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**MARICOPA  
ASSOCIATION of  
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Implementation Assistance Program (IAP)**

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**Maricopa Association of Governments (MAG) System Analysis Program  
2015 Behavior Based Freight Model Development**

***Review of Freight Data Sources for the  
Development of a Behavior-Based Freight Model***

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## Table of Contents

1.0	Introduction.....	1
2.0	Data Types and Sources.....	6
2.1	Data for Forecasting.....	8
3.0	Firm Synthesis .....	9
4.0	Logistics Chain Models .....	19
5.0	Transportation Chain Data.....	27
6.0	Truck Touring Models .....	32
7.0	Other Data Sources.....	34
8.0	Summary.....	35
8.1	Geography Gaps.....	35
8.2	Model Needs Gaps .....	35
8.3	Mode Gaps.....	35

## List of Tables

Table 1. Different Data Types for Freight Modeling .....	6
Table 2. Data Sources by Data Type (See <i>Table2-DataSourceType.xlsx</i> for a clear view) .....	7
Table 3. Data Sources by Modeling Needs (See <i>Table3_DataSourcesSnapshot.xlsx</i> for a clear view) .....	8
Table 4. BEA Input/Output Table Metadata .....	10
Table 5. County Business Patterns Metadata .....	11
Table 6. NETS Metadata .....	12
Table 7. Longitudinal Business Dynamics (LBD) Metadata .....	13
Table 8. ASM Metadata .....	14
Table 9. Business Dynamics Statistics Metadata .....	15
Table 10. Business Employment Dynamics Metadata .....	16
Table 11. Statistics of US Businesses Metadata .....	17
Table 12. Non Employer Statistics Metadata .....	18
Table 13. Commodity Flow Survey (CFS) Metadata .....	20
Table 14. Freight Analysis Framework (FAF) Metadata .....	21
Table 15. TRANSEARCH Metadata .....	22
Table 16. Surface Transportation Board (STB) Carload Waybill Sample Metadata ..	23
Table 17. Air Carrier Statistics Metadata .....	24
Table 18. North American Trans-border Freight Database Metadata .....	25
Table 19. Port Import/Export Reporting Service (PIERS) Metadata .....	26
Table 20. National Highway Planning Network (NHPN) Metadata .....	28
Table 21. ORNL Railroad Network Metadata .....	29
Table 22. Vehicle Inventory and Use Survey (VIUS) Metadata .....	30
Table 23. Vehicle Travel Information System (VTRIS) Metadata .....	31
Table 24. ATRI Truck GPS Data Metadata .....	32
Table 25. National Performance Management Research Dataset (NPMRDS) Metadata .....	33

## List of Figures

Figure 1. Supply Chain Network .....	2
Figure 2. Hybrid Model Layout .....	3
Figure 3. Interactions between various networks .....	4

## 1.0 Introduction

The Maricopa Association of Governments (MAG) was one of the organizations selected in Round Three of the Federal Highway Administration (FHWA) Strategic Highway Research Program Implementation Assistance Program (SHRP2). The main purpose of the project is to develop a new generation regional freight model based on the principles identified in the SHRP2 C20 products and consistent with MAG freight flows forecasting needs.



The new freight modeling framework is envisioned to capture behavioral aspects of freight agents based on a micro-simulation approach to freight demand modeling. The new modeling paradigm would include supply chain and logistics decisions of firms including shippers, carriers and receivers. The framework is envisioned to be composed of several models, including Firm Synthesis, Supply Chain and Logistics, Input-Output flow, Truck Tour and other sub-models. The overall model should be able to provide detailed outputs by different temporal resolutions, economic sectors, industry class and other dimensions.

Robust freight data is needed to build such models and capture a range of freight movements and supply chain related choices for different commodities, types and size of firms, transportation modes, and geographies along the chain. This data can be procured from a variety of primary and secondary data sources. Sources of secondary sources such as Business Economic Area Input-Output (BEA I/O) tables, Freight Analysis Framework (FAF), Longitudinal Business Dynamics (LBD), County Business Patterns (CBP), etc. will be critical for model development.



MAG's Consultant (for the task to identify potential data sources for the project), worked with the MAG modeling team to understand the futuristic model layers and the data requirements for each layer in the initial task. A list of commercially available data as well as public databases with a detailed description of its contents was compiled. Advantages and deficiencies of each of the datasets, sources and methods utilized in compiling the datasets (if available), aggregate statistics of databases (where available), including number of records, levels of geography, exclusions from datasets, pricing (where applicable and available), contact information (where applicable) and periodicity of updates were captured.

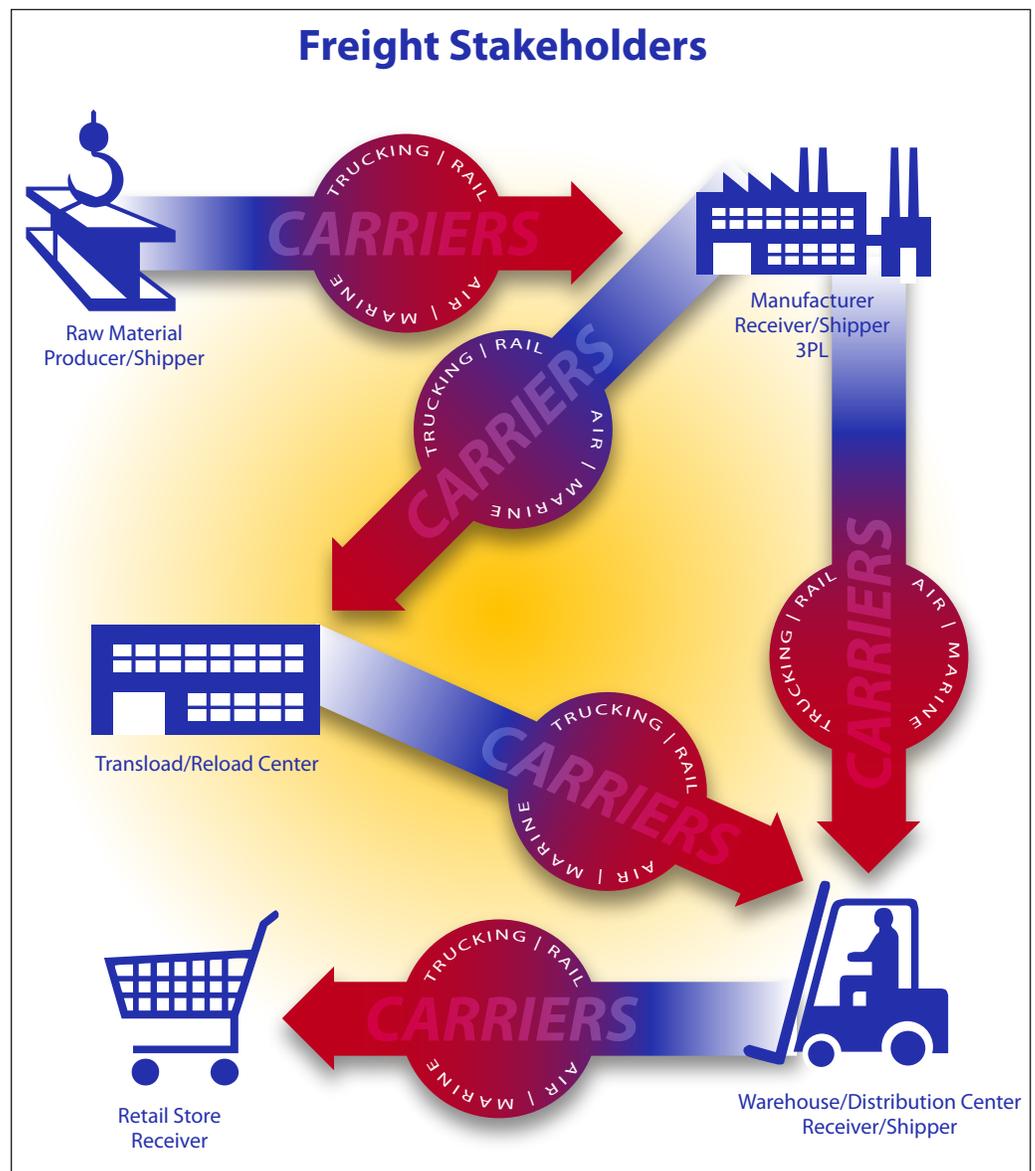
Data utilization from each source in the state of the practice and state of the art freight models was documented (whether they were candidates for estimation, calibration, and validation of models). Finally, data summary from each dataset was prepared at regional level or state level (depending upon its availability).

In order to understand and model freight flows, it is necessary to determine the various entities in the freight system (not limited to producers, shippers, carriers, forwarders and carriers, who drive freight demand). Behavioral freight models capture shippers' perception and their selection of shipment choices along each segment of a supply chain. Once the entities are identified, their mutual behavioral interactions are difficult to capture. Shipper and Carrier surveys capture behavioral data to a certain degree, but they are prohibitively expensive. Since private sector decision making is highly proprietary, understanding and modeling logistics decisions as they affect freight demand at a regional level remains a challenge for public sector agencies.

