NC State Freight Plan

Freight Advisory Committee

Meeting 2

CAMBRIDGE SYSTEMATICS

Agenda

- Role of freight in NC economy

- Freight flow overview

- Identification of primary freight network

- On-going tasks and next steps

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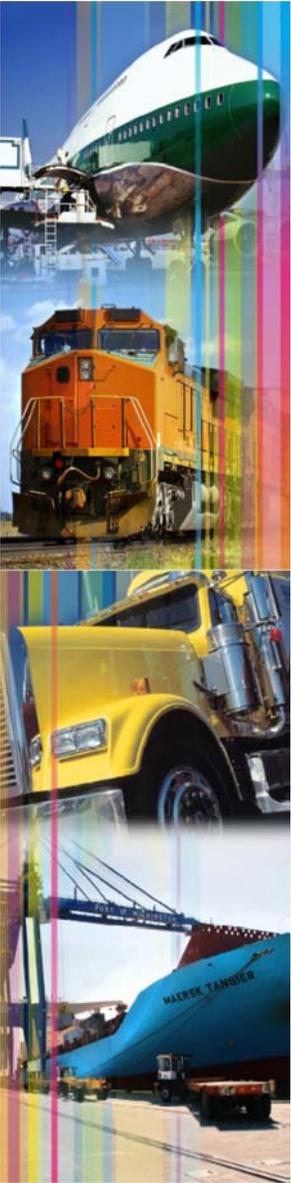
FREIGHT AND THE ECONOMY

