*
Bellevue	*0.7%*	*1.1%*	*2.6%*	*2.9%*	*2.9%*	*3.5%*	*6.1%*	*5.3%*
Kirkland	*-0.6%*	*-0.6%*	*-0.9%*	*-1.1%*	*-1.3%*	*-1.4%*	*-1.7%*	*-1.7%*
Redmond	*1.7%*	*0.7%*	*1.5%*	*1.9%*	*1.9%*	*1.7%*	*1.6%*	*1.4%*
King County	**0.8%**	**0.8%**	**0.9%**	**1.0%**	**1.0%**	**1.0%**	**0.9%**	**0.8%**
Region	**0.0%**	**0.1%**	**0.2%**	**0.3%**	**0.3%**	**0.3%**	**0.3%**	**0.4%**

Source: Community Attributes Inc., 2015

Tables 3-4 and 3-5 show the November 2014 and revised November 2015 employment forecast for the SR 520 corridor. For employment, the regional and King County growth rates were adjusted upwards in the immediate short term. Starting in 2016, regional and King County employment growth rates are virtually unchanged from the November 2014 forecast.

On a subarea basis, Seattle is predicted to experience higher employment through 2040 than the prior forecast. For communities in the Eastside, projections suggest Kirkland employment will be higher, while Bellevue and Redmond employment will be lower through 2040, although at a much smaller scale than the increase in Seattle. Overall, the employment estimates for the combined four cities are slightly reduced in the short term, and are revised upwards starting in 2017. This is primarily driven by an increase in the expected amount of commercial space and employment in Seattle, and to a lesser extent in Kirkland.

Table 3-4: Comparison of Compound Annual Growth Rates for Employment

Employment CAGR	2014-2016	2016-2020	2020-2030	2030-2040
Region				
2015 Updated Forecast	1.9%	1.2%	1.0%	0.9%
2014 Forecast	1.7%	1.2%	0.9%	0.9%
King County				
2015 Updated Forecast	2.2%	1.2%	0.9%	0.9%
2014 Forecast	1.8%	1.2%	0.9%	0.9%

Source: Community Attributes Inc., 2015

Table 3-5: Employment Forecast – Comparison with November 2014 Forecast

	2014	2015	2016	2017	2018	2020	2030	2040
2015 Updated Forecast								
Four Major Cities	**782,000**	**809,400**	**832,300**	**855,900**	**877,800**	**919,200**	**1,007,100**	**1,095,000**
Seattle	*535,300*	*554,400*	*570,000*	*586,700*	*602,500*	*637,300*	*693,300*	*723,700*
Bellevue	*121,200*	*124,800*	*128,400*	*132,400*	*136,800*	*140,700*	*163,600*	*185,400*
Kirkland	*35,700*	*36,500*	*36,800*	*38,100*	*39,100*	*40,100*	*43,700*	*54,500*
Redmond	*89,800*	*93,700*	*97,100*	*98,700*	*99,400*	*101,100*	*106,500*	*131,400*
King County	**1,250,800**	**1,283,700**	**1,305,500**	**1,323,800**	**1,340,100**	**1,371,000**	**1,503,100**	**1,652,100**
Region	**1,942,800**	**1,984,700**	**2,016,800**	**2,044,100**	**2,068,600**	**2,115,000**	**2,327,400**	**2,555,400**
2014 Forecast								
Four Major Cities	**788,800**	**811,700**	**833,000**	**853,100**	**872,200**	**916,500**	**994,800**	**1,074,600**
Seattle	*536,500*	*550,800*	*563,400*	*577,900*	*591,900*	*625,000*	*674,900*	*702,200*
Bellevue	*125,000*	*129,300*	*134,900*	*138,200*	*141,300*	*146,200*	*167,800*	*188,100*
Kirkland	*36,100*	*36,700*	*36,900*	*36,900*	*36,600*	*37,600*	*40,300*	*50,400*
Redmond	*91,200*	*94,900*	*97,800*	*100,100*	*102,400*	*107,700*	*111,800*	*133,900*
King County	**1,271,100**	**1,295,300**	**1,316,900**	**1,335,800**	**1,352,200**	**1,382,300**	**1,504,700**	**1,643,700**
Region	**1,956,400**	**1,990,800**	**2,022,400**	**2,050,200**	**2,074,700**	**2,120,200**	**2,321,200**	**2,537,000**
Absolute Difference								
Four Major Cities	**(6,800)**	**(2,300)**	**(700)**	**2,800**	**5,600**	**2,700**	**12,300**	**20,400**
Seattle	*(1,200)*	*3,600*	*6,600*	*8,800*	*10,600*	*12,300*	*18,400*	*21,500*
Bellevue	*(3,800)*	*(4,500)*	*(6,500)*	*(5,800)*	*(4,500)*	*(5,500)*	*(4,200)*	*(2,700)*
Kirkland	*(400)*	*(200)*	*(100)*	*1,200*	*2,500*	*2,500*	*3,400*	*4,100*
Redmond	*(1,400)*	*(1,200)*	*(700)*	*(1,400)*	*(3,000)*	*(6,600)*	*(5,300)*	*(2,500)*
King County	**(20,300)**	**(11,600)**	**(11,400)**	**(12,000)**	**(12,100)**	**(11,300)**	**(1,600)**	**8,400**
Region	**(13,600)**	**(6,100)**	**(5,600)**	**(6,100)**	**(6,100)**	**(5,200)**	**6,200**	**18,400**
Percentage Difference								
Four Major Cities	**-0.9%**	**-0.3%**	**-0.1%**	**0.3%**	**0.6%**	**0.3%**	**1.2%**	**1.9%**
Seattle	*-0.2%*	*0.7%*	*1.2%*	*1.5%*	*1.8%*	*2.0%*	*2.7%*	*3.1%*
Bellevue	*-3.0%*	*-3.5%*	*-4.8%*	*-4.2%*	*-3.2%*	*-3.8%*	*-2.5%*	*-1.4%*
Kirkland	*-1.1%*	*-0.5%*	*-0.3%*	*3.3%*	*6.8%*	*6.6%*	*8.4%*	*8.1%*
Redmond	*-1.5%*	*-1.3%*	*-0.7%*	*-1.4%*	*-2.9%*	*-6.1%*	*-4.7%*	*-1.9%*
King County	**-1.6%**	**-0.9%**	**-0.9%**	**-0.9%**	**-0.9%**	**-0.8%**	**-0.1%**	**0.5%**
Region	**-0.7%**	**-0.3%**	**-0.3%**	**-0.3%**	**-0.3%**	**-0.2%**	**0.3%**	**0.7%**

Source: Community Attributes Inc., 2015

Downside Alternative Scenario

In order to provide input for sensitivity analysis of the transactions and revenue estimates, a downside alternative scenario forecast was also developed. It should be noted that the downside alternative scenario depicts a situation that is not likely to occur. The sources for population and employment forecasts in the baseline and downside alternative scenarios are as follows:

- **Baseline Scenario:** Conway Pedersen Economics control totals for population and employment
- **Downside Alternative Scenario:** Employment and population growth rates cut in half from the baseline scenario, except during periods when growth was negative (in which case growth remained unchanged).

The results of the baseline scenario and the downside alternative are summarized for the entire region in Tables 3-6 (regional population) and 3-7 (regional employment), and shown graphically in Figures 3-10 (regional population) and 3-11 (regional employment). These tables and figures also include the latest (as of October 2014) PSRC-based forecast as an additional comparison.

The downside regional forecast results in regional population of 4,362,000 in 2040 versus a baseline forecast of 4,969,700 (12.2 percent lower than the baseline). Regional employment is projected to be 2,227,000 in the downside scenario versus a baseline forecast of 2,555,400 jobs in 2040 (12.9 percent lower than baseline).

Note that this downside scenario is not considered likely but was considered for the purposes of sensitivity testing. Since both population and employment affect travel demand, the effect of lower population and/or employment growth is considered a downside risk for toll revenue. Lower growth rates and resulting lower travel demand was one of the risk factors evaluated in the sensitivity analysis presented in Chapter 7 of this report.

Table 3-6: Comparison of Regional Population Forecasts

	2014	2015	2016	2017	2018	2020	2030	2040
Regional Population (millions)								
PSRC 2014	3.83	3.88	3.93	3.98	4.02	4.12	4.50	4.97
Baseline Scenario (CAI 2014)	3.83	3.88	3.92	3.96	4.00	4.08	4.52	4.95
Downside Alternative (CAI 2015)	3.84	3.86	3.88	3.90	3.92	3.96	4.16	4.36
Baseline Scenario (CAI 2015)	**3.84**	**3.88**	**3.93**	**3.97**	**4.01**	**4.09**	**4.53**	**4.97**
Percentage Difference from CAI 2015 Baseline								
PSRC 2014	-0.2%	0.1%	-0.1%	0.1%	0.2%	0.7%	-0.7%	0.1%
Baseline Scenario (CAI 2014)	0.0%	-0.1%	-0.2%	-0.3%	-0.3%	-0.3%	-0.3%	-0.4%
Downside Alternative (CAI 2015)	0.0%	-0.6%	-1.3%	-1.8%	-2.3%	-3.3%	-8.1%	-12.2%
Baseline Scenario (CAI 2015)	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