**Figure 1** shows the supply chain and the related stakeholders. Supply Chains are highly complex, dynamic, time-sensitive and integrated systems. In order to model these integrated systems, it is necessary to capture each segment of the supply chain and the actual movement of goods by mode (truck, rail, air, etc.) along each segment. Sophistication in logistics has built upon globalization of the economy whereby materials, components and finished products are shipped worldwide. Globalization has lengthened supply lines as products may be produced offshore and can be shipped to anywhere in the world. This has resulted in more freight being carried over longer distances, with a noticeably high demand at key nodes (typically ports, airports, intermodal facilities, etc.).

Since supply chain models tend to be national and/or international in scope and are focused on modeling commodity flows, truck tour based models would model

**Figure 1. Supply Chain Network<sup>1</sup>**



1. Arizona DOT, Multimodal Freight Analysis Study

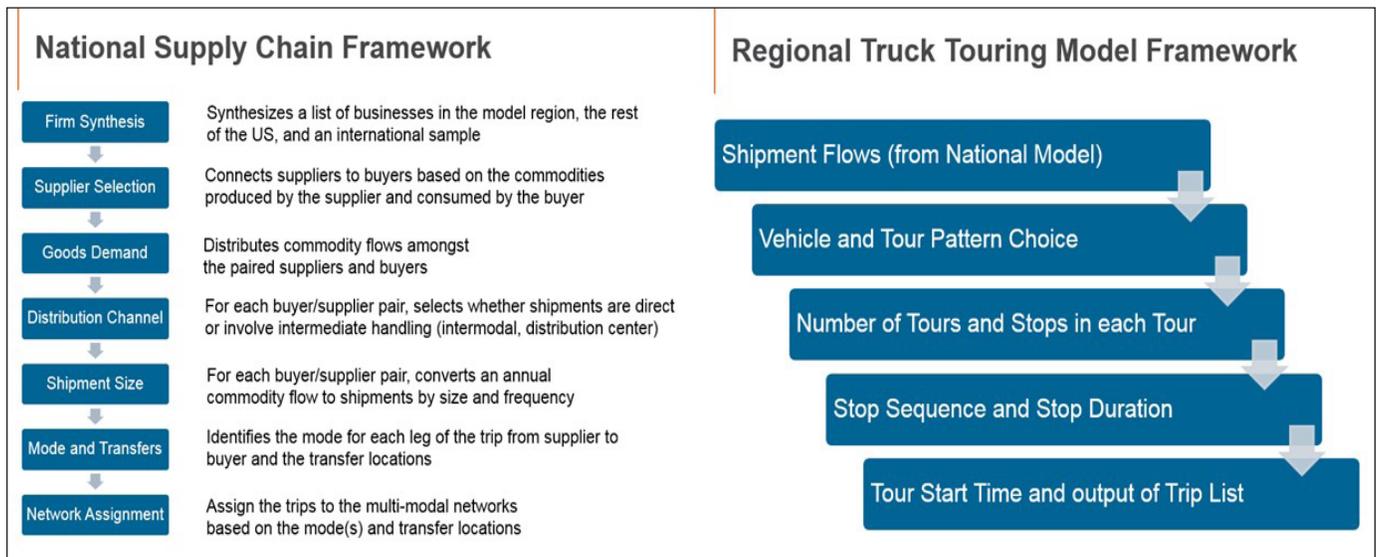
local truck movements. MAG’s behavioral based freight model framework is envisioned to take a hybrid approach that combines supply chain and tour-based models. The shipments are modeled along the supply chain modeling framework and the regional pickup and delivery of these shipments are handled by truck tour models.

**Figure 2** shows the hybrid model framework. As shown in the figure, each of the components of the model requires data that may or may not be in public domain. The available and desired data (disparate datasets) can be classified into four categories:

- Free and widely available at small geographies (e.g. County Business Patterns (CBP))
- Free but restricted availability at any geography (e.g. STB Private Waybill Sample)
- Free but available only at large geographies (e.g. Freight Analysis Framework (FAF))
- Privately available for a fee (e.g. IHS Transearch)

In September 2014, MAG hosted a workshop to kick-off the Behavior Based Freight Model Development On-Call. From a modeling perspective, the overall consensus was to have a Financial Layer and Logistics Layer as the first two components of model hierarchy, whose results will be rolled down to Transportation Layer in the final step.

**Figure 2. Hybrid Model Layout<sup>2</sup>**

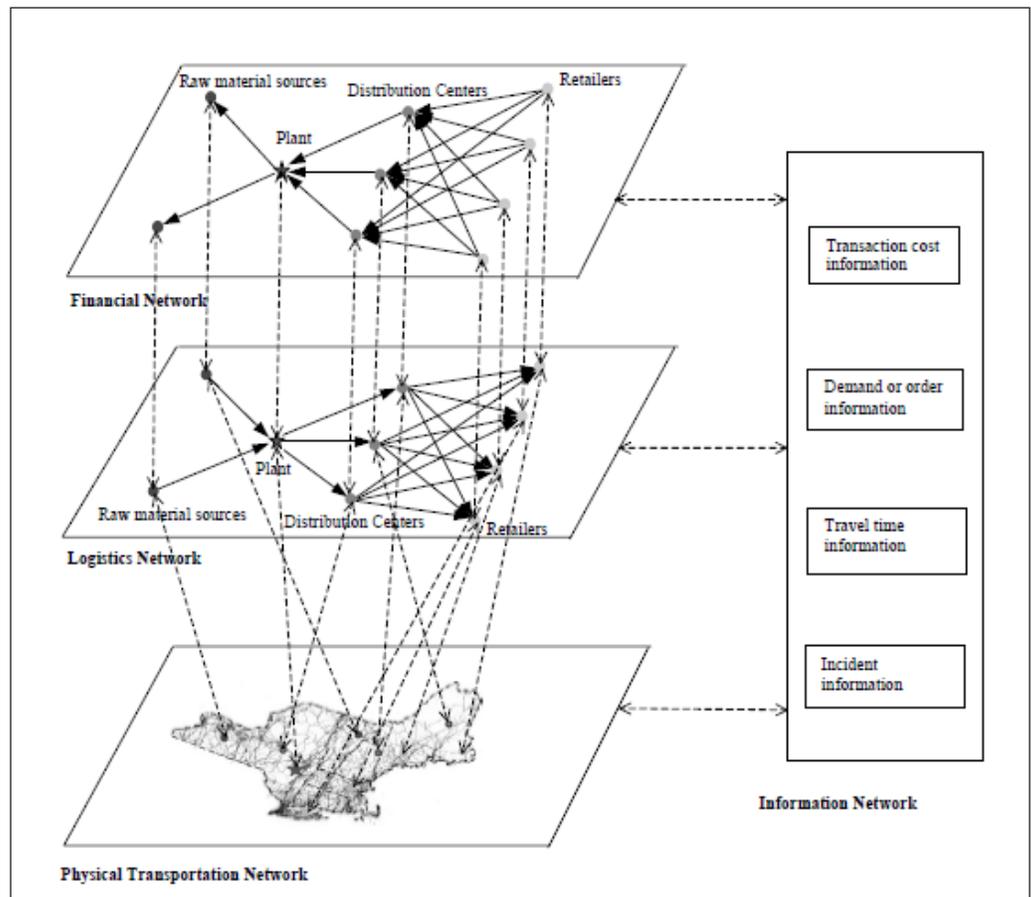


2. RSG.

**Figure 3** shows the interactions between the financial (production-consumption), logistics, and transportation layers along with the information layer and can help define the attributes of a behavior based freight model.

The mathematical representation of these three layers is portrayed via a series of models. These models include **firm synthesis** models which look at production, consumption, the evolution of firms, and the various factors that influence the birth, growth, location, and dissolution of firms. The second series of models focus on understanding the **logistics or supplier behavior** that help goods move efficient among the various actors of the freight story. The third series of models focuses on the **physical transportation infrastructure** on how these goods move from origin to destination, the routes taken, the modes used etc. The final series of models focuses on trucks—how they **tour** through a study area starting from a first pickup of the day from the depot or warehouse to the final trip back to the depot or warehouse and traverse the **logistics** and **physical transportation infrastructure** layers shown in **Figure 3**.

**Figure 3. Interactions between various networks<sup>3</sup>**



3. Xu, J., K. L. Hancock, and F. Southworth. "Simulation of Regional Freight Movement with Trade and Transportation Multinetworks", Transportation Research Record 1854, 2003

In order to develop these mathematical representations it is critical to inventory and understand the various data sources that are available and is the focus of this report.

The rest of this report is organized as follows. First a typology linking data types, sources, and freight models is presented. This is followed by providing metadata on each data source that helps develop firm synthesis, logistics chains, transportation chains, and truck touring models. The metadata and tables in this report identify, where relevant, data summaries in Excel. ***Data summaries are identified in the field Aggregate Statistics in each of the table where it is applicable.***

## 2.0 Data Types and Sources

**Table 1** shows the different data types and how they can be used for freight models. **Table 2** shows how each of the data sources presented relate to the data types identified in Table 1.

