



Freight Analysis Framework (FAF) Modernization: Overview & Feedback

Presented online

June 25, 2024

Moderated by

Stephanie Lawrence

Director, BTS Office of Statistical and Economic Analysis (OSEA)

Presenters

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FAF@DOT.GOV

Disclaimer: Views of the speakers may not reflect views of the Bureau of Transportation Statistics (BTS) or the United States Department of Transportation (DOT).



Ongoing Improvements to the Freight Analysis Framework (FAF)

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Freight Estimation, Forecasting, and Analysis Manager (OSEA)

FAF@DOT.GOV

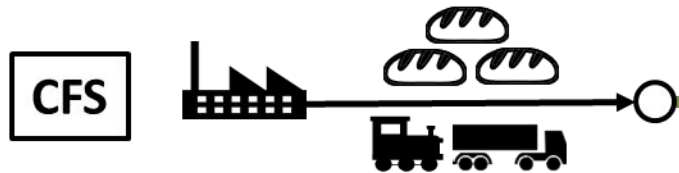
Topics

- FAF Overview: Current Development Process
- Assessment
- Ongoing Advancements
- Product Vision: FAF Modernization

CURRENT DEVELOPMENT PROCESS & PRODUCTS

Data and Approach: OD Flows for 42 Commodity Types & 8 Modes* (Base Year)

SHIPMENT DATA:

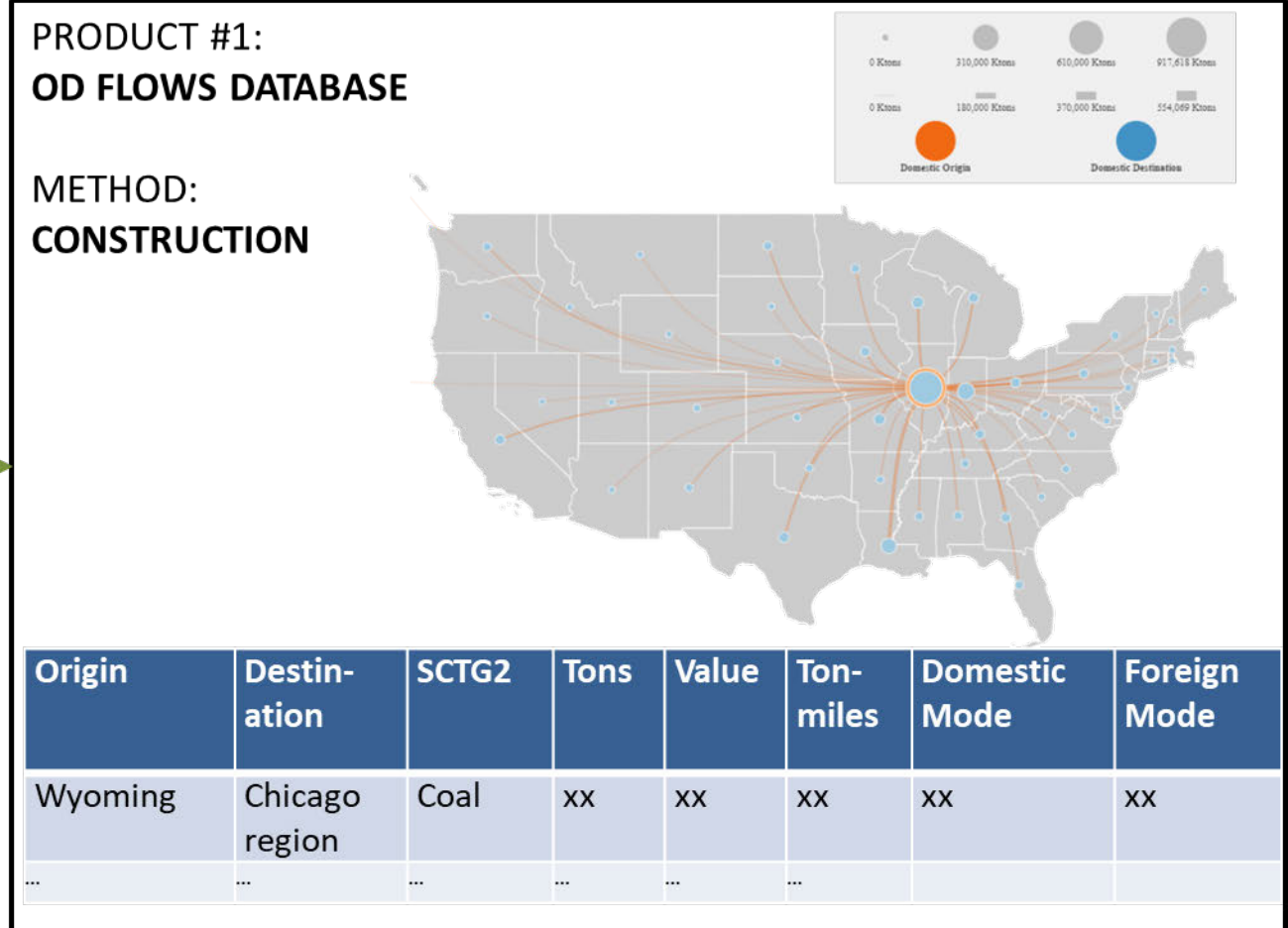


FLOW or PRODUCTION DATA:

11 OOS (Out of Scope) Data Sources	
Farm-based ag.	Crude Petroleum
Waste	Natural Gas
Construction & Demo.	Foreign Trade
Retail	Fisheries
Service	Logging
Moving	

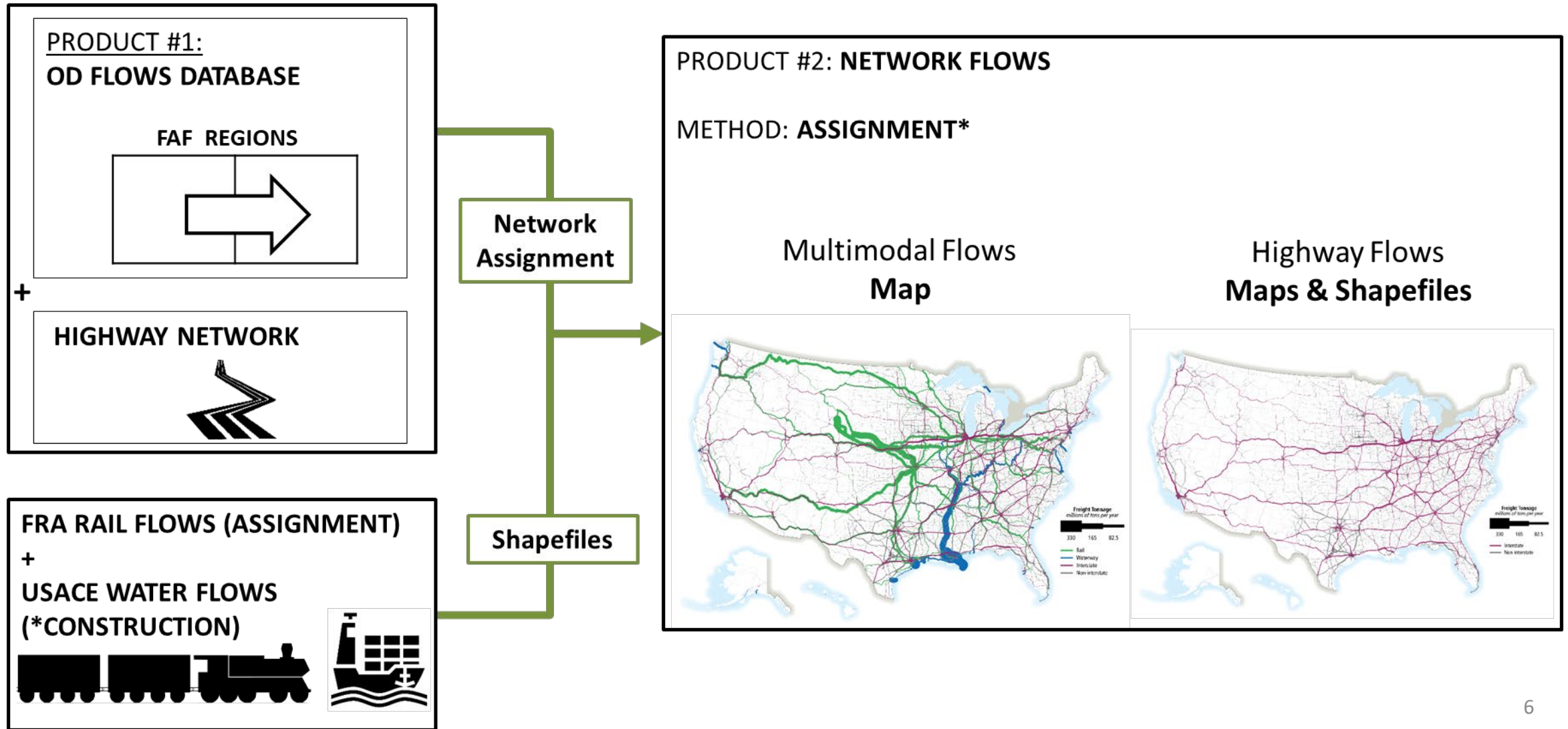
Iterative
Proportional
Fitting (IPF)

11
Processes



*Modes: Truck, Rail, Water, Air, Multiple Modes & Mail, Pipeline, Other/unknown, No domestic mode

Data and Approach: Network Flows (Base Year)



Data and Approach: Forecast

- Inputs
 - FAF5 base year OD flows (2017)
 - Macroeconomic growth factors
 - Base year highway network
- Approach
 - Apply macroeconomic growth factors to base year OD flows
 - Includes low, medium, and high growth demand scenarios
 - Not sensitive to transportation network capacity (i.e., same mode share for each commodity type)
- Updated every 5 years
- Projections out 30 years (to 2050)

Macroeconomic growth factors

Source: IHS Markit's commercial forecasting system of economic scenario models



Forecast methodology report:

