



Tacoma Freight Model Update

Puget Sound Regional Council Model Users Group

October 28, 2020

Overview

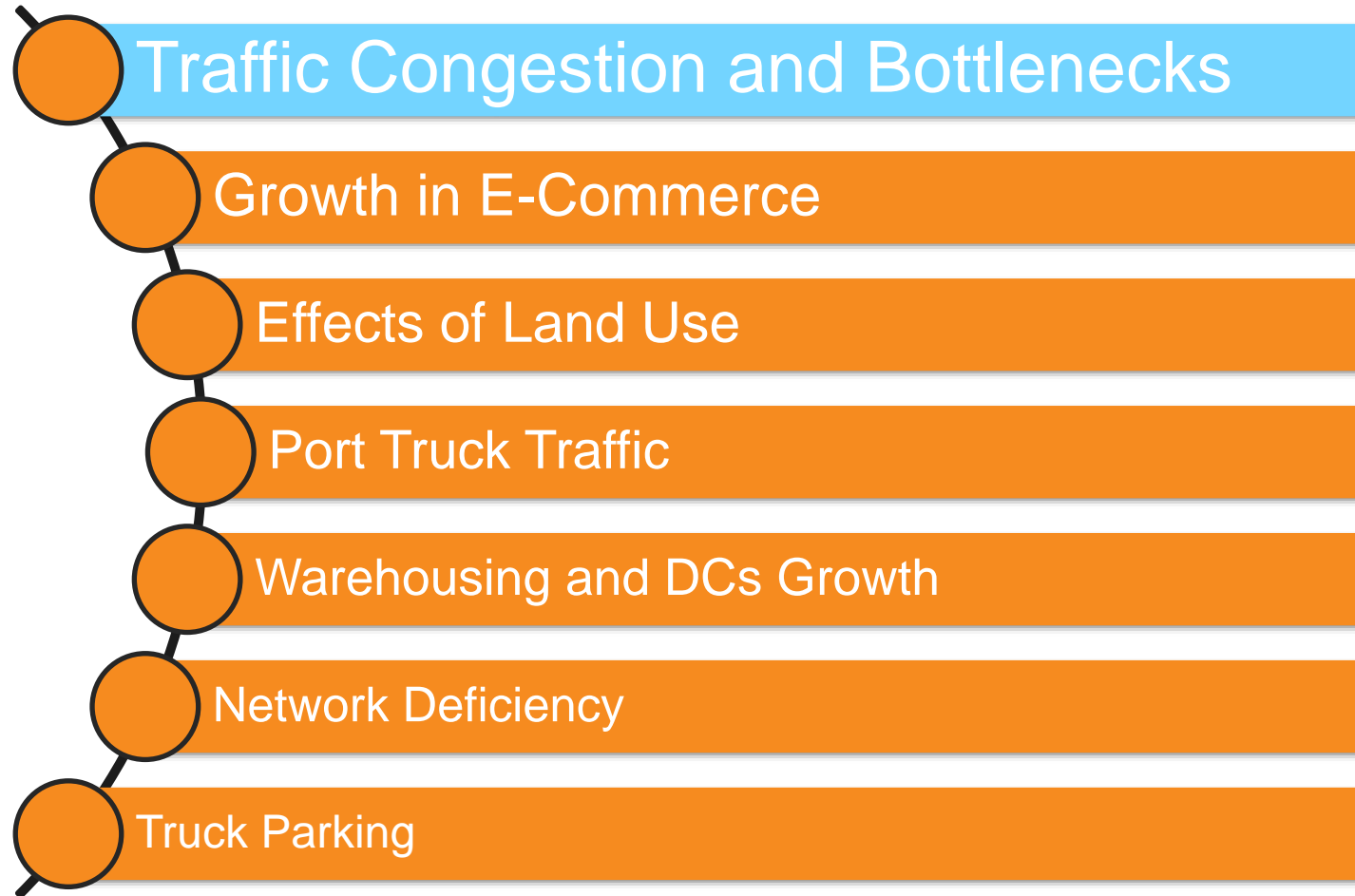
- Model Design
- Data Development
- Observed Origin-Destination Data
- Freight Model
 - Dashboard
 - Trip Generation
 - Trip Distribution
 - Assignment





Model Design

During model design, stakeholders identified the top freight mobility issues.