CAMBRIDGE SYSTEMATICS

Demand for Freight Transportation

➤ Population

» Construction materials

» Consumer goods

» Waste

➤ Employment

» Construction materials

» Raw materials and intermediate goods

» Final products

» Waste

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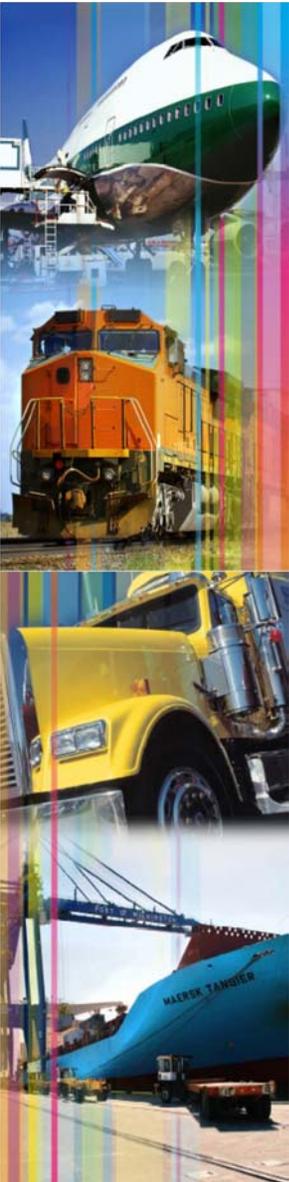
Historical Population Growth
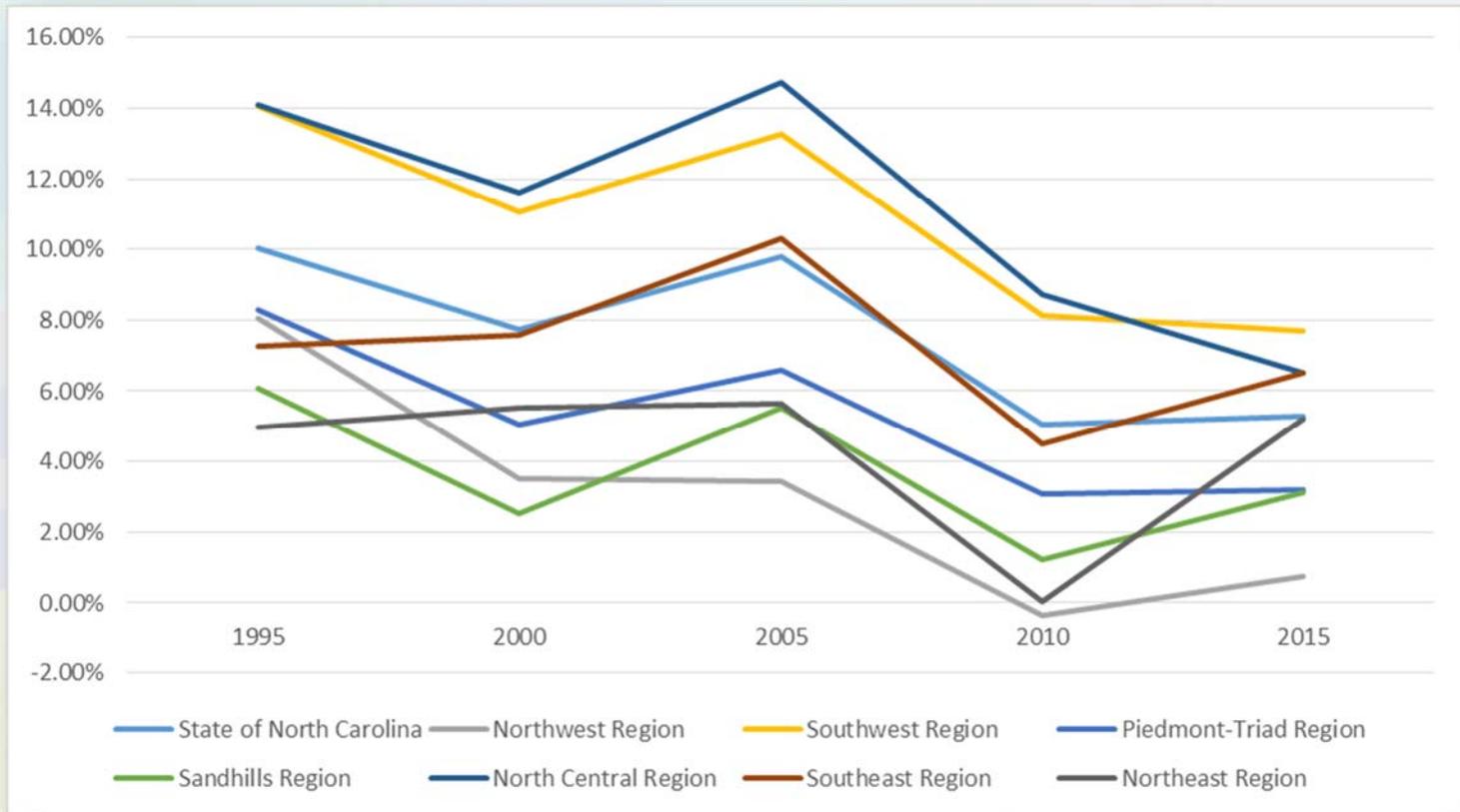
Source: U.S. Census Bureau, Population Division

Historical Population Trends

| Year	Population, 2004	Percent of Total, 2004	Population, 2014	Percent of Total, 2014	Percent Change, 2004 to 2014
North Central Region	1,849,432	21.6%	2,326,414	23.4%	25.8%
Southwest Region	1,781,617	20.8%	2,202,342	22.2%	23.6%
Piedmont-Triad Region	1,496,115	17.5%	1,654,885	16.6%	10.6%
Southeast Region	891,745	10.4%	1,036,686	10.4%	16.3%
Sandhills Region	811,249	9.5%	869,571	8.7%	7.2%
Western Region	630,232	7.4%	697,176	7.0%	10.6%
Northeast Region	564,593	6.6%	605,127	6.1%	7.2%
Northwest Region	528,169	6.2%	548,186	5.5%	3.8%
State of North Carolina	8,553,152	100%	9,940,387	100%	16.2%