**Table 1. Different Data Types for Freight Modeling**

Data Types	Use in Freight Modeling
<b>Trade Statistics</b>	Estimation of Production-Consumption (PC) matrices for the base year
	Aggregate gravity-type models for generation and distribution at the PC level
	Value-to-weight ratios (for exported and imported goods)
<b>National Account Data</b>	Estimation of PC matrices for the base year
	Aggregate I/O models for generation and distribution
<b>Transportation Statistics</b>	Estimation of OD matrices for the base year
	Estimation of gravity-type models for generation and distribution at the OD level (less appropriate than at the PC level)
	Estimation of aggregate mode choice models
	Load factors (cargo weight to vehicle capacity)
	Models for road vehicle type choice, tour formation and empty driving/load factor if micro-data is available
<b>Shipper surveys</b>	Estimation of PC matrices for the base year
	Estimation of disaggregate mode choice models
	Estimation of transportation chain choice models
	Estimation of disaggregate shipment size choice models
	Estimation of disaggregate joint models (mode-shipment; mode-supplier)
	Value-to-weight ratios
<b>Stated preference surveys</b>	Estimation of disaggregate mode choice models
	Estimation of transportation chain choice models
	Estimation of route choice models
	Estimation of disaggregate shipment size choice models
	Estimation of disaggregate joint models (mode-shipment; mode-supplier)
	Monetary value of service attributes (e.g. value of time)
<b>Consignment Bills and RFID data</b>	Estimation of OD matrices for the base year (possibly PC, if tags stay on after transshipment or if combination of tags are registered at transshipment)
	Estimation of disaggregate mode choice models
	Estimation of disaggregate shipment size choice models
	Estimation of disaggregate joint models (mode-shipment; mode-supplier)
<b>Traffic Count data</b>	Estimation of OD matrices for the base year
	Calibration Data
<b>Weight Data</b>	Load factors
<b>Network data with cost functions</b>	Direct input for the estimation of aggregate and disaggregate mode choice models and joint models
	Indirect input for aggregate distribution models
	Direct input for the estimation of route choice models
<b>Terminal data</b>	Direct input for the estimation of transportation chain choice models

Table 2. Data Sources by Data Type (See Table2-DataSourecexType.xlsx for a clear view)

Data Source	Data Type										Spatial (Smallest Geography)	Temporal	
	Trade Statistics	National Account Data	Transportation Statistics	Shipper surveys	Stated preference surveys	Consignment Bills and RFID data	Traffic Count data	Weight Data	Network data with cost functions	Terminal data			
Bureau of Economic Analysis (BEA) Input/Output Tables		✓			Project Specific						National	Annual	
County Business Patterns (CBP)	✓											County	Annual
National Establishment Time-Series (NETS)	✓											County	Annual
Longitudinal Business Dynamics (LBD)	✓											State	Annual
Annual Survey of Manufacturers (ASM)	✓											State	Annual
Business Dynamics Statistics	✓											MSA	Annual
Business Employment Dynamics	✓											County	Quarterly
Commodity Flow Survey (CFS)			✓	✓								CSA or MSA	Every 5 years
Freight Analysis Framework (FAF)			✓									CSA or MSA	Every 5 years
Transearch			✓									County/TAZ available on demand	Annual
Surface Transportation Board (STB) Carload Waybill Sample			✓									BEA	Annual
Air Carrier Statistics North American			✓									Airport	Monthly
Transborder Freight Database			✓									State and Port of Entry/Exit	Monthly
PIERS			✓				✓			✓		Port	Annual
National Highway Planning Network (NHPN)								✓		✓		State	Unknown
National Performance Management Research Dataset (NPMRDS)								✓		✓		Traffic Message Channel	Every 5 minutes
ATRI								✓		✓		Truck Lat/Long	Second
MAG Roadway Network								✓		✓		Unknown	Unknown
Vehicle Inventory and Use Survey (VIUS)									✓			State	Every 5 years
ORNL Rail Network										✓		Unknown	Unknown
VTRIS								✓			Weight Station	Unknown	
Establishment Surveys			✓	✓							Establishment	Varies by Sponsor	
✓ - Applies													

Traffic Message Channel (TMC) is the basic spatial unit (roadway segment) used to report the traffic flow data and at which NPMRDS data is available. TMC is a specific application of the FM Radio Data System (RDS) used for broadcasting real-time traffic and weather information. A 9 digit TMC ID is used to define a unique segment and direction of roadway in North America. For interstates and principal arterials TMCs are coded as two way but for lower functional class roads directionality is not always considered. The length of the roadway segment is variable. In urban areas, TMCs can be as short as a few hundred feet while in rural areas TMCs can be several miles long.

Table 3 shows the sub-models and data sources in a single table and details of each table in subsequent sections.

**Table 3. Data Sources by Modeling Needs (See Table3\_DataSourcesSnapshot.xlsx for a clear view)**

Data Source	Model	Data Type	Spatial	Temporal	Mode	Commodity	Traffic Count	Data Use		
								Estimation	Calibration	Validation
Bureau of Economic Analysis (BEA) Input/Output Tables	Firm Synthesis	IO	National	Annual				✓	✗✓	✗
County Business Patterns (CBP)	Firm Synthesis	TS	County	Annual				✓	✓	✓
National Establishment Time-Series (NETS)	Firm Synthesis	TS	County	Annual				✓	✗✓	✓
Longitudinal Business Dynamics (LBD)	Firm Synthesis	TS	State	Annual				✗	✗	✓
Annual Survey of Manufacturers (ASM)	Firm Synthesis	TS	State	Annual				✗	✗	✓
Business Dynamics Statistics	Firm Synthesis	TS	MSA	Annual				✗	✓	✓
Business Employment Dynamics	Firm Synthesis	TS	County	Quarterly				✓	✓	✓
Commodity Flow Survey (CFS)	Supply Chain	TrS	CSA or MSA	Every 5 years	Truck, Rail, Air, Water, Pipeline, Other	SCTG commodities		✗	✓	✓
Freight Analysis Framework (FAF)	Supply Chain	TrS	CSA or MSA	Every 5 years	Truck, Rail, Air, Water, Pipeline, Other	SCTG commodities		✓	✓	✓
Transearch	Supply Chain	TrS	County/TAZ available on demand	Annual	Truck, Rail, Air, Water, Pipeline, Other	STCC commodities		✓	✓	✓
Surface Transportation Board (STB) Carload Waybill Sample	Supply Chain	TrS	BEA	Annual	Rail	STCC commodities		✗	✓	✓
Air Carrier Statistics	Supply Chain	TrS	Airport	Monthly	Air	None		✗	✓	✓
North American Transborder Freight Database	Supply Chain	TrS	State and Port of Entry/Exit	Monthly	Truck, Rail, Air, Water, Pipeline, Other	SITC	Yes	✗	✓	✓
PIERS	Supply Chain	TrS	Port	Annual	Water	HS		✓	✓	✓
National Highway Planning Network (NHPN)	Transportation Chain	TC, Net	State	Unknown			Yes	✓	✓	✓
National Performance Management Research Dataset (NPMRDS)	Truck Touring	TC, Net	Traffic Message Channel	Every 5 minutes	Trucks	Unknown		✓	✓	✓
ATRI	Truck Touring	TC, Net	Truck Lat/Long	Second	Trucks	Unknown		✓	✓	✓
MAG Roadway Network	Transportation Chain	TC, Net								
Vehicle Inventory and Use Survey (VIUS)	Transportation Chain	WD	State	Every 5 years	Freight Trucks and Commercial Vehicles	None		✗	✓	✓
ORNL Rail Network	Transportation Chain	TC, Net	Unknown	Unknown	Rail			✓	✓	✗✓
VTRIS	Transportation Chain	WD	Weight Station	Unknown	Freight Trucks and Commercial Vehicles	None		✗	✓	✓
Establishment Surveys	TrS, SS	Establishment	Establishment	Varies by Sponsor						

✓ - Applies

✗✓ - May apply

✗ - Does not apply

## 2.1 Data for Forecasting

A lot of the data sources presented here focus on potential application for model estimation, calibration, and validation. However, data such as TRANSEARCH, Freight Analysis Framework (FAF), and private socioeconomic data sources such as Woods & Poole provide information about future freight flows and socioeconomic conditions. Therefore, considering data coverage and limitations, careful thought must be put into how to use each of these data sources for forecasting.

