Estimating Nationwide Truck Flows From the Freight Analysis Framework (FAF) 2017 Data

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FHWA Project Objectives

Improved and transparent methodology for estimating freight trucks on national highway systems

Develop a replicable means of deriving county level Origin-Destination Flow data from FAF

Create a software tool to allocate the Freight Analysis Framework (FAF) data to a national road network.

Background

- The Commodity Flow Survey 2017 Data and the Freight Analysis Framework 5 (FAF5) have been published

- More detailed flow estimates are desired between smaller spatial units such as counties and for major roads

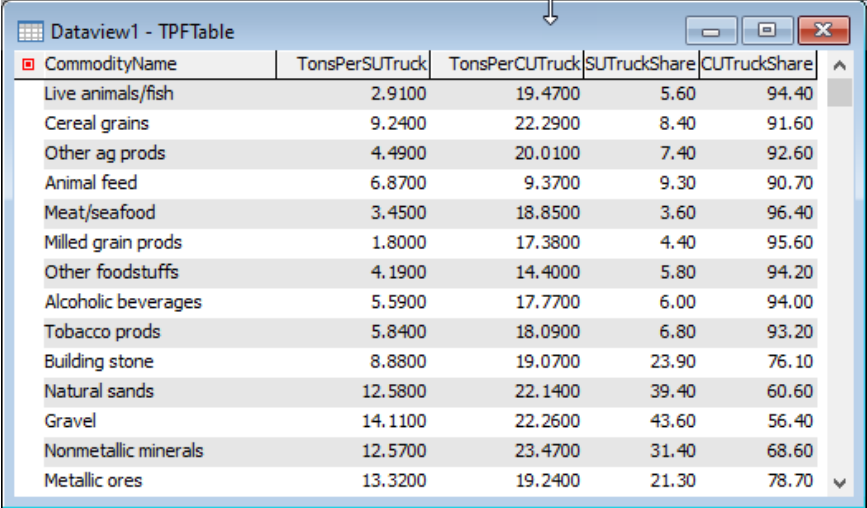- Disaggregation of FAF5 and network assignment are possible through modeling

Project Elements

- Disaggregation of FAF5 flows by commodity group from 132 FAF zones to counties, sub-county areas, ports, airports, and border crossings

- Conversion of commodity tonnage flows to truck trips using payload factors

- Creation of a new national model network suitable for flowing long haul truck trips in 2017

- A new traffic assignment approach for these trips

- Application software for disaggregation of flows, network assignment, data queries, and visualization

Commodity Flow Disaggregation

- Preserves FAF 5 published totals by commodity and FAF to FAF zone
- Creates estimates for 3,599 zones representing county centroids, sub-county centroids for large counties, ports, airports, and border crossings
- Production and attraction regression equations as a function of industry employment, population, and other variables
- Tri-proportional gravity model used to preserve known totals and mean flow length distributions

Commodity Flows Converted to Truck Trips

CommodityName	TonsPerSUTruck	TonsPerCUTruck	SUTruckShare	CUTruckShare
Live animals/fish	2.9100	19.4700	5.60	94.40
Cereal grains	9.2400	22.2900	8.40	91.60
Other ag prods	4.4900	20.0100	7.40	92.60
Animal feed	6.8700	9.3700	9.30	90.70
Meat/seafood	3.4500	18.8500	3.60	96.40
Milled grain prods	1.8000	17.3800	4.40	95.60
Other foodstuffs	4.1900	14.4000	5.80	94.20
Alcoholic beverages	5.5900	17.7700	6.00	94.00
Tobacco prods	5.8400	18.0900	6.80	93.20
Building stone	8.8800	19.0700	23.90	76.10
Natural sands	12.5800	22.1400	39.40	60.60
Gravel	14.1100	22.2600	43.60	56.40
Nonmetallic minerals	12.5700	23.4700	31.40	68.60
Metallic ores	13.3200	19.2400	21.30	78.70

Dataview1 - TPFTable

New National Model Network for Road Freight-2017

- Accurate geography and topology including ramps
- 480,000 links, 342,000 nodes
- Attributes conflated from HPMS data from each state
- Congested speeds from NPMRDS where applicable
- Truck tolls compiled for 2017

Truck Trip Assignment

- Intercity truck flows do not follow equilibrium principles, only overall traffic does
- Truck flows are based on congested travel times
- Path choices are influenced by tolls and travel time
- Meaningful alternative routes are enumerated
- Routes can be viewed, edited, deleted, & added
- Discrete choice model is used to model the route shares
- Path-size logit is used to correct for overlapping routes
- Validation with ATRI data

Empirical Data are Available on Truck Routes That Can be Used for Calibration and Validation

- Quite apart from conceptual reasons, it is attractive to use a method that can benefit from empirical data

