Eastside Corridor
Independent Traffic and Revenue Study

Mid-Project Briefing

presented to

Washington State Transportation Commission

presented by

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with

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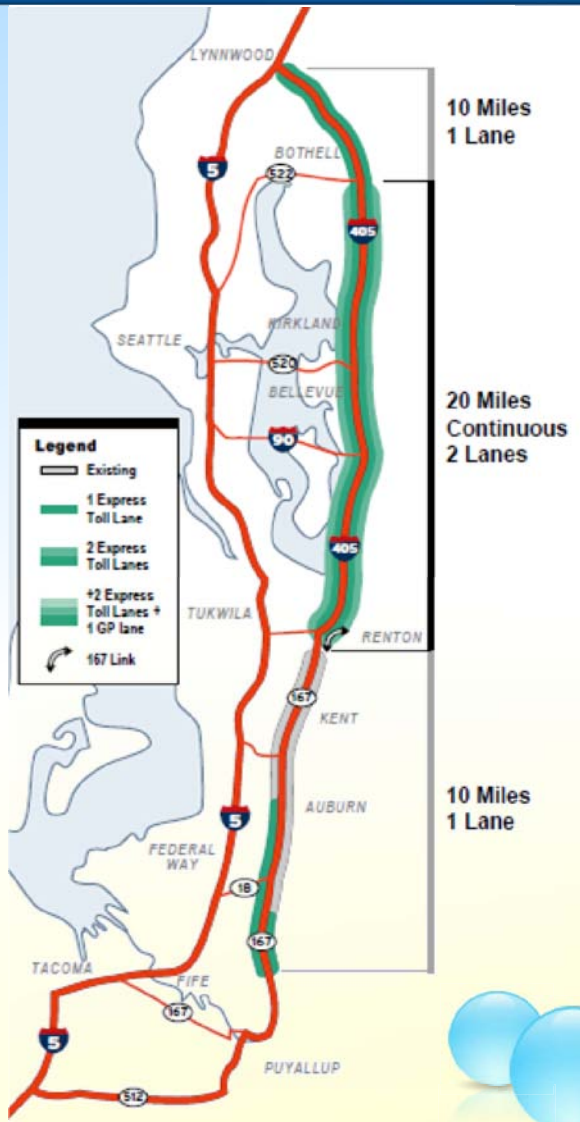
December 13, 2011



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Agenda

- Overview of the Study
- National Experience with Express Toll Lanes
- 2011 Attitudinal and Stated Preference Survey
- Growth Trends and Assumptions
- Corridor Traffic Conditions and Trends
- Concept of Operations

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Overview of the Study

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Legislative Directive

The transportation commission shall retain appropriate independent experts and conduct a traffic and revenue analysis for the development of a 40-mile continuous express toll lane system that includes State Route number 167 and Interstate 405. The analysis must include a review of the following variables within the express toll lane system

- Vehicles with two or more occupants are exempt from payment
- Vehicles with three or more occupants are exempt from payment
- A variable fee
- A flat rate fee

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Traffic and Revenue Study Questions

- Are express toll lanes a workable solution in the I-405/SR167 corridor?
- What range of revenue will they generate?
- How will express toll lanes impact traffic operations?

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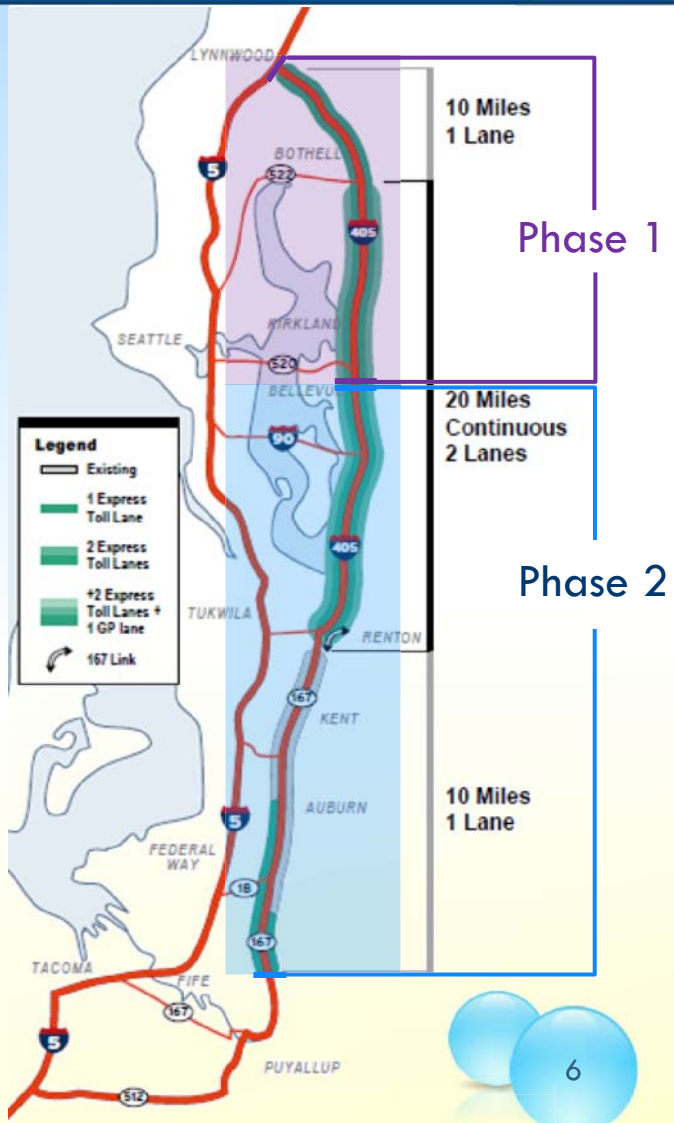
The Express Toll Lane Project

- WSDOT's Option 4: 40+ mile system
  - » Four variations of discounts/exemptions
    - HOV2+ travels free
    - HOV3+ travels free
    - HOV3+ exempt during peak periods and HOV2+ exempt during off-peak periods
    - All HOV discount of $1.00 in 2014 (sensitivity test only)
  - » Toll setting
    - <u>Dynamic</u> pricing (based on actual traffic conditions)
    - <u>Variable</u> pricing (posted rates based on historical conditions)
    - <u>Flat</u> pricing (price is the same all day)



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Study Approach

- Build upon WSDOT's data and models, improved upon by
  - Extensive independent review and modification as necessary
  - New stated-preference/attitude survey
  - Independent model of choice to pay toll
  - National review of similar projects, including willingness to pay tolls
- Incorporate risk analysis directly

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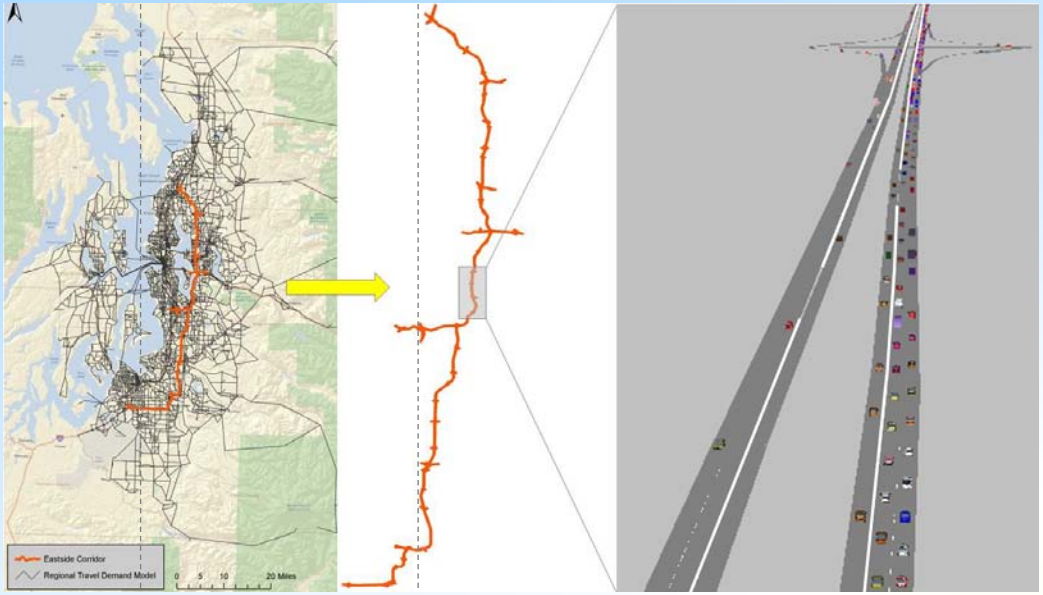
Analytical Overview

Traffic demand; today and tomorrow

Share that would use lanes for free (HOV) and pay

Operational outcomes

Risks



Regional Travel Demands

- PSRC Model
  - ✓2010, 2014, 2018, 2040

Corridor Travel Demands

- The portion of the PSRC Model demand expected to travel in the Eastside Corridor
- The portion of the corridor demand that has access to the express lanes

Choice of Corridor Drivers to Pay to Use Express Toll Lanes

- The portion of the express lane that would pay a toll under different priced conditions

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National Experience with Express Toll Lanes

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Types of Express Toll Lanes

- **10 facilities**
  - » **Excludes Atlanta (opened fall 2011)**
- **Length = 7 to 16 miles**
- **Configurations**

All but one of the Express Toll lane projects are "HOT" lanes. So is the Eastside Corridor.

Number of Express Toll Lanes	Number of Projects
1-lane reversible	1
1-lane in each direction	3
2-lane reversible	3
2-lane in each direction	3

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Toll Exemptions

Toll Exemption	Number of Projects	Notes
HOV2+	6	
HOV2+ off-peak only	1	Katy Freeway, Houston, Texas
HOV3+, but only HOV2+ eligible to pay	1	US 290, Houston, Texas
HOV3+, but pay 50 percent 4-6 p.m. weekdays	1	SR 91, Orange County, California
HOV3+ Registered carpools only	1	I-95, Miami, Florida

- **Most have HOV2+ exemption**
- **Some interesting exceptions**
- **All exempt transit vehicles**

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Tolling Strategies and Share of Traffic

Tolling Strategy	Number of Projects	Notes
Flat toll	1	Katy Freeway, Houston, Texas, Only HOV2 eligible to pay
Time of Day Schedule	3	
Dynamic Pricing	6	

- **Most projects have dynamic pricing**
- **Share of Tolled Vehicles**
  - » **Peak: 32-80 percent**
  - » **Daily: 15-77 percent**

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Toll Rates and Hours of Operation

- **Tolls actually charged: $0.25 to $9.75**
- **All facilities have a minimum and maximum toll**
- **Hour of operation vary**

Hours of Operation	Number of Projects
24/7	4
Peak hours only	4
Peak hours plus midday	2

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Revenue Experience

- Most cover operating expenses
  - » Expenses 50-80 percent of revenue
  - » Most do not recover significant capital cost
- SR 91 generates enough revenue to fund a PPP, but is unique
  - » Highest share of paying vehicles: 80 percent
  - » Intensely congested corridor
  - » No viable alternate routes
  - » HOV3+ pay discounted toll during evening peak (eastbound)

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Willingness to Pay and Value of Time

- Depends on perceived travel time savings, reliability, and other intangibles
- Three analytical approaches
  - Stated-preference (SP)
  - Revealed-preference (RP)
  - Direct measurement (travel time savings and toll paid)
- Values vary significantly from study-to-study and place-to-place…

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Values of Time (VOT) from Recent Studies

Corridor	VOT ($/hr)	VOT as Percentage of Wage
I-15 (San Diego, California)	$15-$17 $20-$51	26-91%
SR 91 (Orange County, California)	$4-16 $20-$40	50-90% (RP)
I-394 MnPass (Minneapolis, Minnesota)	$10-$25	N/A
Katy Freeway (Harris County, Texas)	N/A	40-50%
Katy Freeway (Harris County, Texas)	N/A	63-132%
Katy Freeway (Harris County, Texas)	$22	65%
Katy Freeway (Harris County, Texas)	$51	N/A
Katy Freeway (Harris County, Texas)	N/A	20-40%
Katy Freeway (Harris County, Texas)	$7.40-$8.60 (ordinary) $8-$47.50 (urgent)	N/A

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Value of Time Difficult to Nail Down

- New corridor SP survey a point of comparison to corridor 2006 survey (before the recession)
- National experience shows uncertainties in understanding willingness to pay
- CS Approach
  - » Calibrate the cost coefficient in toll-choice component of simulation model
  - » Use a range of estimates in risk-based approach

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2011 Attitudinal and Stated Preference Survey

Role of Surveys on This Project

- Stated preference (SP) surveys aim to understand how people will respond when faced with new choices
  - » Gets at the issue of "willingness to pay" or "value of time"
  - » Used as one element in forecasting
    - Reflecting national experience as well
- Attitudinal surveys aim to understand how people feel
  - » Do they agree or disagree with the project?
  - » What are underlying attitudes that influence behavior?