Source: U.S. Census Bureau, Population Division

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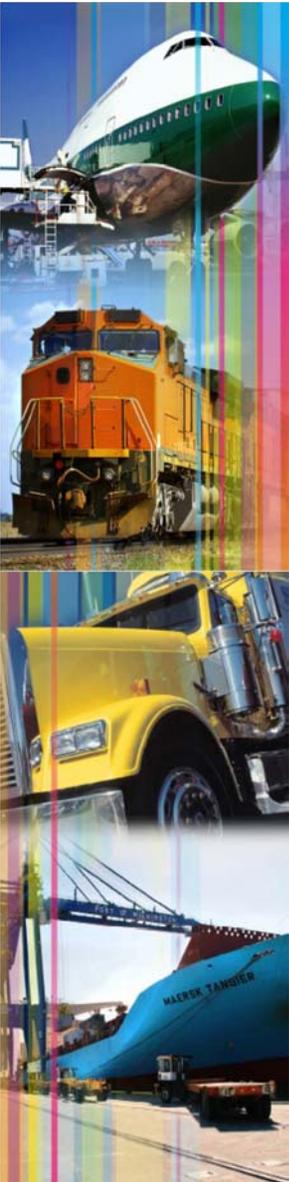
Projected Population Growth, by Region
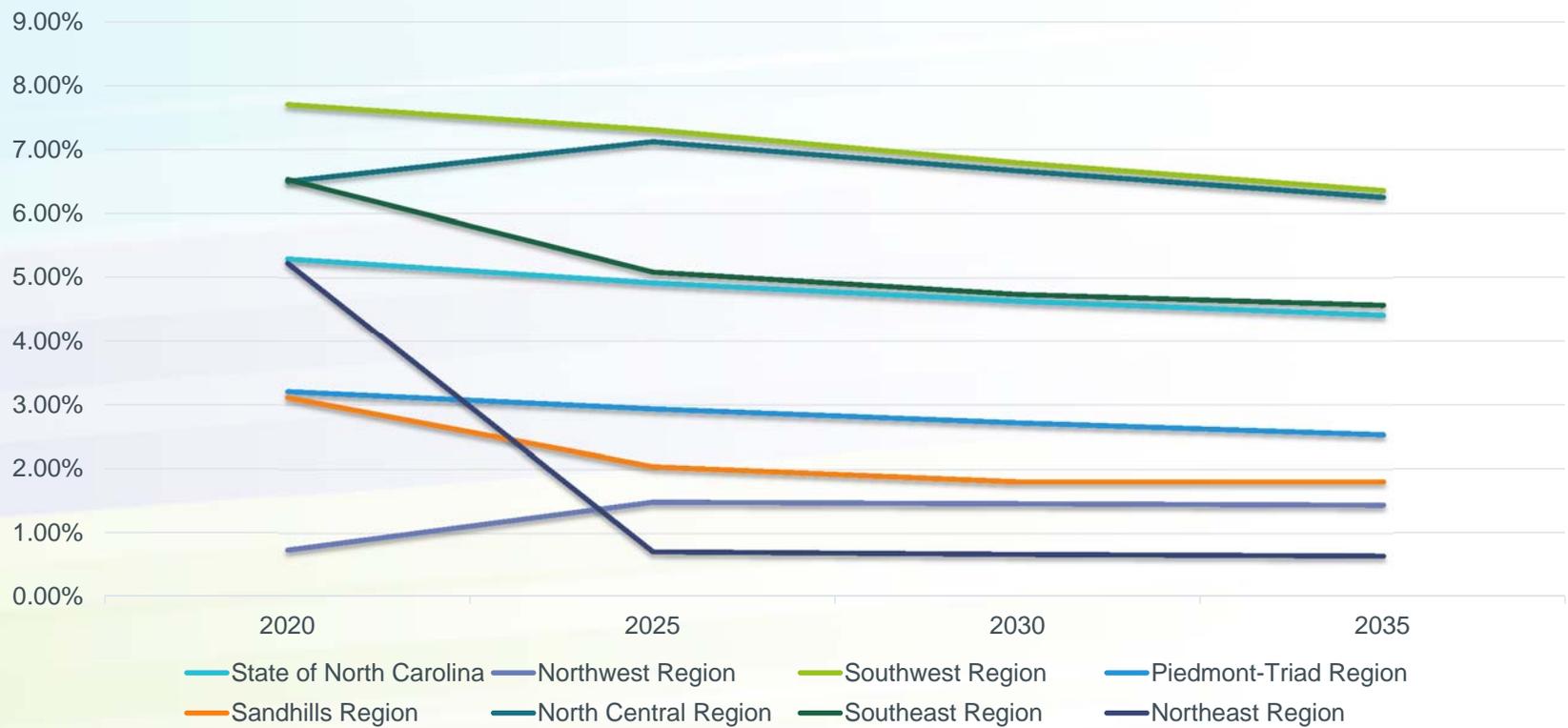
Projected Population Growth, by Region