- Best source for intercity truck route data is GPS data collected from truck fleets such as that available from ATRI-the American Transportation Research Institute

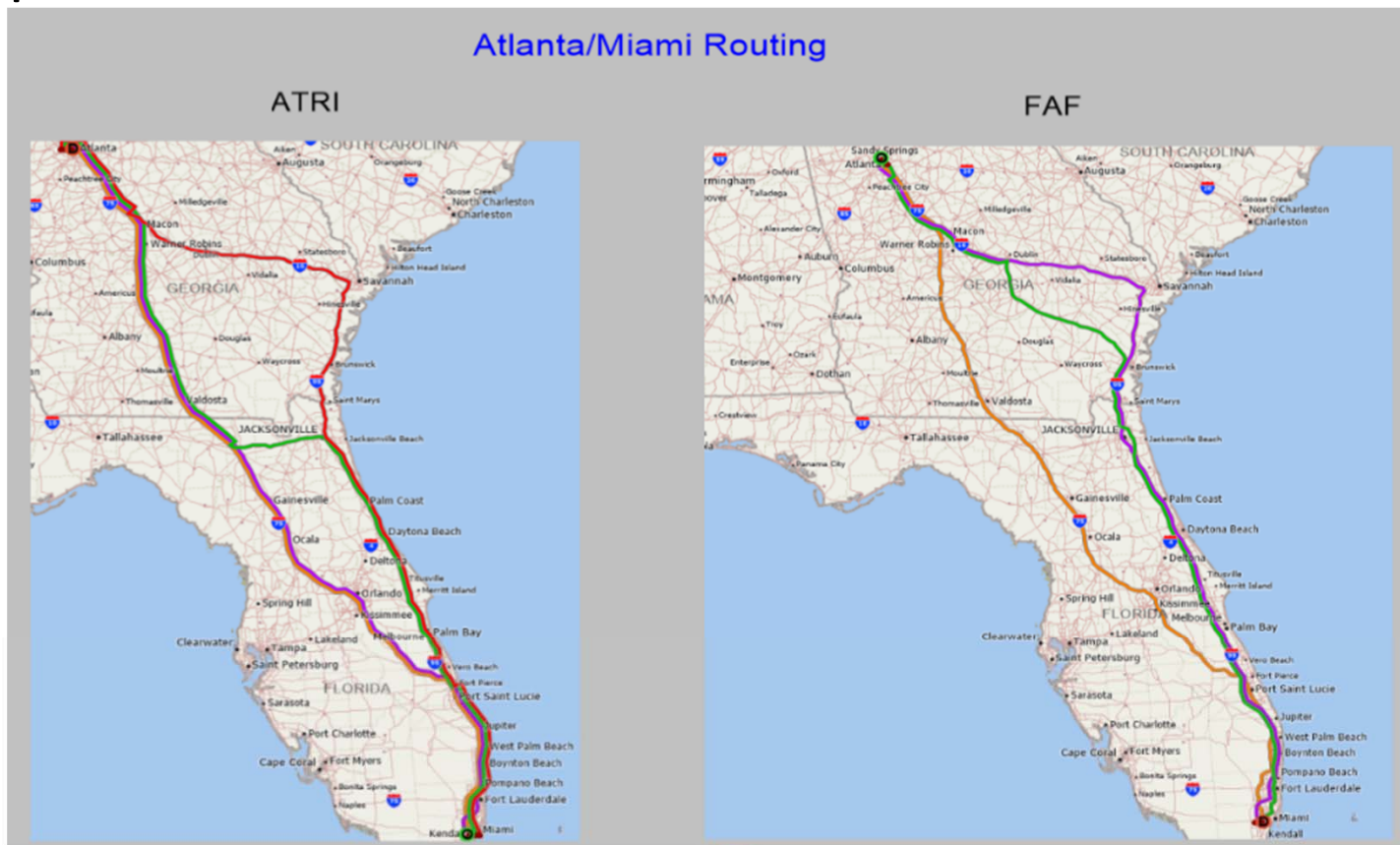- Through an arrangement between ATRI and U.S. DOT, we were able to obtain the routes utilized and the share of traffic on each for some key O-D pairs

