

FTR's Freight Forecasting Model

The principal tool in forecasting freight is FTR's Input/Output model of freight transportation in the United States. This model was first constructed in the mid 1980's and was completely re-estimated in the 1997-99 time period. This model was developed by estimating the movement of (virtually) all items with weight in the U.S. economy. There are several critical freight movement issues analyzed within the structure of FTR's freight transportation model. These issues are:

- How far is each move?
- How many tons are moved?
- What products are moved?
- What are the weight changes between each move?
- How many times are the products moved?
- What type of move is made?
- Who does the moving?

Data on the tons of virtually every product originating in the U.S. economy were collected for each year from 1965 through 2004 (the latest year available as of this time). This data is then compiled into the following product categories:

- Coal, Petroleum and Natural Gas
- Aggregates
- Metallic Ores and Machinery
- Non-Metallic Ores and Chemicals
- Food and Feed
- Wood and Building Materials

- Household Consumables, Paper and Furnishings
- Post Office, Delivery, Moving and Other Services
- Waste, Trash, and Recycling

The next step in FTR's freight transportation model is to move these tons of products between different levels of the country's economic infrastructure. These levels are:

- Extraction
- Basic Manufacturing
- Finished Manufacturing
- Wholesale Distribution
- Retail Distribution
- Waste and Trash Removal and Recycling

These moves are done using four distinctly different types of moves, which are:

- To the Next Stage
- Intra (Movement Within the Stage)
- Imports
- Exports

These tons are then assigned to a 3-digit STCC (Standard Transportation Commodity Code) category using appropriate data from various sources, and when no appropriate source is found the U.S. Department of Commerce's Commodity Flow Survey is used as an initial estimate on splitting the data into smaller categories before calibration. Using these estimates the 3-digit categories are calibrated back to the total tonnage moved.

The following modes of transportation are assigned to move the tonnage. They are:

- Rail
- Truck

- Pipeline
- Water (including domestic coastal)

Length-of-Hauls are set by mode at the 3-digit commodity level to get tonmiles.

Rail, Water and Oil Pipeline tons and tonmiles are calibrated to the numbers published in the ENO Transportation Foundation Report "Transportation in America."

Rail average length-of-hauls are taken from the Rail Waybill database and calibrated, when necessary, to the total tonmiles published by ENO. These numbers are then split to the 3-digit level using the Public Use Waybill Database.

- The rail numbers in this report are obtained from the Association of American Railroads (AAR) and are the totals for both Class I and Non-Class I railroads. The intermodal loadings originated data is also taken from the AAR and starting in 1995 only accounts for approximately 98% of all loadings.

The Water Length-of-Haul data is taken from the U.S. Army Corps of Engineers' Waterborne Commerce Statistics Center.

Natural Gas traffic is calibrated by assuming that their lengths of haul are the same as that of oil pipelines.

The next step is to convert the annual tons and tonmiles estimates to a quarterly series, which is done by using the most appropriate available economic sequence as a pattern. Forecasting of total freight tons and tonmiles is done by using the historical pattern of the relationship between the same economic series and the relevant tons series. Economic forecasts are furnished by the Center for Econometric Model Research of Indiana University.

The forecasts set the tonnage modal share constant from the last known value through the forecast period. The tonnage is then multiplied by the average length-of-haul to derive tonmiles. This is done at each 3 digit commodity by mode. The tonmiles for all modes are then added together to get the total tonmiles for that 3 digit commodity.

- Historical tons of Rail freight at the 3-digit STCC levels are obtained from AAR annual reports. Historical Rail modal shares are calculated and used to forecast Rail modal share of tons at the 3-digit STCC levels. These Rail modal share forecasts are used to calculate the forecast of Rail tons. Rail tonmiles at the 3-digit STCC levels are estimated

in a similar fashion. Rail carloadings at the 3-digit STCC levels are forecast by using the historical method of average tons per car.

- This approach includes virtually all freight generated by the U.S. economy. Our estimation of freight modal shares are distinctly different from other published sources. There are two major reasons for these different modal share estimates. One is the inclusion of short haul trucking which is not included in many other sources. The second is the inclusion of natural gas, which also is missing in other reports. This has the effect of significantly raising truck modal share of tons and to a lesser degree that of tonmiles. Pipeline modal share is also higher, while Rail and Water modal shares are lower.

Truck tonnage is assigned by type to Classes 5-7 Truck, Class 8 Straight Truck, or Class 8 Tractor/Trailers at the 3-digit level. An average length-of-haul is set by type at the 3-digit level to get tonmiles. Using the average length-of-haul set at this point assigns it to a length-of-haul category. These categories are as follows:

- Short-Haul: 0-124 miles average length-of-haul
- Medium-Haul: 125-299 miles average length-of-haul
- Long-Haul: 300 or greater miles average length-of-haul

The 3-digit commodities are also assigned to a “product type” according to the intrinsic characteristics of the product from a transportation viewpoint. They are as follows:

- Raw
- Processed
- Manufactured

Using the above assignments we are able to show the commodities using a 3 x 3 matrix when the commodities are cumulated into 2 digit categories.