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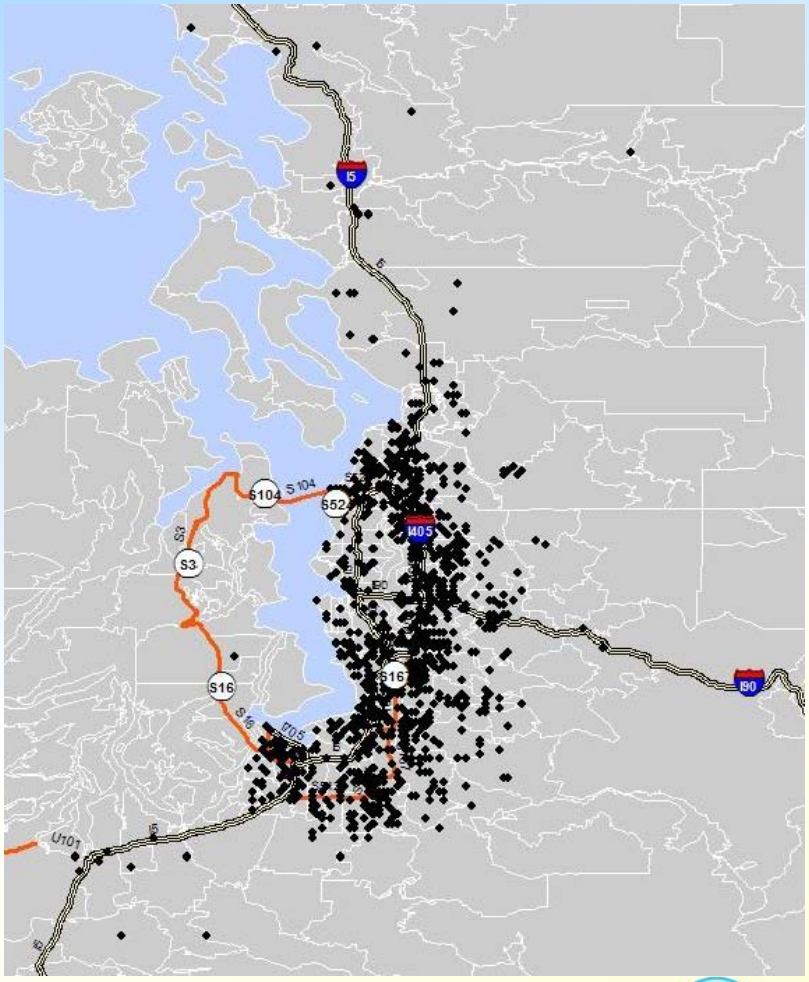
Survey Background

- Led by Resource Systems Group
- September/October 2011
- Computer-assisted self-interview (CASI)

Survey Respondents

Data Source	Completed SP Surveys	Completed Attitude Surveys
Businesses/ Organizations	663	1,241
On-line Research Panel	704	780
Total	**1,367**	**2,021**



Map of Respondent Trip Origins

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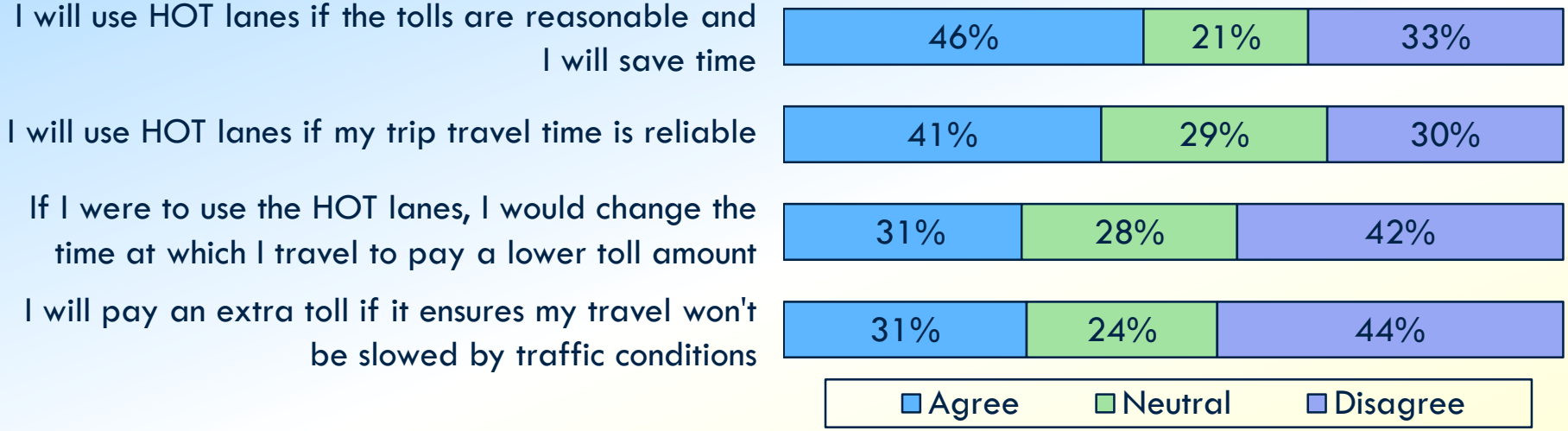
Attitude Survey Highlights

Congestion and Value of HOT lanes

- **65 percent perceive heavy congestion at least some of the time**
- **82 percent expect congestion to increase in the future**
- **Conditions where respondents would use HOT lanes:**



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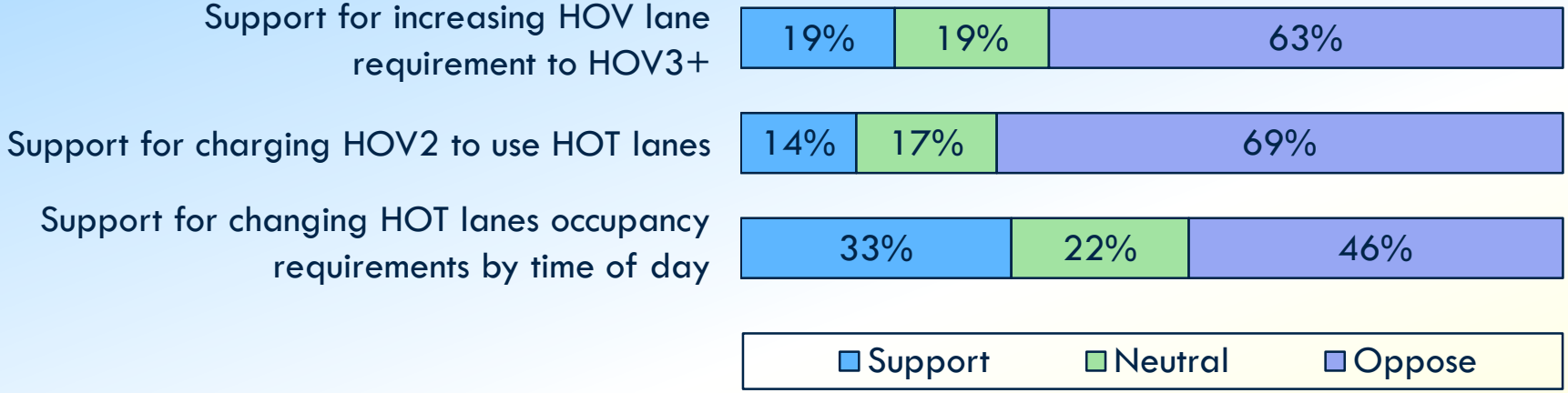
Attitude Survey Highlights

Support for Changing the Rules

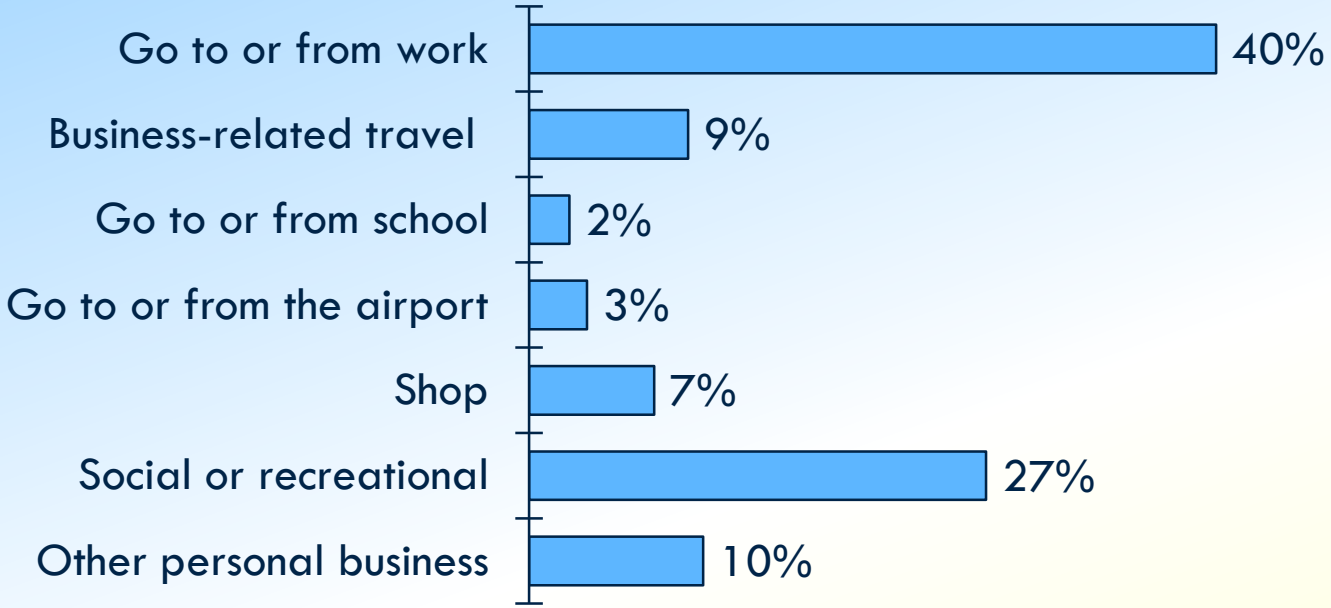
- **Less support for changing HOV lane requirement**
- **Some support for varying requirement by time of day**



SP Survey Results

Types of Trips

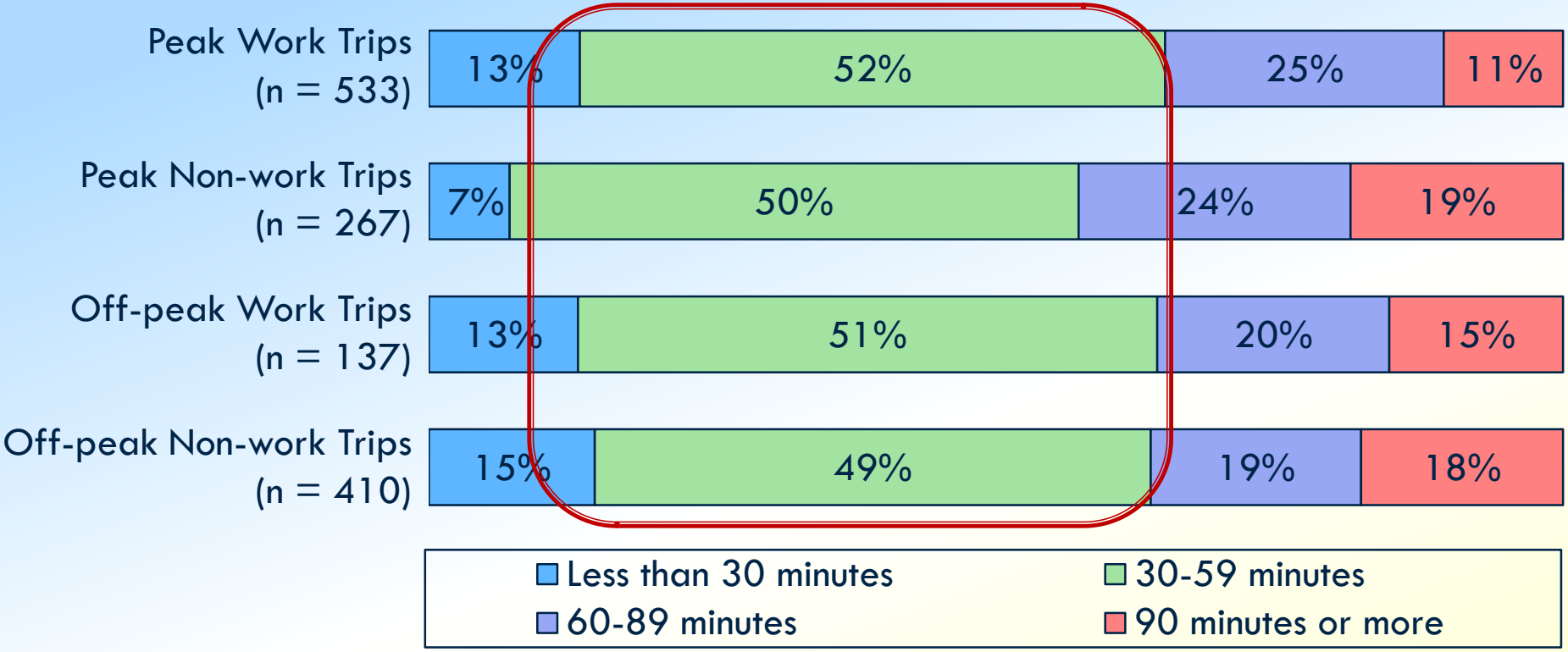
- **Commute and social/recreational trips predominate**