Alternative Routes Between Lubbock and Houston
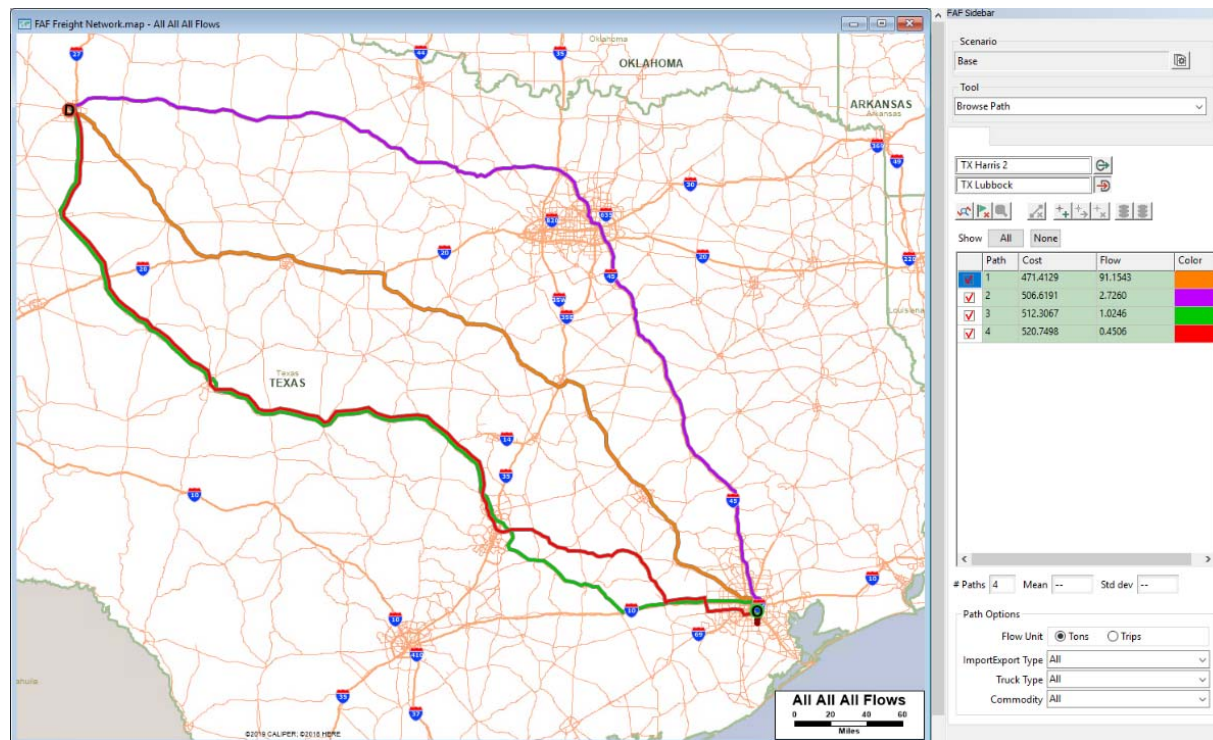
Truck Route Choice Example
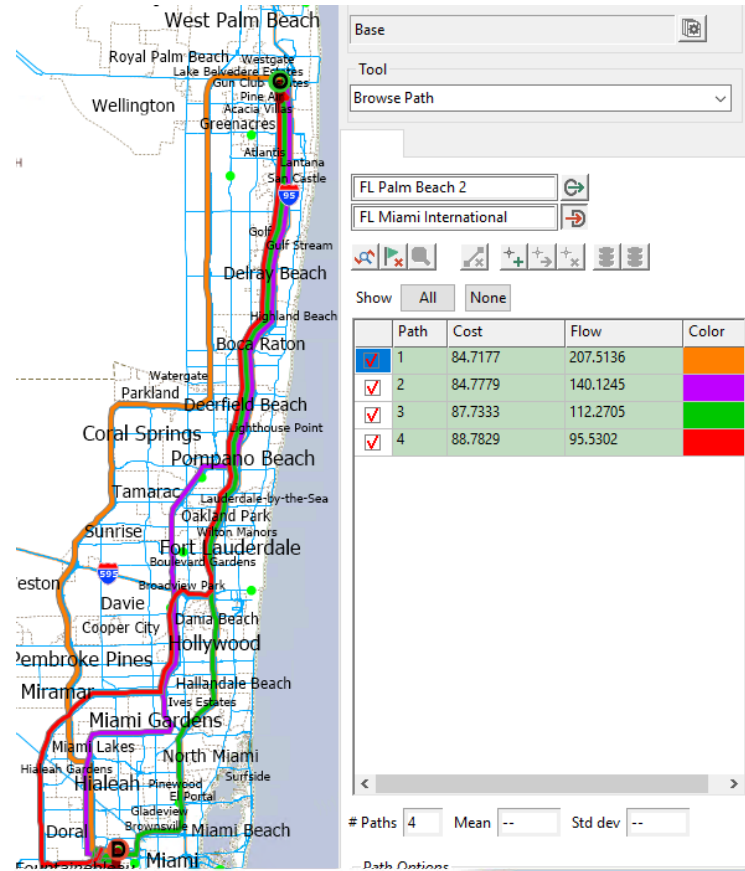
Comparison of FAF Routes with ATRI Data