*Based on the discussions in the first workshop and the stakeholder survey results (overall turnout: ~%30). Prioritized from top to bottom.



Model design focused on these stakeholder suggestions.

- Increased concern with local impacts, “last mile” deliveries, and traffic congestion around the port.
- Demand for a modeling approach that will reflect regional and local movements.
- Common interest in understanding the existing conditions as the main need for the freight modeling tool.
- Interest in using GPS data to supplement traditional sources (e.g., FAF and truck counts).



First phase of model design updated the current Tacoma freight model.



- Adding detail on port and transfer terminal activities
 - Distribution centers, intermodal terminals, and consolidation centers
 - Size of the facility, the number of employees and any traffic counts in the vicinity
 - Using special generator approaches to capture the specialized truck movements into and out of these facilities
- Purchasing observed data on truck movements to validate the truck trip tables
 - Includes truck model validation of truck volumes to counts.
 - Calibration of the generation and distribution components of the truck model by vehicle type
 - Can be purchased from ATRI, INRIX or StreetLight, or both

Model update focused on addressing these issues.



- The model structure is consistent with the current model.
- Special generators (ports and transfer terminals) were included in distribution to capture these intermediate stops.
- The port and transfer terminal data from the NWSA were used.
- Calibration and validation was based on a new, large sample dataset from the American Transportation Research Institute (ATRI).

The model update focused on enhancing data sources.

