I-5 JBLM VICINITY CONGESTION RELIEF STUDY
MODELING EFFORTS
1. **Overview** of the I-5 JBLM Congestion Relief Study

2. **Discuss** selection of modeling tools

3. **Summarize** the modeling process

4. **Share** some of the results from the modeling efforts
PROJECT OVERVIEW
12 Mile Segment of I-5
Connects Tacoma and Olympia
Primarily within PSRC Jurisdiction
Includes Segment within TRPC Jurisdiction
To determine the facilities and strategies necessary to relieve chronic traffic congestion and improve person and freight mobility along Interstate 5 in the vicinity of Joint Base Lewis-McChord while providing access to the communities and military installations neighboring the highway.
I-5 JBLM VICINITY CONGESTION RELIEF STUDY

<table>
<thead>
<tr>
<th>Year</th>
<th>Phase</th>
<th>Description</th>
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<tbody>
<tr>
<td>2013</td>
<td>Phase 1</td>
<td>Feasibility Study</td>
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<td>I-5 – mainline &amp; interchanges</td>
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<td>I-5 Mainline &amp; Interchange Alternatives</td>
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<td>3 General Purpose and 1 HOV lane with Collector-Distributor Roads</td>
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<td>4 General Purpose and 1 HOV lane</td>
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<td>Interchange Alternatives</td>
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<td>2 to 4 alternatives advanced for each of the focus interchanges</td>
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<tr>
<td>2014</td>
<td>Phase 2</td>
<td>Corridor Multi-Modal Alternative Analysis</td>
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<td>Phase 2A</td>
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<td>Brainstorm Options</td>
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<td>Build, Model &amp; Score Alternative Packages</td>
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<td>Transit</td>
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<td>• Interchanges</td>
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<td>Short List of Alternatives</td>
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<td>Environmental Process and Interchange Justification Report</td>
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<td>2015</td>
<td>Phase 3</td>
<td>Build, Model &amp; Score Alternative Packages</td>
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<td>Transit</td>
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<td>• Mainline</td>
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<td>• Interchanges</td>
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</tbody>
</table>
Short List of Options Carried into Phase 2B
Options Used to Develop a Set of Packaged Alternatives

- 13 Alternatives
- Developed Through a Layering Approach
PACKAGE 2
Enhanced Transit Service (15 minute headways):

- Lacey to DuPont P&R to main gate to Lakewood
- Lacey to Yelm to East Gate to Spanaway or Puyallup
- Lacey to SR 512 P&R to Downtown Tacoma
- Spanaway to Lakewood to Lacey
- Lacey to Main Gate to Lakewood
- Expanded On-base shuttle system that matches the Off Base transit schedule
Used BlueMac Readers

- Sample Rates: 5 to 10%
- Confidence Levels: +/- 3%

Approximately 47 locations:
- I-5 Mainline Segments
- I-5 Interchanges
- JBLM Gates
- Major Regional Arterials
I-5 Travel Patterns

- Used to validate the models

To and From Thurston County (at Mounts Road I/C)
JBLM Gate Travel Patterns

- Used to validate the models

To and From JBLM Main Gate (at 41st Division Drive I/C)
Estimated Local “Short Trips”

- Used to validate and calibrate the mesoscopic model

Thorne Lane (Exit #123)
MODEL SELECTION
MODEL SELECTION – PROJECT STAGES

**COMPREHENSIVE PLANNING**
- Infrastructure Needs
- Comparing Scenarios
- Evaluate Policy Implications

**CAPITAL PLANNING / ALTERNATIVES ANALYSIS**
- Feasibility
- Confirmation of Need
- Prioritization

**ENVIRONMENT ANALYSIS**
- Assess Impacts
- Determine Mitigation
- Refine Designs

**CORRIDOR STUDIES / PRELIMINARY DESIGN**
- Confirm Concepts
- Evaluate Project Phasing

**FINAL DESIGN**
- Finalize Channelization
- Confirm Project Phasing

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Selecting the Right Tools

- **Macroscopic Sketch Tool**
  - Mesoscopic
  - Macroscopic
  - Sketch Tool

- **Microsimulation Operations**
  - Operations
  - Mesoscopic
  - Macroscopic
  - Sketch Tool
## Choice of Macro Model

<table>
<thead>
<tr>
<th>Model</th>
<th>Considerations</th>
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</thead>
<tbody>
<tr>
<td>PSRC</td>
<td>I-5 study area at extreme perimeter of model</td>
</tr>
<tr>
<td>TRPC</td>
<td>Undergoing major update and expansion</td>
</tr>
<tr>
<td>Pierce County</td>
<td>Undergoing major update</td>
</tr>
<tr>
<td>I-5/JBLM/Lakewood</td>
<td>Constructed as part of the previous I-5 Alternatives Analysis project</td>
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</tbody>
</table>

I-5 JBLM Macro Model
Concerns with the Phase 1 Results

• Not enough data on trip characteristics
• Additional transit, HOV, and local alternatives need to be considered
• Operational performance not adequately addressed by the macroscopic model, such as:
  o Mainline speeds
  o Interchange operations
  o Gate processing queues
  o Ramp metering queues
• Size and extent of peak spreading due to system congestion
• Local JBLM traffic shifts due to bottleneck locations
Suite of Modeling Tools