<https://ops.fhwa.dot.gov/publications/fhwahop22037/fhwahop22037.pdf>

Using FAF

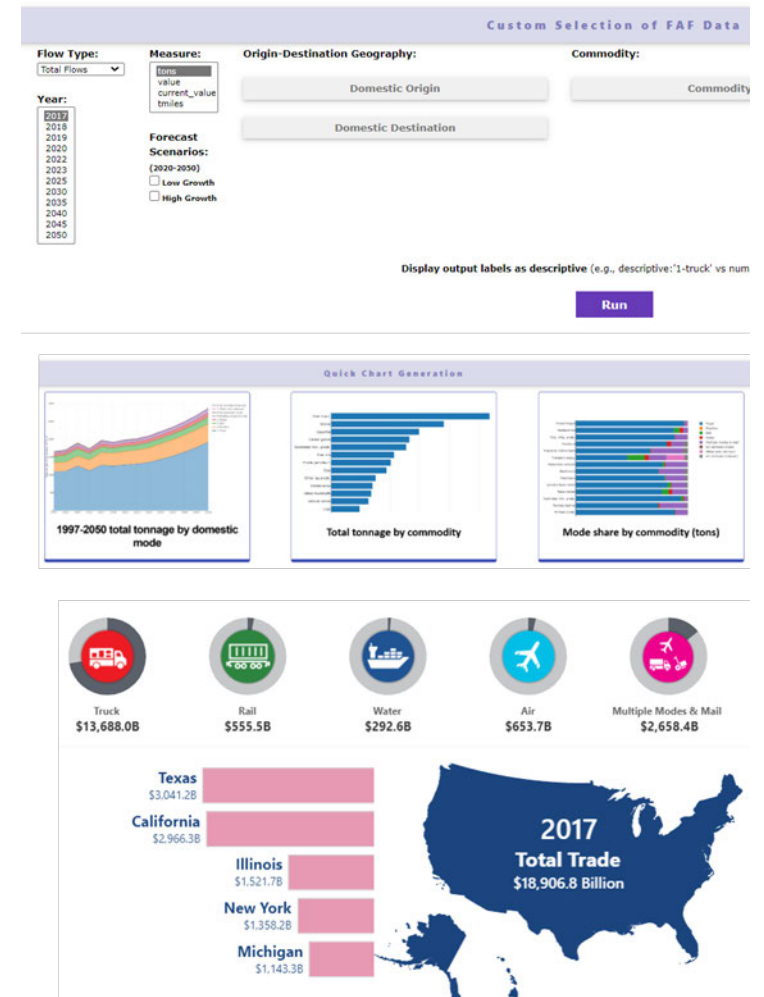
Access products at <https://www.bts.gov/faf>

- OD Flows, Network Flows (truck)
- Visualization tools
- Other (summary statistics, documentation, ...)

Applications include analyzing:

- Impacts of freight movements on congestion, infrastructure, safety, equity and the environment
- Impacts on freight from shifts across industries and economic geographies
- Where to make investments to improve freight movements
- How freight will impact economic development

Also, new dashboard at: https://explore.dot.gov/t/FHWA/views/FAF5_5_1VisualizationFinalv1_1_09_14_2023/NationalSummaryDashboard?%3Aembed=y&%3Aiid=2&%3AisGuestRedirectFromVizportal=y&%3Atabs=n



FAF at 25 years old...and counting

ASSESSMENT

A Brief History

1997

- FAF1 developed by FHWA
- Used some proprietary data & Economic Census data

2002

- FAF2 developed by FHWA
- Used **publicly available data** & Economic Census data
- **Added forecast**

2007

- FAF3: ≈Same as FAF2 (in terms of methods and data)
- **Added highway assignment**

2012 &
2017

- BTS & FHWA co-produce FAF
- FAF4 & FAF5: ≈Same as FAF2
- **Added annual estimates**

2024+

- FAF5.6+: developed by BTS
- Currently **making product improvements**
- **Seeking feedback** on future improvements

*B = BTS Mission requirement;
*F = OST-F requirement;
*U = 49 USC §6303 requirement

FAF Performance

GOAL

- **Production:**
 - Timely delivery (*B)
 - Reasonable development intensity
 - Cost-effective
- **Quality (*B): Validated Estimates**
 - By time period
 - Today's flows (benchmark, annual)
 - Yesterday's flows (historical)
 - Tomorrow's flows (forecast)
 - By Geography: Federal, state, MPO, international) (*U)
- **Useability for Analysis:**
 - Federal, state, MPO, international (*U)
 - Temporal (full year vs. seasons)
 - Single-mode and multi-modal trips (*F)
 - Studies of the US transportation system (*B), (past / current / future) consequences of freight (*B)

ASSESSMENT

- **Production: Benchmark construction**
 - Construction is doable, but limited “levers” to improve when needed
 - 12 processes in total... fewer is better
 - Construction is cost-intensive → explore alternatives
 - Can data enrichment improve timeliness and spatial or temporal granularity
- **Quality (Currently: Anecdotal only...)**
 - Today, yesterday: ≈good (must quantify)
 - Tomorrow: not constrained by transportation capacity
 - MPO, international – can be improved
- **Useability:**
 - MPO and State: limited due to spatial resolution
 - Temporal—seasonal is frequent request
 - Multi-modal assignment—in progress
 - Forecast: no capacity constraint; might not align with local growth assumptions

Question: Can we do better?

Summary

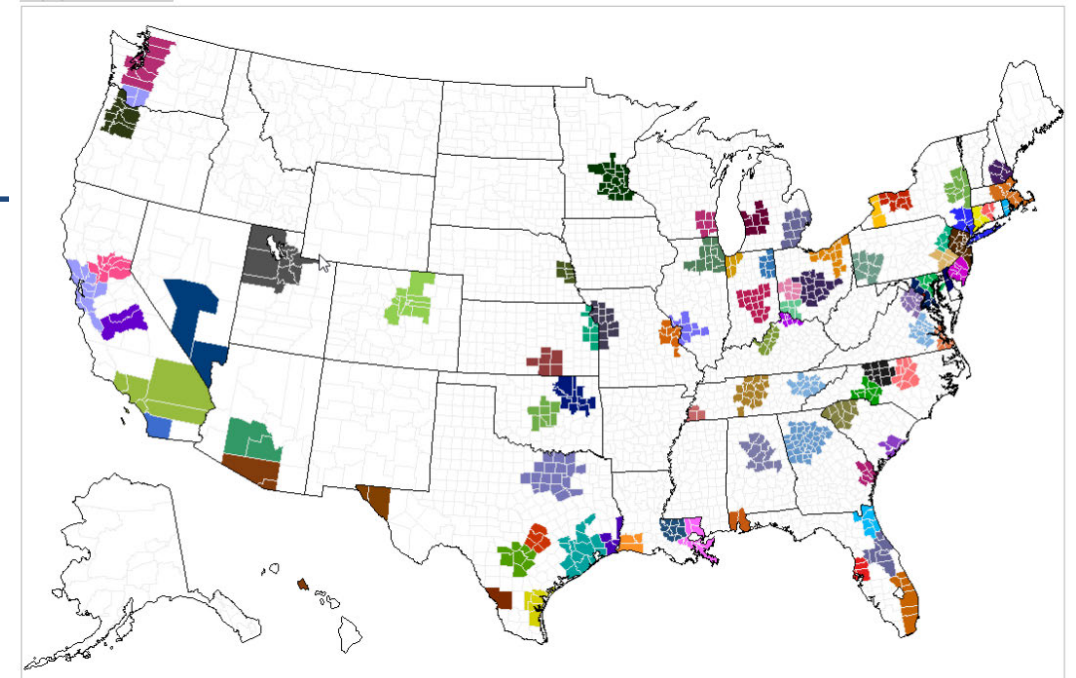
- Base year methods and data – ≈same since 2002
 - BTS is exploring ways to modernize FAF
- Product improvements – in progress (scheduled for release in 2024):
 - Multimodal network assignment
 - County-level OD flows
- Product improvements – upcoming:
 - Improve forecast useability by:
 - Adding network capacity constraints (mode choice)
 - Improving consistency with local growth projections
 - Improve production process
- Seeking feedback on improvements

ONGOING ADVANCEMENTS

In Progress: County-level OD Flows Development

- Objective: Disaggregate FAF OD flows from 132 regions to 3,000+ counties
- Proposed approach: ensemble method
 - Disaggregate flows with several methods
 - Blend the estimates
 - Output: a single “best” estimate
 - Compare to validation targets
 - Iterate until the “best” estimate is (reasonably) close to validation targets
 - Summarize across all US counties
 - Need to decide what is “close”
 - Will need to aggregate commodity categories
- Data
 - FAF5.5 OD flows
 - County-level data (employment, population, ...)
 - Validation targets: real-world flows (HPMS counts, USACE water tons, ...)

132 Domestic Regions



- Status
 - Completed: Literature review on existing disaggregation methods
 - Underway: Selecting methods to include
 - Next: Implement in computational framework
 - Target release date: Fall 2024
- Note: FHWA is developing a guidebook on alternative methods

Feedback

D1: How important is it to have county-level estimates? (**Very important, Somewhat important, Not at all important**)

