Tonight’s Presentation

- Review basic traffic terminology.
- Explain traffic analysis methods.
- Define the performance measures and how mitigation is determined.

Transportation results and potential mitigation will be available at either January or February Milwaukie Monthly meeting.
Project Schedule Elements

- Preliminary Engineering  2/09-6/10
- Final Environmental Impact Statement  5/10
- Record of Decision  7/10
- Final Engineering  8/10-7/11
- Construction  7/11-8/15
- Opening  September 2015
Final Environmental Impact Statement

- Federal Transit Administration (FTA) document.
- Discloses impacts and mitigation, where warranted.
- Analyzes local traffic, transit (bus and other LRT line) service, bicycle and pedestrian facilities, and parking.
- Guided by ODOT, City and County plans and policies.
- Based on forecasts for the year 2030. (Opening day is estimated to be 2015.)
FEIS Alternatives for Analysis

- No Build – Future conditions without light rail
- 2008 Locally Preferred Alternative (LPA) – Future conditions with light rail terminating at Park Ave
- Minimum Operable Segment (MOS) – Future conditions with light rail terminating at Lake Rd

All parties committed to building to Park Ave
Build Alternatives

- The Locally Preferred Alternative (LPA) is the project that TriMet and the project partners prefer to build - not the Minimal Operable Segment (MOS).

- Due to cost considerations the project is studying an MOS.
Build Alternatives

Locally Preferred Alternative (LPA)

Minimum Operable Segment (MOS)

Park Ave. Station Terminus

Lake Road Station Terminus
Traffic 101

- Intersections
- Level of Service
- Volume-to-Capacity Ratio
- Signal Timing
- Queuing
- Traffic Warrants
- Transit Priority
Intersections

- Signalized intersections
- Unsignalized intersections
- At-grade crossings by light rail transit
- Intersections chosen to analyze were reviewed and approved by the City of Milwaukie, City of Portland, Clackamas County and ODOT.
Intersection Level of Service

- Ratings compute intersection delay at a range of A to F, like a report card for traffic operations
- A to C represent intersections with minor delay
- D, E and F represent progressively more congested operations, with F representing excessive delay.
# Level of Service (LOS) Definition

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Signalized Intersections</th>
<th>Un-signalized Intersections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stopped Delay (seconds per vehicle)</td>
<td>Average Total Delay (seconds per vehicle)</td>
</tr>
<tr>
<td>A</td>
<td>&lt; or = 10 .0</td>
<td>&lt; or = 10 .0</td>
</tr>
<tr>
<td>B</td>
<td>10.1 to 20.0</td>
<td>10.1 to 15.0</td>
</tr>
<tr>
<td>C</td>
<td>20.1 to 35.0</td>
<td>15.1 to 25.0</td>
</tr>
<tr>
<td>D*</td>
<td>35.1 to 55.0</td>
<td>25.1 to 35.0</td>
</tr>
<tr>
<td>E</td>
<td>55.1 to 80.0</td>
<td>35.1 to 50.0</td>
</tr>
<tr>
<td>F</td>
<td>&gt; 80.0</td>
<td>&gt; 50.0</td>
</tr>
</tbody>
</table>

* City of Milwaukie Level of Service Standard is D or better during the first and second hour of the peak periods.
The local jurisdictions use Level of Service, ODOT uses a volume-to-capacity (V/C) ratio to define performance at intersections.

When the hourly volumes at an intersection approach capacity, traffic flow becomes unstable and delay increases.

A V/C ratio of 1.0 is when the hourly volumes at an intersection are equal to its capacity.
Signal Timing Optimization

- Changing signal timing at an intersection to minimize delay and maximize signal operations.
- Putting “green time” where you need it.
Vehicle Queuing

- A line of vehicles waiting to cross an intersection.

- Queuing analysis estimates the 95th percentile queue length for each approach. Only 5% of the time, is the queue length longer.

- Analysis uses worst 15 minutes of peak hour.
Traffic Warrants

The FEIS evaluated the need for intersection improvements:

- Right turn lanes
- Left turn lanes
- Stop signs
- Signals

Meeting a warrant does not always mean that the warrant should be implemented.
Transit Priority

- Signal priority is when light rail is given a priority within the signal phasing.

- Signal preemption is when all conflicting traffic is stopped at the signal to let light rail go first.

- Both signal preemption and priority help the speed and reliability of transit service.
Study Area and Sub-Areas

Sub-Area A: PSU to SE Powell Blvd.
- 24 intersections
- City of Portland and ODOT
- No park-and-rides

Sub-Area B: SE Powell Blvd to SE Tacoma
- 17 intersections
- City of Portland and ODOT
- No park-and-rides

Sub-Area C: SE Tacoma St. to Hwy. 224
- 10 intersections (9 AM & PM and 1 PM only)
- City of Portland, City of Milwaukie and ODOT
- LPA - 1,000 space park-and-ride at Tacoma Street
- MOS – 1,250 space park-and-ride at Tacoma Street

Sub-Area D: Hwy. 224 to SE Park Ave.
- 24 intersections (9 AM & PM and 15 PM only)
- City of Milwaukie, Clackamas County and ODOT
- LPA – 1,000 space park-and-ride at Park Avenue
- MOS – 275 space park-and-ride at Lake Road
Data Collection

A variety of data was collected including:

- Existing peak hour turning movement counts*
- 24-hour traffic counts*
- Trip generation counts for park and ride facilities
- Existing street system including lane geometry, traffic signal phasing, and other items (such as proximity to bus stops on-street parking etc.)