Freight Model: Commodities

FTR’s Input/Output model of freight transportation tracks 209 unique commodities. We move these commodities into over 70 different modal sectors. Our model also gives us the ability to

create specialized groupings of data so you can see aggregate numbers instead of searching thru a mind-boggling array of data. Some of our standard summaries are:

- Length-of-Haul:
 - Short, Medium, Long
- Type of Good:
 - Raw, Processed, Manufactured
- Trailer Types:
 - Dry Van, Reefer, Platform, Dump, Tank, Straight Truck, All Other
- Railroad Groups:
 - Agriculture, Chemicals, Coal, Forest, Metallic Ores, Motor Vehicles, Nonmetallic Minerals, All Other

Freight Model: Sources

Association of American Railroads

Profiles of U.S. Railroads Database
Freight Commodity Statistics
Railroad Facts
Weekly Rail Traffic Report

Eno Publications

Transportation in America

Federal Reserve

Industrial Production Statistics

Freight Transportation Research (FTR) Associates

Freight Forecasting Model

Indiana University Center for Econometric Modeling Research (CEMR)

Economic Forecast Model

Interstate Commerce Commission

Public Use Waybill

U.S. National Oceanic and Atmospheric Administration

Fisheries Reports

U.S. Census Bureau

Economic Census

U.S. Department of Agriculture

Crop Reports

U.S. Department of Commerce

Industrial Reports

1993 Commodity Flow Survey

1997 Commodity Flow Survey

U.S. Department of Energy

Coal Statistics

Petroleum Statistics

Natural Gas Statistics

U.S. Geological Survey

Minerals Commodity Summaries

U.S. Forest Service

Timber Statistics

U.S. National Oceanic and Atmospheric Administration

Fisheries Reports

Ward's

RS-3S Report

FS-3 Report

FST Report

Waterborne Commerce Statistics, U.S. Army Corps of Engineers

Waterborne Commerce of the U.S. - Part 5, National Summaries

Freight Model: Glossary of Terms

Average Length-of-Haul

Tonmiles divided by tons.

Carloadings

Rail Carloadings Originated. The transfer of a carload to another railroad for the purpose of terminating the shipment or passing it to another railroad is only counted as one loading. Units shown in thousands, actual seasonally adjusted.

Class I Rail

Railroads with revenue over \$256 million dollars.

Coastwise Water

Domestic traffic receiving a carriage over the ocean, or the Gulf of Mexico, (i.e. New Orleans to Baltimore, New York to Puerto Rico, San Francisco to Hawaii, Alaska to Hawaii). Traffic between Great Lakes ports and seacoast ports, when having a carriage over the ocean, is also termed Coastwise. This is Domestic Traffic Only.

Intermodal

Rail Intermodal Loadings of Units Originated. Contains International and Domestic Containers as well as Trailers shipped via rail. The transfer of a container or trailer to another railroad for the purpose of terminating the shipment or passing it to another railroad is only counted as one loading. Intermodal is defined as a movement of a container or trailer via more than one mode of transportation (i.e. rail and truck). Units are actual seasonally adjusted.

Internal Water

Vessel movements (origin and destination) which take place solely on inland waterways. An inland waterway is one geographically located within the boundaries of the contiguous 48 states or within the boundaries of the State of Alaska. The term "internal traffic" is also applied to these vessel movements: those which involve carriage on both inland waterways and the Great Lakes; those occurring between offshore areas and inland waterways (i.e. oil rig supplies and fish); and those taking place within Delaware Bay, Chesapeake Bay, Puget Sound, and the San Francisco Bay, which are considered internal bodies of water rather than arms of the ocean. This is Domestic Traffic Only.

Lakewise Water

Waterborne traffic between the United States ports on the Great Lakes System. The Great Lakes System is treated as a separate waterway system rather than as a part of the inland waterway system. This is Domestic Traffic Only.

Long Haul

Average Length-of-Haul 300 miles or longer. Designated by Commodity at the 3-Digit level.

Manufactured

This is defined as a good that has gone through a manufacturing process that creates a unique product, excluding those commodities as defined as "processed". This designation is determined at the 3-Digit level.

Medium Haul

Average Length-of-Haul between 125 and 299 miles. Designated by Commodity at the 3-Digit level.

Non-Class I Rail

Railroads with revenue less than \$256 million dollars.

Processed

Typically an intermediate stage between Raw and Manufactured. The goods in this stage have been processed in some fashion but are primarily transported in bulk. This designation is determined at the 3-Digit level. (i.e. hydraulic cement, iron or steel castings, products of petroleum refining, etc.)

Raw

Any commodity that is in the extraction stage and has not yet reached the “processed” stage. This designation is determined at the 3-Digit level. (i.e. coal, iron ore, crushed stone, etc.)