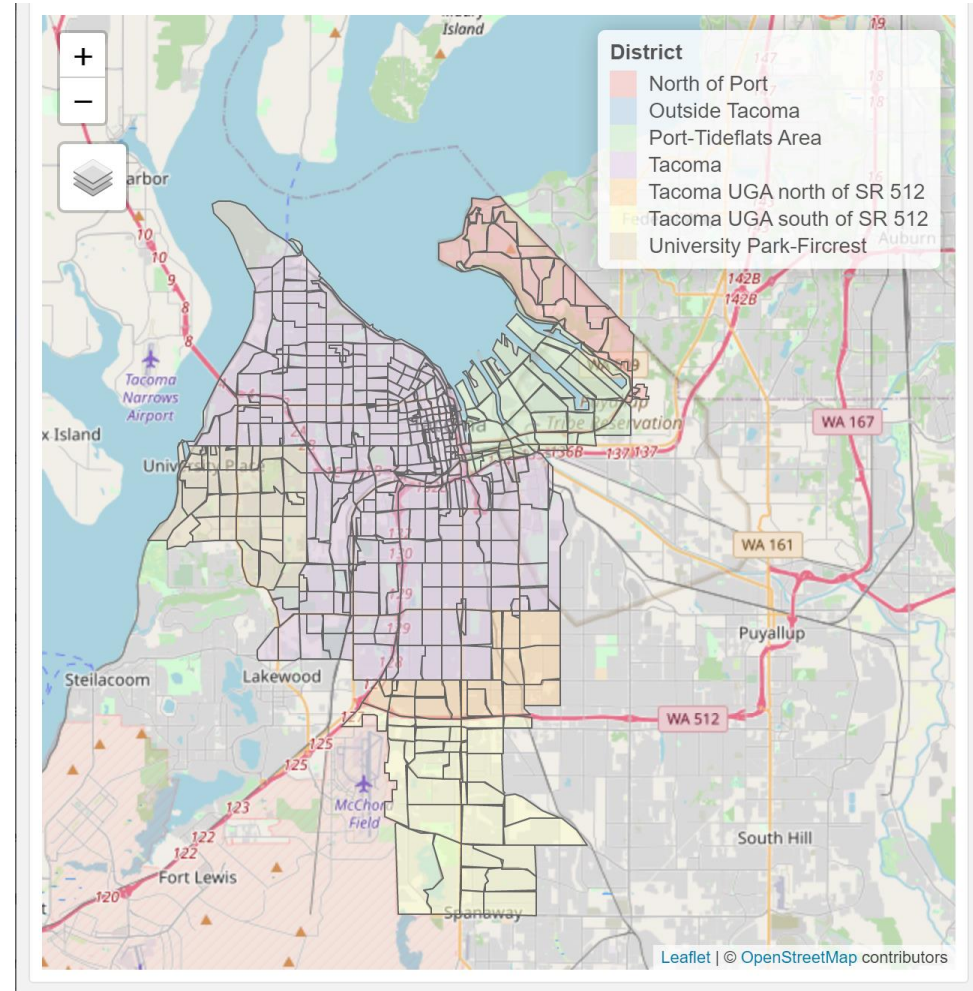




Data Development

Tacoma model zones were updated to better match regional zones.

- Districts were set to understand origin-destination patterns.
- Land use and network data were updated for new zones.



Truck counts were obtained from several sources.

Truck counts were used to:

- Expand the ATRI observed origin-destination data
- Validate the model

COUNT SOURCE	NUMBER OF COUNTS	LIGHT TRUCKS, PASSENGER VEHICLES	MEDIUM, HEAVY TRUCKS	TOTAL
City of Tacoma	388	2,360,174	199,401	2,559,963
Pierce County	20	312,990	32,728	345,738
WSDOT	18	762,878	74,112	837,008
NWSA	16	86,020	24,475	110,511
Total	442	3,522,062	330,716	3,853,220



Four special generators were added.

These were distribution centers and intermodal terminals that have higher truck trip rates than model rates.

TRAFFIC ANALYSIS ZONE	TYPE	FREIGHT ACTIVITY CENTER	AREA (SF)	EMPLOYMENT CATEGORY
13432	Distribution Center	IKEA D.C.	96,140	Trucking and warehousing*
803	Distribution Center	Dental Supply D.C.	116,180	Trucking and warehousing*
13288	Intermodal Terminal	Rail and Truck	–	TCU**
13237	Intermodal Terminal	Rail and Truck	–	TCU**

Notes: **TCU Transportation, Communication, And Utilities (model employment categories)

* This is standard industry category (code: 42) used to get trip rates from ITE and QRFM