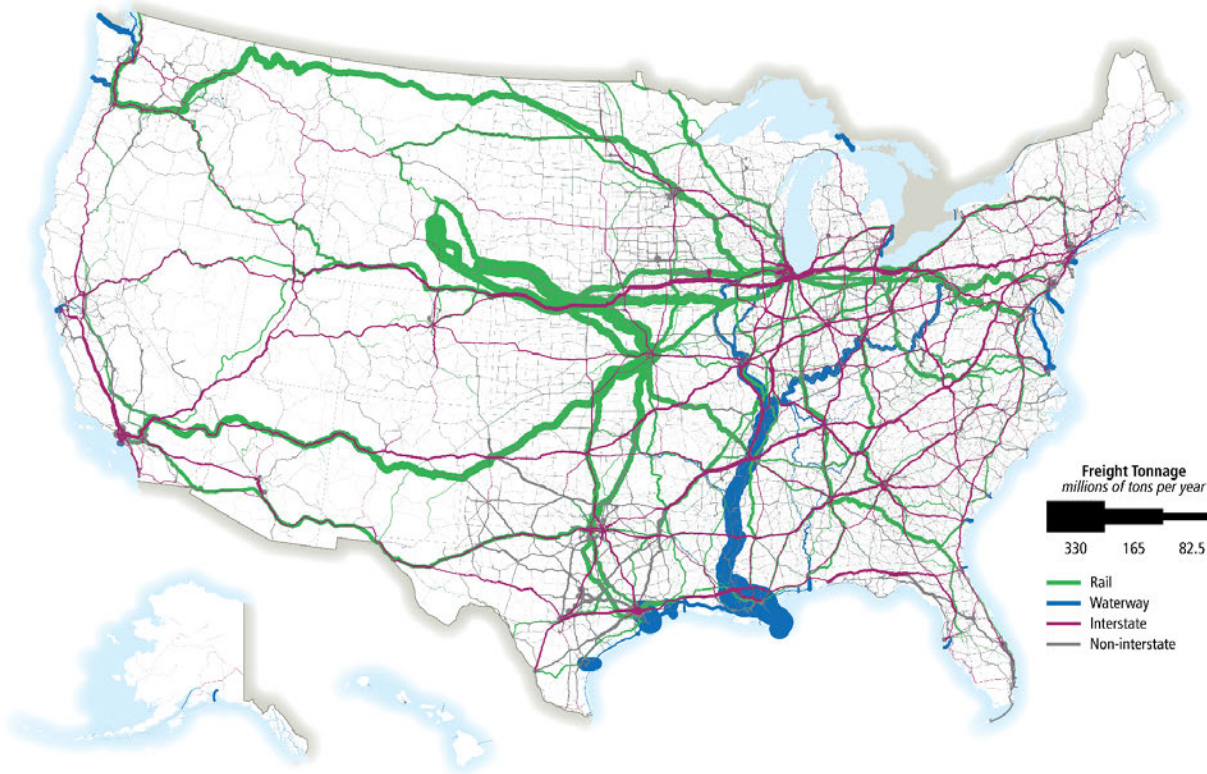
D2: How comfortable are you with the proposed ensemble approach? (**Comfortable, Not comfortable, No opinion**)

D3: What commodity aggregation scheme would be most useful to you (**rank choices**)

- A. Groups based on supply chain function (ex.: raw materials, intermediate, finished goods)
- B. Groups based on packaging (ex.: bulk dry, bulk liquid/tank, boxed, ...)
- C. Groups based on most common mode (ex.: mostly truck, mostly rail, ...)
- D. Groups based on most common shipment size (ex.: <150 lbs., 150-7,000 lbs., ...)
- E. Other (Write in _____)

D4: Please share any other comments on the proposed approach (**type in: _____**)

In Progress: Multi-Modal Freight Assignment



- BTS is developing a process to assign the multimodal flows within “Multiple Modes and Mail” category
- Completes an important missing piece of the network flows
- Important as a stand-alone product
- Also useful for understanding future mode choice

Source:

Freight Flows by Highway, Railway, and Waterway

Highway: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, version 5.4, 2022; Rail: Based on Surface Transportation Board, Annual Carload Waybill Sample and rail freight flow assignment done by Federal Railroad Administration, 2019; Inland Waterways: U.S. Army Corps of Engineers, Institute of Water Resources, Annual Vessel Operating Activity and Lock Performance Monitoring System data, 2022.

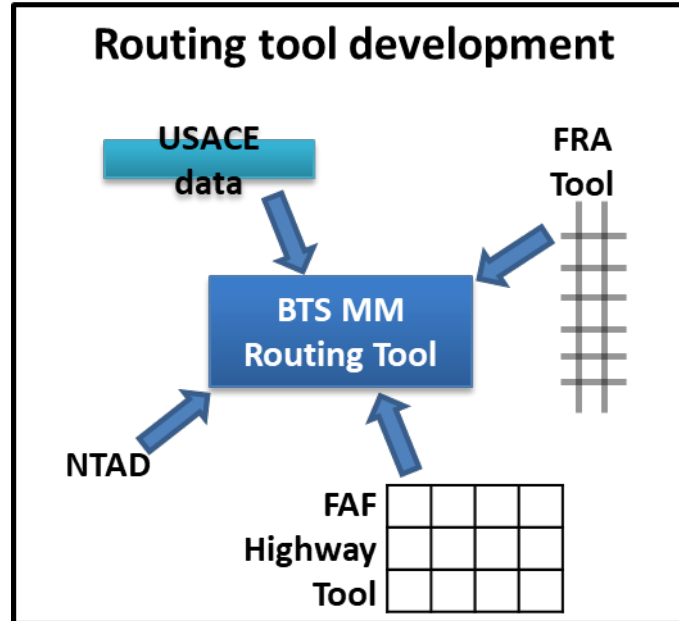
Multi-Modal Freight Assignment



FAF5 highway assignment in TransCAD



NTAD updating intermodal layers including liquid and dry bulk terminals



Adapting FRA rail network assignment



Preparing water OD flow and level-of-service datasets with USACE using detailed network with docks/ports/transshipment points

MORE DETAILS IN NEXT PRESENTATION

PRODUCT VISION

FAF Modernization in Three Stages

Forecast Only (by 2026)

Goal: Improve mode share forecasts (quality, useability).

How: We will set up select elements of the modernized FAF, putting the most effort into mode share model development and validation. We will explore using employment & economic growth data (from BLS, States & MPOs) to project total growth in flows. The resulting forecast will be sensitive to network infrastructure capacity.

Demand Modernization (timeline & funding TBD)

Goal: Improve demand estimation processes in FAF (production, quality, and useability).

How: We will transform the way FAF (or parts of it, e.g., OOS flows) is developed, moving from construction to model-based estimates while leveraging new data that are now available to BTS. Development and validation will focus on demand elements.

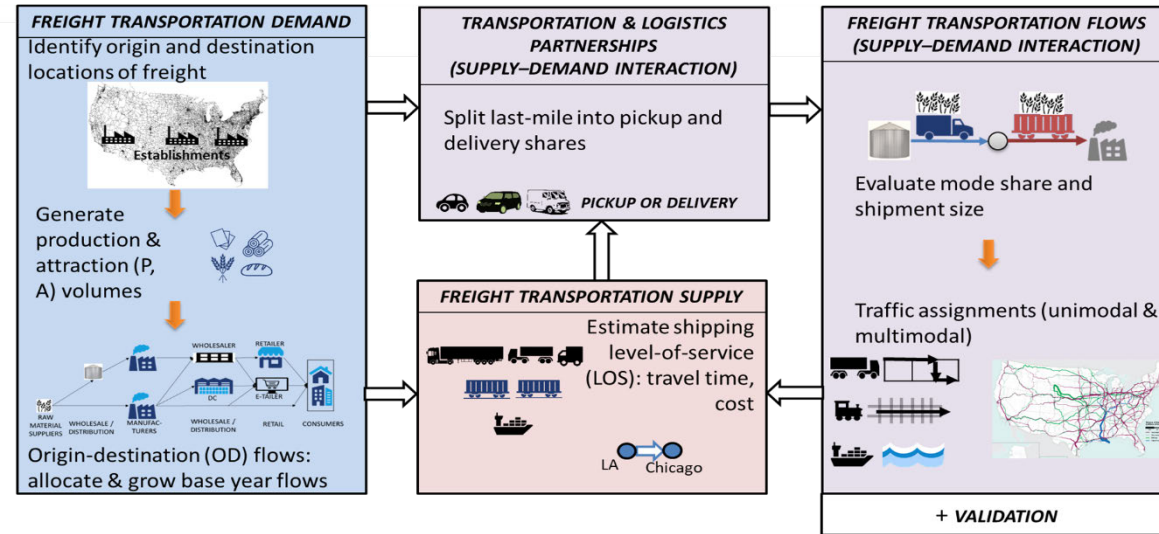
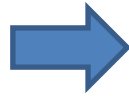
Extended Modernization: End-to-End Supply Chain Analysis Tool (need funding)

Goal: Add supply features and improve demand features (useability, quality).

How: We will add new features that integrate richer data and use updated methodologies, especially filling in the transportation supply side. Extensive attention will be given to validation to ensure robust performance in scenario analysis of both demand and supply. Finally, an EIA NEMS-like scenario tool will be developed for others to use.

Status & Next Steps

- Completed: Draft modernization plans
- (In progress) Get feedback
 - Ongoing refinements at interim product milestones
- (Next) Development



2024-2025:

County-Level Flows & Multimodal Assignment

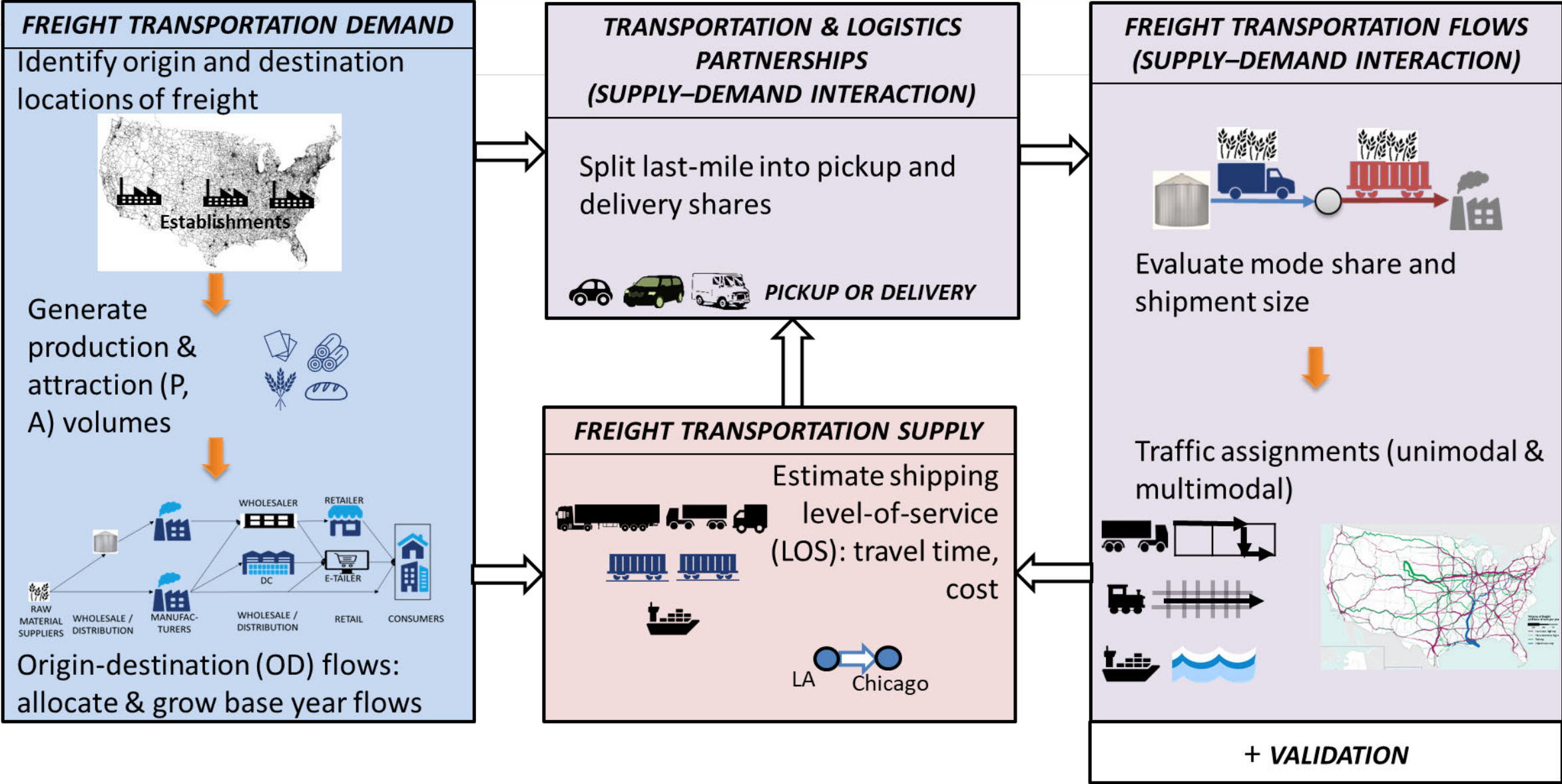
2025-2026:

FAF 6 Benchmark
 FAF Modernization (Forecast Only):
 produce both unconstrained & constrained estimates

Date TBD

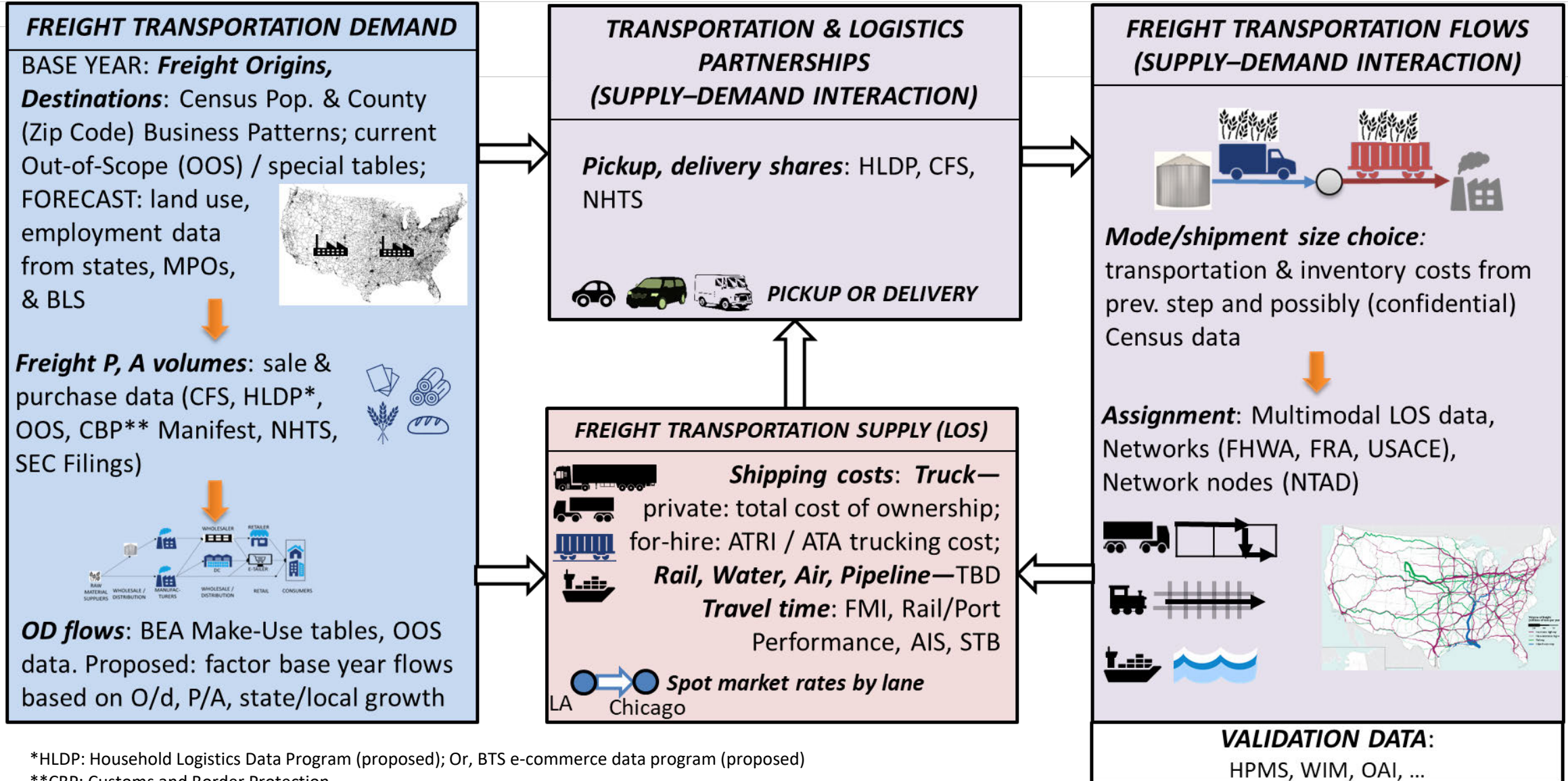
Supply Chain Model (Tentative)

Forecast Only: Components



Forecast Only: Data Sources

Inputs are publicly available unless otherwise noted



*HLDP: Household Logistics Data Program (proposed); Or, BTS e-commerce data program (proposed)

**CBP: Customs and Border Protection

Feedback

F1. What do you use the current forecast data for? (check all that apply)

- Total future freight demand
- Future freight demand by one or more modes (truck, rail, etc.)
- Economic analysis
- Environmental impacts of freight
- Future network performance
- Other (write-in _____)

F2. Do you use the current forecasts “as is”, or do you do additional analysis, such as mode choice? (select 1 option)

- We use them “as is”
- We input the flows into a mode choice model
- Other (write-in _____)

F3. How important is it for FAF forecast flows to have transportation capacity constraints? (Very important, Somewhat important, Not at all important, No opinion / not sure)

F4. How important is it for FAF forecast flows to be consistent with local or state growth forecasts? (Very important, Somewhat important, Not at all important, No opinion / not sure)

F5. How comfortable are you with the proposed forecast approach and data inputs? (Very comfortable, Somewhat comfortable, Not comfortable, No opinion / not sure)

F7. Please share any recommendations on data sources (open response/type in: _____)

F6. Please share any other comments on the proposed approach or data sources (open response/type in: _____)

Thank you!

Contact us if you are willing to share more feedback in a follow-up virtual meeting, or with any questions or comments about FAF:

FAF@DOT.GOV



FAF Multimodal Network Flows: Visualization Feedback

**Bureau of Transportation Statistics
Office of Spatial Analysis and Visualization**

Laura Dods

June 2024

Status of FAF Assignment Products

Mode	Description	Products	Source	Gap
1	Truck	Map; Shapefiles	BTS & US DOT Federal Highway Administration (FHWA)	Is missing the truck portion of...: ...Air-Truck (Mode 4) ...Multiple Modes and Mail (5) ...Pipeline (6)
2	Rail	Future: Map		FAF does not currently have a rail assignment
3	Water	Future: Map		FAF does not currently have a water assignment
4	Air (include truck-air)	Future: Map		FAF does not currently have an air assignment
5	Multiple modes & mail	(In Development: Map/GIS)		
6	Pipeline			FAF does not currently have a pipeline assignment
7	Other and unknown			
8	No domestic mode			

We are currently developing a tool to assign truck, rail, and water flows from (5).

Multimodal Assignment Schedule

- FY24
 - Develop assignment tool
 - Release first product (static map that illustrates the flows)
- FY25+
 - Future (TBD, **depending on funding and interest**): Interactive, web-based visualization tool for multimodal flows

TODAY: Seeking your input on this

Existing FAF5 Data Options

FAF Data

- [FAF Database](#) – Download entire FAF Origin-Destination flow data
- FAF Highway Assignment Results – Download Estimated FAF Flows for Trucks
 - [FAF5 Estimates of Truck Flow for Base Year 2017](#) (Zip File 529 MB)
 - [FAF5 Estimates of Truck Flow for Year 2022 Base Line Scenario](#) (Zip File 530 MB)
 - [FAF5 Estimates of Truck Flow for Year 2050 Base Line Scenario](#) (Zip File 713 MB)
- [FAF Model Highway Network](#) (Zip File 214 MB) - Download model highway network data used for assignment of FAF commodities
- [Freight Analysis Framework Version 5 \(FAF5\) Frequently Asked Questions](#)

Packaged FAF Maps and Summary Tables

- [National Level Freight Flow Maps](#)
- [Information by State – Provides statistics and maps for individual states](#)
- [Prepopulated Summary Tables and Statistics](#)

Web-based Data Analysis Tools

- [Interactive FAF Data Visualization Dashboard](#) – Create and download customized freight dashboards.
- [FAF Data Tabulation Tool](#) – Create and download customized FAF Origin – Destination flow data and summary tables
- [Vehicle Inventory and Use Survey \(VIUS\) Data Visualization Dashboard](#) – Create and download customized VIUS dashboards.

Latest FAF Technical Documents

- [FAF5 Users Guide](#)
- [FAF5 Base Year Data Development Report](#)
- [FAF5 Forecasts Report](#) [PDF 3.2MB]

Source: https://ops.fhwa.dot.gov/freight/freight_analysis/faf/



Existing FAF Network Maps

National Freight Transportation Maps

The following maps appear in publications by the Office of Freight Management and Operations, and are provided here in high-resolution JPEG format and in resolution-independent PDF format.