SAAR

Seasonally Adjusted Annual Rate.

Short Haul

Average Length-of-Haul less than 125 miles. Designated by Commodity at the 3-Digit level.

STCC

Standard Transportation Commodity Code. (Similar to the SIC Codes with a few added categories designed for transportation movements)

Ton

Ton Originated by specific mode (i.e. one ton of coal shipped by rail and then by water would be shown as two tons of coal).

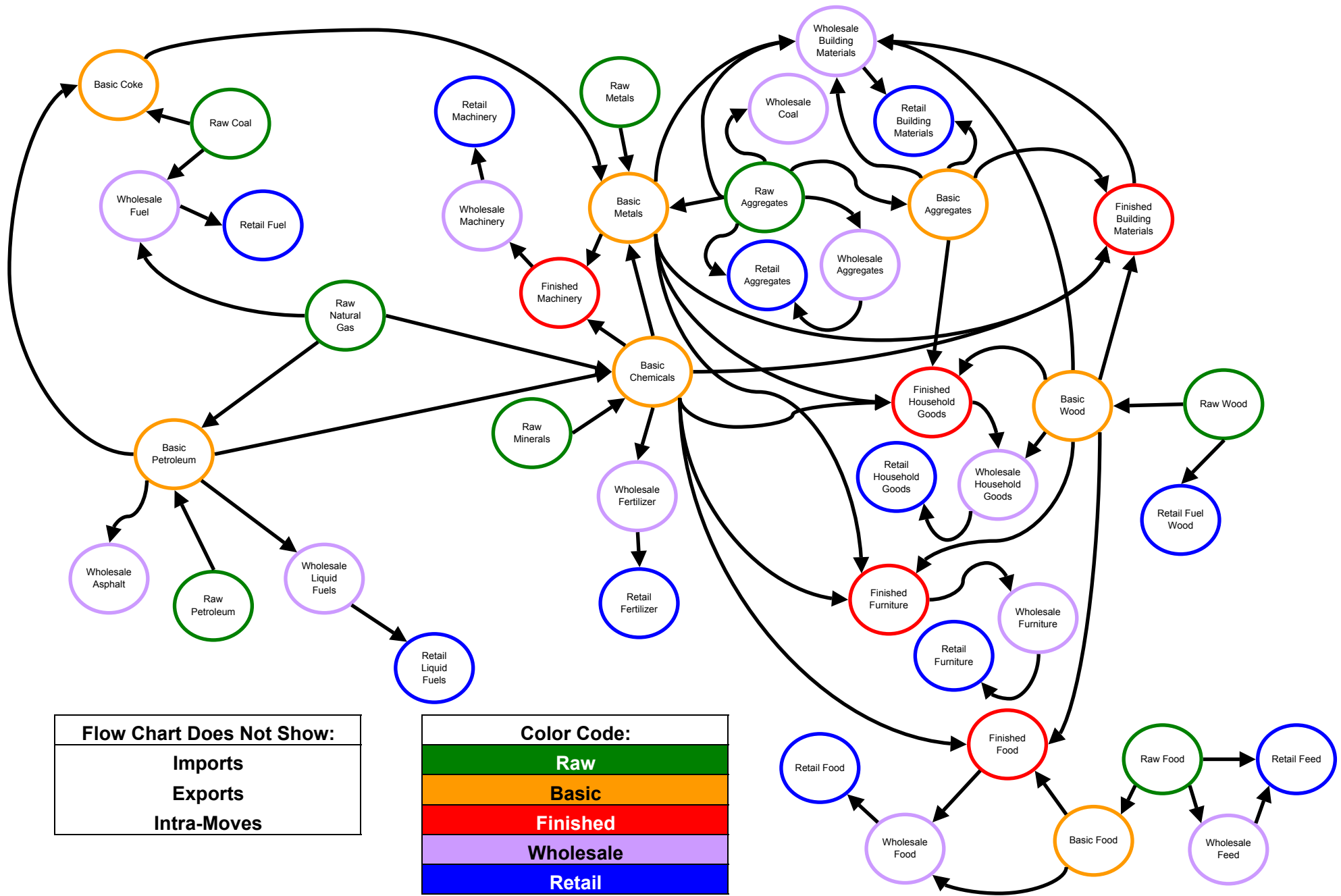
This is Domestic Traffic Only. Export movements are included only as far as the border or to a port in which it will be directly exported. The same is true for Imports. An import is counted once it reaches the border or a port.

Tons are actual seasonally adjusted.