Macro Model
Visum

Meso Model
Dynameq

Transit Sketch Tool
(Similar to FTA STOPS Model)
MODELING PROCESS
4-Step Process

<table>
<thead>
<tr>
<th>Step</th>
<th>Process</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Transit Sketch</td>
</tr>
<tr>
<td>2.</td>
<td>Vehicle Trip Adjustments</td>
</tr>
<tr>
<td>3.</td>
<td>Trip Matrices for Subarea</td>
</tr>
<tr>
<td>4.</td>
<td>Outputs</td>
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</tbody>
</table>

**Outputs**
- I-5 Corridor Transit Ridership
- SOV to HOV Mode Shift
- Volumes
- Average Vehicle Occupancies
- Speeds
- Hours of Congestion
- Travel Time
- Person Throughput
- Demand Served
Highlights

632 TAZs
- 21 external TAZs
- 9 JBLM TAZs

2 Peak Periods
- AM (6 – 9 AM)
- PM (3 – 6 PM)
Highlights

119 TAZs
- 21 external TAZs
- 47 JBLM TAZs

2 Peak Periods
- AM (5 – 11 AM)
- PM (2 – 8 PM)

14 Vehicle Types
- Non-Military
- Military
Network Inputs

- # of Lanes
- Speed Limits
- Traffic Control
- Lane Capacities
- Channelization
- Signal Timing
- At-grade Rail Crossings
- Ramp Meters
- Gate Operations

MESO MODEL OVERVIEW

At-grade Rail Crossings
Gate Operations
Ramp Meters
Household Inputs
• P&R Proximity
• Vehicle Ownership
• Income
• Housing Density

Employment Inputs
• Transit Center/DA Proximity
• Bus Stop Density
• Employment Density
• Block size

Transportation Inputs
• Travel Time (SOV/HOV)
• Transit Travel Time (Including Wait Time)
• Travel Cost (Including mileage, parking, tolls, and transit fare)
• Transit Service Levels

Note:
• Calibrated to base year PSRC model using Pierce County FAZs
• Validated to I-5 transit ridership data through study areas
• Validated to 2014 Sound Transit routes for trips into King County
MODEL APPLICATION
Performance Metrics Evaluated by the Meso Model

**SPEED**
PM peak hour for HOVs and SOVs

**HOURS OF CONGESTION**
Peak spreading over 6-hour PM peak period

**TRAVEL TIME**
Through corridor for 3-hour PM peak period

**PERSON THROUGHPUT**
Regional person trips on I-5 over 6-hour PM peak period

**PERCENT OF PERSON DEMAND SERVED**
Difference between macro model demand and meso model capacity over 6-hour PM peak period

**POTENTIAL REGIONAL PERSON TRIPS VIA TRANSIT & HOV**
Over 3 and 6-hour PM peak period, respectively
MESO MODEL RESULTS

2040 PM Peak Period Performance Scores

<table>
<thead>
<tr>
<th>Alternative Packages</th>
<th>Scores</th>
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<tbody>
<tr>
<td>P1: No Action</td>
<td>11.0</td>
</tr>
<tr>
<td>P2: Enhanced Transit</td>
<td>13.9</td>
</tr>
<tr>
<td>P3: Transit + Local Roads</td>
<td>21.2</td>
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<tr>
<td>P4: 1.5 Express Lanes</td>
<td>79.3</td>
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<tr>
<td>P4a: P4 + Select Local Roads</td>
<td>78.6</td>
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<tr>
<td>P5: 1.5 HOV + CD Roads</td>
<td>83.8</td>
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<tr>
<td>P5a: P5 + Select Local Roads</td>
<td>84.4</td>
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<tr>
<td>P6: 1.5 HOV + GP</td>
<td>76.0</td>
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<tr>
<td>P6a: P6 + Select Local Roads</td>
<td>77.4</td>
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<tr>
<td>P7: HOV Only</td>
<td>68.1</td>
</tr>
<tr>
<td>P7a: HOV + Local + Transit</td>
<td>72.5</td>
</tr>
<tr>
<td>P7b: HOV + Local</td>
<td>69.3</td>
</tr>
</tbody>
</table>
P-7 INITIAL PHASE OF IMPLEMENTATION

- Best overall scoring alternative
- Good performance in 2020 (opening year)

Add HOV Lanes (8-lane Cross-section)
Corridor Travel Time
2020 PM - Northbound

Travel Time (Min)

Time of Day

P1
P7
P7 (HOV)
Free Flow
Corridor Travel Time
2020 PM - Southbound

Travel Time (Min)

Time of Day

P1  P7  P7 (HOV)  Free Flow
2020 NO ACTION & PHASE 1 BUILD COMPARISON

No Action

Phase 1 Build (P7)
P-4 FUTURE PHASE & CORRIDOR PRESERVATION

- Second best performance in 2040
- Allows for staged construction
- Preserves future Right-of-Way

Managed Lanes can evolve over time to best address demand, technology, etc.

1. Congestion pricing – one or both lanes
2. HOV lane(s)
3. HOT lane(s)
4. Truck-only lane
5. Smart Car-only lane

Express Lanes (10-lane Cross-section)