SP Survey Results

Range of Travel Times

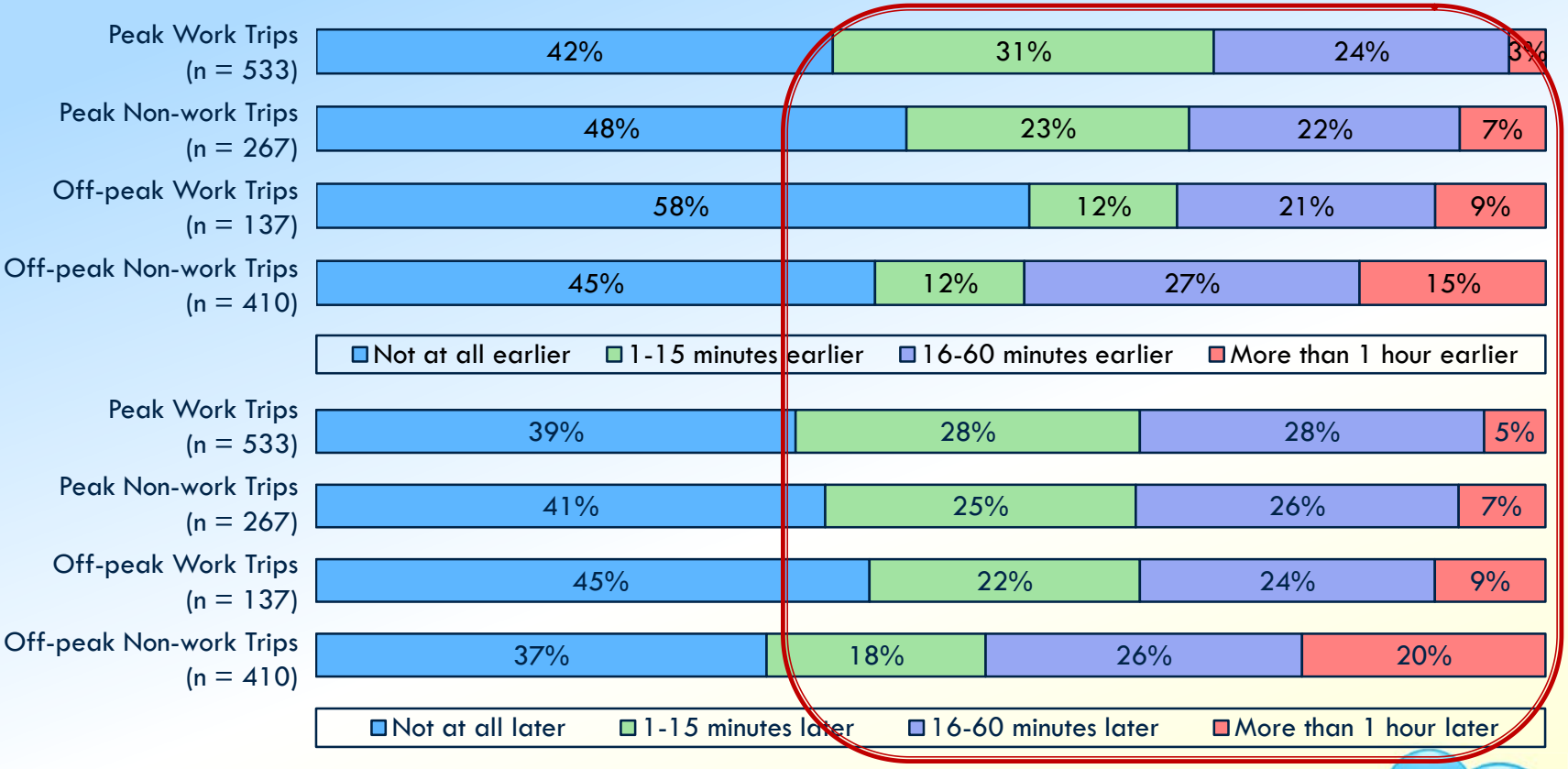
- **Typical trips between 30-60 minutes, of all types**



SP Survey Results

Ability to Shift Time of Trip

- **More than half of trips could shift time of departure earlier than later**



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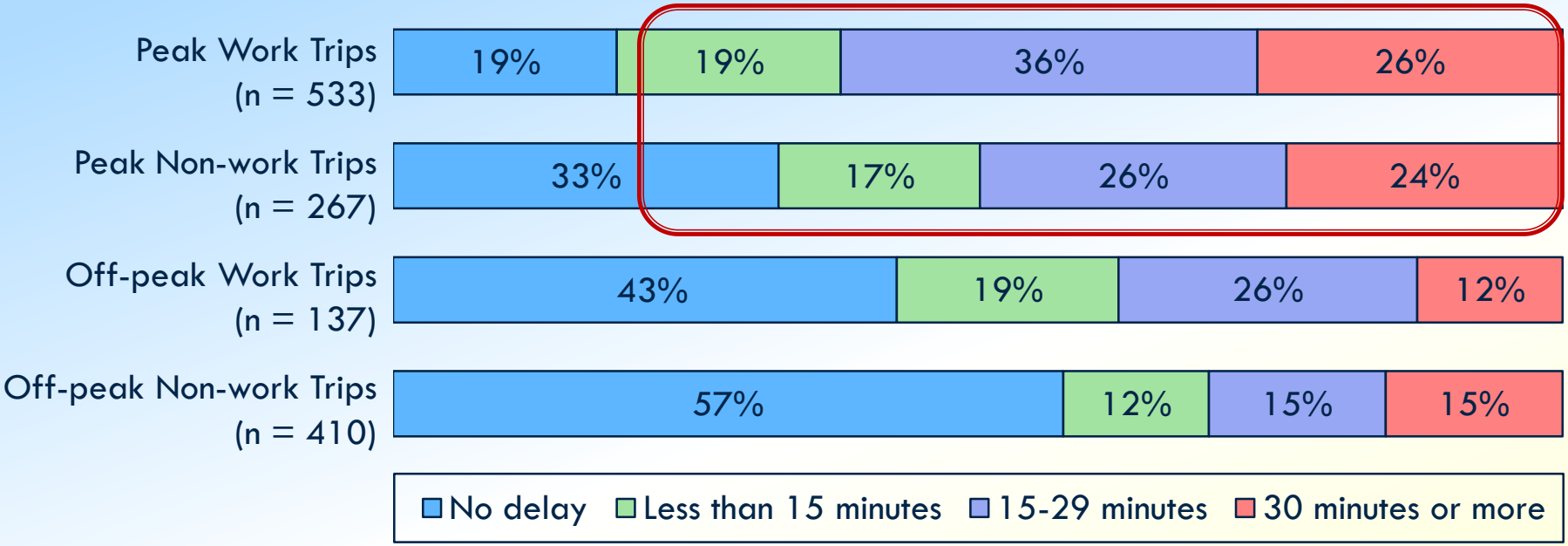
SP Survey Results

Delay Due to Traffic Congestion, by Market

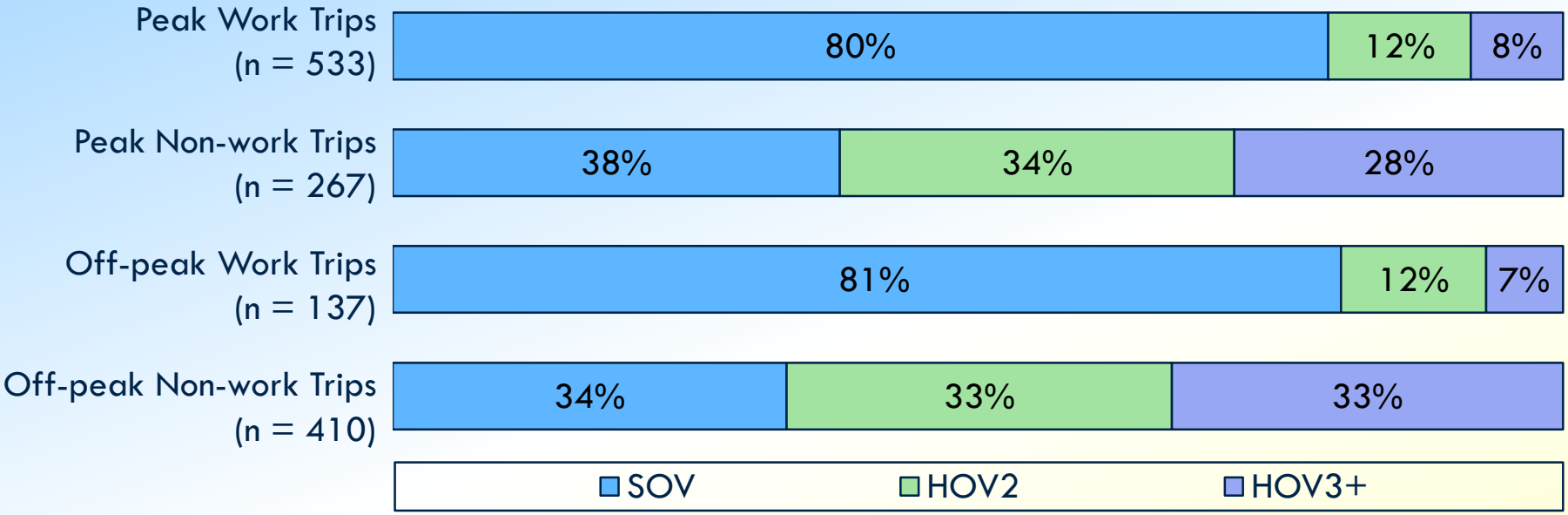
- **Peak trips, work and non-work, most delayed**
  - » **About ¼ by 30 minute or more (self-reported)**



SP Survey Results

Vehicle Occupancy, by Market

- **Work trips 80 percent+ single occupant**
- **Non-work trips less than 40 percent single occupant**

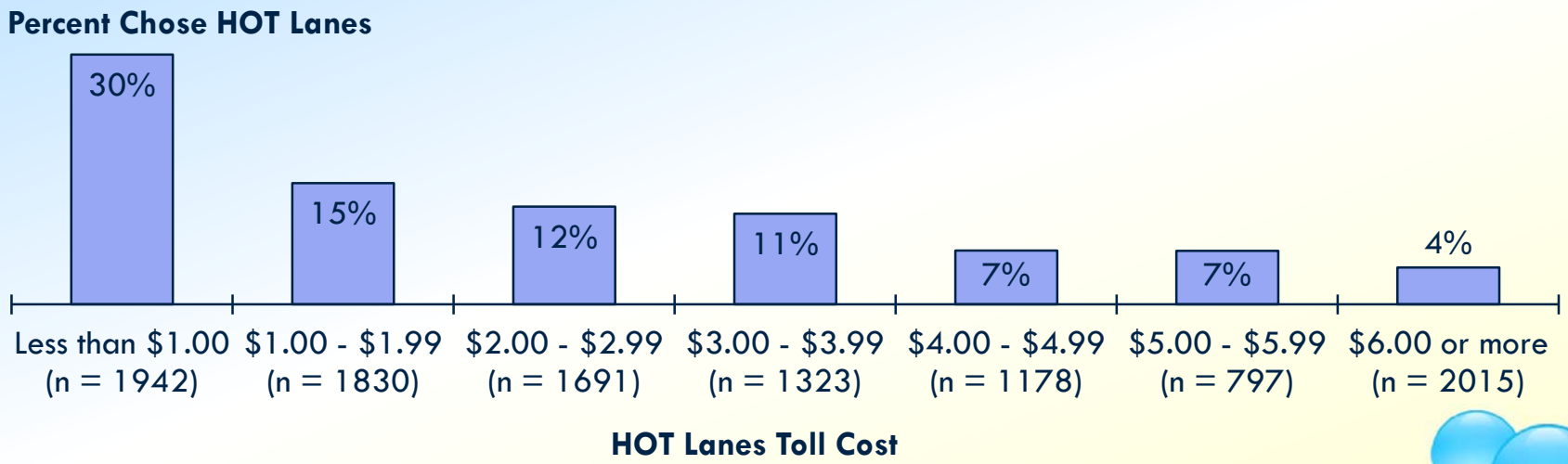


SP Survey Results

Percent of Time "HOT Lanes at Current Occupancy" Chosen

- **Overall, Stated preference choices**
  - » **Regular lanes – 76 percent**
  - » **Proposed HOT lanes – 10 percent**
  - » **Proposed HOT lanes with more passengers – 13 percent**