* Counts collected May through November 2007, or December 2008 through June 2009.
Data Collection Locations (continued)
Existing Conditions Report

- Evaluate traffic operations at key study area intersections.
- Summarize data such as pedestrian activity, bicycle activity, transit usage and parking usage.
Traffic Forecast Elements

Future forecasts (2030) travel volumes based on:

1. Employment type
2. Household size, income, and age
3. Households, population and employment within transportation zones
4. Existing zoning and buildable land - after local review

Future volumes forecast for both the No Build and Build Alternatives.
**Forecast Accuracy** (light rail ridership)

<table>
<thead>
<tr>
<th>Line</th>
<th>Opening Year Forecast</th>
<th>AWB 1st Full Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastside</td>
<td>Banfield</td>
<td>19,000</td>
</tr>
<tr>
<td>Westside</td>
<td>1/2 of Blue</td>
<td>20,470</td>
</tr>
<tr>
<td>Airport Extension</td>
<td>Red</td>
<td>11,057</td>
</tr>
<tr>
<td>Interstate MAX</td>
<td>Yellow</td>
<td>13,900</td>
</tr>
<tr>
<td>I-205 Extension</td>
<td>Green</td>
<td>25,250</td>
</tr>
</tbody>
</table>
Surface Street Analysis

Considers:

- Congestion and capacity.

- Changes in traffic patterns and the potential for traffic impacts associated with transit stations and park and ride facilities.
Traffic Impact Comparison

- Compare Build Alternatives to the No Build Alternative.

- Develop potential mitigation at locations where impacts do not meet performance standards and/or performance thresholds.
Vehicle Delay for At-grade Crossings

- In downtown Milwaukie the average delay (by location and direction) due to a light rail crossing is 6 to 17 seconds during the PM peak hour in 2030.

- By federal regulation, gated crossings are required, and gates are activated for 50 seconds.

- Unlike the delay due to freight trains, no vehicle would be delayed by a light rail train longer than 50 seconds.
## Intersection Impacts & When to Mitigate

<table>
<thead>
<tr>
<th></th>
<th>Meet Standard?</th>
<th>Mitigate?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No-build</td>
<td>Build</td>
</tr>
<tr>
<td>Example 1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Example 2</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Example 3</td>
<td>No</td>
<td>Less than 10 seconds delay</td>
</tr>
<tr>
<td>Example 4</td>
<td>No</td>
<td>More than 10 seconds delay</td>
</tr>
</tbody>
</table>
### Queuing Impacts & When to Mitigate

<table>
<thead>
<tr>
<th>Scenario</th>
<th>No Build</th>
<th>Build</th>
<th>Mitigate?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario 1</strong></td>
<td><img src="image1.png" alt="No Build Traffic Light" /></td>
<td><img src="image2.png" alt="Build Traffic Light" /></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td><strong>Scenario 2</strong></td>
<td><img src="image3.png" alt="No Build Traffic Light" /></td>
<td><img src="image4.png" alt="Build Traffic Light" /></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td><strong>Scenario 3</strong></td>
<td><img src="image5.png" alt="No Build Traffic Light" /></td>
<td><img src="image6.png" alt="Build Traffic Light" /></td>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>
# Traffic Warrants, Spacing & When to Mitigate

<table>
<thead>
<tr>
<th>Example</th>
<th>Meets Traffic Warrant?</th>
<th>Mitigate?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No-Build</td>
<td>Build</td>
</tr>
<tr>
<td>Example 1</td>
<td>✗ No</td>
<td>✗ No</td>
</tr>
<tr>
<td>Example 2</td>
<td>✗ No</td>
<td>✓ Yes</td>
</tr>
<tr>
<td>Example 3</td>
<td>✓ Yes</td>
<td>✓ Yes</td>
</tr>
</tbody>
</table>

* Since warrant is met under No-Build, TriMet will need to coordinate with the local jurisdiction on project mitigation needed and the project share of the cost to mitigate.
Performance Measures

Measure impacts to:

- Freight
- Transit
- Bicycles and pedestrians
- Parking
- Property access
Freight and Transit Performance Measures

- Freight system impacts were measured by out-of-direction travel caused by closure of a local street due to light rail.

- Transit impacts were measured by travel time.

- Transit station and park and ride lot traffic impacts were evaluated by analyzing adjacent key intersections.
Bicycle and Pedestrian Performance Measures

- Primary concern is accessibility and connectivity to transit stations.

- Areas without sidewalks on roadways or having gaps in the existing bicycle network, within 1,000 feet of a light rail station, were evaluated.

- A second bicycle performance measure is adequate facilities provided at the transit stations (bike spaces and/or lockers).
Parking Criteria

- Inventoried existing on-street and off-street parking spaces within 1000 feet of stations.
- Developed data on existing parking demand.
- Calculated loss of existing parking spaces.
- Determined significance of parking loss and developed mitigation strategies.
Access Analysis

- Assessed impacts to property access.
- Developed potential mitigation for losses or changes to property access.
Construction Analysis
(short term impacts)

- Impacts to traffic operations related to potential road, sidewalk or other closures during construction.
- Impacts of construction related traffic.
Examples of Project Mitigation

FEIS Record of Decision for the Green Line:

- **96th Avenue/Park and Ride Entrance**: Relocate Adventist High Scholl access on the east side of SE 96th and create a northbound left turn pocket for traffic accessing the park and ride lot from SE 96th Avenue.

- **SW 4th Avenue/SW Market Street**: Add a northbound right turn lane.

- **Mall Segment Parking Mitigation**: Employ management strategies to partially offset the on-street parking loss.
Next Step

What will be presented at the Milwaukie Monthly Meeting in January or February?

- Extent of traffic impacts
- Proposed mitigation
Questions and Comments?

Thank You.

Tim Collins
Senior Transportation Planner
Metro