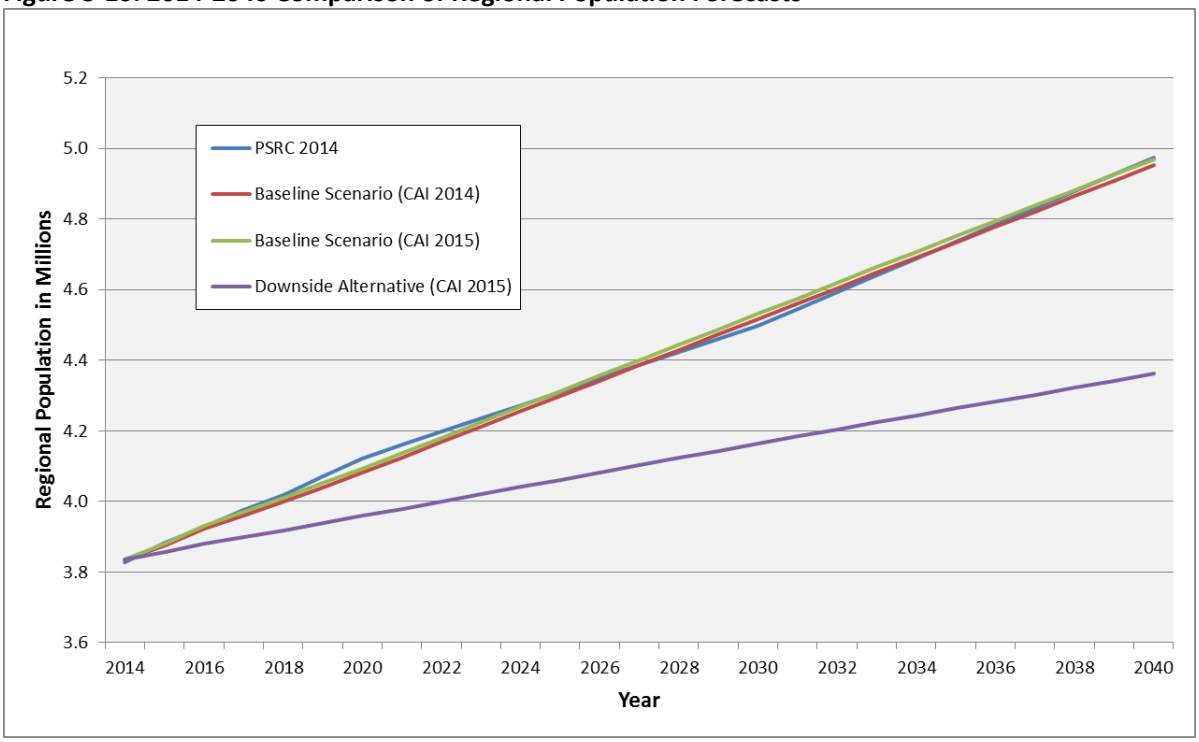
Source: Community Attributes Inc., 2015

Table 3-7: Comparison of Regional Employment Forecasts

	2014	2015	2016	2017	2018	2020	2030	2040
Regional Employment (millions)								
PSRC 2014	1.96	1.99	2.02	2.06	2.10	2.17	2.41	2.81
Baseline Scenario (CAI 2014)	1.96	1.99	2.02	2.05	2.07	2.12	2.32	2.54
Downside Alternative (CAI 2015)	1.94	1.96	1.98	1.99	2.00	2.02	2.12	2.23
Baseline Scenario (CAI 2015)	**1.94**	**1.98**	**2.02**	**2.04**	**2.07**	**2.12**	**2.33**	**2.56**
Percentage Difference from CAI 2014 Baseline								
PSRC 2014	0.7%	0.3%	0.4%	0.8%	1.3%	2.6%	3.8%	10.0%
Baseline Scenario (CAI 2014)	0.7%	0.3%	0.3%	0.3%	0.3%	0.2%	-0.3%	-0.7%
Downside Alternative (CAI 2015)	0.0%	-1.1%	-1.8%	-2.5%	-3.2%	-4.3%	-8.8%	-12.9%
Baseline Scenario (CAI 2015)	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**

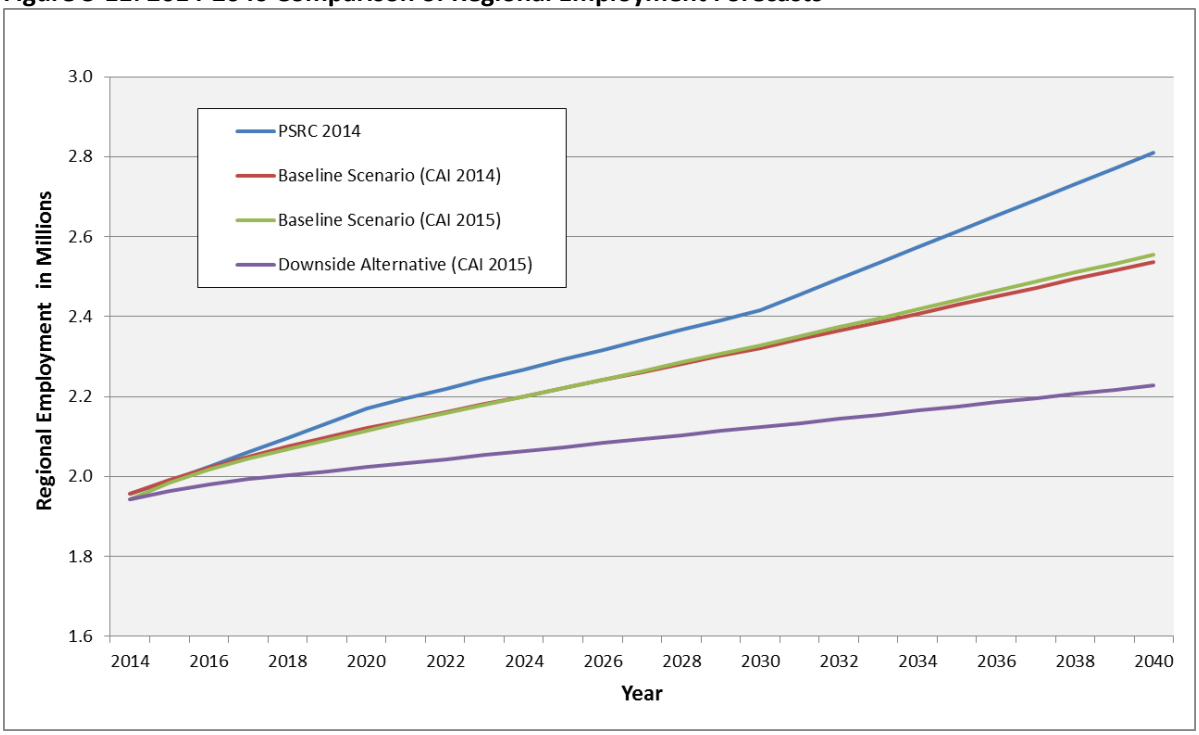
Source: Community Attributes Inc., 2015

Figure 3-10: 2014-2040 Comparison of Regional Population Forecasts



Source: Community Attributes Inc., 2015

Figure 3-11: 2014-2040 Comparison of Regional Employment Forecasts



Source: Community Attributes Inc., 2015

Chapter 4
Tolling Operations

Tolling on the SR 520 bridge commenced on December 29, 2011 in advance of the construction of the replacement bridge. Tolls continued to be collected during construction and will be collected on the replacement bridge span. This report assumes tolling continues through FY 2056.

WSDOT has chosen to implement a variably-priced, cashless tolling system on the SR 520 bridge. The all-electronic approach allows vehicles to travel through the corridor at highway speeds without stopping to pay the toll, while minimizing right-of-way requirements, and allowing faster construction and installation compared to conventional toll plazas. From December 2011 through January 2016, tolls were being collected at the east high-rise section of the SR 520 bridge via all electronic tolling. After January 2016, tolls are collected on land east of the bridge via all electronic tolling.

Toll rates vary by time of day and day of week (weekday versus weekend day) with higher tolls during peak demand periods. The variable pricing allows for better management of traffic operations on the facility during peak periods.

Two payment types are available: account-based (pre-paid) and Pay By Mail (post-paid). Account-based toll payment, branded as "*Good To Go!*" provides two options – via transponder or registered license plate. The first option requires motorists to establish a prepaid account and obtain a *Good To Go!* transponder. The second option requires motorists to establish a prepaid account and register their vehicle license plate, known as Pay By Plate. Pay By Mail toll payments also provide two options – through customer-initiated payments and following receipt of an invoice in the mail. Different costs of toll collection are associated with each payment type including processing costs and revenue losses.

In the November 2014 forecast, estimated payment proportions for the market of potential bridge users were 84.6 percent *Good To Go!* account-based for FY 2015. Actual results for FY 2015 show 83.7 percent *Good To Go!* account-based. (See Table 2-9: Trends in Actual Method of Payment, for details.)

On the existing SR 520 floating bridge, a weekday toll schedule applies to all weekdays, and a separate weekend toll schedule applies to both weekend days. Major holidays[15] that fall on weekdays use the weekend toll schedule. Similarly, toll collection on the replacement bridge is assumed to be based on weekday and weekend day toll schedules.

Currently, tolls are not collected during the overnight period (defined as 11:00 pm to 5:00 am) and no changes are assumed for FY 2017 regarding night time tolling. From FY 2018 onwards, it is assumed tolls will be collected over the entire day. Prior forecasts assumed night time tolling would start on FY 2017.

[15] New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day per WAC rule 468-270-071.

Vehicles are tolled according to vehicle classes by number of axles. The toll rates for multiple-axle vehicles are generally based on the axle multiple of the appropriate two-axle vehicle per axle base toll rate for primary payment types: account-based *Good To Go!* and Pay By Mail.

A variety of toll exemptions have been implemented on the SR 520 bridge, and are assumed to continue throughout the forecast horizon. Some are being initiated by State policy while others are by agreement between the State and Federal Highway Administration. These exemptions include:

- Agency-owned and branded transit vehicles
- Privately-owned transit vehicles which operate on a fixed route and regular schedule
- Agency-sanctioned vanpools
- State Police vehicles
- Bridge maintenance vehicles
- Emergency vehicles
- Tow trucks while responding to SR 520 calls
- Vehicles owned or operated by a foreign government

All passenger car vehicles including carpools with two, three, or more occupants are tolled on the existing bridge. After the replacement bridge opens, it is assumed that carpool vehicles will continue to be tolled. Prior forecasts assumed 3+ carpools would be exempt from tolling from FY 2017 onwards based on indications in the original toll study and financial plans.

The original toll schedule plan assumed in the 2011 T&R study has been implemented with the addition of $0.05 rounding starting in FY 2014. In accordance with this plan, the Washington State Transportation Commission (WSTC) has raised the tolls approximately 2.5 percent on July 1, 2012 (FY 2013), July 1, 2013 (FY 2014), July 1, 2014 (FY 2015), and July 1, 2015 (FY 2016), consistent with the September 2011 traffic and revenue forecast assumptions.

The existing (FY 2016) toll rates for two-axle vehicles are shown in Tables 4-1 and 4-2, respectively for weekdays and weekends, and are summarized below:

- The maximum *Good To Go!* toll rate for 2-axle vehicles is $3.90 on weekdays and $2.40 on weekends in FY 2016. The toll rates have been rounded to the nearest $0.05.
- In FY 2016, Pay By Mail customers pay approximately $1.66 above the *Good To Go!* toll rates on average. The Pay By Mail rates are rounded to the nearest $0.05.
- Tolls for multi-axle vehicles (those with more than two axles on the ground) are generally determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles using the same payment method and rounded to the nearest $0.05. The maximum rate is the six-axle rate, regardless of additional axles. However, the Washington State Transportation Commission has increased toll rates by 2.5 percent and rounded to $0.05 since the rounding policy was adopted for FY 2014. Thus axle multipliers vary slightly than the general policy.

Prior toll rate increases have been consistent with the original toll planning and financial plans, which included four annual 2.5 percent rate increases planned through FY 2016 and an increase of approximately 15 percent in FY 2017. However, the SR 520 rate setting process conducted by the Washington State Transportation Commission in early 2016 recommended different future toll rates

starting in FY 2017. Future toll rates and policies assumed in this study are consistent with the latest toll rate schedule anticipated to be formally adopted by the Washington State Transportation Commission in May 2016.

The assumed toll rates for FY 2017 and beyond for two-axle vehicles are shown in Tables 4-1 and 4-2, respectively for weekdays and weekends.