Atlanta/Miami Routing

ATRI   FAF

National FAF Trucks Flow Map
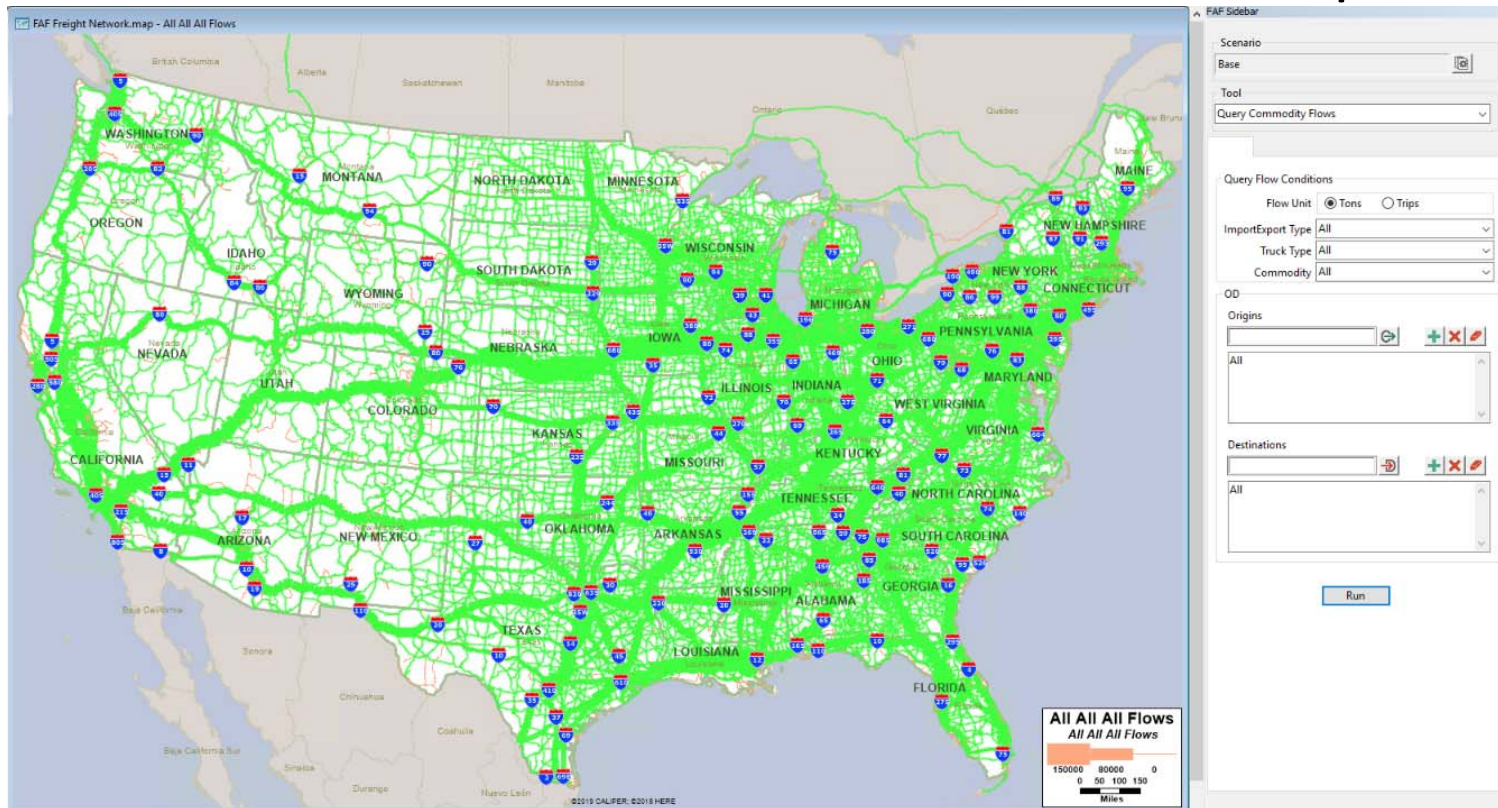
Application Software

- The FAF5 Network Analysis Tool is a software application built upon TransCAD Version 9
- Performs a computationally intensive set of calculations
- Flowchart User Interface
- The methodology and software are modular and flexible so that methods can be updated and improved.
- The tool includes facilities for network management, querying data, and visualization

Routes and Route Choice Parameters

- Routes can be edited, added, or deleted
- Route choice parameters (coefficients and scale) can be edited
- Values of time can be adjusted
- Calibration to known targets is possible

Query Flows by O-D, Commodities, and Route Segments

Route Diversion-I-40 Bridge Closure Impact

Future Work

- Further calibration and validation-flows are expected to be lower than counts due to lack of coverage of all commodities and all truck trips

- Publication of the Data

- Project Final Report

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