Year	State of North Carolina	Western Region	Northwest Region	Southwest Region	Piedmont-Triad Region	Sandhills Region	North Central Region	Southeast Region	Northeast Region
2020	10,574,718	724,373	552,852	2,412,933	1,718,895	895,334	2,520,874	1,112,898	636,559
2025	11,095,319	750,906	561,091	2,589,204	1,769,420	913,635	2,700,373	1,169,577	641,113
2030	11,609,883	777,035	569,324	2,765,021	1,817,550	930,151	2,880,330	1,225,028	645,444
2035	12,122,640	802,770	577,541	2,940,762	1,863,619	946,982	3,060,296	1,281,038	649,632

Source: North Carolina Office of Management and Budget, County/State Population Projections

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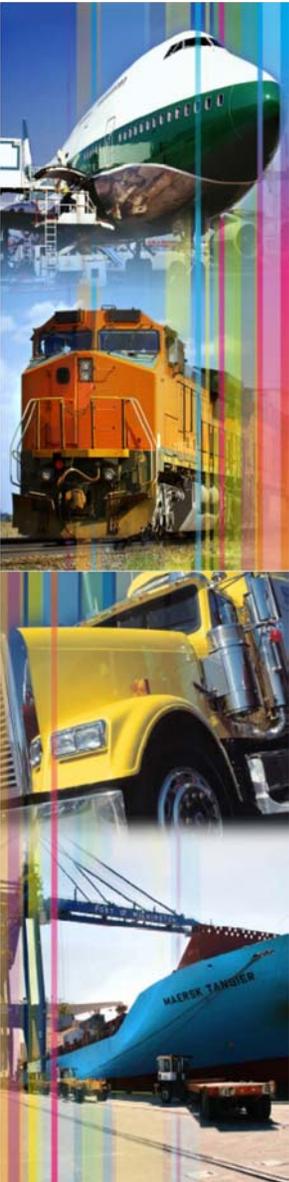
2014 Employment by Industry, Percentage

| Industry	Share of Total
Agriculture, forestry, fishing and hunting	0.7%
Mining, quarrying, and oil and gas extraction	0.1%
Utilities	0.4%
Construction	4.4%
Manufacturing	11.1%
Wholesale trade	4.4%
Retail trade	11.8%
Transportation and warehousing	3.3%
Information	1.8%
Finance and insurance	3.8%
Real estate and rental and leasing	1.3%
Professional and technical services	5.2%
Management of companies and enterprises	2.0%
Administrative and waste services	7.0%
Educational services	9.2%
Health care and social assistance	14.3%
Arts, entertainment, and recreation	1.5%
Accommodation and food services	9.4%
Other services, except public administration	2.5%
Public administration	5.9%

36.2% jobs in freight dependent industries

Employment by Industry, 2014


Horizontal bar chart showing employment by industry:

- Public administration: ~240,000
- Other services, except public administration: ~100,000
- Accommodation and food services: ~385,000
- Arts, entertainment, and recreation: ~60,000
- Health care and social assistance: ~580,000
- Educational services: ~370,000
- Administrative and waste services: ~285,000
- Management of companies and enterprises: ~80,000
- Professional and technical services: ~210,000
- Real estate and rental and leasing: ~55,000
- Finance and insurance: ~155,000
- Information: ~75,000
- Transportation and warehousing: ~130,000
- Retail trade: ~480,000
- Wholesale trade: ~175,000
- Manufacturing: ~450,000
- Construction: ~180,000
- Utilities: ~15,000
- Mining, quarrying, and oil and gas extraction: ~5,000
- Agriculture, forestry, fishing and hunting: ~30,000