- **Decreases with toll cost**



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SP Survey Results

Reasons for Choices

- **Most common reasons for not choosing HOT-lane alternative**
  - » **Time saving not worth the toll cost** **43%**
  - » **Opposed to paying tolls** **34%**
- **Most common reasons for not selecting carpool alternative**
  - » **Like flexibility of traveling alone** **38%**

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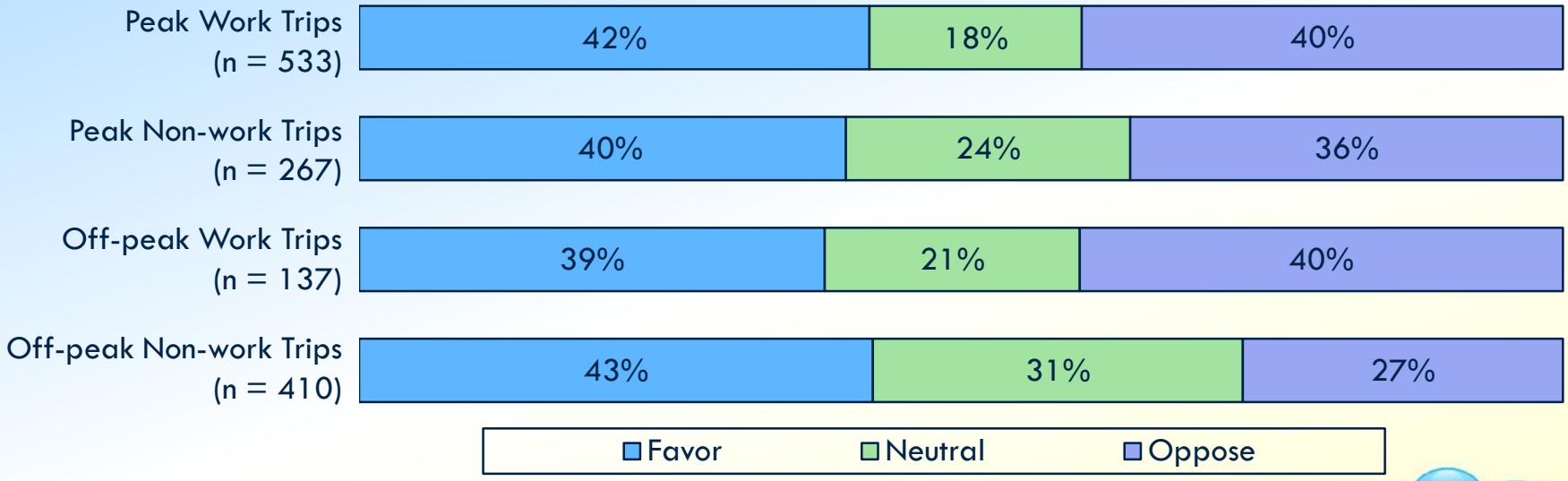
SP Survey Results

Opinion of HOT Lanes Project

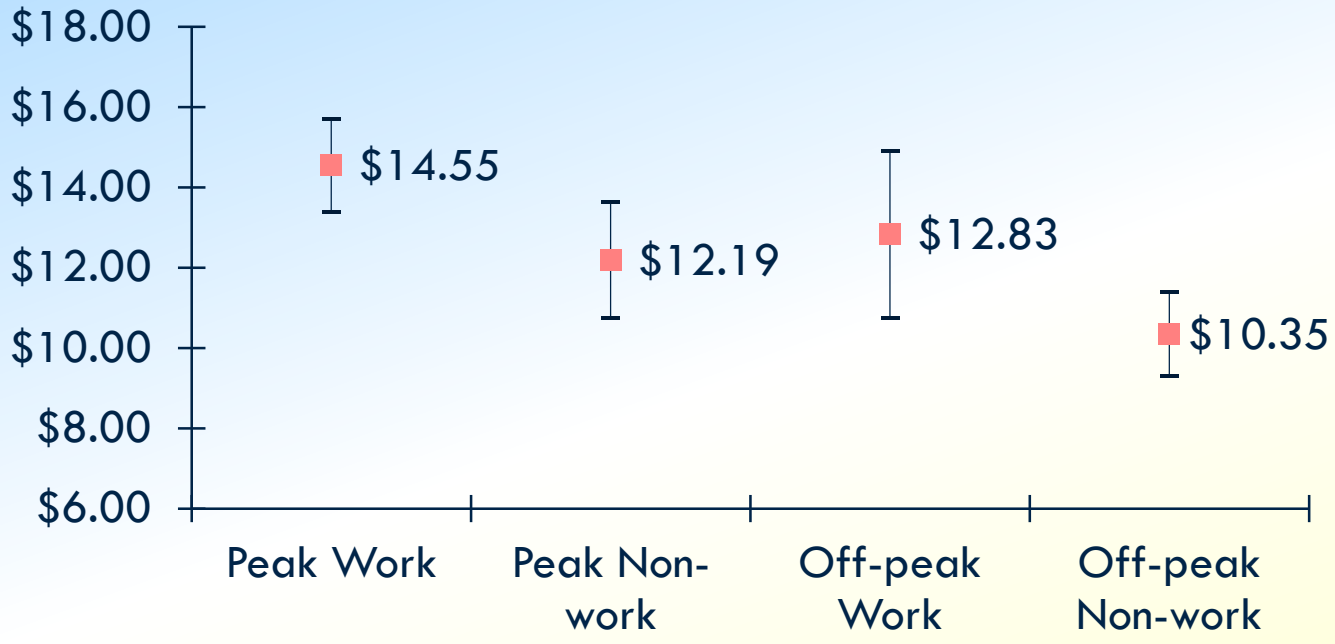
- **As many favor as oppose, with many neutral**
- **Little change after pricing experiments**

Opinion of HOT Lanes before state preference questions



Surveyed Values of Time

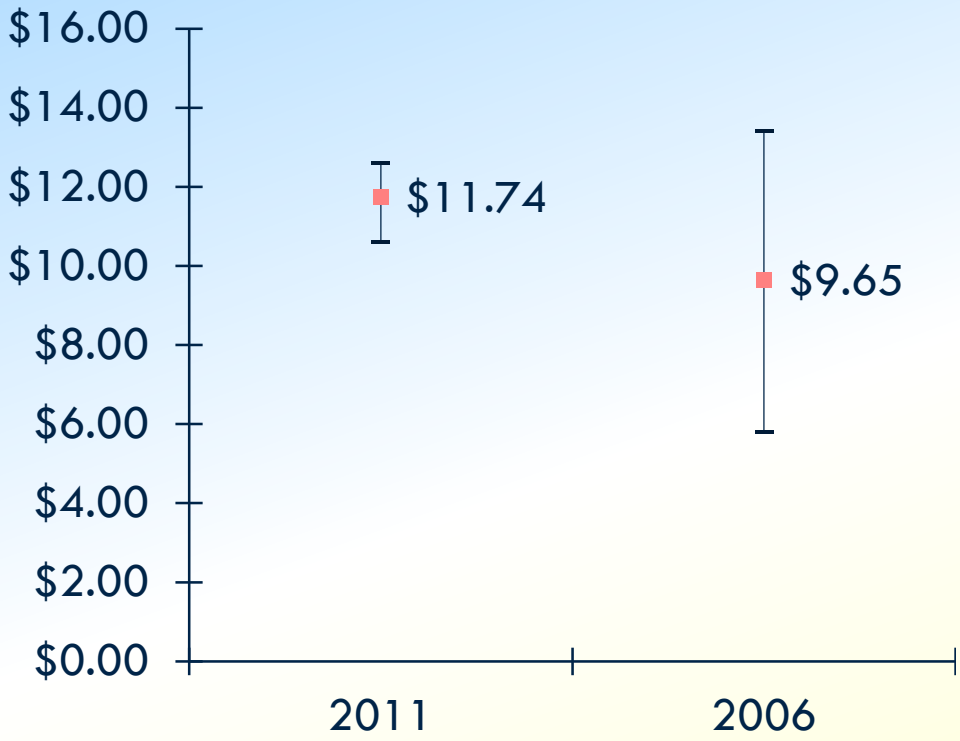
- **Values of time vary by time of day and trip purpose**
- **Overall average = $13.09/hour**



Values of Time

2006 Versus 2011 Surveys

- Different geography
- Different data collection methods
  - » On-line versus intercepts
- More work trips in 2006
- Changes to study corridor
  - SR 167 HOT lanes opened
  - Increased familiarity with tolling?
- Surveyed value of time slightly higher in 2011 than 2006 (inflation adjusted)
- Difference is not significant at 95 percent confidence level



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Growth Trends and Assumptions

Started with Available Forecasts

- Three regional forecasts
  - PSRC (2006)
  - Independent forecast for SR 520 traffic and revenue study (2010)
  - Moody's Analytics (2011)
- Comparison
  - Location of population growth: King County versus dispersed
  - Population growth
    - All similar
  - Employment growth
    - 2006 PSRC employment forecast much higher than the others

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Forecast Basis for This Study

- Midpoint of Moody's and WSDOT
- Large variation in employment growth
  - » PSRC travel demand model not sensitive employment
  - » Potential for long-term changes in basic travel patterns
- Synthesize low/high forecasts based on
  - » Year 2018 +/- 5 percent
  - » Year 2030 +/- 10 percent

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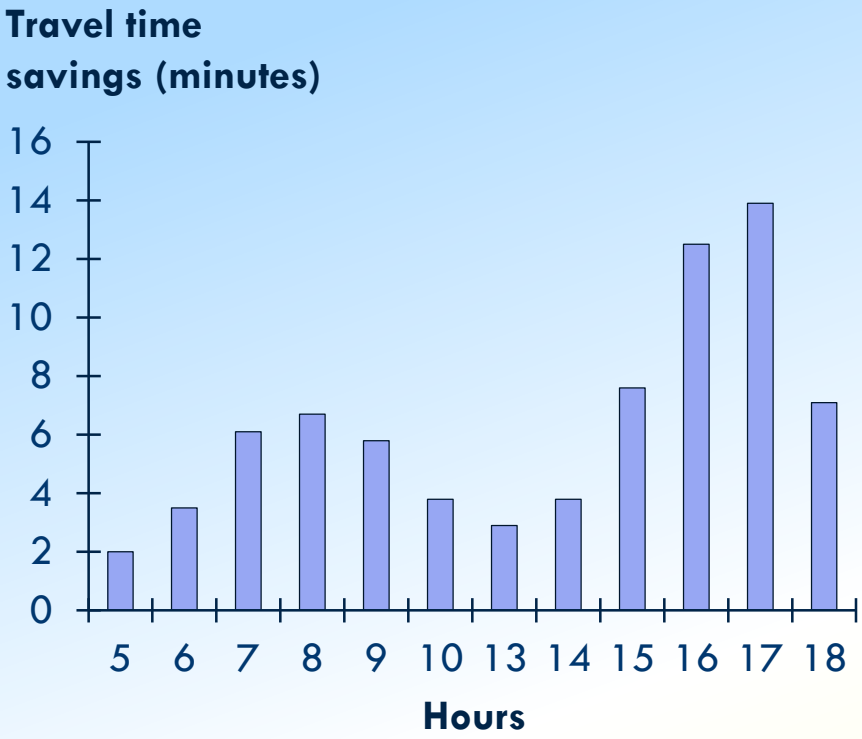
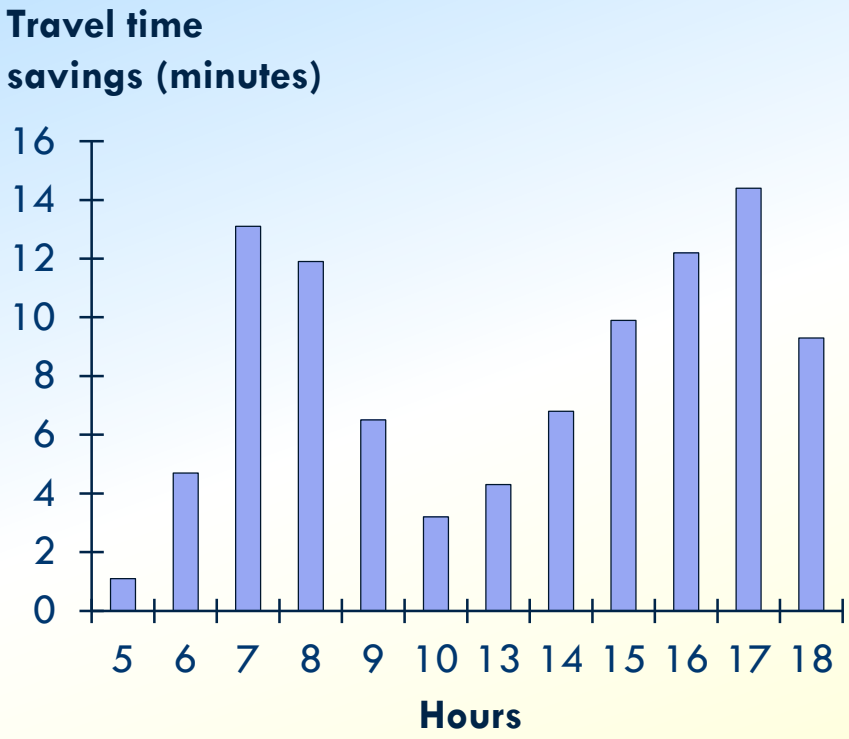
Corridor Traffic Conditions and Trends