- National Level Freight Flow Maps

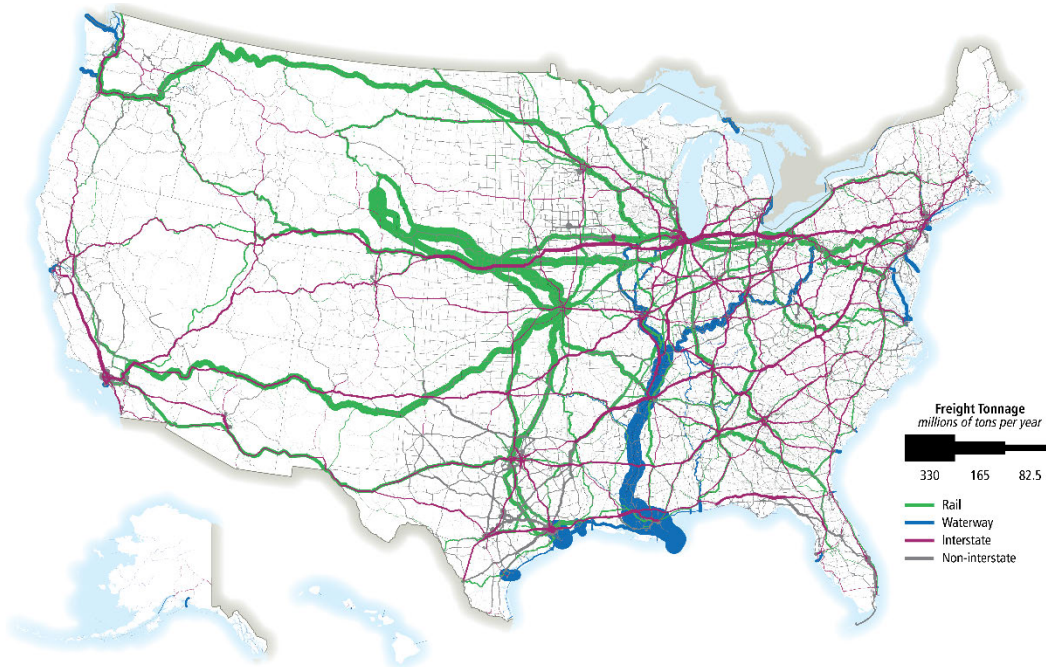
1. [Estimated Average Daily FAF Volumes for Trucks on National Highway System: 2017](#) (PDF 2.9 MB)
2. [Estimated Average Daily FAF Volumes for Trucks on National Highway System: 2050](#) (PDF 2.8 MB)
3. [Estimated Average Daily FAF Volumes for Trucks Carrying Farm Products Commodities on National Highway System:2017](#) (PDF 5.0 MB)
4. [Estimated Average Daily FAF Volumes for Trucks Carrying Farm Products Commodities on National Highway System:2050](#) (PDF 2.8 MB)
5. [Estimated Average Daily FAF Volumes for Trucks Carrying Food, Beverage and Tobacco Commodities on National Highway System:2017](#) (PDF 2.8 MB)
6. [Estimated Average Daily FAF Volumes for Trucks Carrying Food, Beverage and Tobacco Commodities on National Highway System:2050](#) (PDF 2.8 MB)
7. [Estimated Average Daily FAF Volumes for Trucks Carrying Solid Stone, Sand, Gravel and Ores Commodities on National Highway System:2017](#) (PDF 2.7 MB)
8. [Estimated Average Daily FAF Volumes for Trucks Carrying Solid Stone, Sand, Gravel and Ores Commodities on National Highway System:2050](#) (PDF 2.9 MB)
9. [Estimated Average Daily FAF Volumes for Trucks Carrying Liquid and Gases Commodities on National Highway System:2017](#) (PDF 2.7 MB)
10. [Estimated Average Daily FAF Volumes for Trucks Carrying Liquid and Gases Commodities on National Highway System:2050](#) (PDF 2.3 MB)
11. [Estimated Average Daily FAF Volumes for Trucks Carrying Chemicals Commodities on National Highway System:2017](#) (PDF 2.7 MB)
12. [Estimated Average Daily FAF Volumes for Trucks Carrying Chemicals Commodities on National Highway System:2050](#) (PDF 2.7 MB)
13. [Estimated Average Daily FAF Volumes for Trucks Carrying Logs and Other Wood Products Commodities on National Highway System:2017](#) (PDF 2.7 MB)
14. [Estimated Average Daily FAF Volumes for Trucks Carrying Logs and Other Wood Products Commodities on National Highway System:2050](#) (PDF 2.7 MB)
15. [Estimated Average Daily FAF Volumes for Trucks Carrying Waste and Scrap on National Highway System:2017](#) PDF 2.6 MB)
16. [Estimated Average Daily FAF Volumes for Trucks Carrying Waste and Scrap on National Highway System:2050](#) PDF 2.6 MB)
17. [Estimated Average Daily FAF Volumes for Trucks Carrying Consumer Manufacturing Commodities on National Highway System:2017](#) (PDF 2.8 MB)
18. [Estimated Average Daily FAF Volumes for Trucks Carrying Consumer Manufacturing Commodities on National Highway System:2050](#) (PDF 2.8 MB)
19. [Estimated Average Daily FAF Volumes for Trucks Carrying Durable Manufacturing \(low tech\) Commodities on National Highway System:2017](#) (PDF 2.8 MB)
20. [Estimated Average Daily FAF Volumes for Trucks Carrying Durable Manufacturing \(low tech\) Commodities on National Highway System:2050](#) (PDF 2.8 MB)
21. [Estimated Average Daily FAF Volumes for Trucks Carrying Durable Manufacturing \(high tech\) Commodities on National Highway System:2017](#) (PDF 2.7 MB)
22. [Estimated Average Daily FAF Volumes for Trucks Carrying Durable Manufacturing \(high tech\) Commodities on National Highway System:2050](#) (PDF 2.7 MB)
23. [Estimated Average Daily FAF Volumes for Trucks Carrying Motorized and Other Vehicles Commodities on National Highway System:2017](#) (PDF 2.7 MB)
24. [Estimated Average Daily FAF Volumes for Trucks Carrying Motorized and Other Vehicles Commodities on National Highway System:2050](#) (PDF 2.7 MB)
25. [Estimated Average Daily FAF Volumes for Trucks Carrying Mixed Freight on National Highway System:2017](#) (PDF 2.7 MB)
26. [Estimated Average Daily FAF Volumes for Trucks Carrying Mixed Freight on National Highway System:2050](#) (PDF 2.7 MB)
27. [Estimated Annual FAF Tonnage Flow for Trucks on National Highway System: 2017](#) (PDF 2.9 MB)
28. [Estimated Annual FAF Tonnage Flow for Trucks on National Highway System: 2050](#) (PDF 2.8 MB)
29. [Estimated Annual FAF Tonnage Flow for Trucks Carrying Farm Products Commodities on National Highway System: 2017](#) (PDF 5.0 MB)
30. [Estimated Annual FAF Tonnage Flow for Trucks Carrying Farm Products Commodities on National Highway System: 2050](#) (PDF 2.8 MB)

Source: https://ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/index.htm



Existing Freight Network Maps

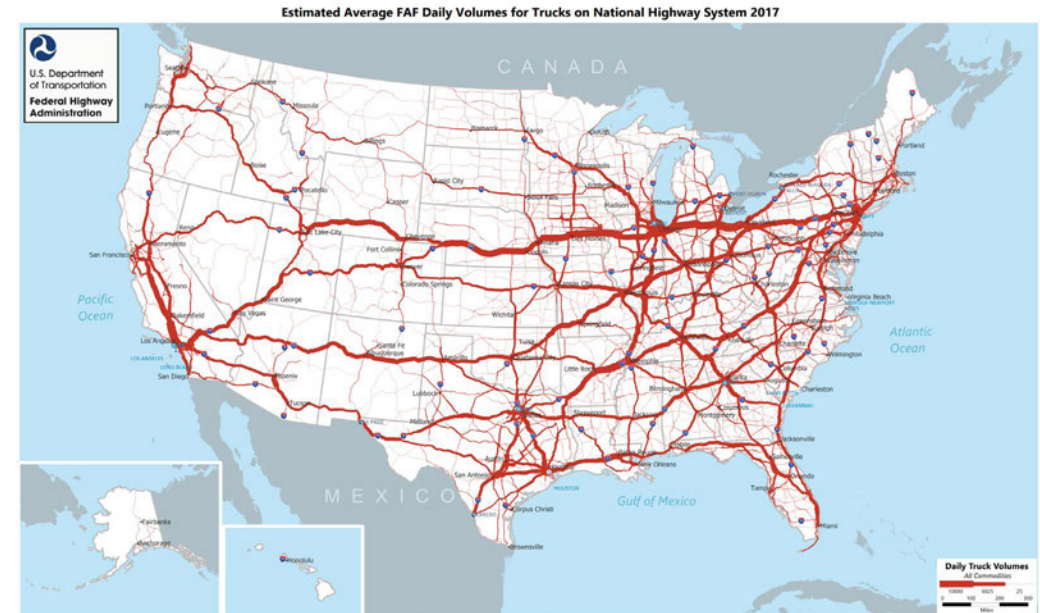
Truck-only Flows + All Rail Flows + All Water Flows



Freight Flows by Highway, Railway, and Waterway (back)

Highway: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, version 5.4, 2022; Rail: Based on Surface Transportation Board, Annual Carload Waybill Sample and rail freight flow assignment done by Federal Railroad Administration, 2019; Inland Waterways: U.S. Army Corps of Engineers, Institute of Water Resources, Annual Vessel Operating Activity and Lock Performance Monitoring System data, 2022.

Truck-only Flows



Map generated using truck flows with more than 25 FAF trucks per day.