### 3.0 Firm Synthesis

The main component of Financial Layer is Firm Synthesis. Substantial data is required to develop a firm synthesis model, which simulates regional firms by industry and by size mainly. Data is required on the industrial classification of firms, number of employees and other attributes in order to develop firm age synthesis, firm formation, location, and survival sub-models. A diverse mix of data can be used to develop firm synthesis models. These include:

- Bureau of Economic Analysis (BEA) Input/Output Tables (**Table 4**)
- County Business Patterns (CBP) data (**Table 5**)
- National Establishment Time-Series (NETS) (**Table 6**)
- Longitudinal Business Dynamics (LBD) (**Table 7**)
- Annual Survey of Manufacturers (ASM) (**Table 8**)
- Business Dynamics Statistics (BDS) (**Table 9**)
- Business Employment Dynamics (BED) (**Table 10**)
- Statistics of US Businesses (**Table 11**)
- Non Employer Statistics (**Table 12**)

The differences between some of these data sources is captured nicely by the Kauffman Foundation. From their report, “National and state-level firm or establishment birth data is captured by the Business Employer Dynamics (BED) or the Statistics of U.S. Businesses (SUSB). The BED data are compiled by the U.S. Bureau of Labor Statistics (BLS) from existing quarterly state unemployment insurance (UI) records through the Quarterly Census of Employment and Wages (QCEW) or ES-202 program. The SUSB data are collected by the U.S. Census Bureau and summarized by the U.S. Small Business Administration (Office of Advocacy). Both of these datasets include only employer firms. Employer firms represent approximately one-fourth of all firms, and many firms start with no employees. These data, therefore, are likely to lead to a substantial undercount in the rate of entrepreneurial activity, particularly for certain industries and regions. Finally, the BED and SUSB data are business-level data containing essentially no information on the owner’s characteristics, while the CPS is person-level data containing very detailed information on the owner” (Source: Kauffman Foundation).

An important distinction to make is between firm and establishment. Here is how the Bureau of Labor Statistics (BLS) describes it: “An establishment is an economic unit that produces goods or services, usually at a single physical location, and engages in one or predominantly one activity, whereas a firm can comprise one or more establishments under common ownership by a corporate parent”. (Source: BLS.gov).

**Table 4. BEA Input/Output Table Metadata**

Name	BEA Input/Output Tables
Agency/Source	Bureau of Economic Analysis 
Data Type	National Accounts
Description	I/O analysis is an economic tool that measures the relationships between various industries in the economy. I/O tables show the commodity inputs that are used by each industry to produce its output, the commodities produced by each industry, and the use of commodities by final consumers.
Data Coverage	The make table shows the production of commodities by industries. The rows present the industries, and the columns display the commodities that the industries produce. The use table shows the uses of commodities by intermediate and final users. In contrast to the make table, the rows in the use table present the commodities or products, and the columns display the industries and final users that utilize them. Data available by commodity and industry. Data generally available at three levels of detail: sector (15 industry groups), summary (71 industry groups), and detail (389 industry groups). The detail tables are available only for the years the Economic Census is conducted (in the years ending with 2 and 7)
Modes of Freight	N/A
Commodities	Based on SCTG codes
Years of Data	1997 to 2013. 2013 is the most current
Format of Data	Excel Spreadsheet
Geographic Level	National
Temporal Factor	Annual
Aggregate Statistics	See Firm_Synthesis\01_InputOutputData.xlsx
Pricing	Free
Contact Info	<a href="http://www.bea.gov/industry/io_annual.htm">http://www.bea.gov/industry/io_annual.htm</a>
Data Use	The data is used to develop production consumption equations by matching industries to commodities, thereby helping ensure the right match between commodities and industries.
Data overlaps	None
Data limitations	Not available locally. RIMS II can be used to obtain to regional I/O tables for a fee or can be obtained from the state Labor department.
Forecast	No
Model Uses	Estimation – Yes; Calibration – Maybe; Validation – No; Control Totals available – No



Table 5. County Business Patterns Metadata

Name	County Business Patterns
Agency/Source	US Census Bureau 
Data Type	Trade Statistics
Description	County Business Patterns (CBP) is an annual series that provides subnational economic data by industry. This series includes the number of establishments, employment during the week of March 12, first quarter payroll, and annual payroll.
Data Coverage	Statistics are available on business establishments at the U.S. level and by State, County, Metropolitan area, and ZIP code levels. Data for Puerto Rico and the Island Areas are available at the State and county equivalent levels. County Business Patterns (CBP) covers most NAICS industries excluding some (not all) crop and animal production; rail transportation; National Postal Service; pension, health, welfare, and vacation funds; trusts, estates, and agency accounts; private households; and public administration. CBP also excludes most establishments reporting government employees. Data available up to 6 digit NAICS
Modes of Freight	N/A
Commodities	N/A
Years of Data	Since 1964. 2012 is the most current year.
Format of Data	CSV
Geographic Level	County and Zip Code (from ZBP)
Temporal Factor	Annual
Aggregate Statistics	See Firm_Synthesis\02_CBP.xlsx
Pricing	Free
Contact Info	<a href="http://www.census.gov/econ/cbp/">http://www.census.gov/econ/cbp/</a>
Data Use	The data is used to develop production consumption equations by providing employment information for generating the equations.
Data overlaps	The BLS Quarterly Census of Employment and Wages (QCEW) is a potential data source that overlaps with the CBP. Private data from InfoGroup, Woods & Poole etc. are another potential source.
Data limitations	Does not have employment information on rail transportation; National Postal Service; pension, health, welfare, and vacation funds; trusts, estates, and agency accounts; private households; and public administration. CBP also excludes most establishments reporting government employees.
Forecast	No
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available - At County and Zip Code Level but not for all industry sectors

Table 6. NETS Metadata

Name	National Establishment Time-Series (NETS)
Agency/Source	Walls & Associates, aggregated data from Dun & Bradstreet 
Data Type	Trade Statistics
Description	Time series of business establishments. Includes following information: business name, address, contact information, headquarter linkages, related establishments in same state, years when business was active, year business started, industry classification, type of establishment, employment at location and job growth relative to peers, estimated annual sales at establishment and sales growth relative to peers, D&B credit ratings and scores, indicators such as foreign owned, import/export, minority/women owned, etc.
Data Coverage	Refined analysis of employment and business patterns; includes sole proprietors, part-time jobs and farm operations, which are not included in government data sources
Modes of Freight	N/A
Commodities	N/A
Years of Data	1990-current year. Documentation provided is for 2008; might have been slight changes to data categories, etc. since then
Format of Data	Probably would be in an Excel spreadsheet, but has lat-long data so could geocode
Geographic Level	State/MSA/County
Temporal Factor	Annual
Aggregate Statistics	See Firm_Synthesis\03_NETS_establishments_Maricopa_Pima_Pinal_2002-2013.docx
Pricing	Unknown
Contact Info	Walls & Associates; 510-763-0641 or dwalls2@earthlink.net
Data Use	DVRPC used this data to delineate the 2010 employment centers in the region at a refined level. Data has historical information (first/last year), so can track birth and death of firms.
Data overlaps	Longitudinal Business Survey and Business Dynamic Statistics also has information about firm entry/exit, but at the aggregate level (not specific company linked to D&B number) and not as location specific (sector data for LBD and BDS is only at national level)
Data limitations	Not Free.
Forecast	No
Model Uses	Estimation – Yes; Calibration – Maybe; Validation – Yes; Control Totals Available – Yes if we assume that D&B has complete universe of establishment data



Table 7. Longitudinal Business Dynamics (LBD) Metadata

Name	Longitudinal Business Database
Agency/Source	U.S. Census (Center for Economic Studies) 
Data Type	Trade Statistics
Description	Provides longitudinally linked data for all employer establishments contained in the Census Bureau's business register, the Standard Statistical Establishment List (SSEL). State specific files include the following: Firm_Annual_Age_State Firm_Annual_Entry_Exit_State_byState_1977_2012 Firm_Annual_Entry_Exit_Size_State Has information about annual age of establishment, entry and exit information by size of establishment, and entry/exit information
Data Coverage	Covers nearly all the non-farm private economy as well as some public sector activities.
Modes of Freight	N/A
Commodities	N/A
Years of Data	1977-2012
Format of Data	Excel spreadsheets, have information for establishment age by initial size and size by sector and state, firm annual age and size by sector, size and state.
Geographic Level	Statewide and total (nation)
Temporal Factor	Annual
Aggregate Statistics	See Firm_Synthesis\04_LBD.xlsx
Pricing	Free
Contact Info	<a href="https://www.census.gov/ces/dataproducts/datasets/lbd.html">https://www.census.gov/ces/dataproducts/datasets/lbd.html</a>
Data Use	Used for creation of the Business Dynamic Statistics, which provides annual measures of business dynamics for the economy and aggregated by firm and establishment characteristics.
Data overlaps	Business Dynamic Statistics, NETS also provides similar data
Data limitations	Sector level information is not available at the state level
Forecast	No
Model Uses	Estimation – No; Calibration – No; Validation – Yes; Control Totals Available – Yes to total establishments at state level but no to state level sector information.

