Two Use Cases of StreetLight: Screenline Counts and External LM Travel

Modeling Task Force Meeting
1/25/2023
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Background

• A one-year regional subscription to the StreetLight InSight platform
  • 1/11/2021 to 1/10/2022
  • Multi-mode tier (Car, Truck, Bus, Rail, Bicycle, Pedestrian)
  • Unlimited queries and analyses
  • Modeling Staff downloaded hundreds of data sets for modeling and planning
    • AADT, OD, Zone Activity, Segment Analysis, Top Routes, etc.
• Plus, additional data services as per customer specifications
  • OD trips by TNC at the level of 4,109 TAZs
  • OD trips by Light Duty at the level of 4,109 TAZs
    • Light Duty: delivery, transportation, commercial fleet vehicles under 10K lb.
  • OD tours for external travel
  • Truck parking dwell time analysis
CASE 1. SCREENLINE COUNTS
Introduction

• Base year model validation:
  • estimated vs observed
• Screenlines: imaginary lines across roadways
  • 35 screenlines on 700+ locations of freeways and non-freeways
• Traffic counts available in the region
  • Freeways: rich (PeMS, Caltrans)
  • Non-freeways: poor (county/city traffic counts available but limited in time/space coverages)
2016 Base Year for 2020 RTP

• One-day field traffic counts
  • Tu, We or Th in 2017 Spring and Fall
  • Excl. holidays, days after holidays, bad weather and spring break
  • Tube and Wavetronix

• Shortcomings
  • Expensive (~$120 per Tube; ~$1000 per Wavetronix)
  • Difficult to install equipment; slow permit process
  • Requires annual and seasonal adjustments
  • Hard to justify that one-day counts represent annual average

<table>
<thead>
<tr>
<th>Month</th>
<th>Tube Data Collection</th>
<th>Wavetronix Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>February</td>
<td>25</td>
<td>NA</td>
</tr>
<tr>
<td>March</td>
<td>76</td>
<td>NA</td>
</tr>
<tr>
<td>April</td>
<td>180</td>
<td>NA</td>
</tr>
<tr>
<td>May</td>
<td>110</td>
<td>NA</td>
</tr>
<tr>
<td>June</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>September</td>
<td>98</td>
<td>12</td>
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<tr>
<td>October</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>November</td>
<td>8</td>
<td>34</td>
</tr>
</tbody>
</table>
2019 Base Year for 2024 RTP

We identified 10 different cases to guess screenline link volumes:
- **Facility types**: freeway (FT < 40) vs arterial (FT > 40)
- **AADT sources**: Caltrans AADT vs StreetLight AADT
- **Directional and ML/HV distribution**: PeMS vs StreetLight
- **LM/HDT vehicle classification**: Caltrans Truck % vs 2017 Tube field counts
- **Conversion of AADT to weekday ADT**: StreetLight Index

<table>
<thead>
<tr>
<th>Method</th>
<th>SCRL Links</th>
<th>Link Dir</th>
<th>Facility Type</th>
<th>AADT Source</th>
<th>Lane Distribution</th>
<th>L/M/H HDT Percentages</th>
<th>WKDY Factor</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>68</td>
<td>1</td>
<td>Freeway (ML Only)</td>
<td>2019 Caltrans AADT</td>
<td>2019 SCAG PeMS ADT for WKDY</td>
<td>2019 Caltrans Axle-Based Truck %</td>
<td>2019 StreetLight Index by ADAY and WKDY for Auto and Truck</td>
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<tr>
<td>2</td>
<td>28</td>
<td>1</td>
<td>Freeway (ML Only)</td>
<td>2019 Caltrans AADT</td>
<td>2019 StreetLight Index for WKDY</td>
<td>2019 Caltrans Axle-Based Truck %</td>
<td>2019 StreetLight Index by ADAY and WKDY for Auto and Truck</td>
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<tr>
<td>3</td>
<td>136</td>
<td>1</td>
<td>Freeway (ML + HV)</td>
<td>2019 Caltrans AADT</td>
<td>2019 SCAG PeMS ADT for WKDY</td>
<td>2019 Caltrans Axle-Based Truck %</td>
<td>2019 StreetLight Index by ADAY and WKDY for Auto and Truck</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>1</td>
<td>Freeway (ML + HV)</td>
<td>2019 Caltrans AADT</td>
<td>Others**</td>
<td>2019 Caltrans Axle-Based Truck %</td>
<td>2019 StreetLight Index by ADAY and WKDY for Auto and Truck</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>1</td>
<td>Arterial</td>
<td>2019 Caltrans AADT</td>
<td>2019 StreetLight Index for WKDY</td>
<td>2019 Caltrans Axle-Based Truck %</td>
<td>2019 StreetLight Index by ADAY and WKDY for Auto and Truck</td>
</tr>
<tr>
<td>6</td>
<td>24</td>
<td>0</td>
<td>Arterial</td>
<td>2019 Caltrans AADT</td>
<td>No need</td>
<td>2019 Caltrans Axle-Based Truck %</td>
<td>2019 StreetLight Index by ADAY and WKDY for Auto and Truck</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>0</td>
<td>Arterial</td>
<td>2019 Caltrans AADT</td>
<td>No need</td>
<td>2017 NDS Tube 13 FHWA Classification</td>
<td>2019 StreetLight Index by ADAY and WKDY for Auto and Truck</td>
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<tr>
<td>8</td>
<td>17</td>
<td>1</td>
<td>Arterial</td>
<td>2019 StreetLight AADT</td>
<td>No need</td>
<td>2017 NDS Tube 13 FHWA Classification</td>
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<td>9</td>
<td>423</td>
<td>0</td>
<td>Arterial</td>
<td>2019 StreetLight AADT</td>
<td>No need</td>
<td>2017 NDS Tube 13 FHWA Classification</td>
<td>2019 StreetLight Index by ADAY and WKDY for Auto and Truck</td>
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<tr>
<td>special</td>
<td>4</td>
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<td>Arterial</td>
<td>2019 StreetLight AADT</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
LM Screenline Validation on Arterials (2016 vs 2019)