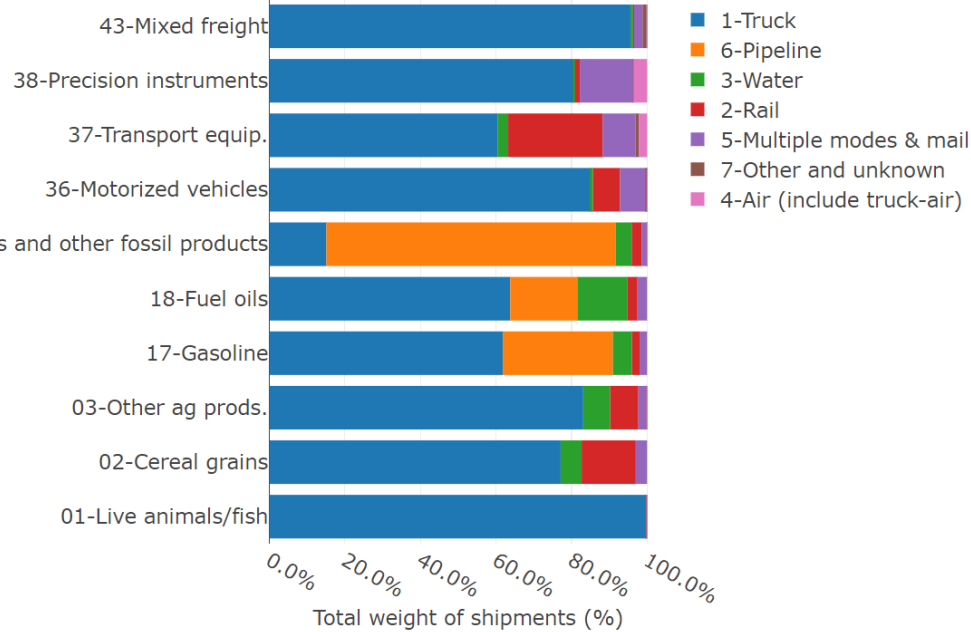
Maps generated using U.S. Department of Transportation, Bureau of Transportation Statistics (BTS), Federal Highway Administration (FHWA). (2017) Freight Analysis Framework, FAF5 [datasets]. <https://rosap.ntl.bts.gov/view/dot/72145>

Feedback on Existing FAF OD Flow Visualization Tools

Data Tabulation Tool (DTT)

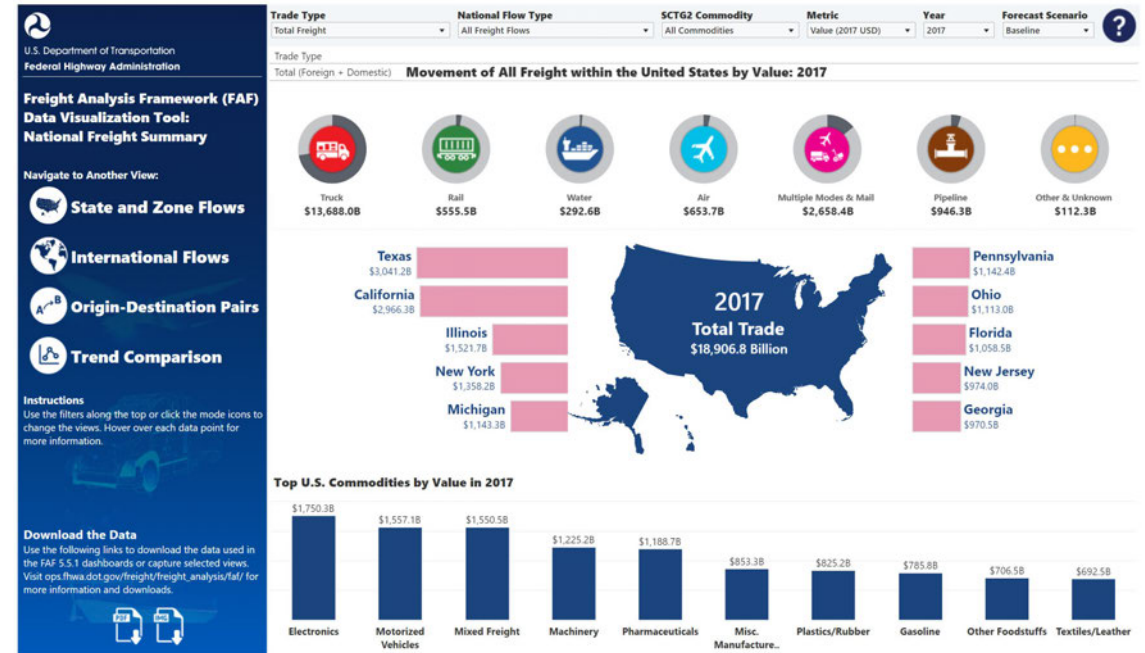
Total weight of shipments by sctg2 and dms_mode

Click to enter y-axis title



Source: https://faf.ornl.gov/faf5/dtt_total.aspx

Additional Visualization FHWA



Workbook: [FAF 5.5.1 Visualization Final v1.1_09_14_2023 \(dot.gov\)-https://explore.dot.gov/t/FHWA/views/FAF5_5_1VisualizationFinalv1_1_09_14_2023/NationalSummaryDashboard?%3Aembed=y&%3Aiid=2&%3AisGuestRedirectFromVizportal=y&%3Atabs=](https://explore.dot.gov/t/FHWA/views/FAF5_5_1VisualizationFinalv1_1_09_14_2023/NationalSummaryDashboard?%3Aembed=y&%3Aiid=2&%3AisGuestRedirectFromVizportal=y&%3Atabs=)

FAF 4 GIS Network Link Attributes

- FAF4 Network Attributes

Attribute	Domain Type	Description
ID	Integer (4 bytes)	GIS internal IDs
LENGTH	Real (8 bytes)	Geometric Length
DIR	Integer (4 bytes)	Flow direction. 0=bidirectional, 1 or -1 = one way flow
DATA	Integer (4 bytes)	GIS internal IDs valid for TransCAD GIS file
FAF4_ID	Integer (4 bytes)	Unique IDs to join with FAFDATA dbf file
VERSION	Character	Release date
STATE	Character	2-digit state abbreviation
FCLASS	Integer (4 bytes)	HPMS 2010 Functional Classification code. See FAF GIS metadata for details.
URBAN_CODE	Integer (4 bytes)	HPMS Urbanized code. 99999 is rural, 99998 is small urban
STFIPS	Integer (4 bytes)	2 digit State FIPS code
CTFIPS	Integer (4 bytes)	3-digit County FIPS code
FAFZONE	Character	FAF4 Zone Ids
SIGN1	Character	Designated primary Sign Route for the arc
SIGNT1	Character	Describes the type of the sign route; See FAF GIS metadata for code details.
SIGNN1	Character	Contains the actual sign route numbers. Using HPMS standards, an optional directional indicator (N, S, E, W) can also be used as part of this field
SIGNQ1	Character	Sign Route Qualifier Record which is used to qualify the sign route description follows the Sign Route Number. See FAF GIS metadata for details
LNAME	Character	Local road name
MILES	Real (8 bytes)	Geometric Length
KM	Real (8 bytes)	mile converted to kilometer using a multiplier of 1.62
STATUS	Integer (4 bytes)	Open status of road. 1=open; 0=closed
NHS	Integer (2 bytes)	National Highway System. Please see FAF GIS metadata for details.
USLRSID	Character	Unique Route IDs
BEGMP	Real (8 bytes)	Beginning mile of the arch
ENDMP	Real (8 bytes)	ending mile of the arch
TRK_RTE	Integer (4 bytes)	Truck restriction. 5=restricted for trucks
NN	Integer (4 bytes)	National Network. Value=1
NFN	Integer (4 bytes)	National Freight Network (Draft) Value=1
LCV_TYPE	Integer (4 bytes)	State permitted Long Combination Vehicle Network. See FAF GIS metadata for detail code definition
THRULANES	Integer (4 bytes)	Number of through lanes for traffic
SPD_LIMIT	Integer (4 bytes)	Posted Speed limited reported in HPMS
TERRAIN	Integer (4 bytes)	Type terrain. Please see FAF GIS metadata for details
MEDIAN	Integer (4 bytes)	Highway Median Type. Please see FAF GIS metadata for details.
ACCESS	Integer (4 bytes)	Highway access control.