Table 8. ASM Metadata

Name	Annual Survey of Manufacturers
Agency/Source	Available from the U.S. Census 
Data Type	Trade Statistics
Description	The survey captures manufacturing activity, products and location for public and private sectors. Provides statistics on employment, payroll, worker hours, payroll supplements, cost of materials, selected operating expenses, value added by manufacturing, capital expenditures, inventories and energy consumption. It also provides estimates of value of shipments for 1,384 classes of manufactured products.
Data Coverage	Manufacturing establishments with 1 or more paid employees or non-employers that use leased employees for manufacturing (NAICS 31-33); Arizona dataset has information broken down at 3 and 4 digit NAICS level. Statewide for other states at 2 digit level.
Modes of Freight	N/A
Commodities	N/A
Years of Data	2010 and 2011
Format of Data	Excel Spreadsheet (Arizona), have PDFs for the entire U.S. as well
Geographic Level	State (Arizona), have other states and entire U.S. available as well
Temporal Factor	Annual (except years ending in 2 and 7, then information is in Economic Census)
Aggregate Statistics	See Firm_Synthesis\05_Annual Survey of Manufacturers_2010_2013_AZ.xlsx
Pricing	N/A
Contact Info	<a href="http://www.census.gov/manufacturing/asm/">http://www.census.gov/manufacturing/asm/</a>
Data Use	Bureau of Economic Analysis uses ASM data to prepare annual updates of the GNP and GNP weight deflators, the annual input-output (I/O) tables, and to the GDP; Bureau of Labor Statistics uses ASM data to calculate annual productivity series, updating producer price index, etc.; State and local agencies use ASM data for economic policymaking and forecasting. Primary basis for updates to Longitudinal Research Database (LRD)
Data overlaps	None
Data limitations	None aware about
Forecast	No
Model Uses	Estimation – No; Calibration – No; Validation – Yes; Control Totals Available – Yes at State Level.



Table 9. Business Dynamics Statistics Metadata

Name	Business Dynamics Statistics (BDS)
Agency/Source	Available from the U.S. Census 
Data Type	Trade Statistics
Description	Business Dynamics Statistics (BDS) provides for measures of net and gross job flows associated with entering, exiting, expanding, and contracting establishments including measures of job creation and destruction. Aggregate statistics are available for the nation and states, by firm characteristics and industry classification.
Data Coverage	Establishments that cover Agricultural services, forestry, and fishing, Mining, Construction, Manufacturing, Transportation and public utilities, Wholesale trade, Retail trade, Finance, insurance, and real estate, Services.
Modes of Freight	N/A
Commodities	N/A
Years of Data	1976-2012
Format of Data	Excel, CSV
Geographic Level	MSA
Temporal Factor	Annual
Aggregate Statistics	See Firm_Synthesis\06_BusinessDynamicStatistics_MSA.xlsx
Pricing	N/A
Contact Info	<a href="http://www.census.gov/ces/dataproducts/bds/index.html">http://www.census.gov/ces/dataproducts/bds/index.html</a>
Data Use	Useful for ascertaining patterns of entrepreneurship, structural change, the gross job flows that underlie net employment change, and employment contributions by firm size and age
Data overlaps	NETS
Data limitations	Does not have self-employed, most government employees
Forecast	No
Model Uses	Estimation – No; Calibration – Yes; Validation – Yes; Control Totals Available - Yes



**Table 10. Business Employment Dynamics Metadata**

Name	Business Employment Dynamics (BED)
Agency/Source	Bureau of Labor Statistics 
Data Type	Trade Statistics
Description	Business Employment Dynamics (BED) provides quarterly data on establishment openings, closings, expansions, and contractions by industry and size of firm, as well as establishment births, deaths, and survival by age, for the nation and states. BED data are generated from longitudinally linked microdata collected by the Quarterly Census of Employment and Wages (QCEW, formerly the ES-202) program.
Data Coverage	Establishments with 1 or more paid employees or non-employers that cover Agricultural services, forestry, and fishing, Mining, Construction, Manufacturing, Transportation and public utilities, Wholesale trade, Retail trade, Finance, insurance, and real estate, Services
Modes of Freight	N/A
Commodities	N/A
Years of Data	1992-Current
Format of Data	Excel, CSV
Geographic Level	County
Temporal Factor	Quarterly
Aggregate Statistics	See Firm_Synthesis\07_BED.xlsx
Pricing	N/A
Contact Info	<a href="http://www.bls.gov/bdm/">http://www.bls.gov/bdm/</a>
Data Use	Identify patterns of gross job creation and destruction by industry sector  Track survival and identify contributions of young and old business establishments to employment growth
Data overlaps	QCEW
Data limitations	Does not have government and self-employment
Forecast	No
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available - Yes



**Table 11. Statistics of US Businesses Metadata**

Name	Statistics of US Businesses
Agency/Source	US Census Bureau 
Data Type	Trade Statistics
Description	The Statistics of US Businesses provides detailed annual data for U.S. business establishments by geography, industry, and enterprise size.
Data Coverage	All U.S. business establishments with paid employees. The Statistics of U.S. Businesses (SUSB) covers all NAICS industries except crop and animal production; rail transportation; National Postal Service; pension, health, welfare, and vacation funds; trusts, estates, and agency accounts; private households; and public administration. The SUSB also excludes most government employees.
Modes of Freight	N/A
Commodities	N/A
Years of Data	Since 1989. 2012 is the most current year.
Format of Data	CSV
Geographic Level	County and State
Temporal Factor	Annual
Aggregate Statistics	See Firm_Synthesis\08_SUSB.xlsx
Pricing	Free
Contact Info	ewd.susb@census.gov
Data Use	Identify patterns of gross job creation and destruction by industry sector. Track survival and identify contributions of young and old business establishments to employment growth
Data overlaps	The data overlaps with Business Employment Dynamics and CBP (for employment).
Data limitations	Does not have establishment information on crop and animal production; rail transportation; National Postal Service; pension, health, welfare, and vacation funds; trusts, estates, and agency accounts; private households; and public administration. SUSB also excludes most establishments reporting government employees.
Forecast	No
Model Uses	Estimation – Maybe; Calibration – Yes; Validation – Yes; Control Totals Available - At County level but not for all industry sectors. At State level for all industry sectors.



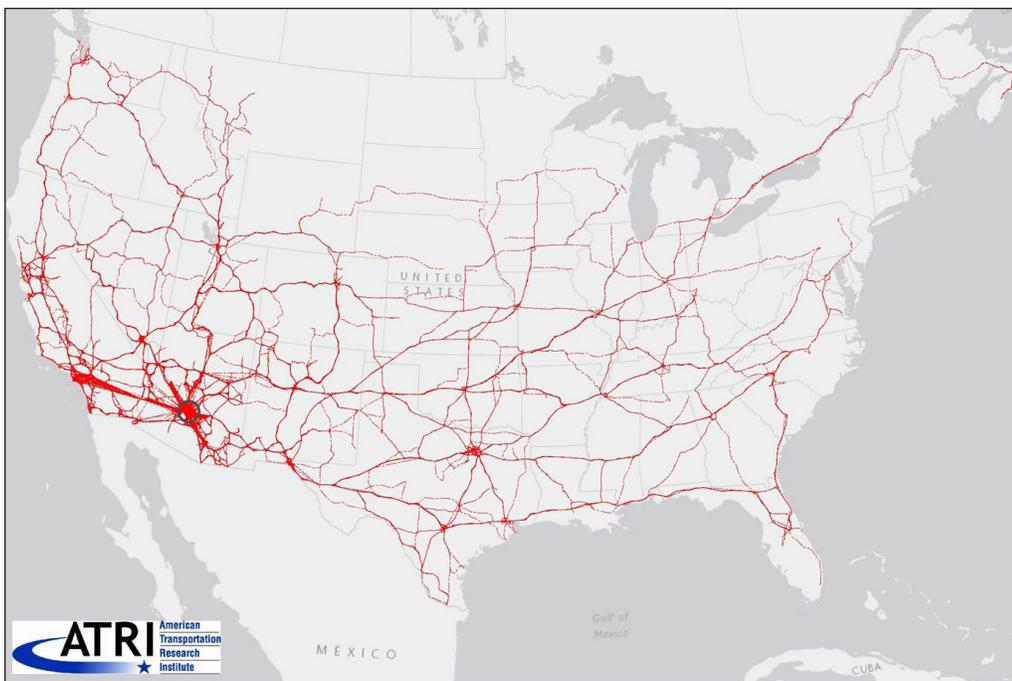
**Table 12. Non Employer Statistics Metadata**

Name	Non-Employer Statistics
Agency/Source	US Census Bureau 
Data Type	Trade Statistics
Description	Nonemployer Statistics is an annual series that provides subnational economic data for businesses that have no paid employees and are subject to federal income tax.
Data Coverage	The data consist of the number of businesses and total receipts by industry. Most non-employers are self-employed individuals operating unincorporated businesses (known as sole proprietorships), which may or may not be the owner’s principal source of income.
Modes of Freight	N/A
Commodities	N/A
Years of Data	Since 1997. 2012 is the most current year.
Format of Data	CSV
Geographic Level	County
Temporal Factor	Annual
Aggregate Statistics	See Firm_Synthesis\09_NES.xlsx
Pricing	Free
Contact Info	ewd.nonemployer.statistics@census.gov
Data Use	The data can be used to develop production consumption equations by providing employment information for generating the equations.
Data overlaps	None.
Data limitations	
Forecast	No
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available - At County level.