For FY 2017, the assumed toll rates are as follows:

- The maximum *Good To Go!* toll rate for 2-axle vehicles will be $4.10 on weekdays and $2.50 on weekends.
- Pay By Mail customers will pay exactly $2.00 above the *Good To Go!* toll rates for 2-axle vehicles. The previous studies assumed a differential of $1.70.
- Weekday *Good To Go!* account-based tolls will increase approximately 4.8 percent on average from FY 2016 to FY 2017 (i.e. on July 1, 2016). The previous studies assumed an increase of approximately 15 percent.
- Weekend account-based tolls will increase approximately 4.5 percent on average from FY 2016 to FY 2017. The previous studies assumed an increase of approximately 1.6 percent.
- All toll rates will continue to be rounded to the nearest $0.05.
- Tolls will be only be charged between 5:00 am and 11:00 pm in FY 2017.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type. The maximum rate is the six-axle rate, regardless of additional axles.

For FY 2018 and beyond, the assumed toll rates are as follows:

- The maximum *Good To Go!* toll rate for 2-axle vehicles will be $4.30 on weekdays and $2.65 on weekends.
- Pay By Mail customers will pay exactly $2.00 above the *Good To Go!* toll rates for 2-axle vehicles.
- Weekday *Good To Go!* account-based tolls will increase approximately 5.2 percent on average from FY 2017 to FY 2018 (i.e. on July 1, 2017).
- Weekend account-based tolls will increase approximately 6.2 percent on average from FY 2017 to FY 2018.
- All toll rates will continue to be rounded to the nearest $0.05.
- No toll rate escalation is assumed after FY 2018.
- Tolls will be charged during all 24 hours starting in FY 2018. The night time (11:00 pm – 5:00 am) account-based toll rate for 2-axle vehicles is $1.25 on both weekdays and weekend days.
- Tolls for multi-axle vehicles will be set to axle factors based on the per axle rate for two-axle vehicles for the same payment type. The maximum rate is the six-axle rate, regardless of additional axles.

Table 4-1: Weekday Two-Axle Vehicle Toll Rates

Fiscal Year	12-5 AM	5-6 AM	6-7 AM	7-9 AM	9-10 AM	10 AM-2 PM	2–3 PM	3-6 PM	6-7 PM	7-9 PM	9-11 PM	11 PM-12 AM
Good To Go! **Weekday 2-Axle Toll Rates**												
2016		$1.80	$3.10	$3.90	$3.10	$2.45	$3.10	$3.90	$3.10	$2.45	$1.80	
2017		$1.90	$3.25	$4.10	$3.25	$2.55	$3.25	$4.10	$3.25	$2.55	$1.90	
2018+	$1.25	$2.00	$3.40	$4.30	$3.40	$2.70	$3.40	$4.30	$3.40	$2.70	$2.00	$1.25
Pay By Mail Weekday 2-Axle Toll Rates												
2016		$3.45	$4.70	$5.55	$4.70	$4.15	$4.70	$5.55	$4.70	$4.15	$3.45	
2017		$3.90	$5.25	$6.10	$5.25	$4.55	$5.25	$6.10	$5.25	$4.55	$3.90	
2018+	$3.25	$4.00	$5.40	$6.30	$5.40	$4.70	$5.40	$6.30	$5.40	$4.70	$4.00	$3.25

Note: Toll rates in year of expenditure dollars

Table 4-2: Weekend Two-Axle Vehicle Toll Rates

Fiscal Year	12-5 AM	5-8 AM	8-11 AM	11AM-6PM	6-9 PM	9-11 PM	11 PM-12 AM
Good To Go! **Weekend 2-Axle Toll Rates**							
2016		$1.25	$1.85	$2.40	$1.85	$1.25	
2017		$1.30	$1.95	$2.50	$1.95	$1.30	
2018+	$1.25	$1.40	$2.05	$2.65	$2.05	$1.40	$1.25
Pay By Mail Weekend 2-Axle Toll Rates							
2016		$2.85	$3.50	$4.10	$3.50	$2.85	
2017		$3.30	$3.95	$4.50	$3.95	$3.30	
2018+	$3.25	$3.40	$4.05	$4.65	$4.05	$3.40	$3.25

Note: Toll rates in year of expenditure dollars

Chapter 5

Traffic and Revenue Approach

This chapter presents an overview of the modeling and forecasting approach. The revised forecast utilized the travel demand toll model and model processing tools developed for the September 2011 forecast, but incorporated new information to account for key changes. This chapter starts with an overview of the tolling analysis model used in the September 2011 forecast, then describes the changes made to the model and associated post processing tools.

Overview of September 2011 Tolling Analysis Model

The September 2011 SR 520 tolling analysis model was built from the Puget Sound Regional Council (PSRC) travel demand model. The PSRC files contain highway and transit networks, data on land-use and socioeconomic forecasts, and trip tables representing vehicle trips. These files formed the basis of the tolling analysis model. CDM Smith used a number of studies and surveys specific to the SR 520 corridor to build and update the modeling tools.

Traffic data was obtained from WSDOT's traffic count stations for the years 2008 through 2010. In addition, CDM Smith conducted vehicle occupancy and truck classification studies in November 2009. This data was used in the calibration stage of the tolling analysis model. Travel time and speed data were collected using Global Positioning System (GPS) equipped vehicles in November 2009 and were also used for model calibration.

A travel pattern survey, conducted by CDM Smith in September 2009 and including 6,400 participants, was a major effort to understand the travel patterns of the SR 520 bridge users. Information obtained from this survey was used to refine the original trip tables. The results showed the strong use of the SR 520 bridge for commuting in both directions across Lake Washington. The survey results indicated:

- AM peak (6:00 to 9:00 am) travel and PM peak (3:00 to 6:00 pm) travel each accounted for approximately 18 percent of total trips; midday trips accounted for approximately 36 percent of total trips
- Trip purpose results showed 85 percent of AM peak and 62 percent of PM peak trips are for work commuting; midday trips were dominated by company business, personal business/ medical trips, and people going to jobs with later start times
- About half of all peak trips were made five times a week
- West end origins and destinations were almost all in Seattle, while east end origins and destinations were dominated by Bellevue, Redmond, and Kirkland.

The CDM Smith team conducted a stated preference survey in November 2009 to help assess current bridge users' willingness to pay tolls. This is measured in value of time, which is the monetary value an individual places on saving a certain increment of travel time. The survey also provided data to estimate changes in travel behavior in response to tolls. Changes in travel behavior include combining or forgoing trips, choosing a different destination, shifting to alternative modes including transit, and/or changes in the time of travel. Value of time results from the 2009 stated preference survey were demonstrably lower than value of time results from a similar stated preference survey of SR 520

users in 2003. The survey results also revealed respondents have a relatively high median household income of about $125,000. While the range of values from the 2009 survey fell within the average range for the region estimated from other sources, the higher income of travelers in this corridor suggested that the value of time estimates should be higher than the regional average. Accordingly, analytical methods were used to re-benchmark value of time estimates to bring them into alignment with average hourly wages.

An independent review of economic growth forecasts was conducted by local economic forecasting consultant Community Attributes Inc. who included impacts of the then recent recession on short and long-term growth forecasts for the region as a whole. The most recent population, employment, and economic activity data was used for this purpose, primarily from 2009 and the first half of 2010. Regional independent population and employment forecasts were applied to updated PSRC regional distributions to model zone areas and the results were further augmented by up to date development pipeline information. The resulting model zone socioeconomic forecasts were used to adjust the tolling analysis model trip tables.

The PSRC highway networks were updated to include the fields necessary to perform toll diversion calculations and also to better represent traffic movements on SR 520 and I-90 bridges. Model modifications were made to allow accounting for possible suppression of trips or shifting to non-automobile modes due to tolling. Since variable rate tolling was planned, the model was split into hourly toll periods from the larger peak and off peak periods.

After the updates of trip tables and highway networks using the data and surveys were completed, CDM Smith developed a tolling analysis model for tolling analysis of the SR 520 bridge. Prior to tolling analysis, the model was calibrated using 2010 hourly traffic counts and travel time data under toll-free operation. The model was then used to develop projected SR 520 transactions and gross toll revenue potential from FY 2012 through FY 2056, known as the September 2011 forecast.

Regional Transportation Projects

The September 2011 model assumed that a number of regional highway and transit projects would be completed. The November 2015 forecast is based on similar modeling assumptions. Table 5-1 provides a list of relevant major regional transportation projects, with an indication of completion date as currently anticipated. While no significant changes in planned major projects have occurred, minor revisions include: the East Link light rail extension to Bellevue has been pushed back to 2023 (original expected completion date was 2020-21); the I-90 reversible lane project completion date has been pushed back to mid-2017; the newly funded I-405 Renton to Bellevue widening and Express Toll Lanes project has been added; completed projects including the SR 520 Eastside expansion/HOV projects and the I-405 Bellevue to Lynnwood widening and Express Toll Lanes projects have been removed from this list.

Table 5-1: Summary of Major Regional Transportation Projects

Route	Expected Completion[1]	Project Description
SR 522	2015-2016	Business Access and Transit Lanes between 61st Ave NE and 65th Ave NE (Kenmore Improvement Project, Segment West A). Construction began in April 2015 and is expected to continue through summer 2016.
I-90	mid 2017	Addition of an HOV2+ lane in each direction on the outer roadway across Lake Washington. Closure of the reversible center roadway once the outer roadway is reconfigured. (Center roadway will be used for East Link Light Rail.)
I-405	2019	I-405/SR 167 Interchange Direct Connector: builds a new flyover ramp to connect the future I-405 express toll lanes with the existing SR 167 HOT lanes. Recently funded in the 2015 Connecting Washington transportation package.
East Link	Targeted 2023	Sound Transit East Link Light Rail Extension - Extension of Link Light Rail from downtown Seattle at International District Station, on I-90 corridor east to Bellevue Way, then north to Downtown Bellevue, and then east to Overlake Transit Center (152nd Ave NE) with possible extension to Downtown Redmond.
I-405	2024	Renton to Bellevue Widening and Express Toll Lanes project: adds one northbound and southbound lane on I-405 between SR 169 in Renton and NE 6th Street in downtown Bellevue. Recently funded in the 2015 Connecting Washington transportation package. These new lanes will be paired with the existing carpool lane to create a two-lane express toll lane system.
Gateway	2031	Completes the SR 509 and SR 167 connections to I-5 to improve mobility and connectivity in the Puget Sound region; adds more capacity to I-5 through express toll lanes, reducing congestion and travel times between Seattle and Tacoma.

Note:

1. Expected completion date as of March 2016

Adjustments Made to Toll Modeling and Traffic and Gross Revenue Forecasting

The revised forecast utilized the travel demand toll model and model processing tools developed for the September 2011 forecast but incorporated new information to account for key changes. This section focuses on the changes made to the September 2011 tolling analysis model and associated post processing tools. The revised model is referred to as the November 2015 model.

The travel demand toll model, which covers average weekday travel, was updated and re-run for the following model years: FY 2015, FY 2016, FY 2017, FY 2018, FY 2021, FY 2022, FY 2024, FY 2025, FY 2026, and FY 2031. The results for years between model years are determined by interpolation.