X-axis: 0, 100,000, 200,000, 300,000, 400,000, 500,000, 600,000, 700,000

1.5 million jobs in freight dependent industries

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Transportation and Warehousing Employment, 2014

Category	Employment
Air transportation	13,542
Rail transportation	14
Water transportation	504
Truck transportation	41,131
Transit and ground passenger transportation	7,850
Pipeline transportation	229
Scenic and sightseeing transportation	342
Support activities for transportation	15,736
Postal service	18,366
Couriers and messengers	15,087
Warehousing and storage	20,701

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Manufacturing Employment, 2014
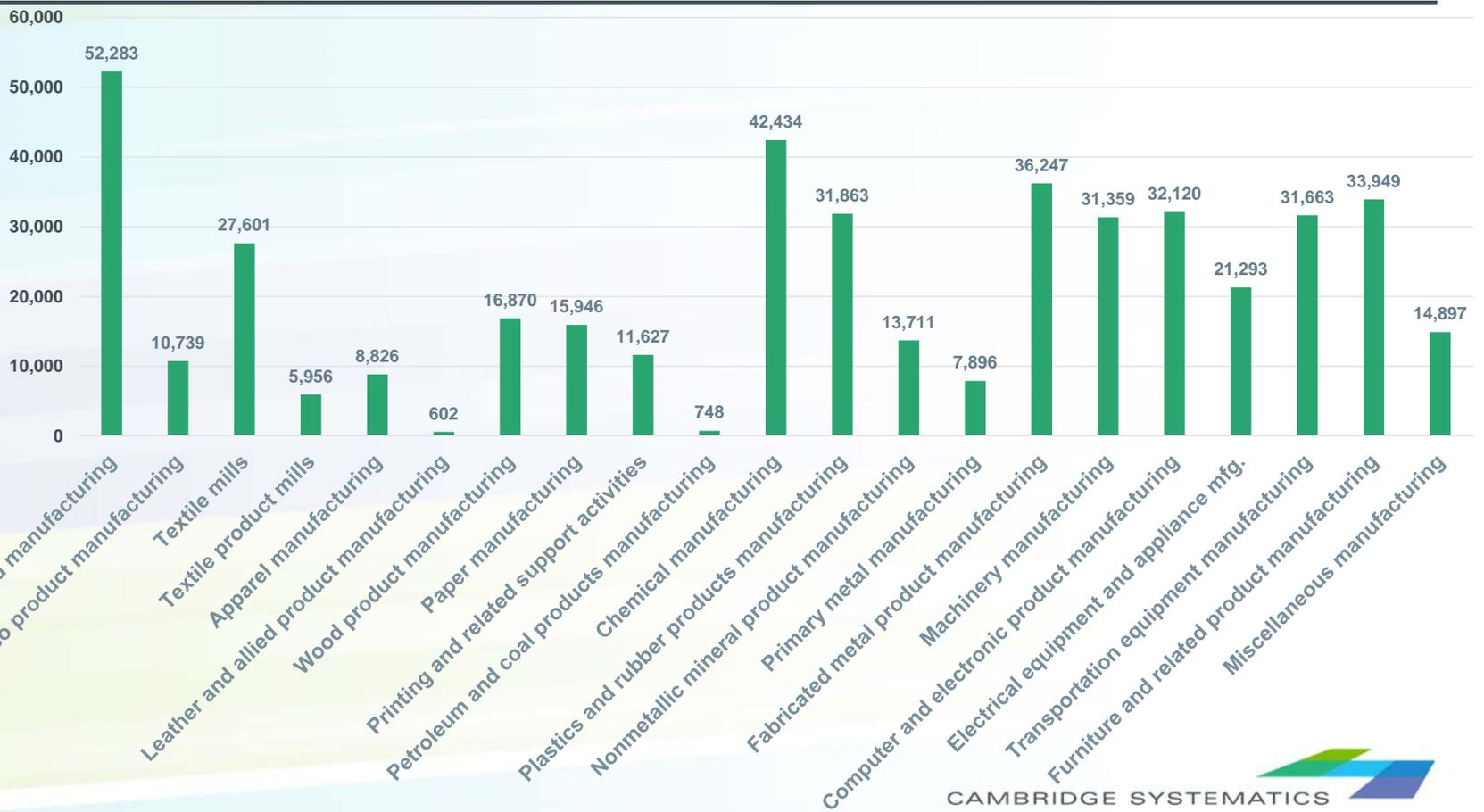
Wholesale and Retail Trade Employment, 2014