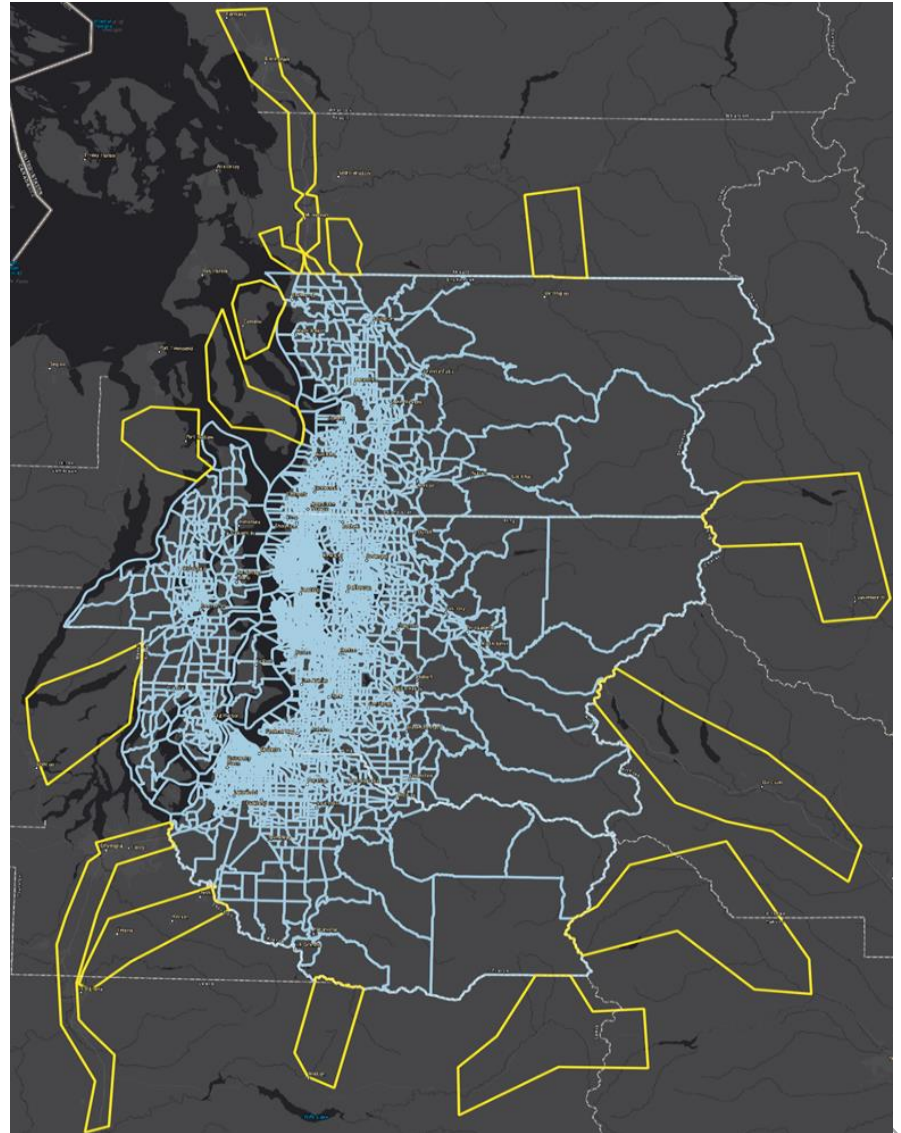




Observed Origin Destination Truck Data

ATRI provided observed OD truck data

- Data provided by the American Transportation Research Institute