The observed data did not indicate a need to update the values and distribution of value of time and trip diversion methodology. Consequently, these parameters and methodology as applied in the September 2011 study were not modified for the current study. The September 2011 study used trip suppression and mode shift parameters and methodologies to estimate the impact of adding tolling to the bridge. The current study, as noted below, includes a model trip table calibration process that accounts for post-tolling experience. This calibration process replaces the suppression and mode shift due to tolling methodologies used in the September 2011 study.

For the current study, the travel demand toll model and post-processing elements were modified to reflect the following elements:

- Revised roadway configuration
- Revised socioeconomic forecasts
- Model trip table calibration
- Review of recent growth performance
- Gas price forecast changes
- Changes to future toll rates
- Payment type proportion refinements
- Revised toll vehicle classification
- Updated truck toll rate multipliers
- Updates to the planned SR 520 closures due to construction

Each of these modifications and adjustments are discussed in this chapter.

Roadway Configuration Assumptions

The model network assumptions were generally kept the same as the September 2011 and November 2014 studies. However, a few important changes in the roadway configuration assumptions were made for this forecast update based on recent project developments. The changes are related to the newly funded SR 520 West Side improvements, and an updated completion date for the I-90 Two-Way Transit & HOV Operations project.

The November 2014 forecast assumed that a three lane westbound West Approach Bridge North (WABN) connector would be completed shortly after the main span. This connector and reconfiguration of the existing four-lane west approach bridge connector were to result in three general-purpose lanes in each direction to the Montlake Boulevard interchange starting in FY 2017. As described below, the WABN connector is now assumed to open in FY 2017, but will carry two general purpose lanes in each direction, similar to the existing four-lane west approach bridge, while the existing approach span is closed for replacement.

In June 2015, the Washington State legislature passed the Connecting Washington transportation funding package, which includes $1.6 B in new funding to complete construction of the West Side of the SR 520 corridor between FY 2018 and FY 2026. In planning for this newly funded section, WSDOT has identified updated preliminary roadway configurations that are reflected in the model network assumptions. The roadway configuration assumed along the SR 520 corridor in the new forecast is discussed in Chapter 1 and shown graphically in Figure 1-2.

Between Montlake Boulevard and the west end of the main SR 520 floating bridge span, the assumed configuration is as follows:

- FY 2016 through FY 2021: current configuration with two general-purpose lanes in each direction
- FY 2022 and beyond: new WABN connector and new West Approach Bridge South (WABS) connector resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction)

Between I-5 and Montlake Boulevard, the assumed configuration is as follows:

- FY 2016 through FY 2025: current configuration with two general-purpose lanes in each direction.
- FY 2026 and beyond: new Portage Bay Bridge resulting in three lanes in each direction (two general-purpose and one inside transit/HOV 3+ lane in each direction) plus a one lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes

The main impact of this change versus the 2014 forecast is continuation of the four lane capacity constriction between Montlake Boulevard and the western high rise through FY 2021.

Another change in roadway configuration was made in the FY 2017 model, related to the I-90 section between Seattle and Bellevue. The ongoing I-90 Two-Way Transit & HOV Operations project will result in the addition of an HOV2+ lane each direction and the closure of the reversible center roadway which will likely be used for East Link Light Rail. The November 2014 forecast assumed that the I-90 Two-Way Transit & HOV Operations project would be complete starting in FY 2017. The completion date has been revised to FY 2018.

Revised Socioeconomic Forecasts

A revised socioeconomic forecast was prepared in July 2015, as discussed in Chapter 3: Regional Demographics & Economic Trends. Overall, when compared to the prior economic forecast, the population forecasts were adjusted slightly upwards for King County and for the region as a whole. Because the slight upward adjustments were consistent in all forecast years, the population growth rates remain virtually unchanged for the region and for King County. Within King County, the total population forecast among the four major cities along the SR 520 corridor (Seattle, Kirkland, Bellevue, and Redmond) has been adjusted slightly upwards, primarily driven by more growth expected in Seattle and to a lesser extent in Bellevue.

For employment, the regional and King County growth rates were adjusted upwards in 2015. Starting in 2016, regional and King County employment growth rates are virtually unchanged from the November 2014 forecast. Considering just Seattle, Kirkland, Bellevue, and Redmond, the employment estimates are slightly reduced in 2015-2016, and are revised upwards starting in 2017. This is primarily driven by an increase in the expected amount of commercial space and employment in Seattle, and to a lesser extent in Kirkland.

The November 2015 forecast study utilizes the changes in the socioeconomic forecast base between the 2011 basis and 2015 forecast to factor the original 2011 trip tables such that they reflect the change in socioeconomics. The process applied a growth ratio to the original September 2011 trip tables derived by comparing the original 2011 study and revised 2015 study socioeconomic forecasts

at the FAZ (Forecast Analysis Zone) level. (Due to changes in the regional socioeconomic baseline resulting from PSRC's recent use of the UrbanSim model and revised baseline data, it was necessary to review the changes in the socioeconomic forecast at the FAZ level instead of the TAZ level so that 2011 and 2015 forecasts would be comparable.) The growth ratio was based on the sum of population and employment at the FAZ level. The individual growth rate for each FAZ was applied uniformly to the TAZ's within that FAZ. Trip tables for the new toll forecast were developed for fiscal years 2015, 2017, 2021, 2031. They were then used to interpolate other model fiscal years.

Model Trip Table Calibration

The trip tables reflecting revised socioeconomic data were used as the starting point for trip table calibration. The other inputs to the calibration were the latest traffic counts including: FY 2015 toll transactions derived from the toll performance review described in Chapter 2; and 2014 traffic data provided by WSDOT for vehicles crossing Lake Washington on SR 520 and I-90, and other nearby facilities (SR 522, I-5, and I-405).

As part of the calibration process, the trip tables for the base year (FY 2015) were adjusted to better match existing traffic volumes at five count stations located on SR 520, I-90, SR 522, I-5, and I-405. The adjustments to the trip tables were done for all individual tolling hours from 5:00 am to 11:00 pm to reflect the peaking patterns on the Lake Washington corridor and surrounding highways.

The model calibration produced a better representation of I-90 congestion levels during peak hours. This is an important improvement given that I-90 is the main alternative route to SR 520 across Lake Washington. The improved model calibration on I-90 and other competing routes led to a better representation of traffic volumes on SR 520, particularly during peak periods.

The calibration results were tested by comparing model assigned volumes to traffic counts at two levels: at a disaggregated level, the volumes were compared on a link by link basis using the GEH statistic, at each of the five count stations by direction and for each hour (the GEH statistic is a standard measurement of traffic model calibration results); and at an aggregated level, the differences between assigned volume and count at individual links were compared to evaluate the overall match of all count stations using Percent Root Mean Square Error (%RMSE) statistic. Both methods indicated a good fit between modeled traffic and actual counts.

Once the FY 2015 trip tables were calibrated, they served as the new base year trip tables. The difference between the original and calibrated base year trip tables for each origin-destination movement was used to adjust future year model trip tables to account for the FY 2015 calibration.

Growth Performance Review

After incorporating the impact of both the revised socioeconomic forecasts and trip table calibration into future model years, actual toll transaction results and trends were reviewed and compared to initial model results and appropriate adjustments made.[16] Details are provided in the next three sections.

[16] Even though Chapter 2 presents actual performance data through February 2016, only FY 2015 data was available at the time the revised (November 2015) forecast was prepared.

Average Weekday Transactions

The toll performance review showed that FY 2015 weekday toll transactions were about 0.4 percent lower than forecasted. As a result, the average weekday traffic for the base year model (FY 2015) was adjusted down by 0.4 percent. Since the weekday transactions were used to calibrate the FY 2015 trip tables, the decrease was reflected in the modeled average weekday transactions for the base year and was also applied to later year model trip tables.

Average weekday transactions grew by 4.1 percent in FY 2015, lower than the 4.6 percent expected. As a result, the short-term growth rates for average weekday transactions were adjusted slightly downward in the revised forecast.

These adjustments when combined led to slightly lower average weekday traffic for FY 2016 (0.7 percent lower than in the previous forecast).

Hourly Weekday Transactions

The toll performance review provided updated information on distribution of transactions by hour on an average weekday. The base year model (FY 2015) and the FY 2016 forecast weekday transaction profiles were adjusted to better reflect the observed hourly distribution of transactions. This adjustment resulted in more transactions occurring during the peak hours compared to the previous forecast. A similar adjustment was made for years beyond FY 2016.

Average Weekend Day Transactions

The weekend model was modified to reflect more extensive data on tolling performance to-date. The overall weekend model methodology starts with the base year average weekend toll transactions and applies annual growth rates to derive future year toll transactions.

The toll performance review showed that FY 2015 weekend toll transactions were about 2.2 percent lower than forecasted number. The review also showed that weekend toll traffic grew at around 3 percent annually since tolling started. The revised weekend growth rates were developed based on a combination of historical weekend transaction growth data and future growth patterns resulting from the weekday model. Future year weekend growth rates were adjusted accordingly and the effect of these adjustments led to lower weekend toll traffic overall.

Gas Price Forecast Change

Compared to the gas price forecast used in the November 2014 forecast, the new forecast has lower gas prices throughout the forecast horizon: approximately 18 percent lower in FY 2015, 24 percent lower in FY 2017, 14 percent lower in FY 2024, and 13 percent lower in FY 2031. The per gallon price for passenger car gasoline was $3.07 in FY 2015 and is assumed to be $2.94 in FY 2017, $4.40 in FY 2024, and $5.37 in FY 2031 (all in year of expenditure dollars), resulting in a long term annual price increase assumption of 3.6 percent. These values are consistent with the State's Transportation Revenue Forecast Council's June 2015 long term actuals estimate and forecast of gas price and also incorporate the FY 2016 and FY 2017 fuel tax rate increases included in the 2015 transportation revenue package (FY 2016 fuel price increased by $0.07 cents and FY 2017 and beyond fuel price increased by $0.119).

Future Toll Rates

As discussed in Chapter 4, the toll rate schedule was revised to reflect the latest assumptions. Based on the original toll planning and financial plans, prior forecasts had assumed an increase of

approximately 15 percent in FY 2017 and no toll increases afterwards. During the recent toll rates setting process conducted by the Washington State Transportation Commission in early 2016, it was decided to increase the toll rates by approximately 10 percent, with a 5 percent increase in FY 2017 and another 5 percent increase in FY 2018. Also, night time tolling (from 11:00 pm to 5:00 am) is now assumed to start in FY 2018 instead of FY 2017.

Another change compared to the previous forecasts is related to Pay By Mail weekday and weekend toll rates starting in FY 2017. The previous forecasts had assumed that Pay By Mail customers would pay $1.70 above the *Good To Go!* toll rates for 2-axle vehicles. In the new forecast, the Pay By Mail toll increment for 2-axle vehicles is assumed to be $2.00. This change was a policy decision by the Washington State Transportation Commission. Note that this increment is factored by the number of axles since tolls for multi-axle vehicles are determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles.

