Cracking the Freight Data Nut: Estimating Center City Inbound and Outbound Vehicle Volumes from Cordon Counts

Presenter: Gabriela Giron-Valderrama
PhD Candidate

Co-authors: Dr. Anne Goodchild

METTRANS International Urban Freight Conference
October 17, 2019
Seattle: the No. 1 growing U.S. city of this decade

Sources: U.S. Census
MARK NOWLIN / THE SEATTLE TIMES
City Center Cordons

Dublin City Council Canal Cordon
Dublin City Council & National Transport Authority

Road Pricing for London
Transport for London
Seattle’s Greater Downtown Cordon Study

The Seattle Department of Transportation (SDOT) engaged the Urban Freight Lab (UFL) to:

a. Develop a baseline cordon count for the Greater Downtown
b. Create a vehicle typology with focus on commercial vehicles

Inbound and outbound vehicle volume are being captured by:

a. Day of the week
b. Time of day
c. Vehicle body type
d. Vehicle use
e. Number of axles.
## Gateway Locations

<table>
<thead>
<tr>
<th>Gateway Type</th>
<th>No.</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intersections</td>
<td>3</td>
<td>M – Su</td>
</tr>
<tr>
<td>Additional Intersections</td>
<td>19</td>
<td>T – W</td>
</tr>
<tr>
<td>I-5 On and Off-Ramps</td>
<td>20</td>
<td>T – W</td>
</tr>
</tbody>
</table>

### Legend

- **Cordon Study Area**
- **Intersections Gateways**
- **Getaways in I-5 Ramps**
  - NB - Off-ramp (6)
  - SB - On-ramp (5)
  - SB - Off-ramp (5)
  - SB - On-ramp (4)
Inside Cordon Area

Outside Cordon Area

Outbound flow

Inbound flow

Cordon Line
Vehicle Typology (1/2)

UFL researchers created a vehicle typology with 65 categories based on two levels of classification:

- **1st Level = Vehicle Body** based on the vehicle frame and number of axles.

- **2nd Level = Use** based on the primary use of the vehicle.
Vehicle Typology (2/2)

(a)

Vehicle Size Types
- Motorcycle
- Passenger Car
- Work Van
- Commercial Pick-up
- Single Unit
- Trailer
- Multi-trailer
- Bus
- RVs

(b)

Vehicle Use Types
- Non-Commercial
  - Private
  - Transit
  - Recreational (RVs)
  - Emergency
- Commercial
  - Goods Transport
  - Service
  - Waste Management
  - Construction
  - General
Data Collection Effort

Sample Size

Total CVs crossing the cordon captured in a 48hrs period for all gateways = **89,490 veh**

<table>
<thead>
<tr>
<th></th>
<th>Intersections</th>
<th>Off Ramps</th>
<th>On Ramps</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total CVs</strong></td>
<td>62,116 (70%)</td>
<td>12,503 (14%)</td>
<td>14,871 (16%)</td>
</tr>
<tr>
<td><strong>Lowest Vol</strong></td>
<td>120</td>
<td>454</td>
<td>820</td>
</tr>
<tr>
<td><strong>Average Vol</strong></td>
<td>1,635</td>
<td>1,134</td>
<td>1,632</td>
</tr>
<tr>
<td><strong>Maximum Vol</strong></td>
<td>5,317</td>
<td>2,486</td>
<td>2,708</td>
</tr>
</tbody>
</table>

CVs traffic was on average **8%** of the total daily traffic.
Cordon Study Findings
There is no significant difference in CV volumes by day of week.
About one half of all CVs were smaller vehicles

<table>
<thead>
<tr>
<th>Weighted AVG</th>
<th>Smaller CM Fleet</th>
<th>Single Unit</th>
<th>Trailer</th>
<th>Multi-Trailer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smaller Fleet</td>
<td>53.0%</td>
<td>27.4%</td>
<td>5.9%</td>
<td>1.5%</td>
</tr>
<tr>
<td>2 axles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 axles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 axles +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailer</td>
<td></td>
<td></td>
<td>9.7%</td>
<td></td>
</tr>
<tr>
<td>Multi-Trailer</td>
<td></td>
<td></td>
<td></td>
<td>0.5%</td>
</tr>
</tbody>
</table>
The largest share of CVs were service vehicles.
There are traffic pattern variations between Gateways

4th Ave S & S Holgate St
Max = 85 veh
Avg = 26 veh
Avg = 15 veh
Max = 39 veh

Elliot Ave W and W Mercer Pl
Max = 47 veh
Avg = 16 veh
Avg = 15 veh
Max = 46 veh

16
There are traffic pattern variations between Gateways

<table>
<thead>
<tr>
<th></th>
<th>Intersections</th>
<th></th>
<th>Ramps</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Smaller CV Fleet</td>
<td>Single Unit</td>
<td>Trailer</td>
<td>Multi Trailer</td>
</tr>
<tr>
<td>Average Share of CVs daily traffic (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smaller CV Fleet</td>
<td>56.2%</td>
<td>27.4%</td>
<td>5.4%</td>
<td>1.3%</td>
</tr>
<tr>
<td>2 axles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 axles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 axles +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi Trailer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 axles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 axles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 axles +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trailer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Findings Summary

• There is no significant difference in CV volumes by day of week.

• About 50% of all CVs entering/exiting the Greater Downtown area were smaller 2 axles fleet (i.e., vans, pick-ups), and 80% are 2 axles vehicles. This is consistent across the locations.

• The largest percentage (one third) of CVs entering/leaving the Greater Downtown Seattle city were service vehicles.

• There are traffic pattern variations between Gateways.
Greater Downtown Seattle Cordon Count Applications

• Provide a baseline count for 41 gateways in Seattle’s Greater Downtown area.

• Enable the first ever estimation of the entire traffic flow entering and exiting the downtown core.

• Allow the evaluation of different freight planning and traffic management strategies; such as the implementation of new technologies, infrastructure planning, assessment of current major trucks streets classification, and congestion pricing.

• Establish a method to collect cordon count data in the future to capture trends.
Questions? Please contact:

Gabriela Giron-Valderrama, MSc
PhD Candidate
Research Assistant, SCTL Center
gabgv13@uw.edu

Dr. Anne Goodchild
Professor
SCTL Center
annegood@uw.edu