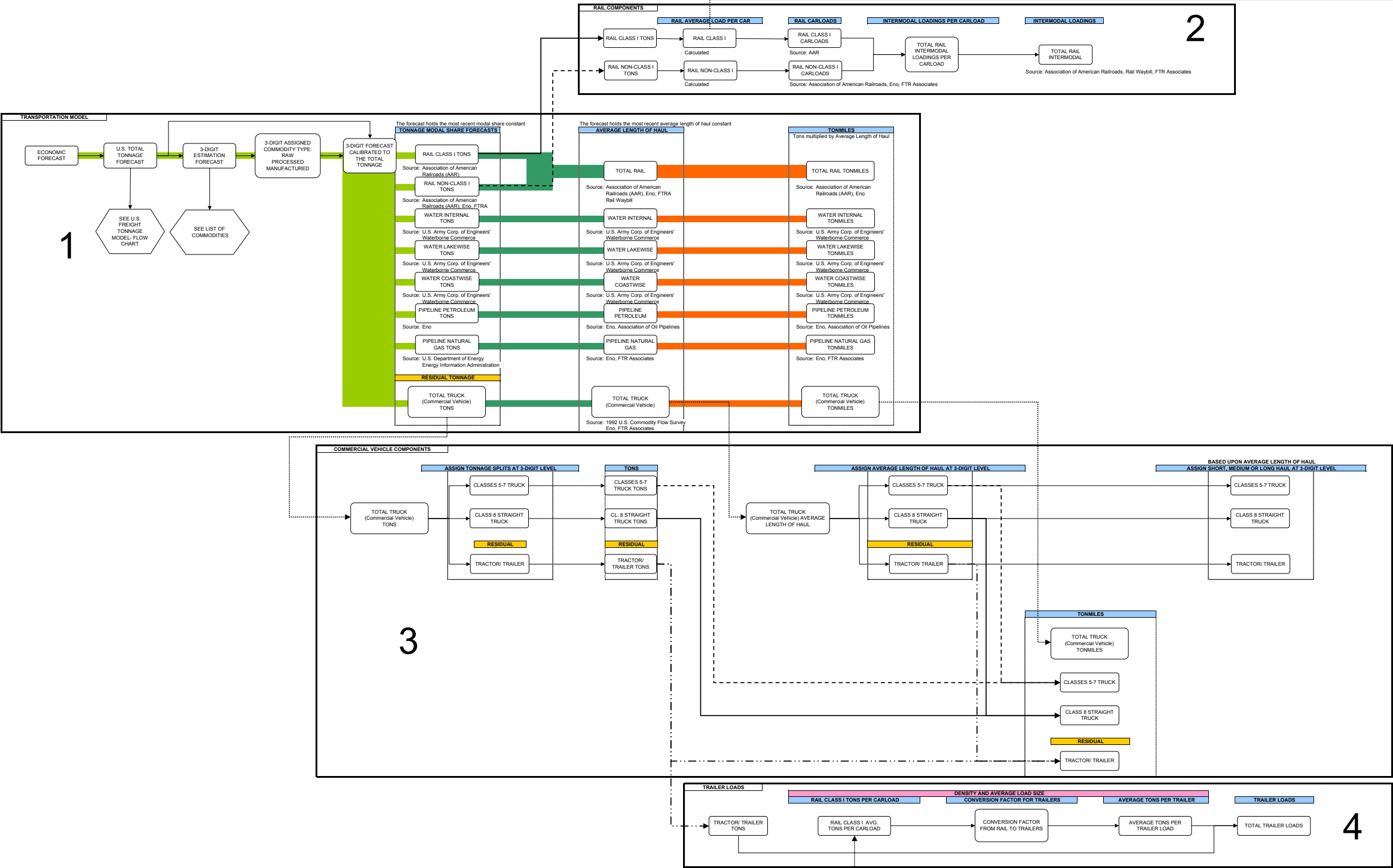
Tonmile

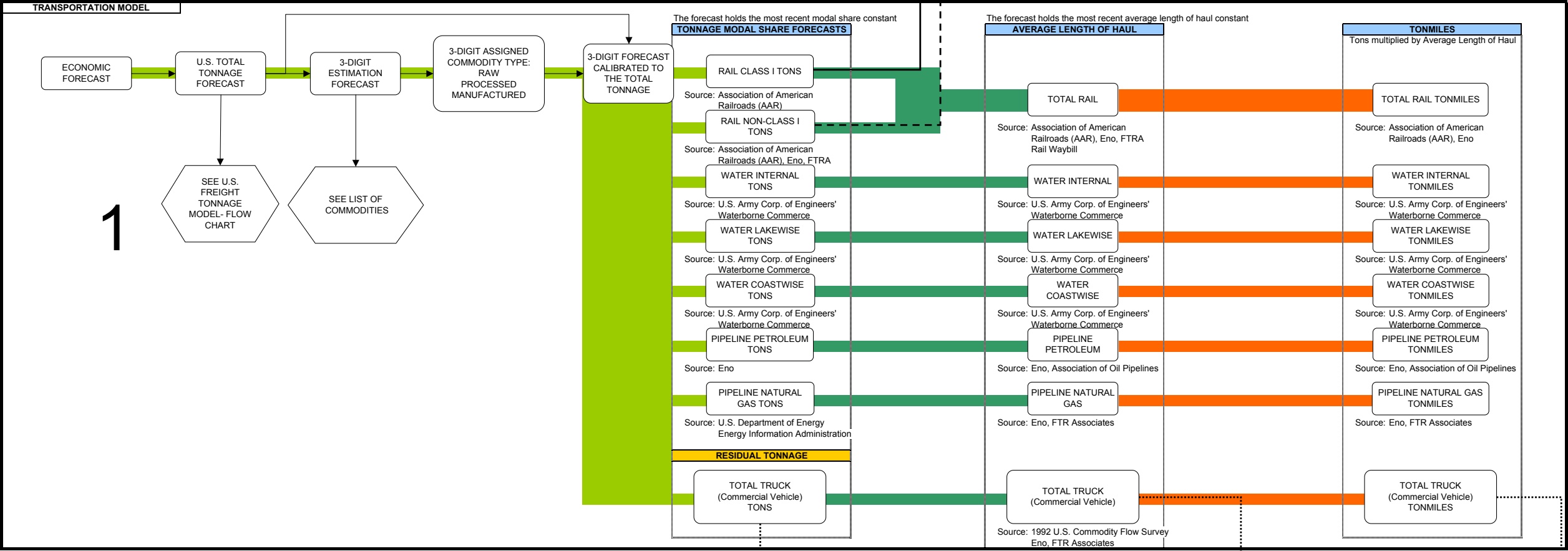
One ton moved one mile. Tonmiles are actual seasonally adjusted

FTR ASSOCIATES U.S. FREIGHT TONNAGE MODEL - FLOW CHART



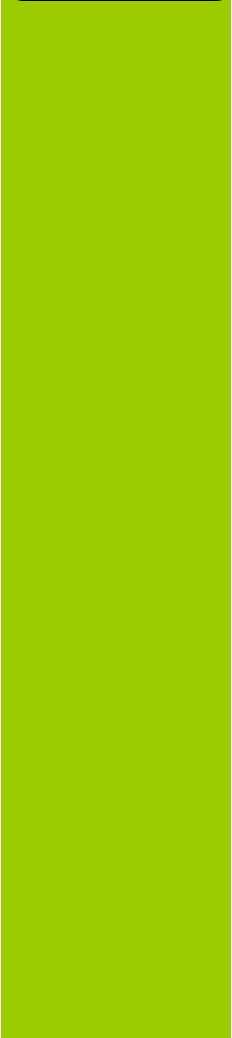
FTR ASSOCIATES U.S. FREIGHT MODEL







1a



The forecast holds the most recent modal share constant

TONNAGE MODAL SHARE FORECASTS

The forecast holds the most recent average length of haul constant

AVERAGE LENGTH OF HAUL

TONMILES

Tons multiplied by Average Length of Haul

3-DIGIT FORECAST
CALIBRATED TO
THE TOTAL
TONNAGE

RAIL CLASS I TONS

Source: Association of American
Railroads (AAR)

RAIL NON-CLASS I
TONS

Source: Association of American
Railroads (AAR), Eno, FTRA

WATER INTERNAL
TONS

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

WATER LAKEWISE
TONS

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

WATER COASTWISE
TONS

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

PIPELINE PETROLEUM
TONS

Source: Eno

PIPELINE NATURAL
GAS TONS

Source: U.S. Department of Energy
Energy Information Administration

RESIDUAL TONNAGE

TOTAL TRUCK
(Commercial Vehicle)
TONS

TOTAL RAIL

Source: Association of American
Railroads (AAR), Eno, FTRA
Rail Waybill

WATER INTERNAL

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

WATER LAKEWISE

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

WATER
COASTWISE

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

PIPELINE
PETROLEUM

Source: Eno, Association of Oil Pipelines

PIPELINE NATURAL
GAS

Source: Eno, FTR Associates

TOTAL TRUCK
(Commercial Vehicle)