- 8-week data sample
 - 2 weeks in January, April, July and October
- Covers 4-county PSRC region



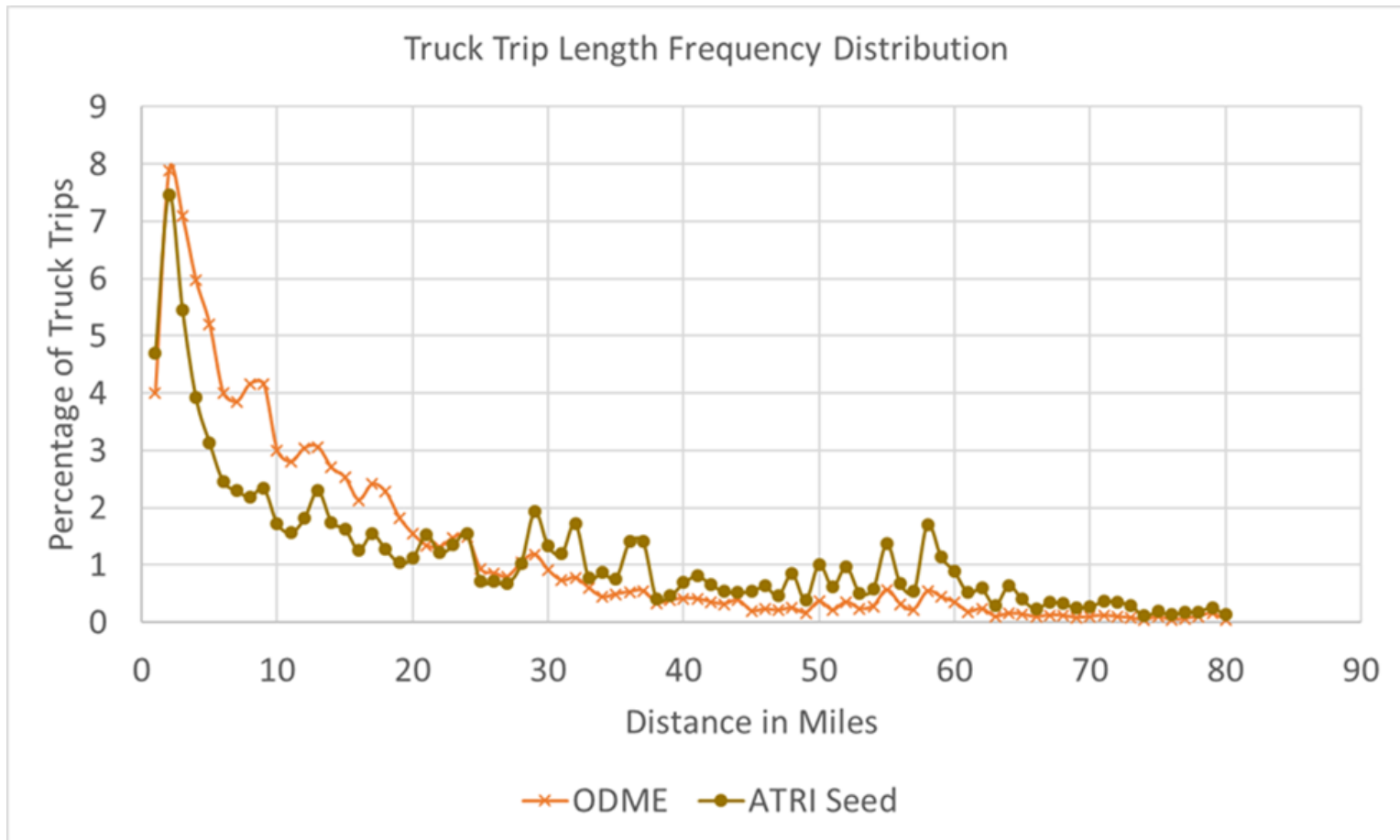
Observed data were expanded to represent all trucks in the region.