Corridor Travel Time Savings
I-405: Average

I-405 NB



I-405 SB



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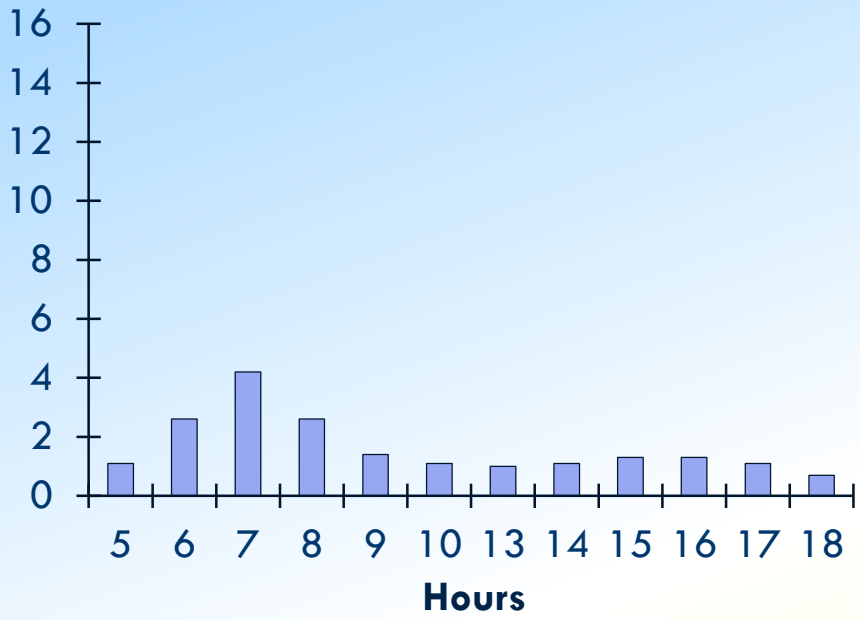
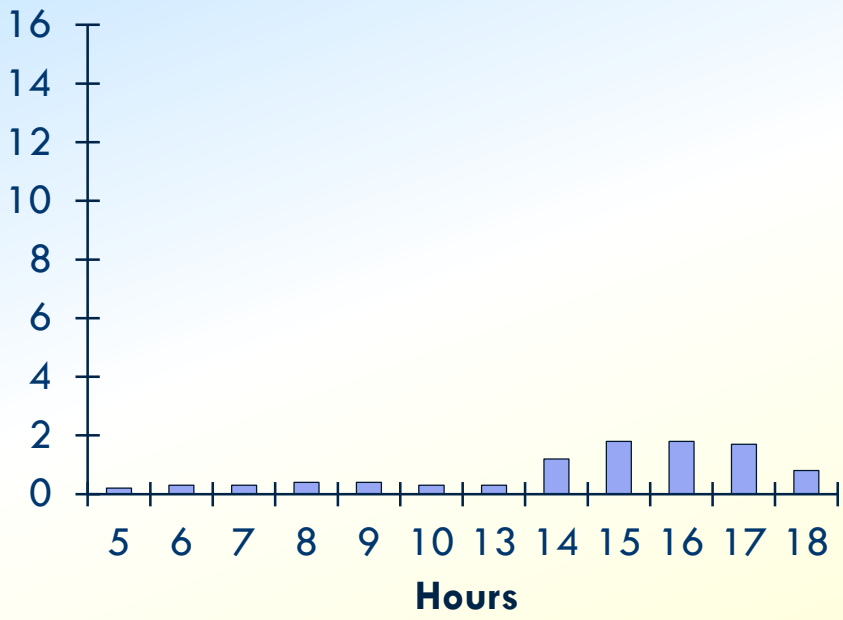
Corridor Travel Time Savings
SR 167: Average

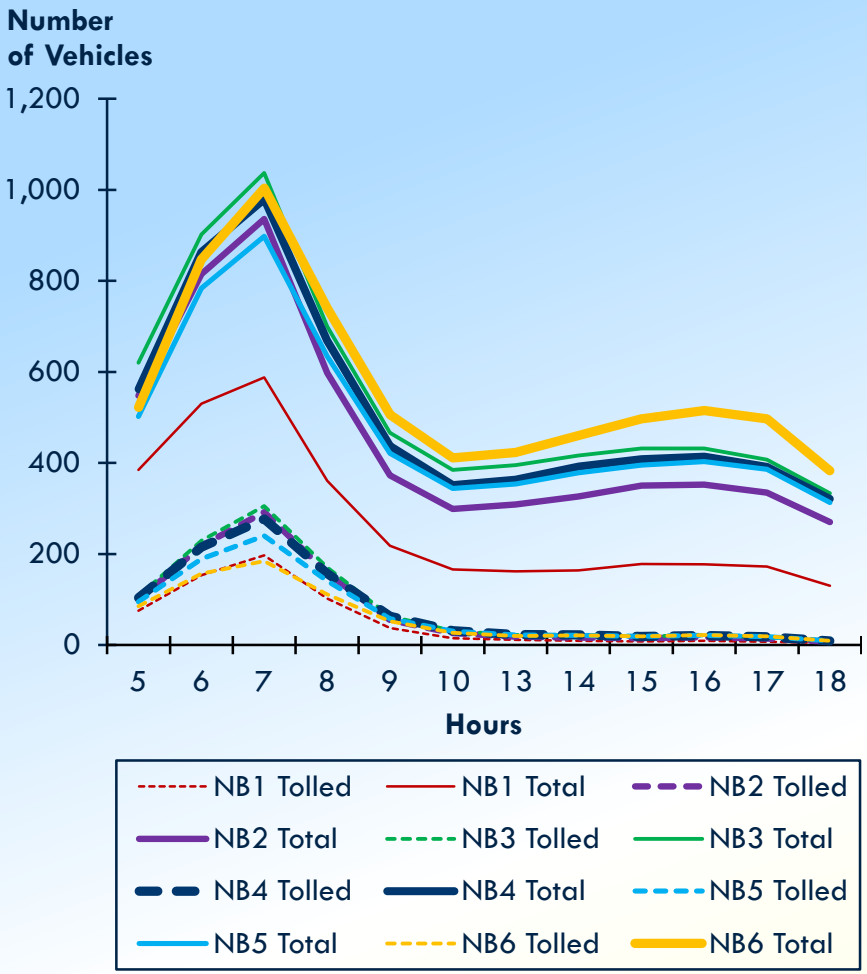
SR 167 NB

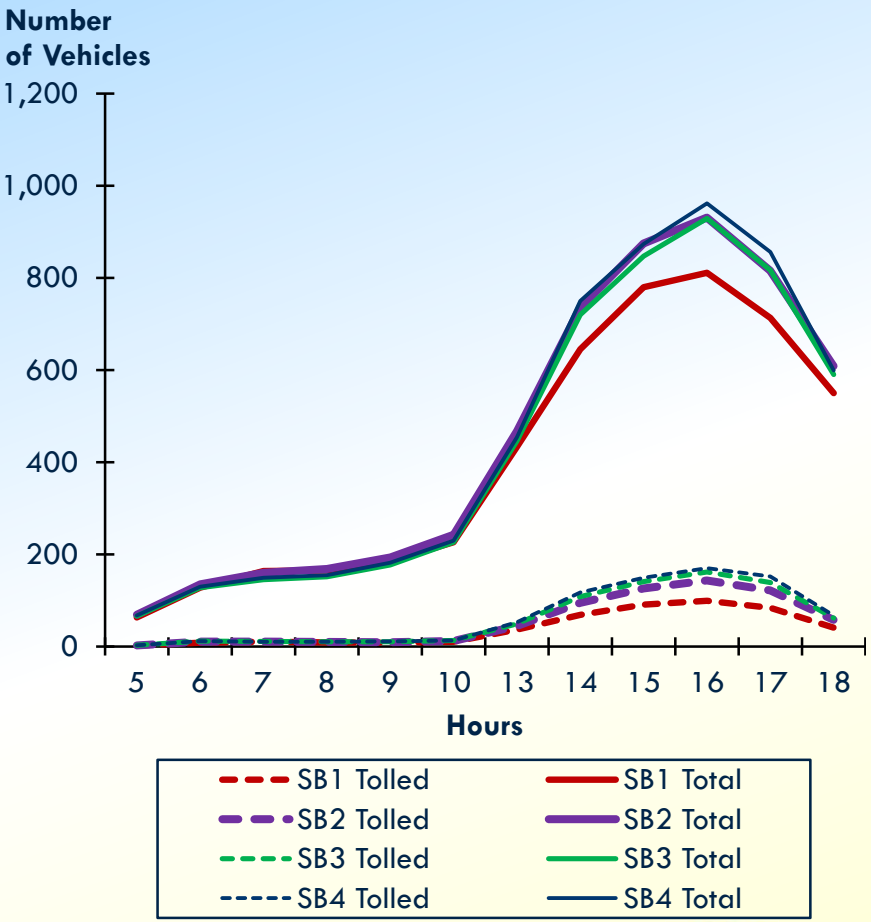


SR 167 SB



SR 167 Average Weekday Express Toll Lane Utilization





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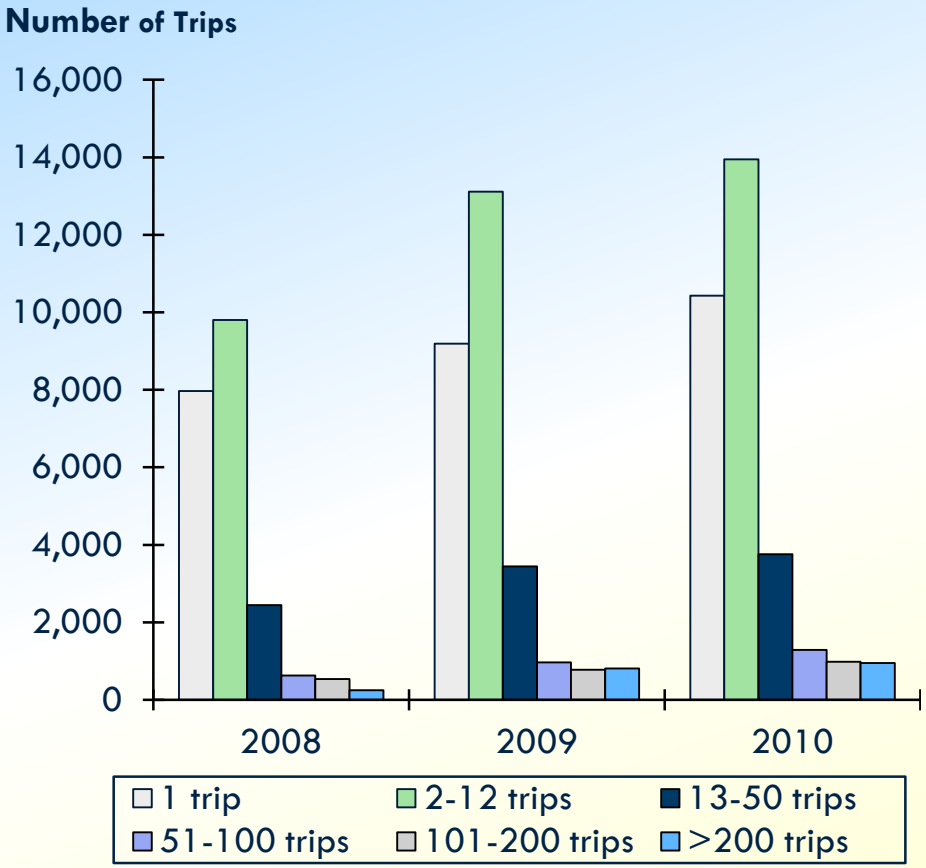
Good to Go! Transponder Ownership SR 167 Corridor