Source: 1992 U.S. Commodity Flow Survey
Eno, FTR Associates

TOTAL RAIL TONMILES

Source: Association of American
Railroads (AAR), Eno

WATER INTERNAL
TONMILES

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

WATER LAKEWISE
TONMILES

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

WATER COASTWISE
TONMILES

Source: U.S. Army Corp. of Engineers'
Waterborne Commerce

PIPELINE PETROLEUM
TONMILES

Source: Eno, Association of Oil Pipelines

PIPELINE NATURAL GAS
TONMILES

Source: Eno, FTR Associates

TOTAL TRUCK
(Commercial Vehicle)
TONMILES

1b

RAIL COMPONENTS

RAIL AVERAGE LOAD PER CAR

RAIL CLASS I TONS

RAIL CLASS I

Calculated

RAIL NON-CLASS I
TONS

RAIL NON-CLASS I

Calculated

RAIL CARLOADS

RAIL CLASS I
CARLOADS

Source: AAR

RAIL NON-CLASS I
CARLOADS

Source: Association of American Railroads, Eno, FTR Associates

INTERMODAL LOADINGS PER CARLOAD

TOTAL RAIL
INTERMODAL
LOADINGS PER
CARLOAD

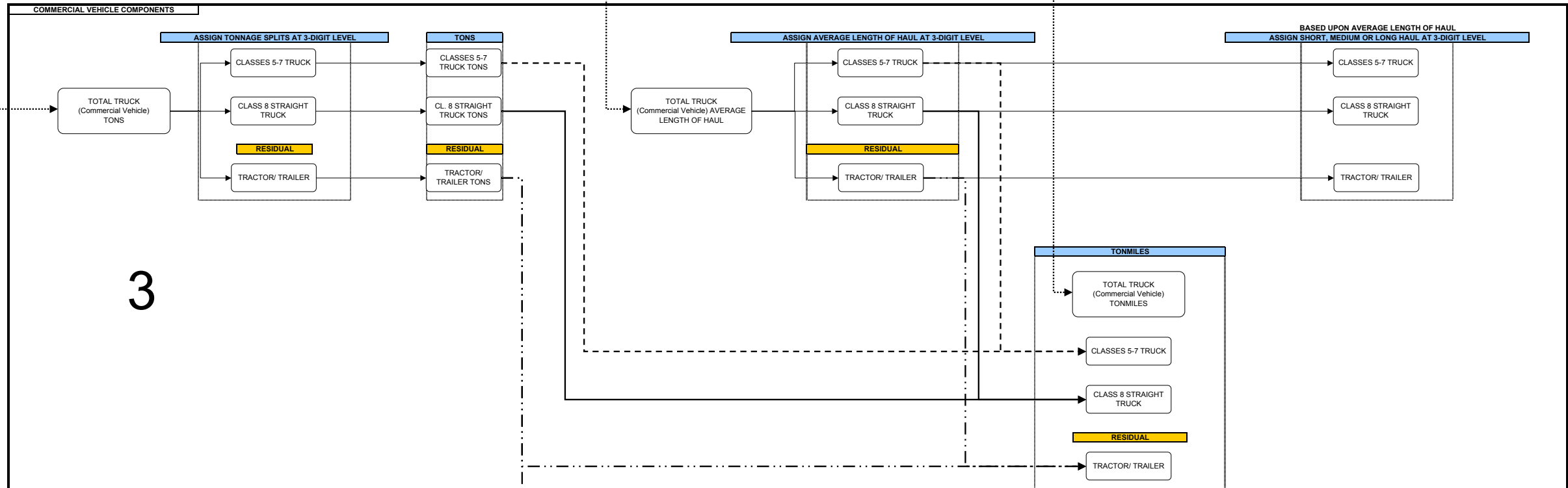
INTERMODAL LOADINGS

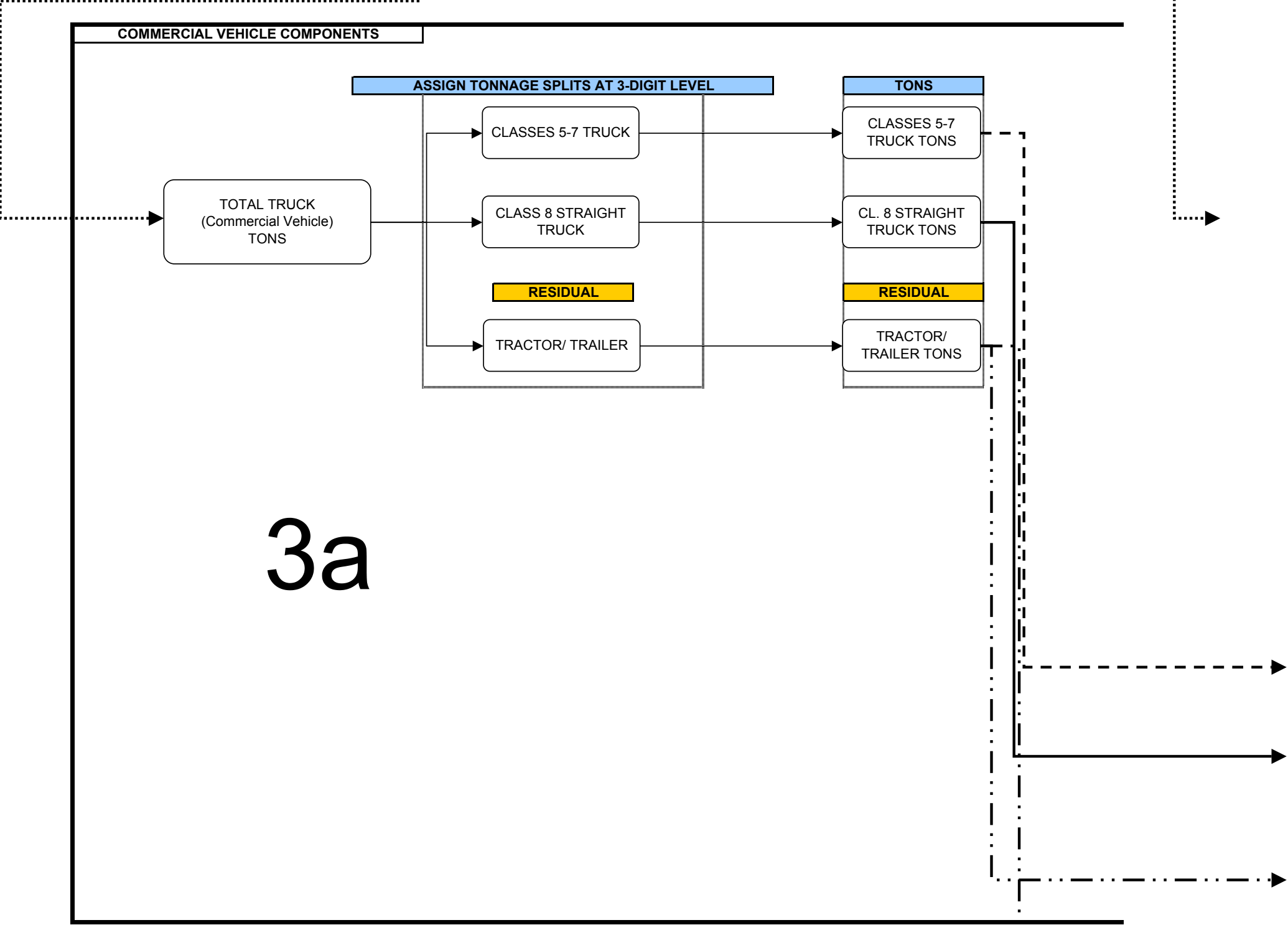
TOTAL RAIL
INTERMODAL

Source: Association of American Railroads, Rail Waybill, FTR Associates

2

3





3b

ASSIGN AVERAGE LENGTH OF HAUL AT 3-DIGIT LEVEL

TOTAL TRUCK
(Commercial Vehicle) AVERAGE
LENGTH OF HAUL

CLASSES 5-7 TRUCK

CLASS 8 STRAIGHT
TRUCK

RESIDUAL

TRACTOR/ TRAILER

BASED UPON AVERAGE LENGTH OF HAUL
ASSIGN SHORT, MEDIUM OR LONG HAUL AT 3-DIGIT LEVEL

CLASSES 5-7 TRUCK

CLASS 8 STRAIGHT
TRUCK

TRACTOR/ TRAILER

TONMILES

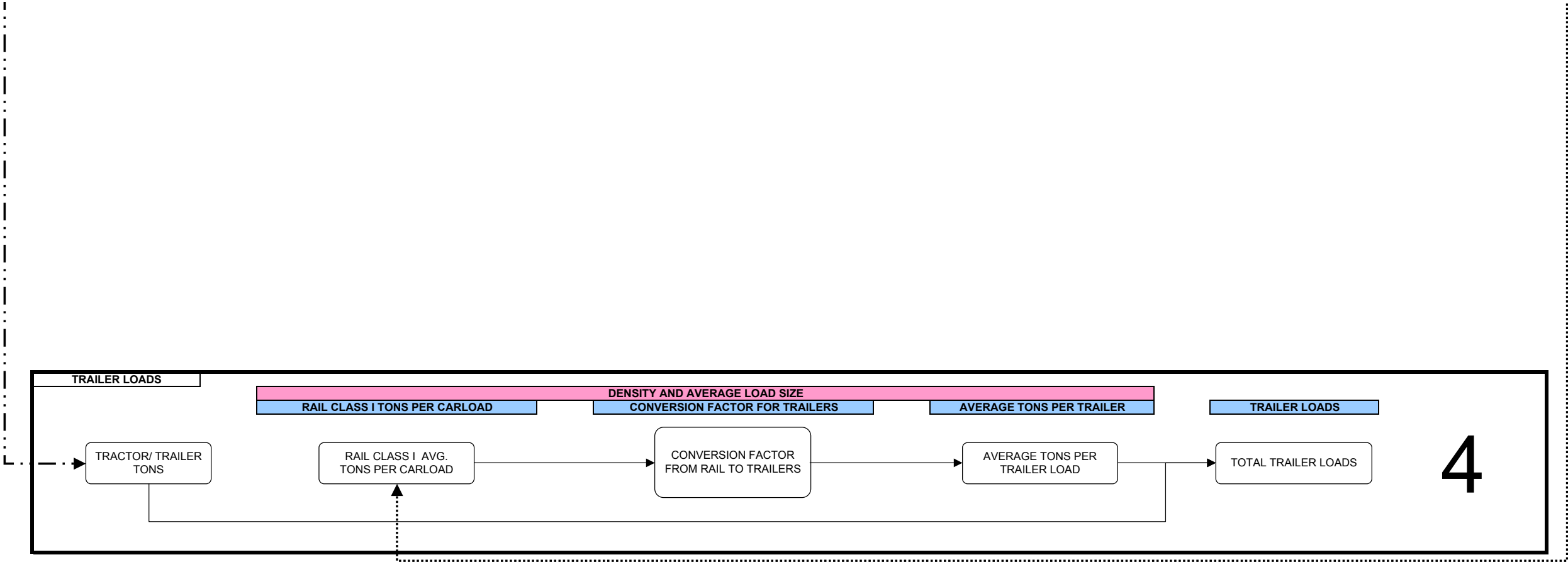
TOTAL TRUCK
(Commercial Vehicle)
TONMILES