4-step process

1. Scaled overall to match observed vehicle miles traveled
2. Scaled parametrically based on OD distance
3. Adjusted for trip length biases using iterative screenline fitting
4. Adjusted for origin-destination matrix estimation to match truck counts



Truck trip length frequency distribution matches observed data reasonably well.



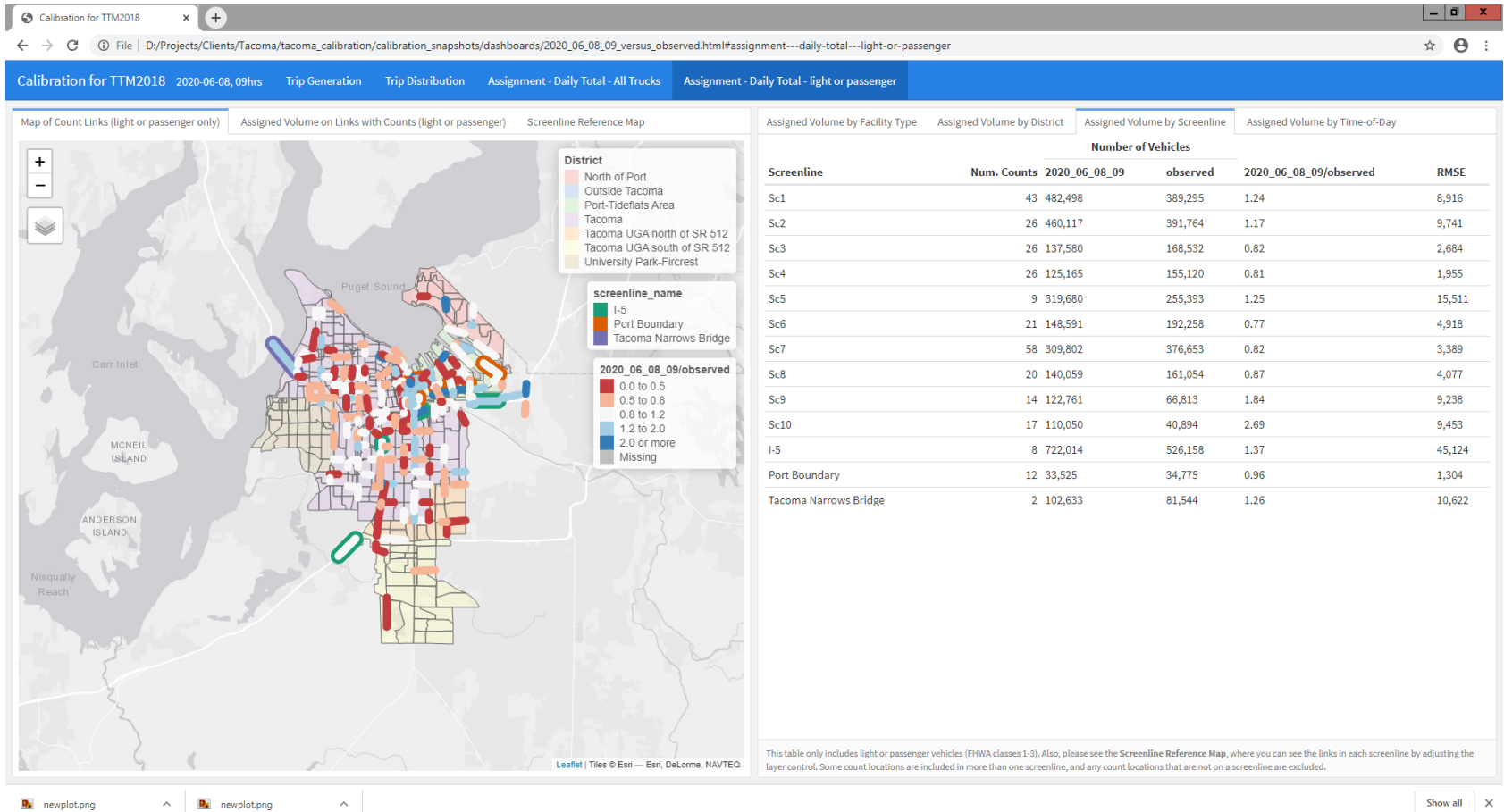
ODME is the output from the origin-destination matrix estimation process, derived from traffic counts. ATRI is the observed origin-destination data after expansion and data cleaning.





Freight Model Update

RSG developed a dashboard to display model outputs and compare scenarios.