- Used SR 167 at least once
  - » Increased from 2008 through 2010
- 80 percent used SR 167 Express Lanes less than once a month
- 10 percent used facility at least once per week



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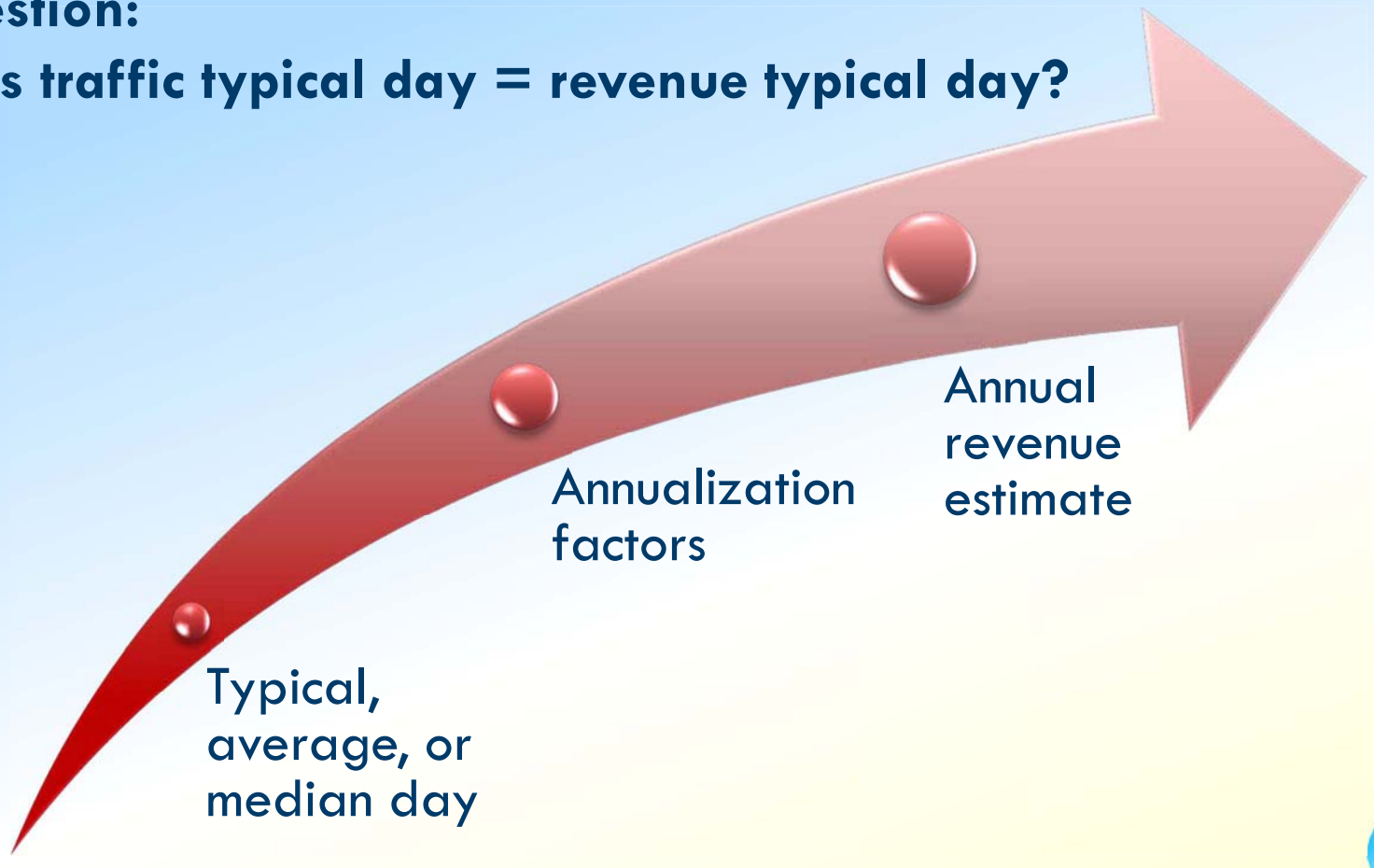
The Typical Day
Why is it Important?

Question:
Does traffic typical day = revenue typical day?



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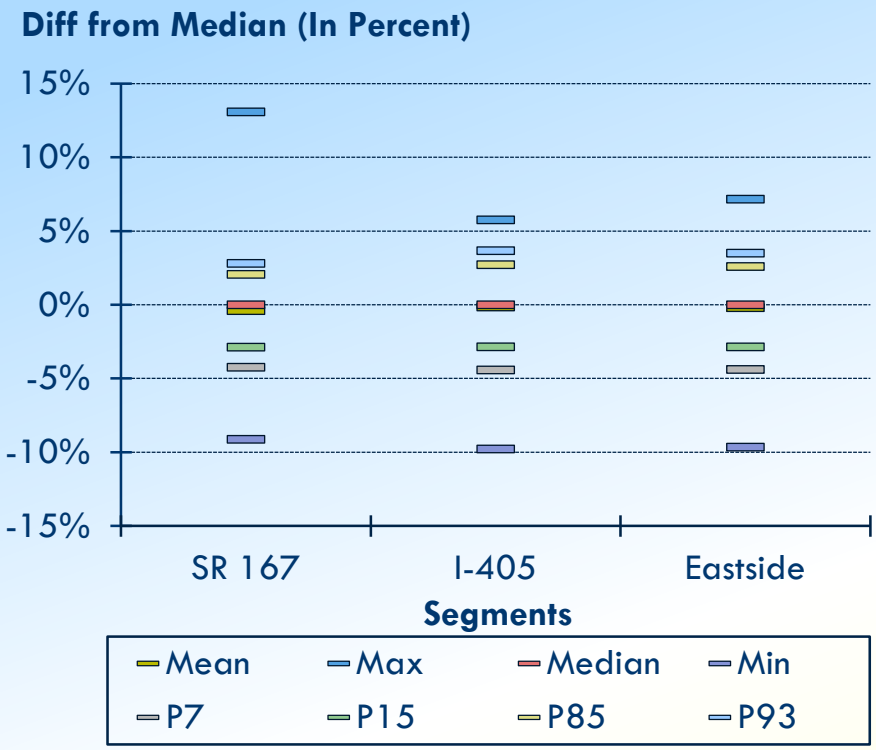
Variation in Total Vehicle Miles in 2010

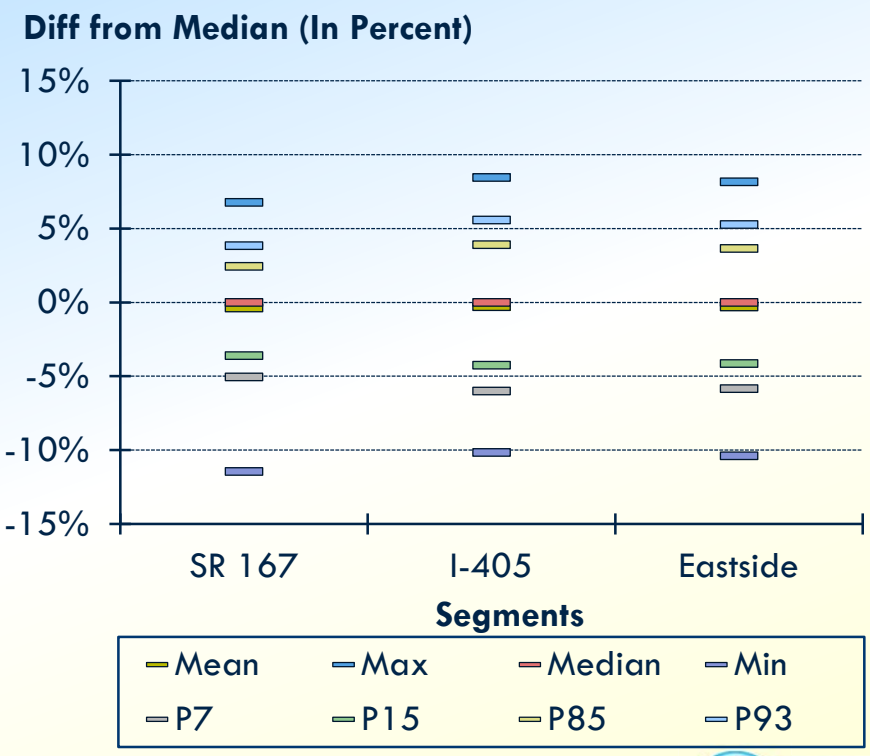
Eastside Corridor

- **Relatively small variations in traffic over the year**

A.M. Peak Period



P.M. Peak Period



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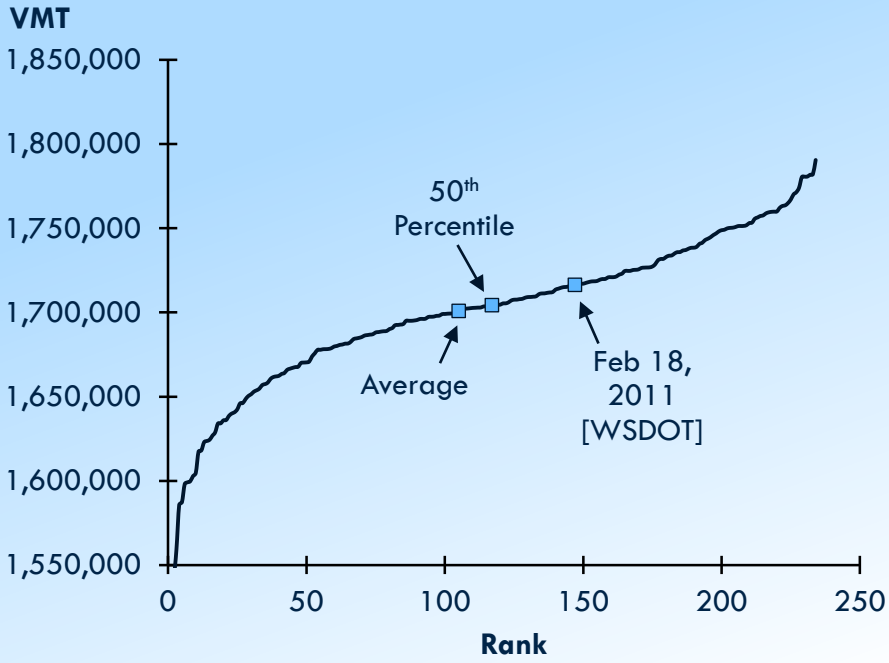
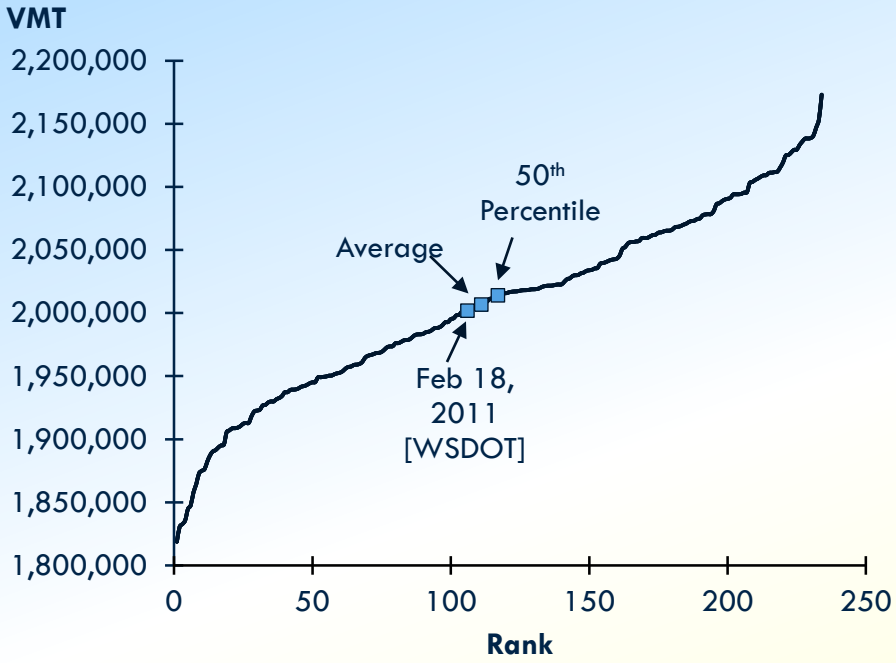
2010 Typical Day