## 4.0 Logistics Chain Models

The logistics network models the supply-driven product flows from one facility to another, with freight moving from raw material sources to manufacturing plants, then on to distribution centers or warehouses or to retailers, and from there to final demand markets (i.e., customers). The objectives are to minimize total transaction costs and maximize satisfaction of the product demands involved at each stage. The following secondary data sources can help model logistics chains:

- Commodity Flow Survey (CFS) (**Table 13**)
- Freight Analysis Framework (FAF) (**Table 14**)
- TRANSEARCH (**Table 15**)
- Surface Transportation Bureau (STB) Carload Waybill Sample (**Table 16** **Table 16. Surface Transportation Board (STB) Carload Waybill Sample Metadata**)
- Air Carrier Statistics (**Table 17**)
- North American Trans-border Freight Database (**Table 18**)
- Port Import/Export Reporting Service (PIERS) (**Table 19**)



**Table 13. Commodity Flow Survey (CFS) Metadata**

Name	Commodity Flow Survey
Agency/Source	Available from the U.S. Census 
Data Type	Transportation Statistics, Shipper Surveys
Description	The CFS data are used by policy makers and transportation planners in various federal, state, and local agencies for assessing the demand for transportation facilities and services, energy use, and safety risk and environmental concerns. Additionally, business owners, private researchers, and analysts use the CFS data for analyzing trends in the movement of goods, mapping spatial patterns of commodity and vehicle flows, forecasting demands for the movement of goods, and determining needs for associated infrastructure and equipment.
Data Coverage	<p>The CFS covers business establishments in the following industries: Mining, Manufacturing, Wholesale trade, Select Retail and Services.</p> <p>The survey also covers selected auxiliary establishments (e.g., warehouses) of in-scope, multi-unit, and retail companies. Industries not covered by CFS include transportation, construction, most retail and services industries, farms, fisheries, foreign establishments, and most government-owned establishments.</p> <p>Shipment coverage: The CFS collects data on shipments originating from within-scope industries, including exports. Imports are not included until the point that they leave the importer’s initial domestic location for shipment to another location. The survey does not cover shipments originating from business establishments located in Puerto Rico and other U.S. possessions and territories.</p>
Modes of Freight	Truck, Rail, Air, Water, Pipeline, Other
Commodities	SCTG Commodities
Years of Data	Since 1993 and conducted in years ending in 2 and 7
Format of Data	Downloadable from American Fact Finder
Geographic Level	Consolidated Statistical Area or Metropolitan Statistical Area as defined by OMB
Temporal Factor	Once every Five years
Aggregate Statistics	See Logistics_Chain\01_2012_CFS_data.xlsx
Pricing	Free
Contact Info	<a href="http://www.census.gov/econ/cfs/">http://www.census.gov/econ/cfs/</a>
Data Use	Used to analyze trends in goods movement over time, develop models and analytical tools for policy analysis and investment decisions, forecast future demand for goods movement, analyze and map spatial patterns of commodity and vehicle flows.
Data overlaps	
Data limitations	Temporal and spatial resolution makes it difficult to account for small geography swings in the economy
Forecast	No
Model Uses	Estimation – No; Calibration – Yes; Validation – Yes; Control Totals Available - Yes

**Table 14. Freight Analysis Framework (FAF) Metadata**

Name	Freight Analysis Framework (FAF)
Agency/Source	FHWA  U.S. Department of Transportation <b>Federal Highway Administration</b>
Data Type	Transportation Statistics
Description	FAF integrates data from a variety of sources to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation.
Data Coverage	FAF provides estimates of freight measures available in FAF3 include value, tons, and domestic ton-miles by mode of transportation, for type of commodity, between and within states or the 123 domestic FAF regions, and to and from 8 foreign regions for exports and imports.
Modes of Freight	Truck, Rail, Air, Water, Pipeline, Other
Commodities	SCTG Commodities
Years of Data	Since 1997 and based on the CFS as the primary data source.
Format of Data	Access Tables
Geographic Level	Consolidated Statistical Area or Metropolitan Statistical Area as defined by OMB and rest of state
Temporal Factor	Once every Five years
Aggregate Statistics	See Logistics_Chain\02_FAF3_summary_032015.xlsx
Pricing	Free
Contact Info	<a href="http://faf.ornl.gov/fafweb/Default.aspx">http://faf.ornl.gov/fafweb/Default.aspx</a>
Data Use	The FAF helps users understand the movement of freight between regions within the US and between the US and the rest of the world.
Data overlaps	TRANSEARCH provides similar data but uses STCC instead of SCTG codes and data is available at county level. Data can also be purchased from TRANSEARCH at the Zip code and TAZ levels.
Data limitations	Temporal and spatial resolution makes it difficult to account for small geography as well as swings in the economy
Forecast	Yes
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available - Yes



Table 15. TRANSEARCH Metadata

Name	TRANSEARCH
Agency/Source	IHS Global Insight 
Data Type	Transportation Statistics
Description	TRANSEARCH is an annual database of U.S. county-level freight movement data used for freight modeling and forecasting.
Data Coverage	TRANSEARCH includes market-to-market flow data for more than 450 individual commodities and seven modes of transportation at the county level
Modes of Freight	Truck, Rail, Air, Water, Pipeline, Other
Commodities	STCC Commodities
Years of Data	Since 1995 and available yearly
Format of Data	Access database
Geographic Level	US County and BEA regions (outside of geography of interest)
Temporal Factor	Annual
Aggregate Statistics	See Logistics_Chain\03_TRANSEARCH.xlsx
Pricing	Ranges from \$28,000 to \$500,000
Contact Info	844-301-7334
Data Use	Used to analyze trends in goods movement over time, develop models and analytical tools for policy analysis and investment decisions, forecast future demand for goods movement, analyze and map spatial patterns of commodity and vehicle flows.
Data overlaps	FAF provides similar data but uses SCTG instead of STCC codes and data is not available at TAZ level in the standard tables but available as special tabulations
Data limitations	Methodology not very transparent
Forecast	Yes
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available - Yes

**Table 16. Surface Transportation Board (STB) Carload Waybill Sample Metadata**

Name	Carload Waybill Sample
Agency/Source	Surface Transportation Board 
Data Type	Transportation Statistics
Description	The Carload Waybill Sample is a stratified sample of carload waybills for all U.S. rail traffic submitted by those rail carriers terminating 4,500 or more revenue carloads annually.
Data Coverage	Under statute (49 CFR Part 1244) each railroad is required to file waybill sample information for all line-haul revenue waybills terminated on its lines if it terminates at least 4,500 revenue carloads in any of the three preceding years, or if it terminates at least 5% of the revenue carloads terminating in any state in any of the three preceding years.
Modes of Freight	Rail
Commodities	STCC Commodities
Years of Data	Since 1972 and available yearly (2013 most current)
Format of Data	ASCII Files
Geographic Level	BEA Regions
Temporal Factor	Annual
Aggregate Statistics	See Logistics_Chain\04_STBWaybill2013_040615.xlsx
Pricing	Free
Contact Info	<a href="http://www.stb.dot.gov/stb/industry/econ_waybill.html">http://www.stb.dot.gov/stb/industry/econ_waybill.html</a>
Data Use	Used to understand rail flow and for development of state transportation plans. Also used to develop TRANSEARCH rail tables.
Data overlaps	None
Data limitations	The Public Use Waybill Sample is restricted to BEA Regions. The confidential Waybill Sample data is available at the county level but is subject to approval by STB.
Forecast	Yes: MAG has 2009, 2020, 2035, 2040 and 2050 Waybill Sample data at the County level. Since the dataset is confidential, data summary cannot be provided in this report.
Model Uses	Estimation – No; Calibration – Yes; Validation – Yes; Control Totals Available - Yes



Table 17. Air Carrier Statistics Metadata

Name	Air Carrier Statistics
Agency/Source	US DOT Office of the Secretary – Research (OST-R) 
Data Type	Transportation Statistics
Description	The Air Carrier Statistics database contains domestic and international air carrier traffic information on US and foreign air carriers having at least one point of service in the United States.
Data Coverage	Large carriers with annual operating revenues of \$20 million or more
Modes of Freight	Air
Commodities	None
Years of Data	Since 1990 and available yearly (2014 most current)
Format of Data	CSV
Geographic Level	Airport
Temporal Factor	Monthly
Aggregate Statistics	See Logistics_Chain\05_AirCarrierStats_1995-2014_PHXTUS.xlsx
Pricing	Free
Contact Info	
Data Use	Used to understand air flow and for development of state transportation plans.
Data overlaps	None
Data limitations	Commodity information and value of goods is not available.
Forecast	No
Model Uses	Estimation –No; Calibration – Yes; Validation – Yes; Control Totals Available - Yes