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>2016 LM</th>
<th></th>
<th>2019 LM</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model</td>
<td>Count</td>
<td>Ratio</td>
<td>RMSE</td>
</tr>
<tr>
<td>Principal Arterial</td>
<td>6,035,602</td>
<td>4,976,164</td>
<td>1.21</td>
<td>46</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>3,045,350</td>
<td>2,582,401</td>
<td>1.18</td>
<td>55</td>
</tr>
<tr>
<td>Major Collector</td>
<td>484,006</td>
<td>519,754</td>
<td>0.93</td>
<td>82</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>13,466</td>
<td>9,334</td>
<td>1.44</td>
<td>154</td>
</tr>
</tbody>
</table>

• Currently, we are calibrating the 2019 model. Meanwhile, we will continue to review screenline counts for both freeways and arterials.
• As we are also updating the HDT model, the HDT screenline validation result will be available later.
CASE 2. EXTERNAL LM TRAVEL
Introduction

• 40 external cordons
  • Santa Barbara (3); Kern (11); Inyo (2); Nevada (5); Arizona (7); Mexico (3); San Diego (9)
• ~8% of total LM VMT
• SCAG’s LM External Model requires:
  • Cordon traffic counts
  • Observed OD matrices
Cordon Traffic Counts

- Freeway cordons (23 locations)
  - Caltrans AADT
  - LM/HDT vehicle classification: Caltrans Truck %
  - Conversion of AADT to Weekday ADT: StreetLight Index

- Arterial cordons (17 locations)
  - StreetLight AADT
  - LM/HDT vehicle classification: 2017 SCAG field traffic counts by Tube (13 FHWA vehicle classification)
  - Conversion of AADT to Weekday ADT: StreetLight Index
In 2002 and 2003, SCAG conducted a regional cordon survey to estimate the observed OD distribution of external trips.

- Didn’t cover Imperial County and Mojave desert areas
- Limited to the 17 busiest cordons

It is time to update!
Observed OD Matrices (New)

• First, we tried to collect external OD trips passing through external cordons from/to internal CSAs directly from the StreetLight InSight platform.
  • By default, in-platform trips break when a device does not move more than five meters in five minutes.
• In SCAG’s regional model, external LM trips are considered as long-distance travel and should not include intermediate short stops, such as stopping for meal or rest.
  • StreetLight chained multiple trips if there is less than 90 mins and 1 kilometer b/w consecutive trip stops.
Further Revision

• Carefully review and revise the StreetLight external OD tours at the RSA level
  • Exclude I-X, X-I and X-X trips going out of and returning the region
  • Exclude X-X trips traveling between the same cordon
  • Exclude X-X trips traveling between nearby cordons
  • For some cordons, we observe a big difference b/w the regional cordon survey and the StreetLight tour data.
    • For cordons with less than 5K traffic volumes, follow the StreetLight OD patterns without any adjustment
    • For cordons with more than 5K traffic volume, adjust the StreetLight tour data based on the cordon survey result
**Additional Processes**

- Construct a 96x96 matrix (56 RSAs+40 Cordons) based on the above revision
- Expand to a 409x409 matrix (369 CSAs+40 Cordons) based on the StreetLight tour data
- Expand to a 4149x4149 matrix (4109 TAZs+40 Cordons) based on population and employment
- Split into 5 time periods based on StreetLight’s hourly distribution for each cordon
- Split into 3 auto modes (DA, SR2, SR3+) based on the existing external OD matrices
External LM Travel

X-I OD by DA for AM at **Cordon 4114 on I-5 North (Old vs New)**
External LM Travel

X-I OD by DA for AM at **Cordon 4149 on I-5 South (Old vs New)**
THANK YOU!

For more information, please contact Kihong Kim (kimk@scag.ca.gov)