Average, Median, and WSDOT

A.M. Peak Period

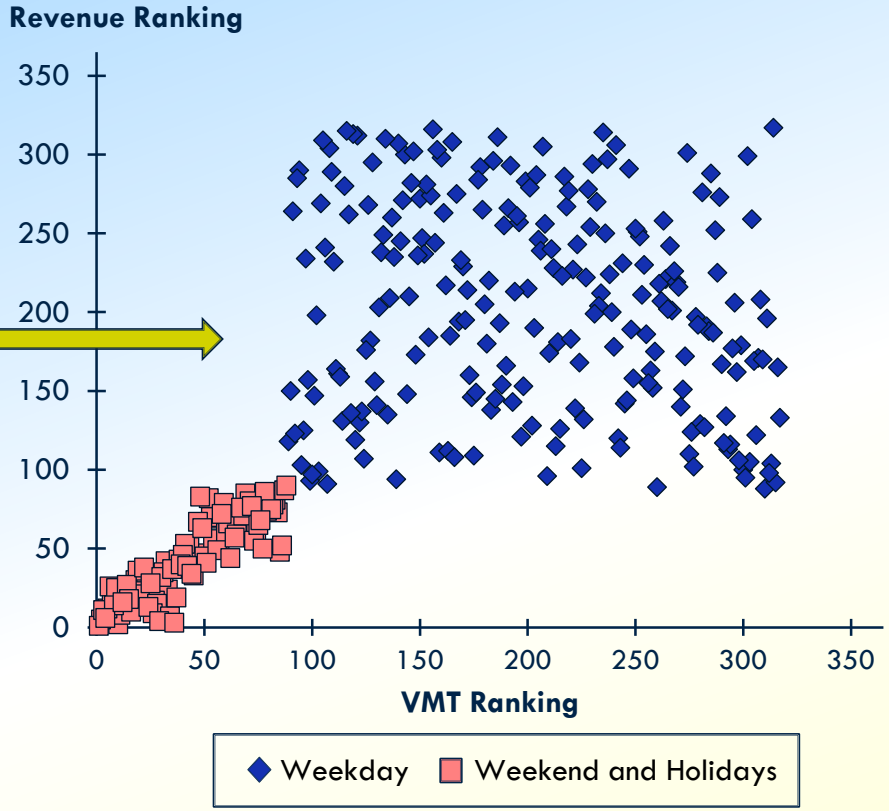


P.M. Peak Period



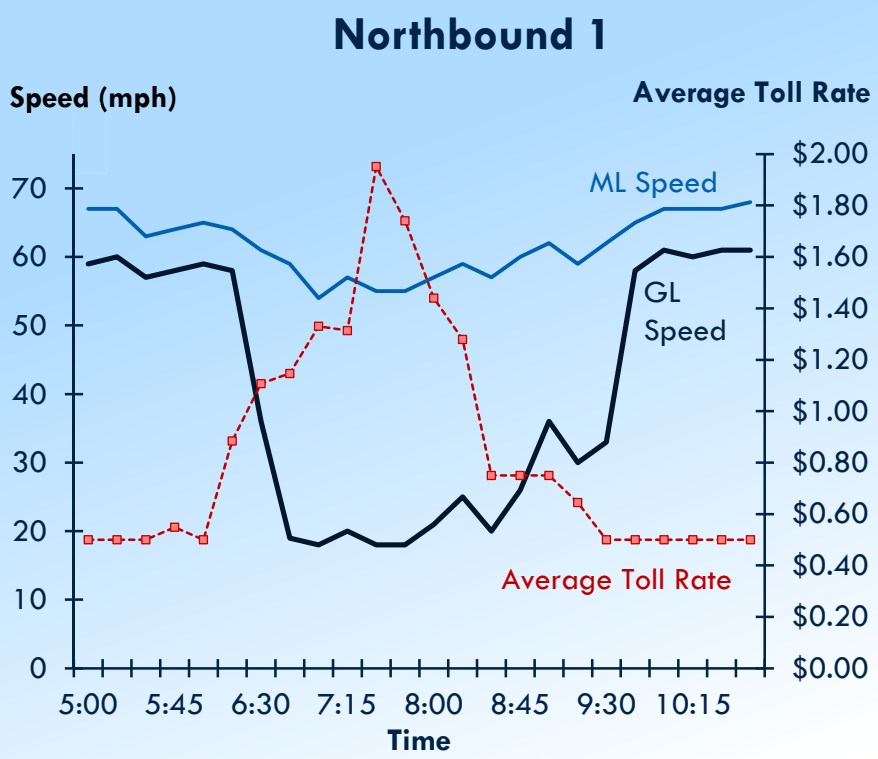
Relationship of Typical Day to Annual Revenue on SR 167 in 2010

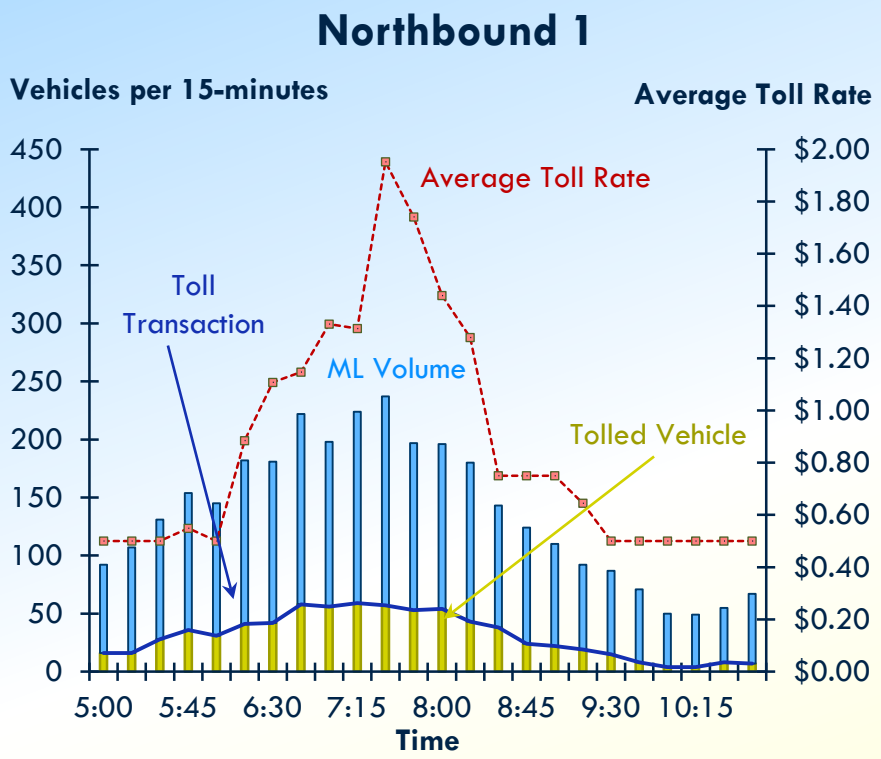
- Reasonable to expect that the rank of traffic volume would be similar to the rank of revenue on a given day
  - » But it's not
- Adds uncertainty to calculating annual revenue from a typical day of traffic
- Risk analysis can address this



How can this be?

Relationship between Speed, Volume, and Toll Rate on SR 167: September 8, 2010





- **Speed seems to influence toll rates more than volume**
- **So – much different revenue possible on days with similar volumes**

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Concept of Operations

Concept of Operations, or… How the Express Lane System Will Work

- **Who gets tolled?**

HOVs (transit and public vanpools)	Free
Private HOVs (cars)	Toll Rate discount or Free
Other vehicles	Tolled

- **Toll setting policy**
  - » **Keep speed > 45 mph**

- **WSDOT approach to toll setting**
  - » **Toll rate calculated based on speed and volume in the Express lane**
  - » **Adjusted every five minutes**
  - » **CS to also study static variable tolling and flat tolling**

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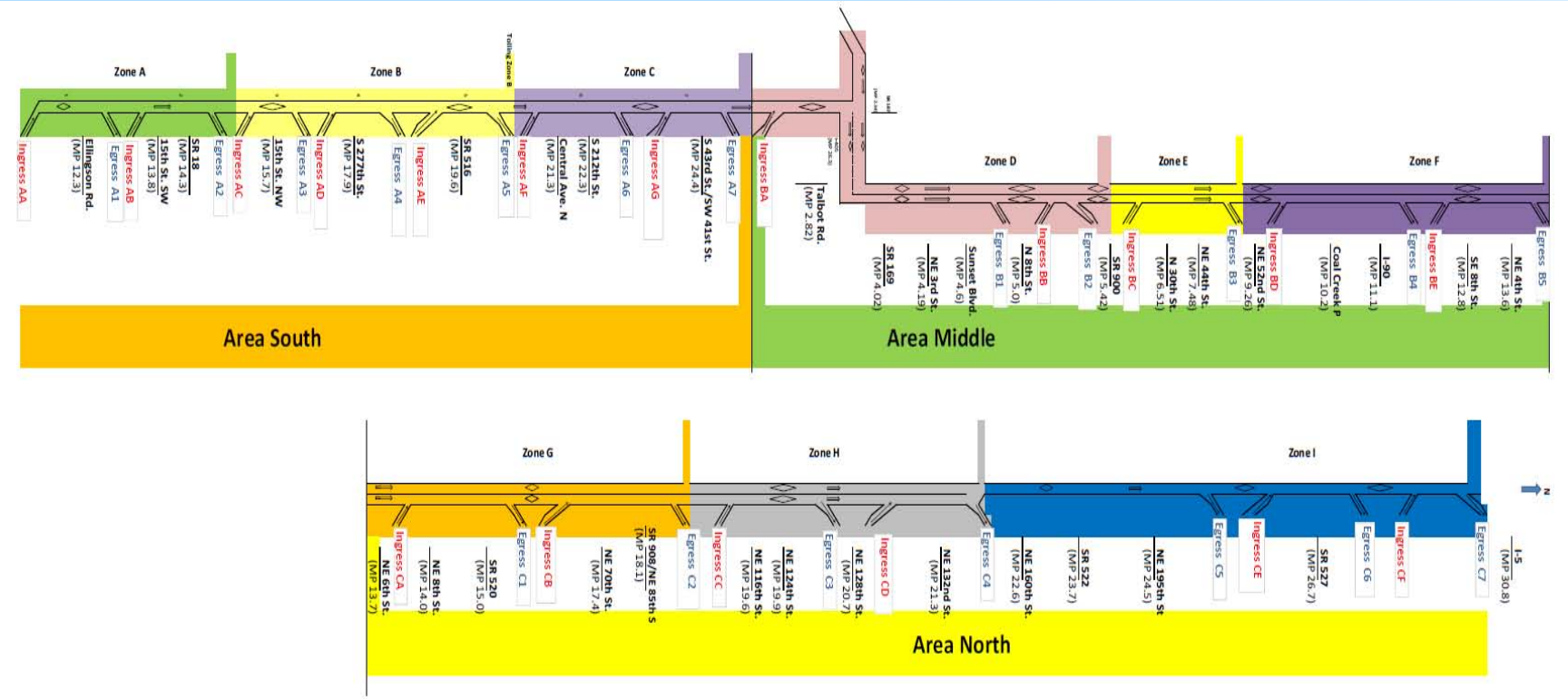
Three Levels of Geography



- **From large to small**
  - » **Areas**
  - » **Toll zones**
  - » **Segments**

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Toll Rates

- Posted at ingress location for up to three downstream destinations within a single tolling area
- Rates for the next area will be displayed just before a decision point to continue onto the next segment or exit the express lanes
- Toll rates
  - » Increments of $0.25
  - » Minimum toll per toll area
    - Phase 1 (2014) = $0.50 (2011$)
    - Phase 2 (2018) - $0.70 (2011$)
  - » No maximum

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Toll Exemptions Under Different Scenarios

CS 3+ Scenario

	Phase 1 2015	Phase 1 2018	Phase 2 2018	Phase 2 2030
SR 167	HOT2+	HOT2+	HOT3+	HOT3+
South I-405	HOV2+	HOV2+	HOT3+	HOT3+
North I-405	HOT3+	HOT3+	HOT3+	HOT3+

CS 2+ Scenario

	Phase 1 2015	Phase 1 2018	Phase 2 2018	Phase 2 2030
SR 167	HOT2+	HOT2+	HOT2+	HOT2+
South I-405	HOV2+	HOV2+	HOV2+	HOV2+
North I-405	HOT2+	HOV2+	HOV2+	HOV2+

- **Also testing**
  - » **Hybrid scenario**
    - **HOV3+ free in peaks**
    - **HOV2+ free on off-peak**
  - » **HOV discount scenario (sensitivity test)**
    - **HOV2+ get a $1.00 discount at all times**
    - **HOV3 get same discount**

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Other Items

- ***Good To Go!* pass required**
  - » **Declarable pass required for private carpools**
  - » **Photo enforcement**
- **Operates seven days a week**

	Hours of Operation
Phase 1 (2014): I-405	5 a.m. to 8 p.m.
Phase 1 (2014): SR 167	5 a.m. to 7 p.m.
Phase 2: I-405 and SR 167	5 a.m. to 8 p.m.