All passenger car vehicles including carpools with two, three, or more occupants are tolled on the existing bridge. After the replacement bridge opens, it is now assumed that carpool vehicles will continue to be tolled. This was a policy decision by the Washington State Transportation Commission. Prior forecasts had assumed 3+ carpools would be exempt from tolling from FY 2017 onwards based on indications in the original toll planning and financial plans.

Payment Type Refinements

As described in Chapter 2, posted transactions and revenue results including split between account-based and Pay By Mail transactions are now available for FY 2014 and FY 2015. These are summarized in Table 5-2.

Table 5-2: SR 520 FY 2014 and FY 2015 Actuals

Table 5-2: SR 520 FY 2014 and FY 2015 Actuals

FY	Transactions			Gross Toll Revenue Potential		
	GTG!	PBM	Total	*GTG!*	PBM	Total
2014	17,687,660	3,271,914	**20,959,574**	$50,625,660	$13,963,487	**$64,589,147**
2015	18,433,116	3,586,654	**22,019,770**	$54,209,706	$15,173,503	**$69,383,209**

Sources:
- Actual transactions for July-December periods are based on CDM Smith analysis of toll transaction data from CSC provided by WSDOT. Actual transactions for January-June periods are based on monthly toll collection system equipment reports adjusted for non-revenue and duplicate transactions.
- Actual gross toll revenue for July-December periods are based on CDM Smith analysis of toll transaction data from CSC provided by WSDOT. Actual gross toll revenue for January-June periods are based on preliminary financial reporting system results adjusted for estimated CSC processing effects.

FY 2015 actual payment split was used to benchmark the base year model. At the time the forecast was prepared, payment split information was only available through April 2015. For May and June 2015, payment splits were estimated based on recent trends. The tolling analysis model was modified to reflect changes in payment types based on actual tolling performance data covering January 2012 through April 2015, and estimated payment splits for May and June 2015. Table 5-3 shows the *Good To Go!* (account-based) payment share assumed in the November 2014 forecast, the actual values for fiscal years 2012 through 2015, and the revised payment type proportions in the new forecast.

Table 5-3: *Good To Go!* Transaction Account-based Share

Fiscal Year	Nov2014 Forecast	Nov2015 Forecast	Actual[1]
2012	--	--	82.8%
2013	--	--	83.7%
2014	--	--	84.5%
2015	84.6%	--	83.7% [2]
2016	84.8%	84.6%	--
2017	85.1%	84.8%	--
2024	87.3%	86.0%	--
2031	87.8%	87.7%	--

Notes:
1. For FYs 2012, 2013 and 2014, actual values are based on WSDOT toll transaction data provided to CDM Smith on May 20, 2013; July 9, 2013; August 25, 2014; and May 8, 2015. These values may slightly differ from reported values and do not represent a change in officially reported values. They are used for informing future forecasts only.
2. July-December 2014 actual, January-June 2015 preliminary data

As discussed in Chapter 2, the actual share of *Good To Go!* transactions in FY 2015 was lower than assumed in the November 2014 forecast. Also, the review showed weekday vs. weekend transaction payment shares are different with approximately 85.6 percent of weekday and 78.4 percent of weekend transactions being account-based. As a result, payment shares have been adjusted accordingly. Compared to the previous forecast, the weekday *Good To Go!* transaction share is lower in the base year, changing from 86.0 percent to 85.6 percent. Also, the weekend *Good To Go!* transaction share is lower in the base year, changing from 78.7 percent to 78.4 percent. This affects the *Good To Go!* share assumptions for all future years. The new forecast has overall lower *Good To Go!* shares, as shown in Table 5-3, with the decrease being most pronounced in FY 2024. The effect is an increase in Pay By Mail share throughout the forecast horizon.

As an additional improvement, the tolling analysis model was also refined by introducing hourly account-based proportions and truck account-based proportions separate from car proportions. The toll performance review provided information on average weekday *Good To Go!* share of transactions by hour and vehicle class based on the analysis of CY 2014 transactions. These proportions were used in adjusting the base year and future year models.

Revised Toll Vehicle Classification

The performance data indicated that the actual share of trucks (defined as vehicles with 3 or more axles) in FY 2015 was consistent with what was assumed in the November 2014 forecast. With more extensive data on truck traffic available and recent data confirming trends observed since tolling started, the revised forecast lowers future weekday and weekend truck shares. The weekday truck share is now assumed to be 0.7 percent in FY 2016 and to gradually increase to 1.5 percent in FY 2031 (the previous forecast was 0.8 percent in FY 2016, increasing to 2.1 percent in FY 2031). Weekend truck share is now assumed to be 0.3 percent in FY 2016 and stay at that level throughout the forecast period (the previous forecast assumed an increase from 0.3 percent in FY 2016 to 0.9 percent in FY 2031). The new annual average forecast for share of trucks is shown in Table 5-4 below. The effect is a slight lowering of revenue throughout the forecast horizon.

Table 5-4: Proportion of Trucks

Fiscal Year	Nov2014 Forecast	Nov2015 Forecast	Actual
2012	--	--	1.0%
2013	--	--	0.8%
2014	--	--	0.6%
2015	0.7%	--	0.7% *
2016	0.7%	0.7%	--
2017	0.8%	0.7%	--
2024	1.3%	1.0%	--
2031	1.8%	1.2%	--

* July-December 2014 actual, January-June 2015 preliminary data

Truck Toll Rate Multipliers

Toll rates on SR 520 vary by vehicle class and number of axles: two, three, four, five, and six or more axles. The tolling analysis model categorizes vehicles as passenger cars/light trucks (two axles), medium trucks (three and four axles), and heavy trucks (five axles or more). Representative toll rates for medium and heavy trucks are provided to the model by applying a factor (called truck toll rate multiplier) to the two-axle toll rates. In the original 2011 IG model, the truck multipliers were derived from a sample SR 520 vehicle axle count from November 2009. The factors used were 1.59 times the two-axle rate for medium trucks (accounting for the proportional mix of the 1.5 factor for three axles and 2.0 factor for four axles), and 2.71 times the two-axle toll rate for heavy trucks (accounting for the proportional mix of the 2.5 factor for five axles and 3.0 factor for 6 or more axles). These were refined in later forecasts using the resolved transactions toll performance data. For the 2014 forecast, 1.57 times the two-axle rate was used for medium trucks and 2.74 times the two-axle rate for heavy trucks.

In the November 2015 forecast update, the approach was refined to use truck toll rate multipliers based on more recent vehicle classification counts (using CY 2014 toll performance analysis results), and varying by time of day (hour), day of the week (weekday vs. weekend), and payment type (account-based vs. Pay By Mail). The resulting truck multipliers are generally slightly higher on average than the values used previously, with the exception of the heavy truck Pay By Mail multiplier which tends to be slightly lower on average. Medium truck multipliers range from 1.59 to 1.64 on average and heavy truck multipliers range from 2.67 to 2.78. Overall this change increases revenue slightly in the early forecast years.

SR 520 Closures due to Construction

The SR 520 construction project has progressed with the Floating Bridge nearing completion, and the West Approach Bridge North currently under construction. In addition, as described previously, the 2015 Washington Legislature fully funded the remaining improvements to SR 520 between I-5 and the new floating bridge. These elements resulted in several revisions to future closure assumptions, as shown in Table 5-5 and described below.

Starting in FY 2018, it is assumed tolls will be charged during all 24 hours and therefore closure assumptions are reported separately for weekend days and weekday nights. One weekend day closure represents a closure in both directions of SR 520 during 24 hours (from 12:00 am to 12:00 am). One

weekday night closure represents a closure in both directions of SR 520 from 11:00 pm to 5:00 am, and can include the Friday night and Monday morning shoulder periods for weekend closures.

Days (or nights) with partial closure of the SR 520 are accounted for only for the fraction of time the full highway capacity is available. For instance, a day (or night) with SR 520 closed in one direction only is counted as half-day (or half-night).

Construction of the West Approach Bridge South and Montlake Boulevard interchange improvements are currently assumed to occur between FY 2018 and FY 2022. Weekend day and weekday night closures of the SR 520 main toll span will be required and are reflected in Table 5-5. Note that the closure assumptions reflect WSDOT's preliminary estimations of the number of closures needed at the time the forecast was prepared; these closure assumptions will very likely be revised in future forecast updates.

Construction of the new Portage Bay Bridge and I-5 transit and 3+ carpool direct connector improvements are currently assumed to occur between FY 2020 and FY 2026. During these closures, traffic will be allowed to use the floating bridge between the Montlake interchange and I-405. Only the section of SR 520 west of the Montlake interchange will be closed. Weekend and weekday night closures of the Portage Bay bridge are shown separately in Table 5-5 (see Portage Bay Bridge columns). Note that the closure assumptions reflect WSDOT's preliminary estimations of the number of closures needed at the time the forecast was prepared; these closure assumptions will likely be revised in future forecast updates.

No other construction closures in the regional highway system are considered as part of this analysis.

Table 5-5: SR 520 Program Construction Closures

Fiscal Year	November 2014 Forecast		November 2015 Forecast				Actuals	
	SR 520		SR 520 Main Span		Portage Bay Bridge		SR 520	
	Weekend Day	Weekday Night	Weekend Day	Weekday Night	Weekend Day	Weekday Night	Weekend Day	Weekday Night
2012	--	NA	--	NA	--	NA	10.0	NA
2013	--	NA	--	NA	--	NA	14.2	NA
2014	--	NA	--	NA	--	NA	13.8	NA
2015	15.5	NA	--	NA	--	NA	13.1	NA
2016	10.0	NA	10.4	NA	--	NA	--	NA
2017	1.0	NA	2.0	NA	--	NA	--	NA
2018	2.5	16.0	12.0	22.5	--	--	--	--
2019	--	--	17.0	29.5	--	--	--	--
2020	--	--	16.0	29	7.0	12.0	--	--
2021	--	--	17.0	29.5	10.0	17.5	--	--
2022	--	--	13.0	23	10.0	17.5	--	--
2023	--	--	--	--	5.0	15.0	--	--
2024	--	--	--	--	3.0	10.0	--	--
2025	--	--	--	--	3.0	10.0	--	--
2026	--	--	--	--	7.0	12.0	--	--

Notes:
1. November 2014 forecast closures shown here have been modified since the November 2014 forecast report to reflect a revised closure quantifying system which separates weekend days and weekday nights as noted in the text.
2. The closures assumed for this forecast are only a rough draft placeholder and very likely to change. The SR 520 project office will be working on west end completion planning over the next several months and provide updates as appropriate.

Summary of Assumptions

A summary of the assumptions used for the forecast is shown in Table 5-6.