- FAF4 GIS Network included joined assignment values

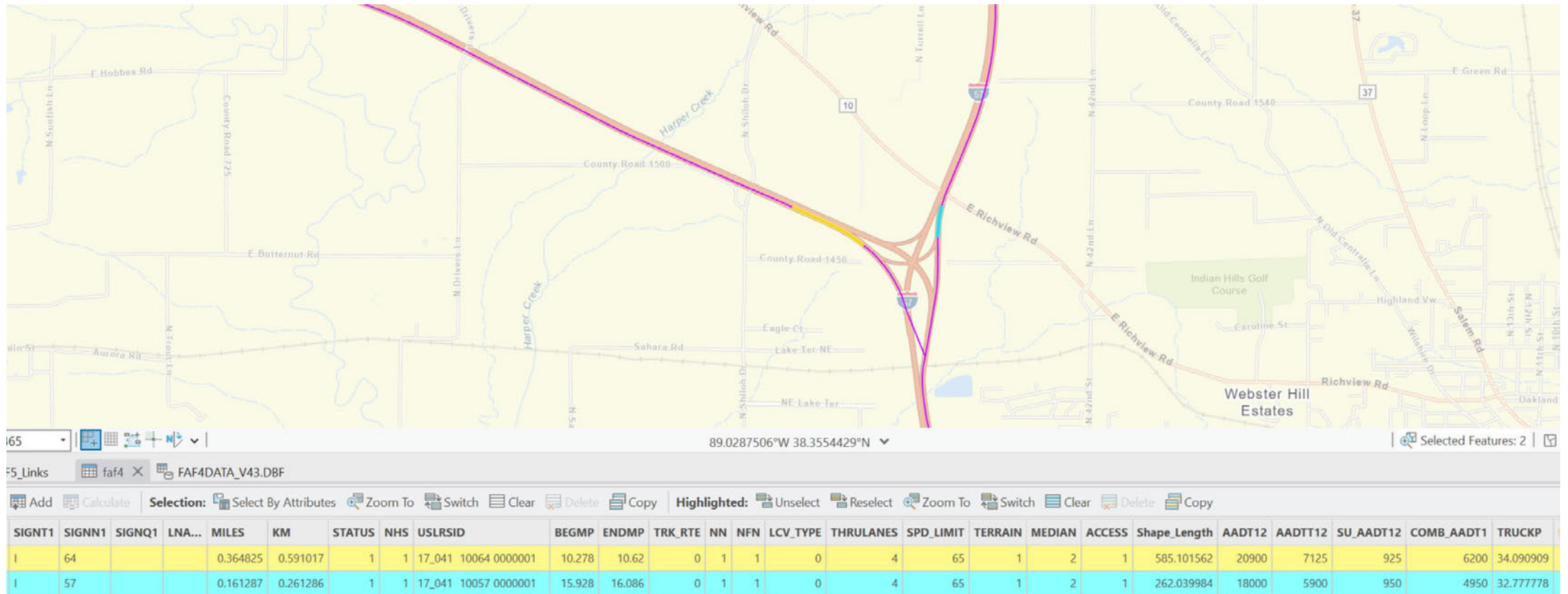
Volume/Count Data

Field Name	Domain	Definition
FAF4_ID	Integer	Unique identifier to link with FAF network arc field FAF4_ID
VERSION	Character	Used for maintaining consistency across data files containing alternate releases of the FAF
STATE	Character	State Abbreviation
CTFIPS	Integer	3-Digit County Code
SIGN1	Character	State Highway Route Sign
USLRSID	Character	Unique State Route Key
BEGMP	Real Number	Start of section milepost
ENDMP	Real Number	End of section milepost
AADT12	Integer	HPMS annual average daily traffic for year 2012, derived from HPMS 2012 database. Volume/day/section
AADTT12	Integer	Year 2012 Truck Volume estimated using a combination of HPMS 2012 database, State truck percentage, and functional class specific defaults. Volume/day/section
SU_AADT12	Integer	Single Unit Truck Traffic year 2012
COMB_AADT1	Integer	Combination Unit Truck Traffic year 2012
TRUCKP	Real Number	Truck Percentage year 2012
AADT45	Integer	Year 2045 forecast Annual Average Traffic Volume estimated using the HPMS 20 years growth factors and projected to future using linear growth. Volume/day/section
AADTT45	Integer	Year 2045 Forecast Annual Average Truck Volume estimated using the HPMS 20 years growth factors and projected to future using linear growth. Volume/day/section
FAF12	Integer	Year 2012 FAF long distance truck volume estimated based on the FAF 4 Origin-Destination truck tonnage and includes empty trucks. Volume/day/section
NONFAF12	Integer	Year 2012 Local truck traffic that is not part of FAF 4 O-D database. Volume/day/section
YKTON12	Integer	Year 2012 FAF tonnage kton/year/section
FAF45	Integer	Year 2045 FAF long distance truck volume estimated based on the forecasted FAF 4 Origin-Destination truck tonnage and includes empty trucks. Volume/day/route
NONFAF45	Integer	Year 2045 Local truck traffic that is not part of FAF 4 O-D database. Volume/day/section
YKTON45	Integer	Year 2045 FAF forecasted tonnage kton/year/section
CAP12	Integer	Year 2012 Link specific peak capacity estimated using the procedures outlined in HCM 2000 and the arc geometry provided in 2012 HPMS database. Volume/hour/section
SF12	Integer	Year 2012 Estimated service flow using the procedures outlined in HCM 2000 and arc geometry, FAF truck, non-FAF truck and passenger volume. Volume/hour/section
VCR12	Real Number	Year 2012 estimated volume to capacity ratio, estimated by dividing SF07 with CAP12. Unit less
CAP45	Integer	Year 2045 Link specific peak capacity estimated using the procedures outlined in HCM 2000. Volume/hour/section
SF45	Integer	Year 2045 Estimated service flow using the procedures outlined in HCM 2000 and arc geometry, FAF truck, non-FAF truck and passenger volume. Volume/hour/section
VCR45	Real Number	2045 estimated volume to capacity ratio, estimated by dividing SF45 with CAP45. Unit less
VMT12	Integer	Daily Traffic Vehicle miles of travel, Year 2012
TVMT12	Integer	Daily Truck Vehicle miles of Travel, Year 2012
FAFVMT12	Integer	FAF Truck Vehicle miles of Travel, Year 2012
KTONMILE12	Integer	Yearly Kilo- tonnage miles of travel, Year 2012
VMT45	Integer	Forecasted Daily Traffic Vehicle miles of travel, Year 2045
TVMT45	Integer	Forecasted Daily Truck Vehicle miles of Travel, Year 2045
FAFVMT45	Integer	Forecasted FAF Truck Vehicle miles of Travel, Year 2045
KTONMILE45	Integer	Forecasted Yearly Kilo- tonnage miles of travel, Year 2045



FAF 4 GIS Network Example

- FAF4 Interstates Shown as Single Lines, as well as Count data



FAF5 GIS Network Link Attributes

Field_Name	Type	Description
ID	Integer	Unique identifier for road segment to link to FAF5 assignment flow tables
Dir	Integer	Permitted Travel Direction: 0 - Two-way roadway 1 - One-way roadway
Length	Real	Computed length of feature in miles
DATA	Integer	Identifier of road segment for tracking CDF file to original database (not needed for most applications)
VERSION	Character	Database Version Number (Year. Month)
Class	Integer	Two - Digit code for type of road feature (useful for selecting subsets of road features based on function or operational characteristics): 11 - Interstate Highway 12 - Other Controlled Access Highway 13 - Non-Controlled Access Interstate (Alaska only) 14 - Arterial or Major Collector 15 - Local Road 16 - Frontage/Service Road 17 - Traffic Circle 18 - Turn Lane/Crossover 19 - Facility Access/Circulator Road 21 - System Ramp 22 - Ramp 23 - Collector/Distributor Lane 33 - Express Lane 36 - Administrative/Service Road 41 - Ferry Route 50 - Centroid Connector
Class_Description	Character	Type of road feature description (text string of class coded value)
Road_Name	Character	Common local road name or sign route number
Sign_Rte	Character	Sign route number and classification (e.g., I 95, US 101)
Rte_Type	Character	Sign route classification: I - Interstate U - US Primary S - State Route O - Off-Interstate Business Marker C - County Route
Rte_Number	Character	Sign route number
Rte_Qualifier	Character	Sign route qualifier: A - Alternate Route B - Business Route L - Loop P - Bypass Route S - Spur

Field_Name	Type	Description
Country	Character	Country where road segment is located: CAN - Canada USA - United States
STATE	Character	2-character postal abbreviation of state or province where road segment is located
STFIPS	Character	2 -digit FIPS code of state where road segment is located (US roads only)
County_Name	Character	Name of county where road segment is located (US roads only)
CTFIPS	Character	5-digit FIPS code of state and county where road segment is located (US roads only)
Urban_Code	Character	5-digit urbanized area code where road segment is located (US roads only): 99998 - small urban area 99999 - rural area
FAFZONE	Integer	3-digit code of FAF zone where road segment is located (US roads only)
Status	Integer	Current operational status of road segment 1 - Open to traffic 2 - Proposed or under construction
F_Class	Integer	FHWA highway functional class designation: 1 - Interstate 2 - Principal Arterial - Other Freeways and Expressways 3 - Principal Arterial - Other 4 - Minor Arterial 5 - Major Collector 6 - Minor Collector 7 - Local
Facility_Type	Integer	FHWA highway facility type designation: 1 - One-Way Roadway 2 - Two-Way Roadway 4 - Ramp 5 - Non-Mainline 6 - Non-Inventoried Direction 7 - Planned/Unbuilt
NHS	Integer	National Highway System (NHS) designation: 1 - Interstate Highway 3 - Non-Interstate STRAHNET 4 - STRAHNET Connector 7 - Other NHS Route 8 - Approved NHS Intermodal Connector 9 - NHS Intermodal and STRAHNET Connector 10 - Principal Arterial added under MAP21 11 - Non-Inventoried Travel Direction (not included in NHS mileage) 12 - NHS Ramp or Connector (not included in NHS mileage)

Field_Name	Type	Description
STRAHNET	Integer	Strategic Highway Network (STRAHNET) designation: 1 - Mainline STRAHNET Route 2 - STRAHNET Connector
NHFN	Integer	National Highway Freight Network designation: 1 - Primary Highway Freight System (PHFS) 2 - Other Non-PHFS Interstate Route 11 - Non-Inventoried Route Direction (not included in NHFN mileage) 12 - NHFN Ramp or Connector (not included in NHFN mileage)
Truck	Character	Truck restrictions or permissions: Prohibited - No trucks allowed Reserved - Truck-only or truck priority lane Restrictions - Limits on truck size, weight, or specific cargo
AB_Lanes	Integer	Number of thru lanes in the direction of travel (or inventory direction on 2-way roads)
BA_Lanes	Integer	Number of thru lanes in the non-inventory direction on 2-way roads
Speed_Limit	Integer	Posted speed limit
Toll_Type	Integer	Type of toll facility: 1 - Conventional Toll Facility 2 - HOT/Managed Lane 3 - Ferry Route
Toll_Name	Character	Common local name for toll facility
Toll_Link	Integer	Specific link where toll collection occurs
Toll_Link_Name	Character	Common local name for toll collection plaza or toll gantry
HPMS_USA_RouteID	Character	State HPMS unique route identifier, preceded by state 2-character postal code
HPMS_Begin_Point	Real	HPMS milepoint measure where road segment begins (in direction of travel)
HPMS_End_Point	Real	HPMS milepoint measure where road segment ends (in direction of travel)
BorderState1	Character	2-character postal code of adjacent state for road segments that end at a state border
BorderState2	Character	2-character postal code of adjacent state for road segments that end at a state border
BorderFAF1	Integer	3-digit code of FAF zone for road segments that end at a state border
BorderFAF2	Integer	3-digit code of FAF zone for road segments that end at a state border
AB_CombinedSpeed	Real	CALCULATED VALUE: Posted speed * 0.9 or NPMRDS average speed (where available) in the direction of travel (or inventory direction on 2-way roads)