Category	Employment
Merchant wholesalers, durable goods	88,331
Merchant wholesalers, nondurable goods	56,762
Electronic markets and agents and brokers	31,660
Motor vehicle and parts dealers	62,838
Furniture and home furnishings stores	14,946
Electronics and appliance stores	13,561
Building material and garden supply stores	39,862
Food and beverage stores	88,481
Health and personal care stores	32,895
Gasoline stations	28,995
Clothing and clothing accessories stores	36,732
Sporting goods, hobby, book and music…	17,527
General merchandise stores	106,618
Miscellaneous store retailers	24,571
Nonstore retailers	11,661

Number of Establishments in Freight Dependent Industries, 2014

Agriculture, forestry, fishing and hunting, 3,093

Transportation and warehousing, 6,911

Mining, quarrying, and oil and gas extraction, 235

Construction, 24,789

Utilities, 476

Retail trade, 34,009

Manufacturing, 10,316

Wholesale trade, 20,082

Nearly 99,500 freight dependent establishments

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Key Industry Trends – Food Manufacturing Location Quotient

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Key Industry Trends – Chemical Manufacturing Location Quotient

Legend: NC, SC, GA, VA

Key Industry Trends – Plastics and Rubber Manufacturing Location Quotient

	1990	1995	2000	2005	2010	2014

Legend: NC, SC, GA, VA

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Key Industry Trends – Trucking Location Quotient

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FREIGHT FLOW OVERVIEW

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Freight Flow Overview

➢ FHWA Freight Analysis Framework (FAF) Version 4

➢ FHWA provides at BEA region level

➢ CS developed process for disaggregation to county level

➢ County level flows for inbound, outbound, through and intrastate flows by commodity and mode

➢ Completed initial disaggregation and conducting validation

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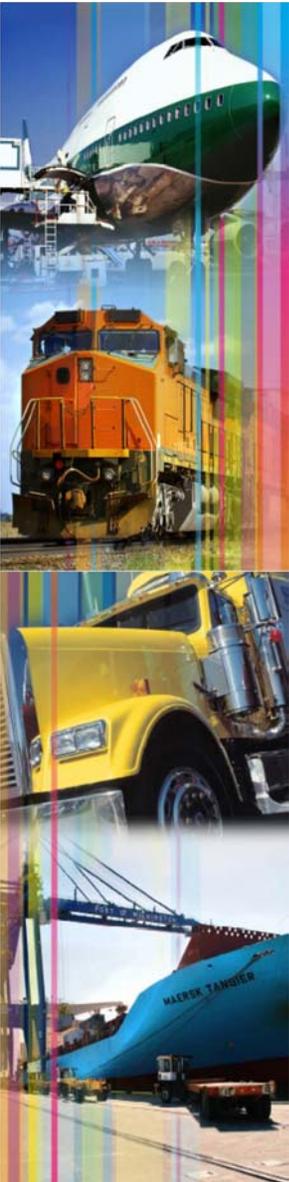
Total Freight Demand, 2012