Truck trip generation

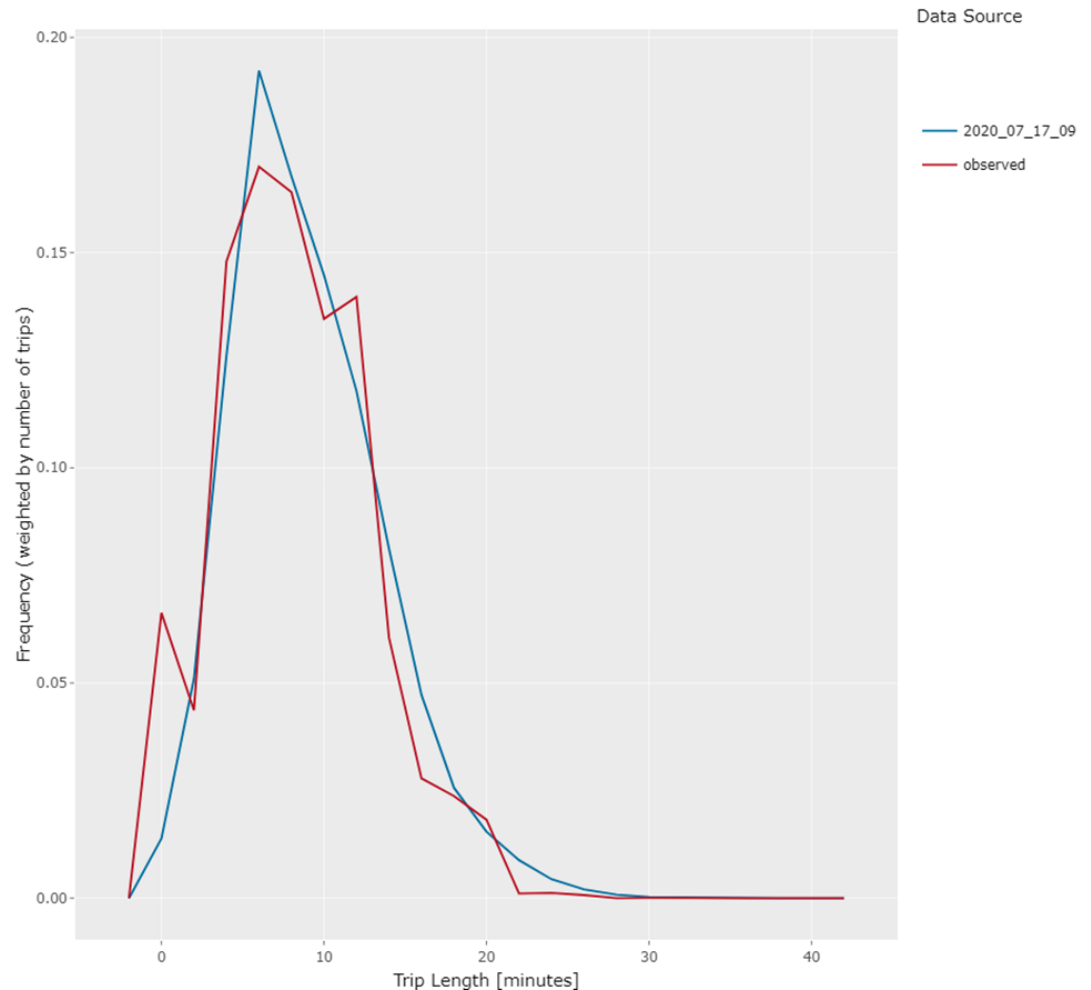
For the Tacoma region, the model is estimating truck productions and attractions in the center of the range bounded by the observed productions and attractions (48,685 productions and 51,538 attractions).

DISTRICT	PRODUCTIONS [TRIPS]			ATTRACTIONS [TRIPS]		
	MODEL	ATRI OBSERVED	MODEL - OBSERVED	MODEL	ATRI OBSERVED	MODEL - OBSERVED
North of Port	1,195	230	965	1,190	308	882
Port-Tideflats Area	14,678	20,101	-5,423	14,391	20,871	-6,480
Tacoma	27,092	22,043	5,049	27,271	22,769	4,502
Tacoma UGA North of SR 512	1,629	866	763	1,630	793	837
Tacoma UGA South of SR 512	3,149	4,114	-965	3,191	5,545	-2,354
University Park-Fircrest	2,326	1,331	995	2,326	1,252	1,074
Tacoma Region	50,069	48,685	1,384	49,999	51,538	-1,539
Outside Tacoma	300,679	302,081	-1,402	301,059	299,536	1,523
External	21,630	21,630	0	21,322	21,322	0
All PSRC Region and Externals	372,379	372,396	-17	372,379	372,396	-17



Truck trip length frequency

- Medium and heavy trucks only
- AM peak trip lengths compared to observed data are reasonable (per chart)



Internal truck trips within Tideflats area is slightly low compared to observed.

Focused review of zones, networks and land use data near the Port will improve these results. These results are within 10% of observed.

MODEL: PERCENTAGE OF INTERNAL-TO-INTERNAL TOTAL	DESTINATION DISTRICT						TOTAL INTERNAL TRIPS
	ORIGIN_DISTRICT	NORTH OF PORT	PORT-TIDEFLATS AREA	TACOMA	TACOMA UGA NORTH OF SR 512	TACOMA UGA SOUTH OF SR 512	
North of Port	0.2%	0.8%	0.6%	0.0%	0.0%	0.0%	1.8%
Port-Tideflats Area	0.8%	5.1%	17.4%	0.8%	1.1%	1.2%	26.6%
Tacoma	0.6%	17.4%	34.1%	1.4%	2.1%	3.0%	58.7%
Tacoma UGA North of SR 512	0.0%	0.8%	1.4%	0.2%	0.3%	0.1%	3.0%
Tacoma UGA South of SR 512	0.0%	1.1%	2.1%	0.3%	1.1%	0.2%	4.8%
University Park-Fircrest	0.0%	1.2%	3.0%	0.1%	0.2%	0.6%	5.1%
Total Internal Trips	1.8%	26.6%	58.7%	3.0%	4.8%	5.1%	100.0%