Table 5-6: November 2015 Traffic and Gross Revenue Forecast Assumptions

General Assumptions
Improvements in the Puget Sound Regional Council's current regional transportation plan, *Transportation 2040*, will be implemented as planned. No new competitive toll-free facilities or additional capacity will be constructed during the projection period other than those assumed in the plan.
The percentage of payment types will be consistent with the ranges assumed for this study. The percentage of potential bridge users in the *Good To Go!* account-based program is assumed to increase from 85% in FY 2016 to 88% in FY 2031.
Economic growth in the project study area will occur as forecasted herein based in part on the 2013 PSRC Land Use Baseline Forecast from the Puget Sound Regional Council, Conway Pedersen 2015 forecasts, and the independent socioeconomic consultant.
The facility will continue to be well maintained, efficiently operated, effectively signed, and promoted to encourage maximum usage.
Inflation will average 2.5% annually over the forecast horizon. This figure is based on historic CPI up to 2015. While current inflation forecasts are somewhat lower for the state overall (2.1% long term), the greater Seattle region and the SR 520 primary market corridor are growing at a significant pace implying the assumption of 2.5% inflation throughout the SR 520 forecasts should be kept.
Motor fuel will remain in adequate supply and no national or regional emergency will arise that would abnormally restrict the use of motor vehicles. The per gallon price for passenger car gasoline is assumed to be $3.07 in FY 2015, $2.94 in FY 2017, $4.40 in FY 2024, and $5.37 in FY 2031, resulting in a long term annual growth assumption of 3.6%. These values are consistent with TRFC's June 2015 long term forecast of gas price and also incorporate the tax rate increases included in the 2015 transportation revenue package.
The value of time for work trips ranges from $9.60 per hour for the lowest income group to $22.80 per hour for the highest income group. The value of time for non-work passenger car trips is $13.80 per hour. Truck trip value of time reaches $36.00 per hour for heavy trucks. All values are in 2010 dollars.
SR 520 Corridor Lane Configuration
FY 2016: Bridge configuration is two narrow general-purpose lanes and shoulders in each direction.
FY 2017 through FY 2021: Floating bridge replacement with two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction. West of the replacement span, SR 520 will remain in its current two-lane per direction configuration.
FY 2022 through FY 2025: Two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction on replacement span. New west approach bridge north and south connections from the western high rise to Montlake Blvd. interchange such that three standard lanes and full shoulders are provided between the floating span and Montlake Blvd. West of Montlake Blvd., SR 520 will remain in its current two-lane per direction configuration.
FY 2026 and onward: On replacement span, west approach bridge north and south connections, and new Portage Bay bridge between I-5 and the Montlake Blvd, roadway configuration includes two wider general-purpose lanes in each direction, one inside HOV/transit lane in each direction, and wider shoulders in each direction. Also includes a one-lane transit/HOV3+ reversible direct connector between SR 520 and the I-5 reversible express lanes operating in the direction of the I-5 reversible lanes.
SR 520 Configuration East of Bridge to I-405, FY 2016 and onward: Two general-purpose lanes in each direction and one inside HOV/transit lane in each direction (with three person occupancy requirement HOV3+).

(table continued)

Table 5-6: November 2015 Traffic and Gross Revenue Forecast Assumptions (Continued)

Construction Closures	
Weekend closures of SR 520 from the Montlake Interchange to I-405 including the tolled section will occur an equivalent of 10.4 days in FY 2016, 2 days in FY 2017, 12 days in FY 2018, 17 days in FY 2019, 16 days in FY 2020, 17 days in FY 2021, and 13 days in FY 2022. Since night time (11pm - 5am) tolling is assumed from FY 2018 forward, weekday night time closures from FY 2018 forward are also considered. Weekday night time closures will occur an equivalent of 22.5 nights in FY 2018, 29.5 nights in FY 2019, 29 nights in FY 2020, 29.5 nights in FY 2021, and 23 nights in FY 2022.	
Construction of the new Portage Bay bridge will start in FY 2020 and will require closures of SR 520 between I-5 and the Montlake interchange. During these closures, traffic will still be allowed on the tolled section between the Montlake interchange and I-405. Portage Bay bridge weekend closures will occur an equivalent of 7 days in FY 2020, 10 days in FY 2021, 10 days in FY 2022, 5 days in FY 2023, 3 days in FY 2024, 3 days in FY 2025, and 7 days in FY 2026. Weekday night time closures will occur an equivalent of 12 nights in FY 2020, 17.5 nights in FY 2021, 17.5 nights in FY 2022, 15 nights in FY 2023, 10 nights in FY 2024, 10 nights in FY 2025, and 12 nights in FY 2026.	
Toll Collection	
Tolls were collected at a single point on the eastern high-rise of the main span through January 2016. After January 2016, tolls are collected on land east of the bridge.	
Toll rates will be the same for either direction on the bridge.	
The toll collection is all electronic; there will be no manual toll collection.	
FY 2016 and FY 2017: no night time tolling (11pm - 5am). FY 2018 and beyond: tolls will be charged during all 24 hours.	
Toll Rates	
FY 2016	
	The maximum *Good To Go!* toll rate for 2-axle vehicles is $3.90 on weekdays and $2.40 on weekends in FY 2016 as adopted by the Washington State Transportation Commission. The toll rates have been rounded to the nearest $0.05.
	In FY 2016, Pay By Mail customers pay approximately $1.66 above the *Good To Go!* toll rates on average. The Pay By Mail rates are rounded to the nearest $0.05.
	Tolls for multi-axle vehicles (those with more than two axles on the ground) are generally determined by multiplying the number of axles by the per axle toll rate for two-axle vehicles using the same payment method. However, the Washington State Transportation Commission set the FY 2016 class rates based on a 2.5% increase from the FY 2015 class rates then rounded to $0.05. The maximum rate is the six-axle rate, regarless of additional axles.

(table continued)

Table 5-6: November 2015 Traffic and Gross Revenue Forecast Assumptions (Continued)

Toll Rates	
FY 2017	
	The maximum *Good To Go!* toll rate for 2-axle vehicles is $4.10 on weekdays, and $2.50 on weekends in FY 2017.
	In FY 2017, Pay By Mail customers pay exactly $2.00 above the *Good To Go!* toll rates.
	Weekday *Good To Go!* account-based tolls will increase approximately 4.8% on average from FY 2016 to FY 2017 (i.e. on July 1, 2016).
	Weekend *Good To Go!* account-based tolls will increase approximately 4.5% from FY 2016 to FY 2017 (i.e. on July 1, 2016).
	All toll rates will be rounded to the nearest $0.05.
	Tolls for multi-axle vehicles (three or more axles) will be set to the axle multiple of the per-axle rates for two-axle vehicles using the same payment method.
FY 2018 and beyond	
	The maximum *Good To Go!* toll rate for 2-axle vehicles is $4.30 on weekdays, and $2.65 on weekends in FY 2018
	In FY 2018 and beyond, Pay By Mail customers pay exactly $2.00 above the *Good To Go!* toll rates.
	Weekday *Good To Go!* account-based tolls will increase approximately 5.2% on average from FY 2017 to FY 2018 (i.e. on July 1, 2017).
	Weekend *Good To Go!* account-based tolls will increase approximately 6.2% from FY 2017 to FY 2018 (i.e. on July 1, 2017).
	All toll rates will be rounded to the nearest $0.05.
	Night time tolling (11pm - 5am) will be introduced starting in FY 2018. The night time account-based toll rate for 2-axle vehicles is $1.25 on both weekdays and weekend days
	Tolls for multi-axle vehicles (three or more axles) will be set to the axle multiple of the per-axle rates for two-axle vehicles using the same payment method.
	No toll rate escalation is assumed after FY 2018.
Toll Exemptions	
	Toll exemptions currently in place (public/private buses, registered vanpools, State Police vehicles, bridge maintenance vehicles, emergency vehicles, tow trucks while responding to SR 520 calls, and vehicles owned and maintained by a foreign government) are continued.
	Two-person carpools pay the same toll as single occupant vehicles (SOVs).
	3+ carpools pay the same toll as single-occupant vehicles (SOVs).

This page intentionally left blank to allow for double-sided printing.

Chapter 6

Updated Transactions and Gross Toll Revenue Potential

This chapter provides the results of the updated estimates of transactions and gross toll revenue potential for the revised baseline forecast. Taking into account the tolling experience to date, revised independent economic forecasts, and revised bridge configuration assumptions including closures, the methodology outlined in Chapter 5 was used to generate FY 2016 through FY 2056 transaction and gross toll revenue potential forecasts. This update is referred to as the November 2015 forecast.

Table 6-1 shows the SR 520 annual transactions and gross toll revenue potential updated baseline forecast. Initially, annual growth in transactions and revenue is expected to generally follow recent trends. Revenue grows somewhat faster than transactions due to the toll increase in FY 2016. In FY 2017, the transaction growth increases in part due to the increased capacity on the SR 520 main span (with two general-purpose and one inside transit/HOV 3+ lane in each direction) and fewer closures compared to FY 2016. With the 5 percent toll rate increase and the pay by mail differential change to $2.00, revenue grows significantly faster than transactions in FY 2017. In FY 2018, the growth rate of transactions decline in part due to more closure days and another 5 percent toll rate increase, even though night time tolling (from 11:00 pm to 5:00 am) brings additional transactions. After FY 2018, toll rates are assumed not to change, which makes the real value of the toll decline due to inflation. From FY 2019 through 2036, average transactions are expected to grow at a rate varying between approximately 1 and 6 percent annually, while revenue growth rates vary between approximately 1 and 5 percent. Strong growth in FY 2022 and FY 2023 can be attributed to much fewer assumed closures and the opening of three operational lanes in each direction to the Montlake interchange. Throughout the remainder of the forecast horizon, the growth rates of both transactions and revenue declines to well below 1 percent annually.

Table 6-2 shows the revised baseline forecast compared to the November 2014 forecast for the entire study period; the same information is shown graphically on Figure 6-1. In the long term, transactions are up 2 to 4 percent in FY 2023 and thereafter in the November 2015 forecast compared to the November 2014 forecast, primarily due to the 3+ carpools not assumed to be exempted in the new forecast. In the short term (FY 2016 through FY 2022), transactions in the November 2015 forecast versus those in the November 2014 forecasts vary between -1 and +2 percent, and the changes are primarily driven by: removal of the 3+carpool exemptions; changes in toll rate increase assumptions with a two-step increase (FY 2017 and FY 2018) resulting in approximately 10 percent increase in toll rates compared to 15 percent in the previous forecast; increased number of closures; and start of night time tolling (11:00 pm to 5:00 am) postponed from FY 2017 to FY 2018.

For revenue, the changes between forecasts are more pronounced than transactions. In general, the revenue per transaction increased in the November 2015 forecast, due to the combination of several factors: increase of Pay By Mail toll differential, higher share of forecasted traffic during the peak periods with higher toll rates, and slightly higher Pay By Mail share of transactions. In comparing the November 2015 revenue forecast to the November 2014 revenue forecast, forecasted gross toll revenue potential is higher in all years. In the short term (FY 2016 through FY 2022), gross toll

revenue potential in the November 2015 forecast exceeds the November 2014 forecast by 0.1 to 3 percent. For FY 2023 and beyond, the forecasted gross toll revenue potential is consistently higher than the November 2014 forecast, with changes varying between 3 and 6 percent.