Table 18. North American Trans-border Freight Database Metadata

Name	Trans-border Freight Database
Agency/Source	US DOT Office of the Secretary – Research (OST-R) 
Data Type	Transportation Statistics
Description	The Trans-border Freight Database contains freight flow information by commodity type and mode for US Exports and Imports from Canada and Mexico.
Data Coverage	Beginning with the 1997 data, the North American Trans-border Freight Data represents official U.S. trade with Canada and Mexico for shipments that entered or exited the United States by surface modes of transport (other than air or maritime vessel). The data from April 1993 to December 1996 included official U.S. trade with Canada and Mexico by surface modes and trans-shipments that moved from a third country through Canada or Mexico to the United States or from the United States to a third country through Canada or Mexico. For this time period, it was not possible to separate transshipment activity from the official trade activity at the detailed level. Due to customer requests, BTS discontinued the inclusion of transshipment activity in the North American Trans-border Freight Data beginning with the January 1997 data month. This allows customers to perform comparable trade analyses by mode of transportation.
Modes of Freight	Truck, Rail, Air, Water, Pipeline, Other
Commodities	<a href="http://apps.bts.gov/programs/international/transborder/commodity.html">http://apps.bts.gov/programs/international/transborder/commodity.html</a>
Years of Data	Since 1990 and available yearly (2014 most current)
Format of Data	CSV
Geographic Level	State and Customs Port
Temporal Factor	Monthly
Aggregate Statistics	Logistics_Chain\06_Transborder_Freight.xlsx
Pricing	Free
Contact Info	<a href="http://apps.bts.gov/programs/international/transborder/TBDR_QA.html">http://apps.bts.gov/programs/international/transborder/TBDR_QA.html</a>
Data Use	Used to understand cross border freight movements and can help develop freight model.
Data overlaps	None
Data limitations	Commodity information not available at port level (only aggregate ports). Also only value available and weight is not available
Forecast	No
Model Uses	Estimation – No; Calibration – Yes; Validation – Yes; Control Totals Available - Yes

**Table 19. Port Import/Export Reporting Service (PIERS) Metadata**

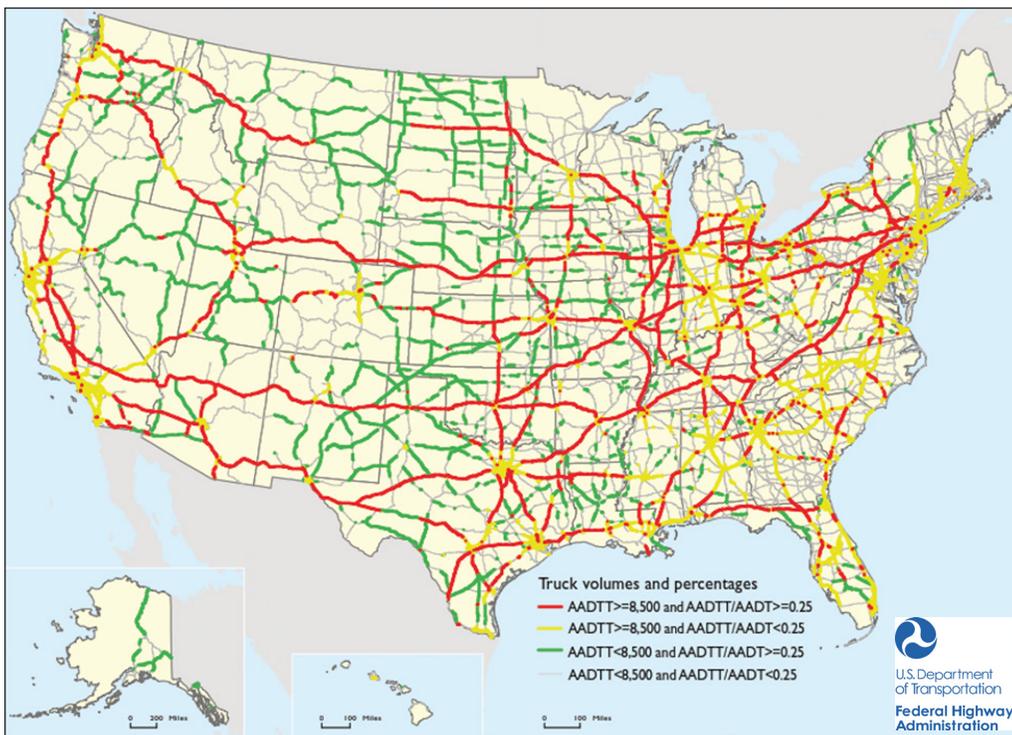
Name	PIERS
Agency/Source	IHS PIERS 
Data Type	Transportation Statistics, RFID, Terminal Data
Description	The PIERS database provides information on U.S. foreign waterborne imports and exports. The database also reports trade shipment statistics for cargo movements between ports in Mexico and South America to major trade partners around the world.
Data Coverage	Electronically filed or hard-copy freight vessel manifests submitted to the U.S. Customs Service are the source of information in the database. Vessel manifest data are collected from all foreign trade carriers at major port locations in the U.S., Mexico, Latin America, and Asia. Manual vessel manifests filed at smaller port locations are not reported in the database. Shipments are collected for the following: Containerized, Break bulk, Dry bulk, Tankers
Modes of Freight	Water
Commodities	6-digit Harmonized System Commodity classification (HS)
Years of Data	2014 Most recent
Format of Data	Excel
Geographic Level	State and Customs Port
Temporal Factor	Monthly
Aggregate Statistics	None
Pricing	\$799/month for pro version
Contact Info	Online contact form ( <a href="https://www.piers.com/ContactUs">https://www.piers.com/ContactUs</a> )
Data Use	Used to understand freight manifest, shipper and consignee party names (useful for supply chain modeling)
Data overlaps	US Census Bureau Foreign Trade Statistics has some overlaps
Data limitations	Cost
Forecast	No
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available - Unknown



## 5.0 Transportation Chain Data

The physical transportation infrastructure as goods and services move through the network from manufacturer/distributor to the final customer is manifested via the transportation chain as goods move from different modes and intermodal centers. Information such as distance, travel time, and capacity is needed for each link along the transportation chain, allowing intermodal as well as single-mode routing of freight traffic. The following sources are available for representing the transportation network:

- National Highway Performance Network (NHPN) (**Table 20**)
- ORNL Rail Network (**Table 21**)
- Vehicle Inventory and Use Survey (VIUS) (**Table 22**)
- Vehicle Travel Information System (VTRIS) (**Table 23**)
- MAG Roadway Network



**Table 20. National Highway Planning Network (NHPN) Metadata**

Name	National Highway Planning Network (NHPN)
Agency/Source	FHWA  U.S. Department of Transportation <b>Federal Highway Administration</b>
Data Type	Traffic Count Data & Network Data with Cost Functions
Description	The NHPN is a geospatial network database that contains line features representing more than 450,000 miles of highways in the United States.
Data Coverage	This database covers all principal arterials and rural minor arterials.
Modes of Freight	Truck
Commodities	N/A
Years of Data	2005 to Current
Format of Data	Shape file
Geographic Level	State
Temporal Factor	Unknown
Aggregate Statistics	See Transportation_Chain\01_NHPN.xlsx
Pricing	Free
Contact Info	<a href="http://www.fhwa.dot.gov/planning/processes/tools/nhpn/">http://www.fhwa.dot.gov/planning/processes/tools/nhpn/</a>
Data Use	Used as base network for freight modeling applications. Also can be used for validation of models.
Data overlaps	MAG Roadway network
Data limitations	Does not cover every facility type. Also, the AADT information is not updated more frequently.
Forecast	Yes
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available - No

**Table 21. ORNL Railroad Network Metadata**

Name	CTA Railroad Network
Agency/Source	CTA, ORNL 
Data Type	Network Data with Cost Functions
Description	The CTA Railroad Network is a representation of the North American railroad system that contains every railroad route in the US, Canada, and Mexico that has been active since 1993. The network is an extension of the Federal Railroad Administration’s strategic network.
Data Coverage	This database covers every railroad route in the US, Canada, and Mexico.
Modes of Freight	Rail
Commodities	N/A
Years of Data	1993 to Current
Format of Data	Shape file
Geographic Level	Unknown
Temporal Factor	Unknown
Aggregate Statistics	See Transportation_Chain\02_ORNL_Rail.xlsx
Pricing	Free
Contact Info	<a href="http://www-cta.ornl.gov/transnet/RailRoads.html">http://www-cta.ornl.gov/transnet/RailRoads.html</a> (Bruce Peterson, 865-946-1352, PetersonBE@ornl.gov)
Data Use	The data can be used for network analysis and developing railroad skims.
Data overlaps	None
Data limitations	
Forecast	No
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Maybe; Control Totals Available - No



**Table 22. Vehicle Inventory and Use Survey (VIUS) Metadata**

Name	VIUS
Agency/Source	US Census Bureau 
Data Type	Weight Data
Description	VIUS provides physical and operational characteristic data of nationwide private and commercial truck fleet. The physical characteristic data include weight, number of axles, overall length, body type, etc. for medium and heavy trucks. The operational characteristic data include commodities handled, distance traveled, mileage, etc.
Data Coverage	The VIUS excludes vehicles owned by Federal, state, or local governments; ambulances; buses; motor homes; farm tractors; and non-powered trailer units. Additionally, trucks that were included in the sample but reported to have been sold, junked, or wrecked prior to the survey year (date varies) were deemed out-of-scope.
Modes of Freight	Freight Trucks and Commercial Vehicles
Commodities	N/A
Years of Data	1997, 2002
Format of Data	Access
Geographic Level	State
Temporal Factor	The VIUS has not been updated since 2002 and current plans to develop a new version are unknown.
Aggregate Statistics	None
Pricing	Free
Contact Info	<a href="http://www.census.gov/svsd/www/vius/2002.html">http://www.census.gov/svsd/www/vius/2002.html</a>
Data Use	Used for development of truck payload factors.
Data overlaps	VTRIS
Data limitations	Lack of more current data. FHWA has plans to develop a new VIUS database.
Forecast	No
Model Uses	Estimation – No; Calibration – Yes; Validation – Yes; Control Totals Available - No