Truck trips into and out of the region are reasonable but can be improved.

The Port-Tideflats and Tacoma districts and could be improved with a detailed review of the zones, networks and land use data in the area near the Port of Tacoma.

Internal District	EXTERNAL-TO-INTERNAL		INTERNAL-TO-EXTERNAL	
	Model	Observed	Model	Observed
North of Port	3.1%	0.6%	3.1%	0.4%
Port-Tideflats Area	32.7%	46.0%	31.5%	43.0%
Tacoma	48.4%	36.3%	49.4%	36.3%
Tacoma UGA North of SR 512	3.6%	1.7%	3.6%	1.7%
Tacoma UGA South of SR 512	8.1%	13.1%	8.3%	17.2%
University Park-Fircrest	4.0%	2.3%	4.1%	1.3%
Total	100.0%	100.0%	100.0%	100.0%



Total volumes are within 4% of observed.

- Modeled light trucks are combined with passenger cars.
- The model slightly over-estimates heavy trucks.
- Medium trucks match observed within 1%.

TRUCK TYPE	NUMBER OF TRUCK COUNTS*	MODEL	OBSERVED	MODEL OBSERVED RATIO	MODEL OBSERVED DIFFERENCE
Heavy	426	110,468	88,788	1.24	21,680
Medium	426	216,130	217,453	0.99	-1,323
Light or Passenger	426	3,268,122	3,436,042	0.95	-167,920
All Links with Counts	426	3,594,720	3,742,283	0.96	-147,563

**Only 426 of the 442 counts distinguished between medium and heavy trucks.*



Truck counts were validated by facility type.

- Urban arterials are close to truck counts, but freeways are over-estimated.
- Rural facilities are under-estimated.
- Overall, truck volumes are within 8% of counts.

FACILITY TYPE	NUMBER OF COUNTS*	MODEL	OBSERVED	MODEL OBSERVED RATIO	MODEL OBSERVED DIFFERENCE
Urban 2-Way Arterials	352	196,441	193,774	1.01	2,667
Freeway	17	102,082	69,173	1.48	32,909
Rural 2-Way Arterials	67	40,766	61,942	0.66	-21,176
Expressway	6	16,372	5,827	2.81	10,545
All Links with Counts	442	355,661	330,716	1.08	24,945



Cars and light trucks were included in assignments from original Tacoma model.

- Overall, the model is under-estimating light truck and passenger volumes by 5%
- Freeways and expressways are over-estimated, like trucks.
- Rural arterials are under-estimated, like trucks.

FACILITY TYPE	NUMBER OF COUNTS*	MODEL	OBSERVED	MODEL OBSERVED RATIO	MODEL OBSERVED DIFFERENCE
Urban 2-Way Arterials	352	1,888,665	2,134,281	0.88	-245,616
Freeway	17	913,409	742,981	1.23	170,428
Rural 2-Way Arterials	67	448,144	606,915	0.74	-158,771
Expressway	6	111,017	37,885	2.93	73,132
All Links with Counts	442	3,361,235	3,522,062	0.95	-160,827



Summary

- The Tacoma truck model update has improved input data and taken advantage of observed origin-destination data.
 - These data may be useful to Pierce County, Northwest Seaport Alliance and PSRC
- Focused review of model outputs in subareas is recommended for use in planning studies.
 - Minor adjustments will improve assignments locally.
 - Some adjustments to the passenger model will also be useful to improve local subareas.





the science of insight

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