Field_Name	Type	Description
BA_CombinedSpeed	Real	CALCULATED VALUE: Posted speed * 0.9 or NPMRDS average speed (where available) in the non-inventory direction on 2-way roads
TRUCKTOLL	Real	CALCULATED VALUE: Average per-mile toll for a 5-axle vehicle * road segment length (only on toll facilities)
BorderLink	Integer	Identifier for road segments that end at the U.S./Canadian border and connect to a road segment in Canada
AddedBorderTime	Real	Time penalty for trips that cross the border between the United States and Canada (in min)
AdjustSpeed	Real	Selective speed adjustments to reflect unusual road characteristics (in mph)
AdjustReason	Character	Reason for adjustments to travel time of speed
AB_FinalSpeed	Real	CALCULATED VALUE: ABCombinedSpeed + Adjusted Speed
BA_FinalSpeed	Real	CALCULATED VALUE: BACombinedSpeed + Adjusted Speed
AB_FreeFlowTime	Real	CALCULATED VALUE: (Length / AB_FinalSpeed) + AddedBorderTime
BA_FreeFlowTime	Real	CALCULATED VALUE: (Length / BA_FinalSpeed) + AddedBorderTime

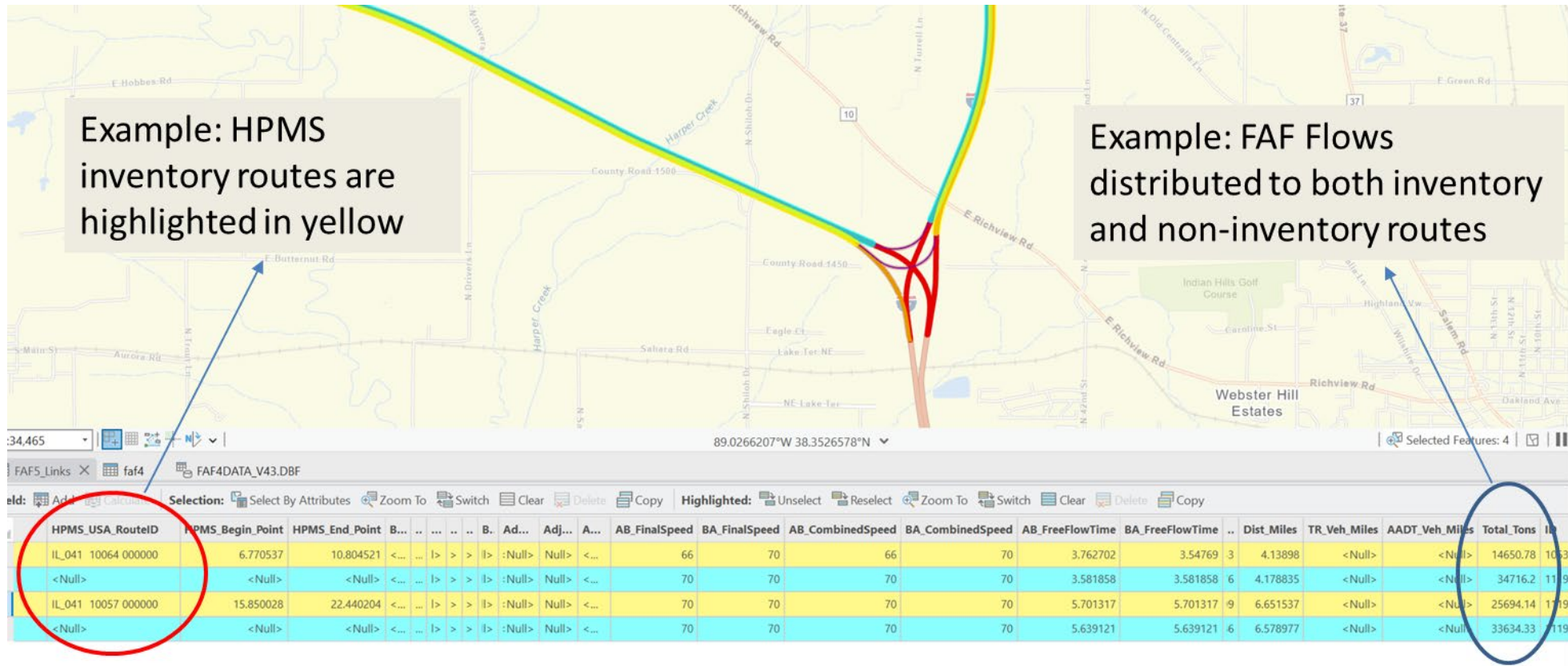
Table 1: FAF Link Attributes

- FAF5Network LINK Attributes Did NOT Include Assignment Data (No Volume/Counts)



FAF5 GIS Network

- FAF5Network LINK Attributes Included Dual-Lanes for Interstates; divided Flow Assignment to both inventory and non-inventory routes



What do you like about current FAF network data?

- FAF Networks (GIS format) – current products :
 - Highway Network: FAF5 GIS ESRI Network with separate CSV Table for inventory and non-inventory assignment results; did not offer AADT from HPMS
 - FAF4 included only inventory routes/single lane for assignment; network included matched segment HPMS count data (single-line)
- FAF Flows over the Network
 - Current products: single mode assignment only
 - Pre-built (static) maps (historically offered in PDF format)
 - GIS shapefile with trucks and tons for Mode 1 (truck-only)
 - Potential new products for multimodal assignment flows
 - Pre-built (static) maps (PDF)
 - GIS shapefile with flows for each mode (truck, rail, water)

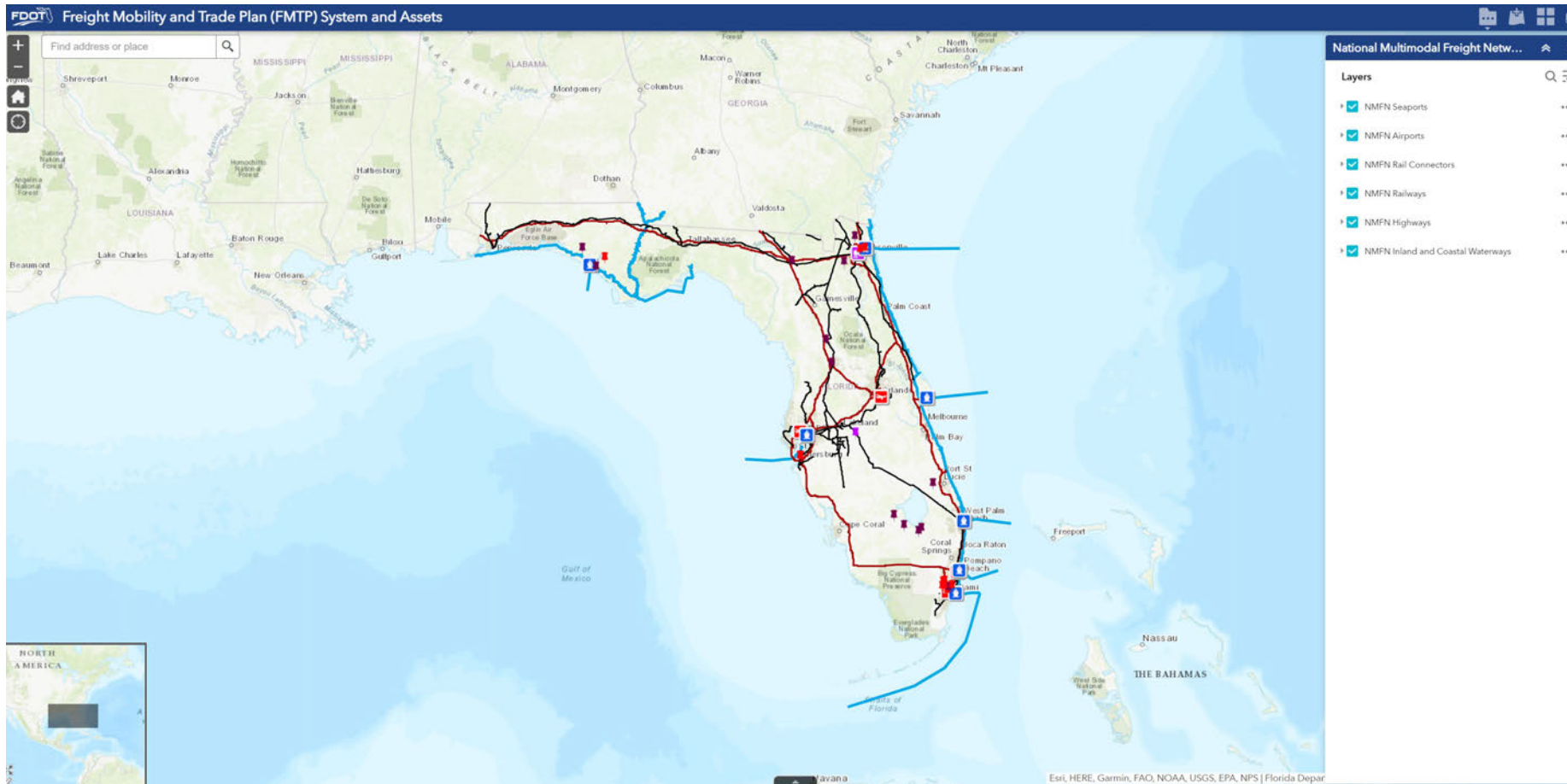
What Can Be Improved?

- FAF Networks (GIS format) –
 - Preferred geometry (Dual-lanes or single)?
 - Preferred attributes (must have list for you?)
 - Prefer assignment results joined to GIS network or separate or both?

Feedback on (Potential) Interactive Tool for FAF Multi-Modal Network Flows

- Potential map display features
 - Modal networks (highway, rail, water)-Select by Mode individually or multiple (Rail-Water-Truck, Rail Only, etc)
 - Intermodal transfer locations (e.g., ports)
 - Flow volume at key intermodal nodes – aggregated for public release
 - Flows on each network link – aggregated for public release for Rail and Water
- Potential tool capabilities
 - What tools are useful for customer visualization and analysis?
 - Interactive Tool to enable users to visualize and select data and scenarios
 - Allow users to build/customize their own maps/export data?

Feedback on FAF Tools/Capabilities



- Example of Florida DOT
- Shows Multimodal Networks and Key Intermodal facilities
- Helpful at National Level or just for States?



**THANK
YOU!**

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