Table 6-1: SR 520 Transactions and Gross Toll Revenue Potential – November 2015 Forecast

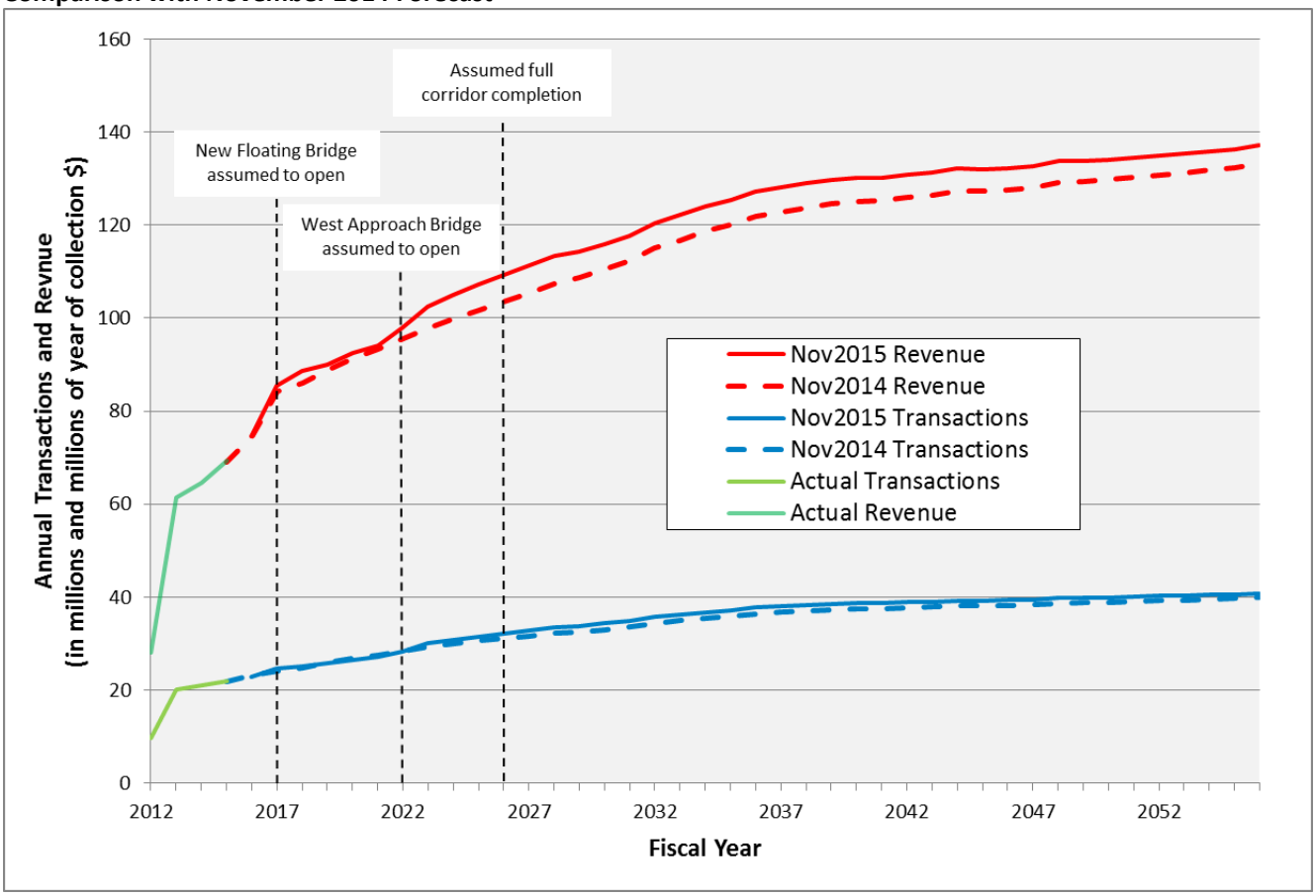
Fiscal Year	Transactions (millions)	Annual Growth	Gross Toll Revenue Potential (millions of year of collection $)	Annual Growth
2016	22.886	--	$74.492	--
2017	24.715	8.0%	85.459	14.7%
2018	25.065	1.4%	88.517	3.6%
2019	25.679	2.4%	90.090	1.8%
2020	26.531	3.3%	92.503	2.7%
2021	27.187	2.5%	94.098	1.7%
2022	28.390	4.4%	97.949	4.1%
2023	30.012	5.7%	102.527	4.7%
2024	30.803	2.6%	104.913	2.3%
2025	31.483	2.2%	107.173	2.2%
2026	32.101	2.0%	109.223	1.9%
2027	32.798	2.2%	111.286	1.9%
2028	33.424	1.9%	113.278	1.8%
2029	33.797	1.1%	114.309	0.9%
2030	34.318	1.5%	115.926	1.4%
2031	34.884	1.6%	117.764	1.6%
2032	35.679	2.3%	120.434	2.3%
2033	36.189	1.4%	122.103	1.4%
2034	36.746	1.5%	123.951	1.5%
2035	37.188	1.2%	125.336	1.1%
2036	37.725	1.4%	127.138	1.4%
2037	38.005	0.7%	128.100	0.8%
2038	38.281	0.7%	128.999	0.7%
2039	38.484	0.5%	129.649	0.5%
2040	38.683	0.5%	130.235	0.5%
2041	38.691	0.0%	130.206	0.0%
2042	38.870	0.5%	130.850	0.5%
2043	39.000	0.3%	131.253	0.3%
2044	39.252	0.6%	132.092	0.6%
2045	39.260	0.0%	132.063	0.0%
2046	39.341	0.2%	132.224	0.1%
2047	39.473	0.3%	132.632	0.3%
2048	39.779	0.8%	133.728	0.8%
2049	39.788	0.0%	133.700	0.0%
2050	39.921	0.3%	134.112	0.3%
2051	40.054	0.3%	134.527	0.3%
2052	40.211	0.4%	134.887	0.3%
2053	40.323	0.3%	135.359	0.3%
2054	40.457	0.3%	135.776	0.3%
2055	40.593	0.3%	136.196	0.3%
2056	40.855	0.6%	137.067	0.6%

Table 6-2: SR 520 Transactions and Gross Toll Revenue Potential – November 2015 Forecast and Comparison with November 2014 Forecast

Fiscal Year	Transactions (millions)			Gross Toll Revenue Potential (millions of year of collection $)		
	November 2014 (1)	November 2015 (2)	Change	November 2014 (1)	November 2015 (2)	Change
2016	23.181	22.886	-1.3%	$74.383	$74.492	0.1%
2017	24.175	24.715	2.2%	84.207	85.459	1.5%
2018	24.850	25.065	0.9%	85.960	88.517	3.0%
2019	25.863	25.679	-0.7%	88.640	90.090	1.6%
2020	26.802	26.531	-1.0%	91.339	92.503	1.3%
2021	27.552	27.187	-1.3%	93.273	94.098	0.9%
2022	28.383	28.390	0.0%	95.507	97.949	2.6%
2023	29.215	30.012	2.7%	97.741	102.527	4.9%
2024	30.081	30.803	2.4%	99.951	104.913	5.0%
2025	30.548	31.483	3.1%	101.755	107.173	5.3%
2026	31.050	32.101	3.4%	103.536	109.223	5.5%
2027	31.553	32.798	3.9%	105.316	111.286	5.7%
2028	32.151	33.424	4.0%	107.447	113.278	5.4%
2029	32.524	33.797	3.9%	108.679	114.309	5.2%
2030	33.025	34.318	3.9%	110.455	115.926	5.0%
2031	33.560	34.884	3.9%	112.435	117.764	4.7%
2032	34.344	35.679	3.9%	115.070	120.434	4.7%
2033	34.862	36.189	3.8%	116.752	122.103	4.6%
2034	35.421	36.746	3.7%	118.603	123.951	4.5%
2035	35.881	37.188	3.6%	120.021	125.336	4.4%
2036	36.420	37.725	3.6%	121.828	127.138	4.4%
2037	36.705	38.005	3.5%	122.828	128.100	4.3%
2038	36.996	38.281	3.5%	123.776	128.999	4.2%
2039	37.215	38.484	3.4%	124.486	129.649	4.1%
2040	37.441	38.683	3.3%	125.145	130.235	4.1%
2041	37.478	38.691	3.2%	125.210	130.206	4.0%
2042	37.663	38.870	3.2%	125.908	130.850	3.9%
2043	37.813	39.000	3.1%	126.386	131.253	3.9%
2044	38.078	39.252	3.1%	127.279	132.092	3.8%
2045	38.115	39.260	3.0%	127.346	132.063	3.7%
2046	38.232	39.341	2.9%	127.608	132.224	3.6%
2047	38.386	39.473	2.8%	128.092	132.632	3.5%
2048	38.690	39.779	2.8%	129.224	133.728	3.5%
2049	38.728	39.788	2.7%	129.293	133.700	3.4%
2050	38.883	39.921	2.7%	129.785	134.112	3.3%
2051	39.038	40.054	2.6%	130.278	134.527	3.3%
2052	39.244	40.211	2.5%	130.752	134.887	3.2%
2053	39.352	40.323	2.5%	131.272	135.359	3.1%
2054	39.509	40.457	2.4%	131.772	135.776	3.0%
2055	39.667	40.593	2.3%	132.274	136.196	3.0%
2056	39.945	40.855	2.3%	133.210	137.067	2.9%

1. November 2014 Traffic and Revenue Forecast by CDM Smith
2. November 2015 Traffic and Revenue Forecast by CDM Smith.

Figure 6-1: SR 520 Transactions and Gross Toll Revenue Potential – November 2015 Forecast and Comparison with November 2014 Forecast



Chapter 7

Sensitivity Tests

This chapter includes the results of a series of tests conducted to measure the sensitivity of baseline forecasts to changes in key study assumptions. The assumptions varied in the tests are those that present risks and have a potential impact on the magnitude of the revenue estimates.

The following sensitivity tests were performed for the years indicated in conjunction with the forecast update:

- Toll rate sensitivity (FY 2017 – after bridge completion)
- Regional growth (FY 2018, FY 2022, and FY 2031)
- Account-based participation rate (FY 2018, FY 2022, and FY 2031)

Each test was performed individually. The results are not necessarily additive and do not provide an estimate of the overall impact if they were to occur simultaneously.