Table 23. Vehicle Travel Information System (VTRIS) Metadata

Name	VTRIS
Agency/Source	FHWA  U.S. Department of Transportation <b>Federal Highway Administration</b>
Data Type	Weight Data
Description	VTRIS provides information on vehicle travel characteristics.
Data Coverage	Unknown.
Modes of Freight	Freight Trucks and Commercial Vehicles
Commodities	N/A
Years of Data	Unknown
Format of Data	Stand Alone Executable
Geographic Level	Weight Station
Temporal Factor	Unknown
Aggregate Statistics	None
Pricing	Free
Contact Info	<a href="http://www.fhwa.dot.gov/ohim/ohimvtis.cfm">http://www.fhwa.dot.gov/ohim/ohimvtis.cfm</a>
Data Use	Used for development of truck payload factors.
Data overlaps	VTRIS
Data limitations	More information is not available.
Forecast	No
Model Uses	Estimation – No; Calibration – Yes; Validation – Yes; Control Totals Available - No

## 6.0 Truck Touring Models

Given the preponderance of trucks as a major contributor of freight, it is necessary to develop truck tour models to determine the impacts trucks have on congestion, VMT, air quality etc. Therefore it is necessary to develop truck touring models as part of behavior based freight models. Two data sources that are available include:

- ATRI Truck GPS Data (**Table 24**)
- National Performance Management Research Dataset (NPMRDS) (**Table 25**)

**Table 24. ATRI Truck GPS Data Metadata<sup>4</sup>**

Name	ATRI Truck GPS Data
Agency/Source	ATRI 
Data Type	Traffic Count and Network Data
Description	The American Transportation Research Institute (ATRI) collects truck position data throughout the U.S. and North America from a large sample of trucks that use onboard, wireless communications systems.
Data Coverage	Each record contains truck id, geographic information at lat/long level, and temporal information regarding location of a truck.
Modes of Freight	Freight Trucks
Commodities	N/A
Years of Data	2005 to Current
Format of Data	CSV Files
Geographic Level	Individual Truck Location
Temporal Factor	Every second
Aggregate Statistics	None
Pricing	Contact ATRI
Contact Info	Dan Murray 651-641-6162
Data Use	Used for development of truck touring models and for developing speed and travel time profiles.
Data overlaps	NPMRDS
Data limitations	Sample of trucks so need to develop truck expansion factors.
Forecast	No
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available – No but expansion methods are being developed using ODME (see Pinjari FDOT Report <sup>1</sup> )

4. [http://www.dot.state.fl.us/research-center/Completed\\_Proj/Summary\\_PL/FDOT-BDK84-977-20-rpt.pdf](http://www.dot.state.fl.us/research-center/Completed_Proj/Summary_PL/FDOT-BDK84-977-20-rpt.pdf)

Table 25. National Performance Management Research Dataset (NPMRDS) Metadata

Name	NPMRDS
Agency/Source	FHWA  U.S. Department of Transportation <b>Federal Highway Administration</b>
Data Type	Traffic Count and Network Data
Description	Vehicle Probe Data available for passengers and freight. ATRI data makes up the freight data.
Data Coverage	Each record contains truck id, geographic information at lat/long level, and temporal information regarding location of a truck.
Modes of Freight	Freight Trucks
Commodities	N/A
Years of Data	2013 to current
Format of Data	CSV Files
Geographic Level	Traffic Message Channel
Temporal Factor	Every 5 minutes
Aggregate Statistics	None
Pricing	Free
Contact Info	Nicole Katsikides, 202-366-6993, Nicole.Katsikides@dot.gov or Ed Strocko, 202-366-2997, Ed.Strocko@dot.gov
Data Use	Used for development of truck touring models and for developing speed and travel time profiles.
Data overlaps	ATRI Truck GPS
Data limitations	Sample of trucks so need to develop truck expansion factors.
Forecast	No
Model Uses	Estimation – Yes; Calibration – Yes; Validation – Yes; Control Totals Available – No



## 7.0 Other Data Sources

The other data sources that are relevant to MAG for the development of the Behavioral Freight Model include:

- *Inland Ports Foreign Trade Zones:* Increasingly, inbound cargo is transferred directly from an ocean carrier to railcars and then transported to an inland location, away from the more congested port itself, for further processing and distribution. These inland locations or intermodal centers serve as inland ports. Details about Arizona Inland Port Foreign Trade Zones can be found in (Other\_Data\Inland Ports\_Free Trade Zones\FTZ\_InlandPorts.xlsx).
- *Land Use Information:* The MAG demographics office has compiled information about land use in the state and a summary of land use information of Maricopa, Pima, and Pinal Counties is provided in (Other\_Data\Land\_Use\CAAG\_MAG\_PAG\_LU.xlsx).
- *Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW):* The Quarterly Census of Employment and Wages Program is a co-operative program involving the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor and the State Employment Security Agencies (SESAs). The QCEW program produces a comprehensive tabulation of employment and wage information for workers covered by State unemployment insurance (UI) laws and Federal workers covered by the Unemployment Compensation for Federal Employees (UCFE) program.

Publicly available files include data on the number of establishments, monthly employment, and quarterly wages, by NAICS industry, by county, by ownership sector, for the entire United States. These data are aggregated to annual levels, to higher industry levels (NAICS industry groups, sectors, and super-sectors), and to higher geographic levels (national, State, and Metropolitan Statistical Area (MSA)). The QCEW program serves as a near census of monthly employment and quarterly wage information by 6-digit NAICS industry at the national, State, and county levels. At the national level, the QCEW program publishes employment and wage data for nearly every NAICS industry.

At the State and area level, the QCEW program publishes employment and wage data down to the 6-digit NAICS industry level, if disclosure restrictions are met. In accordance with BLS policy, data provided to the Bureau in confidence are not published and are used only for specified statistical purposes. BLS withholds publication of UI-covered employment and wage data for any industry level when necessary to protect the identity of cooperating employers. Totals at the industry level for the States and the Nation include the non-disclosable data suppressed within the detailed tables. However, these totals cannot be used to reveal the suppressed data. Summary of the QCEW data for the state of Arizona as well as Maricopa, Pima, and Pinal Counties is provided in (Other\_Data\QCEW\QCEW.xlsx).

- MAG staff has collected information on Warehouses, Motor Carriers, Air Freight Carriers, Contract Logistics Companies, International Freight Forward Custom Brokers, Railroads and Airports for the region from the MAG Employer database. This table is provided in (Other\_Data\Freight Related Employers).



## 8.0 Summary

This report discussed the various data sources that are available and/or needed by MAG to develop a behavior based freight model. As can be seen from this overview, many public and private data sources are available to MAG to develop a behavior based freight model. However, as can be seen from the preceding sections there are gaps in the data in terms of geography, model needs, and mode. This section provides a summary of the data gaps.

### 8.1 Geography Gaps

Commodity flows across the nation are very aggregate and values and volumes of commodities by corridor also are difficult to create from available data, except at a very aggregate level. Some of the current data bases are synthesized or inputted from other not directly correlated data sets. The importance of intermodal locations and rail/highway transfer points cannot be readily determined with current data. Published data, whether rail, air or highway, do not include the modal travel times. Such information is critical in fully estimating competitive demand for transportation by mode, corridor or commodity/industry and is an existing gap.

At the state and local level, knowing local distribution, retail and warehousing movements are a major gap when examining data needs. Little is known about such movements, yet they account for a large portion of the VMT. Trip patterns, weights, vehicle configuration, and routing are not systematically collected and travel times, routing, number of stops, weights, etc. are needed.

### 8.2 Model Needs Gaps

Developing a behavior based freight model requires intimate knowledge of the commodities/products being moved, the markets and origins for those commodities, the demand nodes for the commodities and the cost and market share by modes of the overall transportation system. The datasets identified above fill some of the gaps, but cost information is a gap (and the toughest to obtain) that needs to be filled so that decision making by freight stakeholders are reflected properly in the model.

### 8.3 Mode Gaps

The data gaps dealing with the origin, destination, shipper, receiver, intermodal nodes, weight, value, commodity, etc. are all applicable to each of the modes. The data sources for the differing modes do vary somewhat in data detail and completeness. Air suffers the most as far as value of goods transported is concerned, while rail analysis needs more information on origin and destination to be made available in the public domain. Local wholesale, and retail distribution along with information on commercial vehicles is a missing data gap w.r.t. trucks.



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