CLASSES 5-7 TRUCK

CLASS 8 STRAIGHT
TRUCK

RESIDUAL

TRACTOR/ TRAILER



VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available

		U.S. TRUCK								U.S. WATER				U.S. PIPELINE		
		Total Truck (Commercial Vehicle)	Total Class 8 Vehicles		Tractor/ Trailer		Class 8 Straight Truck		Classes 5-7 Straight Truck	Total Water	Internal Water	Lakewise Water	Coastwise Water	Total Pipeline	Petroleum Pipeline	Natural Gas Pipeline
		Tons	Tonmiles	Tons	Tonmiles	Tons	Tonmiles	Tons	Tonmiles	Tons	Tonmiles	Tons	Tonmiles	Tons	Tonmiles	Tonmiles
STCC	Description															
20	Food and Kindred Products															
201	Meat (Including Poultry and Small Game)															
202	Dairy Products															
203	Canned/Preserved Fruits, Vegetables, Sea Food															
204	Grain Mill Products															
205	Bakery Products															
206	Sugar (Beet and Cane)															
207	Confectionery and Related Products															
208	Beverages and Flavoring Extract															
209	Miscellaneous Food Preparations															
21	Tobacco Products															
211	Cigarettes															
212	Cigars															
213	Chewing and Smoking Tobacco															
214	Stemmed and Redried Tobacco															
22	Textile Mill Products															
221	Cotton Broad Woven Fabrics															
222	Man Made Fiber and Silk															
223	Wool Broad Woven Fabrics															
224	Narrow Fabrics															
225	Knit Fabrics															
227	Floor Coverings, Textile															
228	Yarn and Thread															
229	Miscellaneous Textile Goods															
23	Apparel and Other Finished Textile Products Including Knit															
231	Men and Boys Clothing															
233	Women, Girls and Infants Clothing															
235	Millinery, Hats and Caps															
237	Fur Goods															
238	Miscellaneous Apparel and Accessories															
239	Miscellaneous Fabricated Textile															
24	Lumber and Wood Products, Except Furniture															
241	Primary Forest Products (Pulpwood, Piling, Planning)															
242	Sawnmill and Planing Mill Products															
243	Millwork, Veneer, Plywood															
244	Wooden Containers															
249	Miscellaneous Wood Products															
25	Furniture and Fixtures															
251	Household and Office Furniture															
253	Public Building and Related Furniture															
254	Partitions, Shelving, Lockers															
259	Miscellaneous Furniture and Fixtures															
26	Pulp, Paper and Allied Products															
261	Pulp and Pulp Mill Products															
262	Paper, Except Building Paper															
	26211 NEWSPRINT															
	26212 GROUND WOOD PAPER, UNCOATED															
	26213 PRINTING PAPER															
	26214 WRAPPING PAPER															
	26217 SPECIAL INDUSTRIAL PAPER															
	26218 SANITARY TISSUE STOCK															
263	Paperboard, Pulpboard and Fiberbd															
264	Converted Paper and Paperboard Products															
265	Containers and Boxes, Paperboard															
266	Building Paper and Building Board															
27	Printed Matter															
271	Newspapers															
272	Periodicals															
273	Books															
274	Miscellaneous Printed Matter															
276	Manifold Business Forms															
277	Greeting Cards, Seals, Labels															
278	Blankbooks, Loose-leaf Binders															
279	Products of Service Industries															

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]

STCC Description
Special Summaries

LENGTH-OF-HAUL:

Short-Haul (0-124 miles)
Medium-Haul (125-299 miles)
Long-Haul (300 miles and greater)

TYPE OF GOODS:

- Raw Goods
- Processed Goods
- Manufactured Goods

TRAILER TYPES:

Dry Vans (includes containers)
Reefers
Platforms
Dumps
Tanks
All Others
Straight Trucks

RAILROAD SUMMARY GROUPS:

Agricultural Products
Chemicals
Coal
Forest Products
Metallic Ores and Metals
Motor Vehicles and Equipment
Non-Metallic Minerals and Products
Other

VIEW COMMODITIES BY MODE OF TRANSPORTATION
LIST OF FREIGHT DATA SERIES AVAILABLE

☒ Series Available ☐ Series Not Available[illegible]