Total (2012): 556 million tons
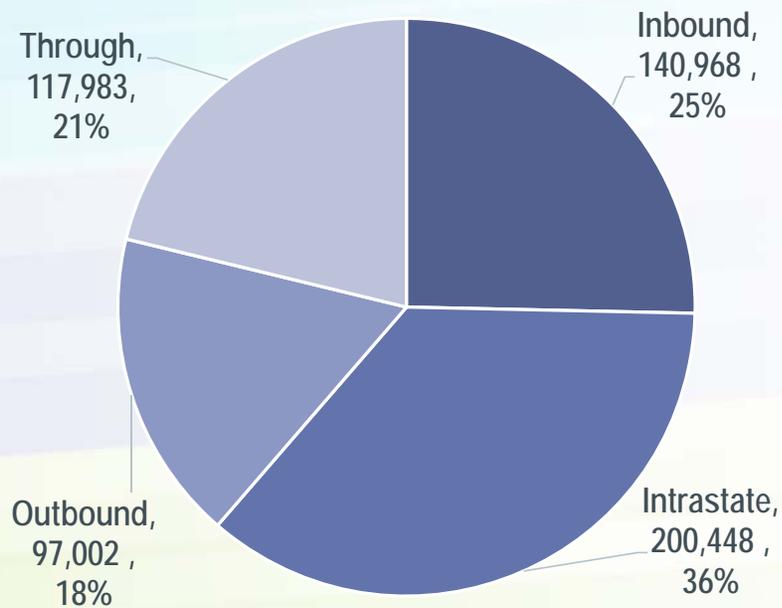
Total (2012): $691 billion
