There’s a Signal in my ROUNDABOUT!!

SR 240 – Steptoe Roundabout Metering

LisaRene Schilperoort,
WSDOT South Central Region
Traffic Engineer
June 29th, 2020
Current volumes (PM)

- Off Ramp: 1,652
- CPT: 346
- Steptoe: 1,067
- CPT: 639

Total: 3,704
Trucks: 54
V/C > 1
Before Roundabout Meter – PM Peak
Before Roundabout Meter

2,900 ft. from roundabout

2,200 ft. from roundabout
Should we meter?
Analysis (PM)

Methods:
- Sidra
- Conflicting flow evaluation

1213
639
Initially After installation

- 2,900 ft. from roundabout
- No longer queueing to here

- 2,200 ft. from roundabout
- Queue now rarely experienced

Typical queue
Meter Information

• Same program WSDOT uses for ramp meters
• “METERED AHEAD WHEN FLASHING” flashes for 20 seconds before meter turns on
• Signal starts with three seconds of yellow, then alternates red and green
• Meter evaluates % occupancy of four loop detectors on ramp
• Meter rate calculated every 20 seconds
• Before turning dark signal stays green for 60 seconds
## Iteration of Parameters

<table>
<thead>
<tr>
<th>PARAMETER (units)</th>
<th>INITIAL</th>
<th>CURRENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Meter Rate (vehicles/minute)</td>
<td>5 (1 car/12 sec)</td>
<td>6 (1 car/10 sec)</td>
</tr>
<tr>
<td>Maximum Meter Rate (vehicles/minute)</td>
<td>12 (1 car/5 sec)</td>
<td>11 (1 car/5.5 sec)</td>
</tr>
<tr>
<td>Meter Rate Calculation</td>
<td>Min or Max</td>
<td>Fuzzy Logic</td>
</tr>
<tr>
<td>Turn-On Time</td>
<td>4:45 pm</td>
<td>Auto: After 4:00 pm</td>
</tr>
<tr>
<td>Turn-Off Time</td>
<td>5:45 pm</td>
<td>Auto: Until 7:00 pm</td>
</tr>
<tr>
<td>Parameter evaluated for meter turn on/off and meter rate</td>
<td>Average % occupancy of loop detectors</td>
<td>% occupancy of each loop detectors individually</td>
</tr>
</tbody>
</table>

Note: roundabout meter releases one vehicle per green
# Additional Parameters

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>Units</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display when meter is off</td>
<td></td>
<td>Dark</td>
</tr>
<tr>
<td>Occupancy needed to turn On meter</td>
<td>% occupied</td>
<td>&gt;40% *</td>
</tr>
<tr>
<td>Minimum duration meter will remain on</td>
<td>minutes</td>
<td>15</td>
</tr>
<tr>
<td>Occupancy needed to turn Off meter</td>
<td>% occupied</td>
<td>&lt;30% *</td>
</tr>
<tr>
<td>Minimum duration meter must remain off before turning on again</td>
<td>minutes</td>
<td>10</td>
</tr>
<tr>
<td>Days Operating</td>
<td></td>
<td>Monday - Friday</td>
</tr>
</tbody>
</table>

*Threshold must be met 60 seconds
One year later observations

• Drivers have become more aggressive and gaps provided by the meter are rarely missed
• Meter rate changes less frequently
• Meter is running on average 10 minutes less than initial installation
• Typical turn on between 4:45 and 5:00
• Typical turn off between 5:30 and 5:45
Volume Comparison

Before Meter Installation:
• Off Ramp – 1360
• CPT – 565
• Peak Hour 4:15 – 5:15
• 4:00-6:00 volume = 3870

After Meter Installation:
• Off Ramp – 1335
• CPT – 520
• Peak Hour 4:15 – 5:15
• 4:00-6:00 volume = 3605
## Results and Conclusion

Queue on EB off ramp was successfully reduced increasing driver’s safety.

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>Initial turn on</th>
<th>1 year later</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB Off Ramp queue</td>
<td>Queue sustained</td>
<td>Queue sustained</td>
<td>Queue sustained</td>
</tr>
<tr>
<td>(1,275 ft or greater)</td>
<td>15-30 min.</td>
<td>&lt;5 min.</td>
<td>&lt;5 min.</td>
</tr>
<tr>
<td>EB Off Ramp delay</td>
<td>2.25 min.</td>
<td>3.0 min.</td>
<td>1.9 min.</td>
</tr>
<tr>
<td>(1336 vehicles)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPT delay</td>
<td>minimal</td>
<td>2.0 min.</td>
<td>1.5 min.</td>
</tr>
<tr>
<td>(518 vehicles)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lessons Learned

• Collect a lot of loop data prior to signal installation to provide a more accurate starting point for parameters
• Expect to have several iterations of parameters
• Location of loops – our “far” set of loops on the off ramp were too far out
• Queue loop detector (500 ft upstream of signal) is important
• Don’t be discouraged by initial installation, find the appropriate parameters, and let drivers adjust
• Don’t turn on signal in winter, it’s hard to monitor in the dark😊
Questions?

LisaRene Schilperoort
509-573-8338
schilpl@wsdot.wa.gov