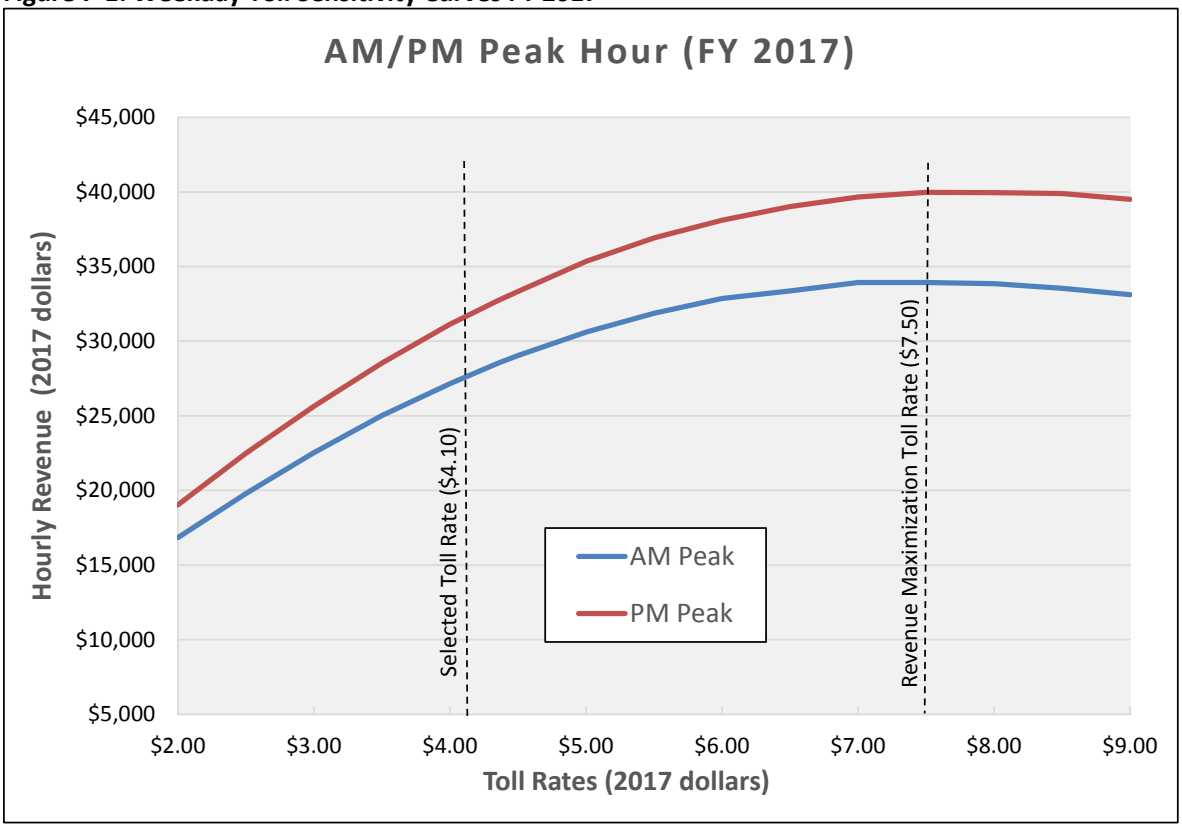
Toll Rate Sensitivity

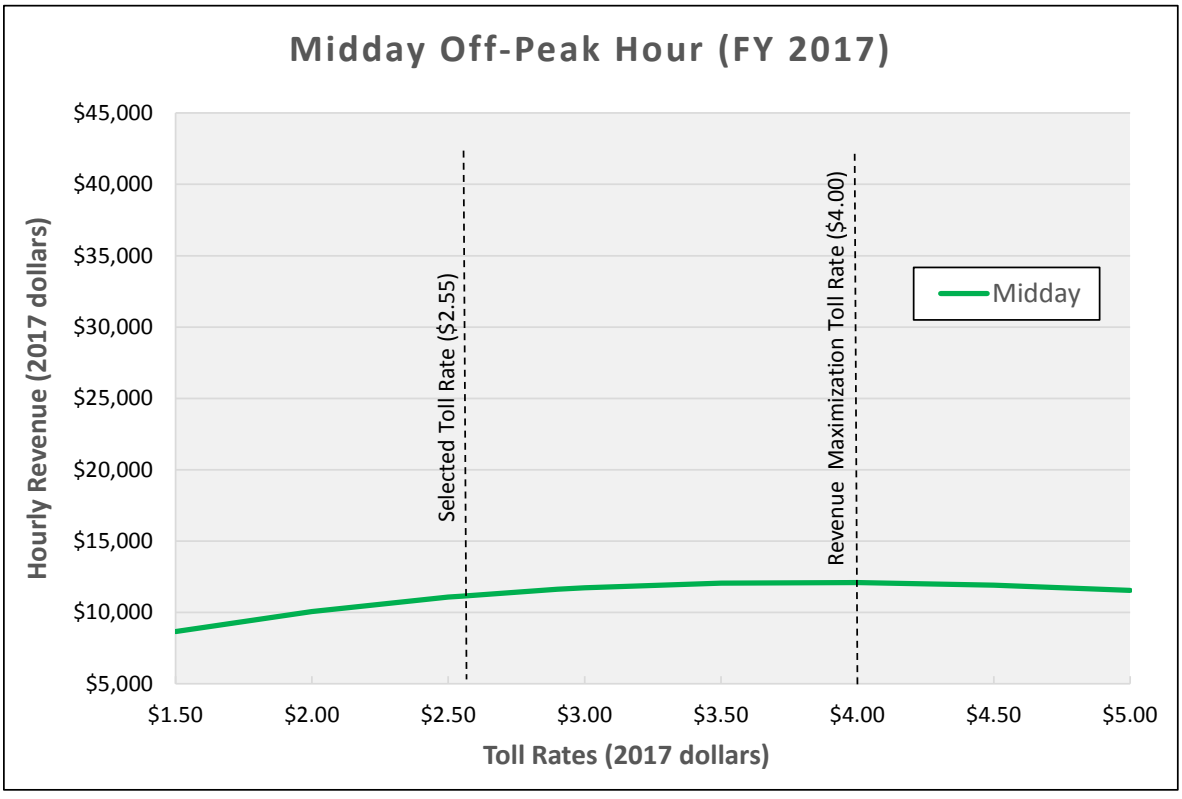
A range of toll rates from $2.00 to $9.00 during peak hours and from $1.50 to $5.00 during the midday was modeled using the tolling analysis model for FY 2017. These toll rates are expressed in year of collection dollars (FY 2017). For each toll rate, the corresponding revenue was computed to develop toll sensitivity curves for AM peak, midday, and PM peak periods.

Figure 7-1 shows toll sensitivity curves for FY 2017. The graphs show where the selected toll rates fall on the sensitivity curves ($4.10 for peak hours and $2.55 for midday). Revenue maximization is obtained at toll rates corresponding to the crest of the revenue curve. As indicated on the figure, the selected toll rates are lower than the revenue maximization toll rates.

The FY 2017 selected peak period toll rate of $4.10 is estimated to generate 81 and 79 percent of the maximum revenue during the AM and PM peak periods, respectively. During the off-peak (midday) period in FY 2017, the selected toll rate of $2.55 is estimated to generate 92 percent of the maximum revenue.

Figure 7-1: Weekday Toll Sensitivity Curves FY 2017





Regional Growth

Using the downside economic forecast described in Chapter 3, the tolling analysis model was run to determine transactions and gross toll revenue potential under lower economic growth conditions. Under the downside scenario, the growth rates were generally reduced by 50 percent from the baseline. The results are presented in Table 7-1.

For FY 2018, under the economic downside scenario, regional population and employment totals are reduced by approximately 2 and 3 percent, respectively. Transactions and revenue are expected to be about 3 percent lower.

For FY 2022, under the economic downside scenario, regional population and employment totals are reduced by approximately 4 and 5 percent, respectively. Transactions and revenue are expected to be about 6 percent lower.

For FY 2031, under the economic downside scenario, regional population and employment totals are reduced by approximately 9 percent when compared to the baseline. Transactions and revenue are expected to be about 10 percent lower.

Table 7-1: Regional Growth Sensitivity Test

Growth Scenario	Transactions[1]	Gross Toll Revenue Potential[2]
FY 2018[3]		
Baseline	25.065	$88.517
Downside Socioeconomic	24.330	$85.870
Percent Difference	*-2.9%*	*-3.0%*
FY 2022[3]		
Baseline	28.390	$97.949
Downside Socioeconomic	26.713	$92.125
Percent Difference	*-5.9%*	*-5.9%*
FY 2031		
Baseline	34.884	$117.764
Downside Socioeconomic	31.370	$105.948
Percent Difference	*-10.1%*	*-10.0%*

1. In millions
2. In millions of year of collection dollars
3. FY 2018 and FY 2022 results incorporate impact of closures

Account-based Participation Rate

This test examined the difference in transactions and revenue if account-based participation rates were different from those assumed in the baseline scenario.

The overall output transaction *Good To Go!* share for the baseline scenario is 85 percent in FY 2018, 86 percent in FY 2022, and 88 percent in FY 2031.The account-based participation rate sensitivity test evaluated an increase to 87 percent in FY 2018, 90 percent in FY 2022, and 93 percent in FY 2031.

The results of the tests are shown in Table 7-2. The higher account-based participation rate results in transactions increasing by 1.1 percent in FY 2018, 1.4 percent in FY 2022, and 0.9 percent in FY 2031. Under this scenario, gross toll revenue potential would be expected to decline by 0.4 percent in FY 2018, by 1.2 percent in FY 2022, and by 2.2 percent in FY 2031.

Table 7-2: Account-based Participation Rate Sensitivity Test

GTG! Rate Scenario	Overall *GTG!* Rate	Transactions[1]	Gross Toll Revenue Potential[2]
FY 2018[3]			
Baseline	84.9%	25.065	$88.517
Higher *GTG!* Rate	87.2%	25.336	$88.197
Percent Difference		*1.1%*	*-0.4%*
FY 2022[3]			
Baseline	85.8%	28.390	$97.949
Higher *GTG!* Rate	90.0%	28.795	$96.799
Percent Difference		*1.4%*	*-1.2%*
FY 2031			
Baseline	87.7%	34.884	$117.764
Higher *GTG!* Rate	92.6%	35.202	$115.211
Percent Difference		*0.9%*	*-2.2%*

1. In millions
2. In millions of year of collection dollars
3. FY 2017 and FY 2022 results incorporate impact of closures

DISCLAIMER

CDM Smith used currently-accepted professional practices and procedures in the development of the traffic and revenue estimates in this report. However, as with any forecast, it should be understood that differences between forecasted and actual results may occur, as caused by events and circumstances beyond the control of the forecasters. In formulating the estimates, CDM Smith reasonably relied upon the accuracy and completeness of information provided (both written and oral) by the Washington State Department of Transportation (WSDOT). CDM Smith also relied upon the reasonable assurances of independent parties and is not aware of any material facts that would make such information misleading.

CDM Smith made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this report.

All estimates and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from multiple agencies, including WSDOT. These estimates and projections may not be indicative of actual or future values, and are therefore subject to substantial uncertainty. Future developments, economic conditions cannot be predicted with certainty, and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that the projections and other forward-looking statements contained within the report are based on reasonable assumptions as of the date of the report, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd Frank Bill) to WSDOT and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to WSDOT with respect to the information and material contained in this report. CDM Smith is not recommending and has not recommended any action to WSDOT. WSDOT should discuss the information and material contained in this report with any and all internal and external advisors that it deems appropriate before acting on this information.

This page intentionally left blank to allow for double-sided printing.


CDM
Smith
Washington State
Department of Transportation