- **No vehicles over 10,000 gross vehicle weight (GVW)**

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SR 167 Concept of Operations through 2018

- Who gets tolled
  - HOVs 2+ (public and private): Free
  - SOVs: Tolled
- Toll rates
  - Minimum: $0.50
  - Maximum: $9.00

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Assumptions and Next Steps

Creating the Forecasts

Corridor Forecasts	• Ranges based on socioeconomics and travel patterns
Analyze traffic with typical day, different exemption scenarios	• 2014 HOT2+ free • 2018 HOT3+ free • 2030 Mixed, and discount
Test express lane use and revenue, varying	• Willingness to pay • Annualization factor
Risk Analysis with Monte Carlo Simulation	• Probabilistic outcomes

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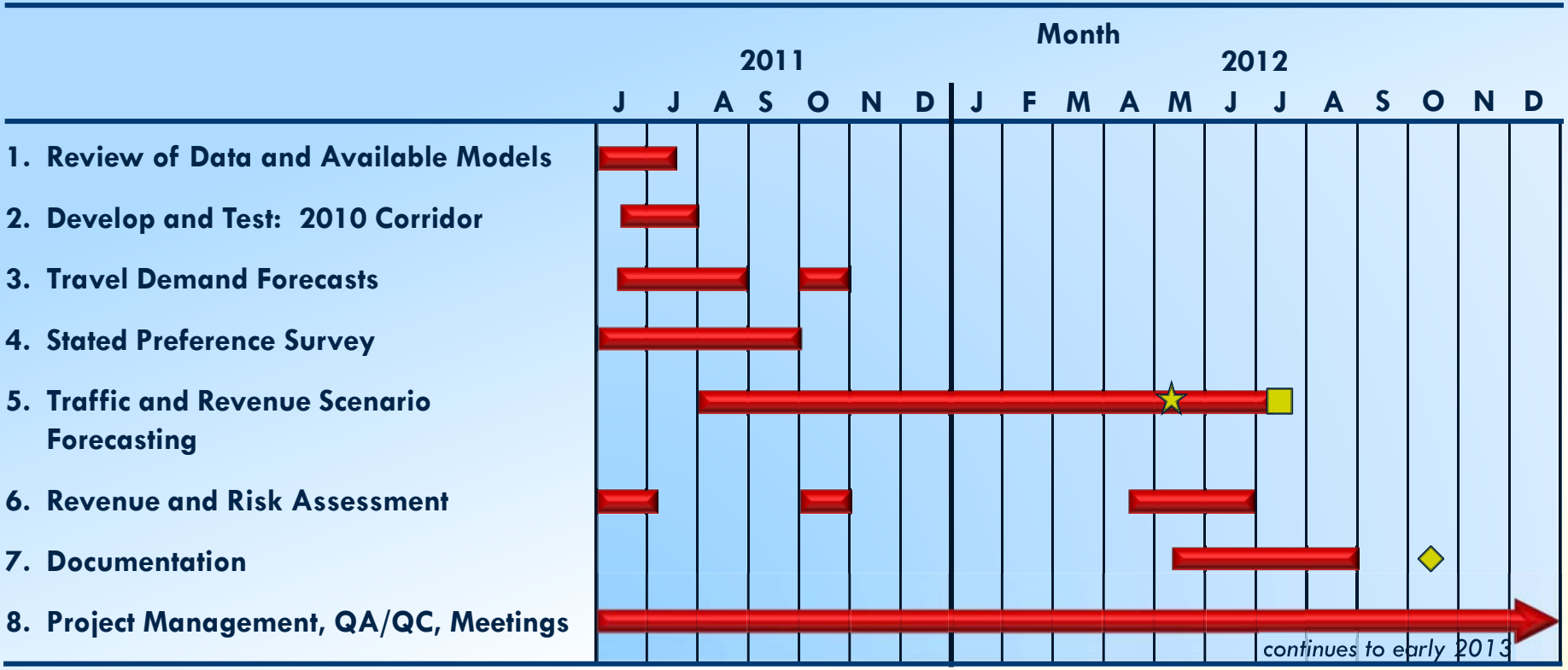
Next Steps



Key Milestones

- ★ Optional delivery of HOV2+ and HOV3+ free scenario findings for use in WSDOT financial planning
- ■ Technical Work Complete by July 2012
- ◆ Present Findings to WSTC in the fall of 2012 and to Legislature before 2013 Legislative Session

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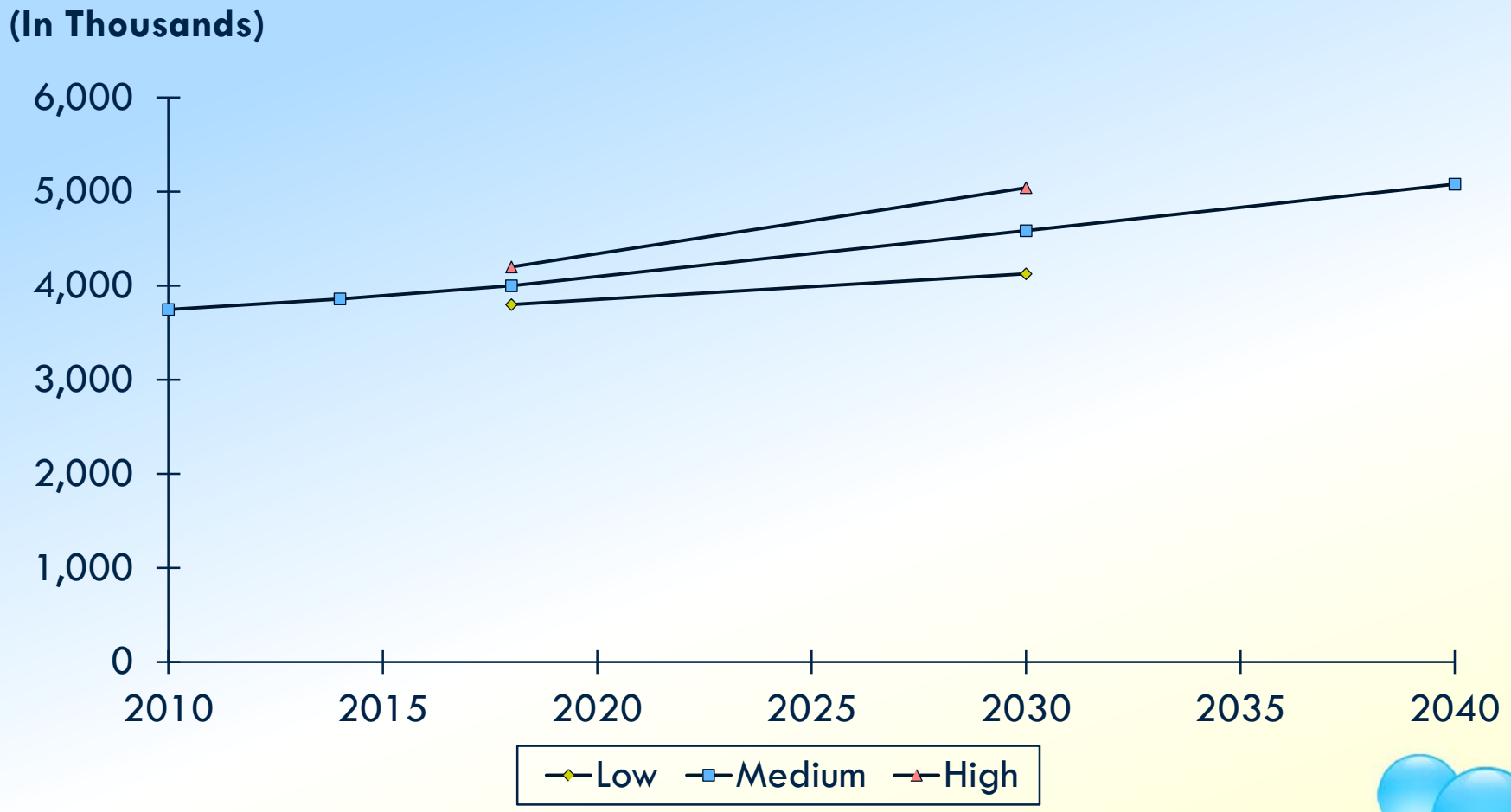
Questions and Discussion

Population Forecast (Region)



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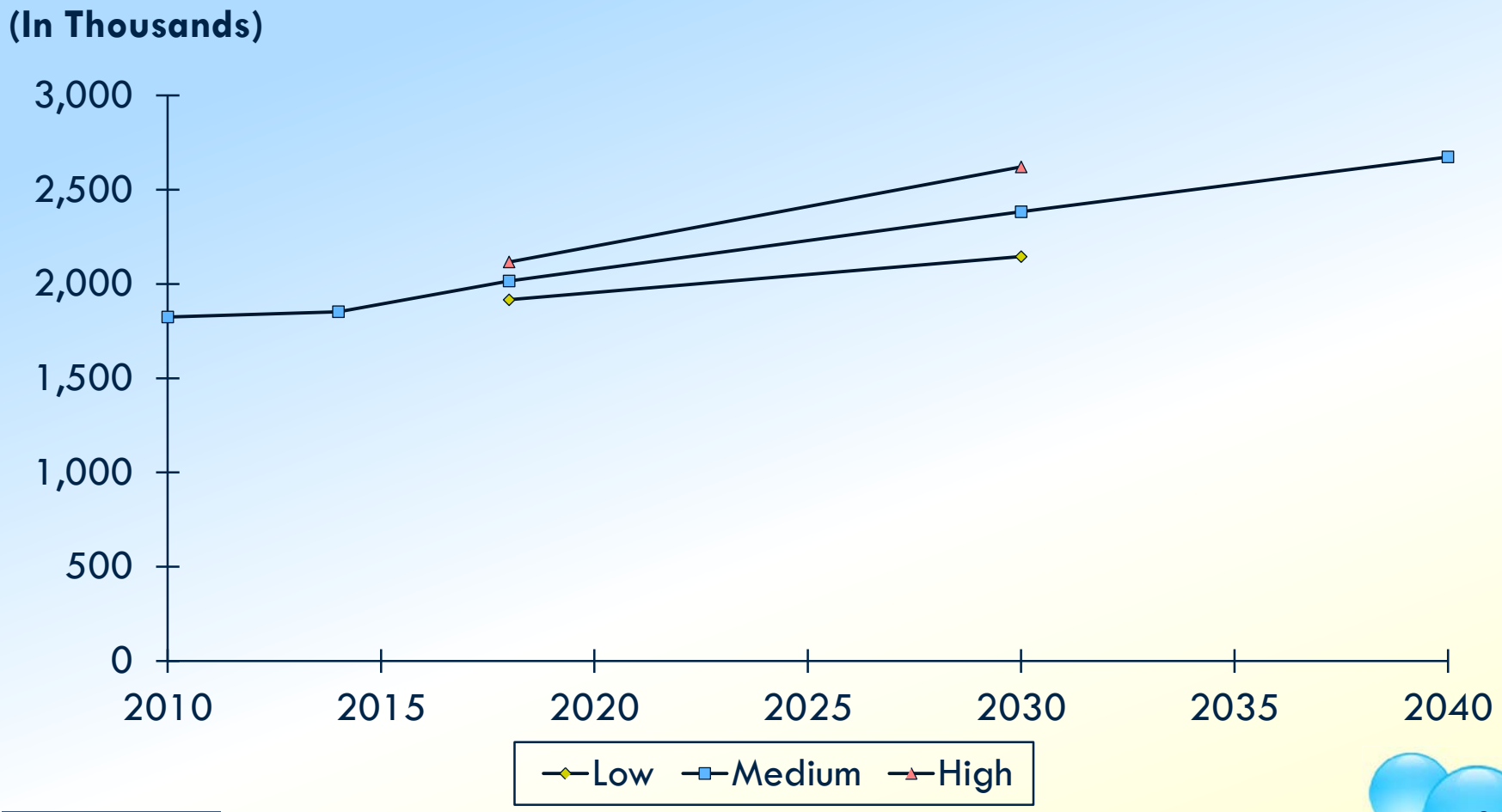
Employment Forecast (Region)



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Eastside Corridor
Annual Average Daily Traffic (AADT)

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