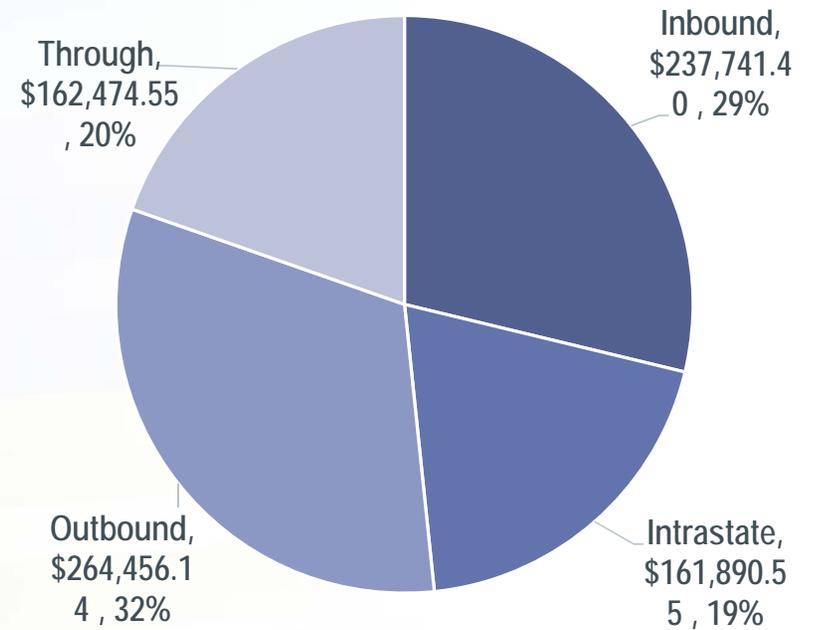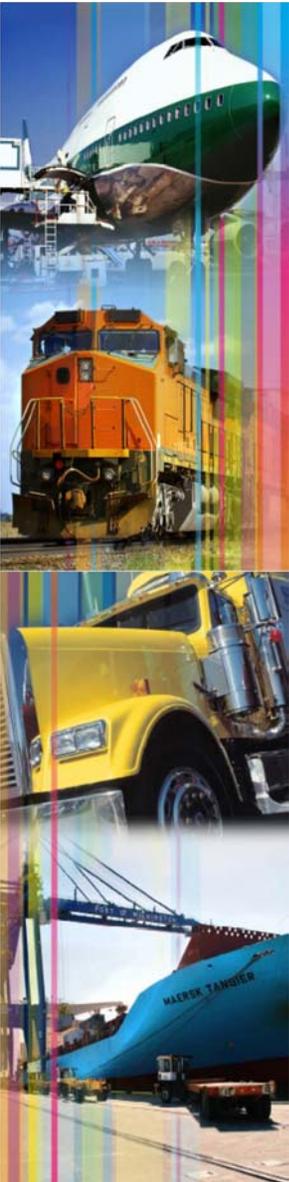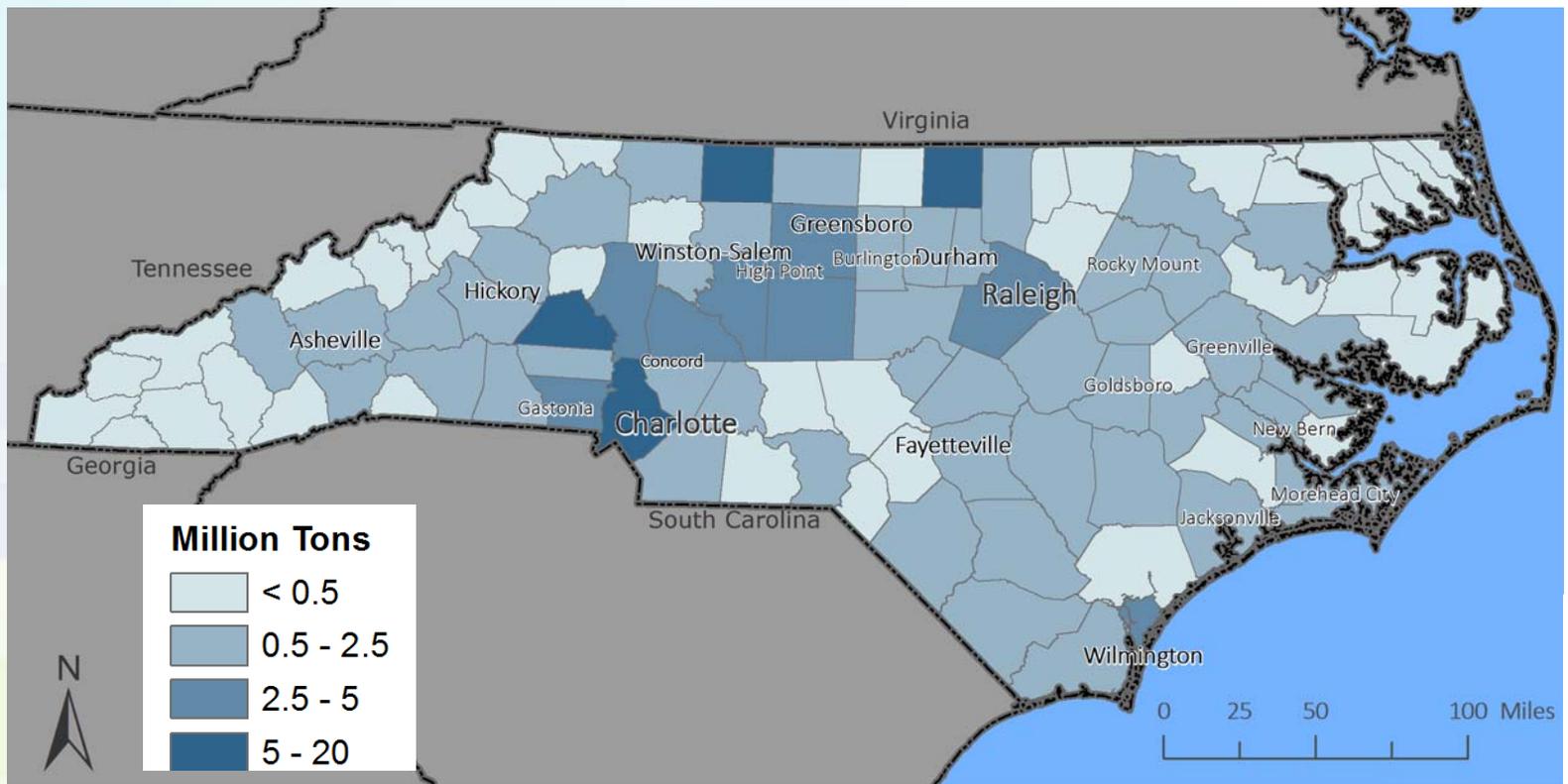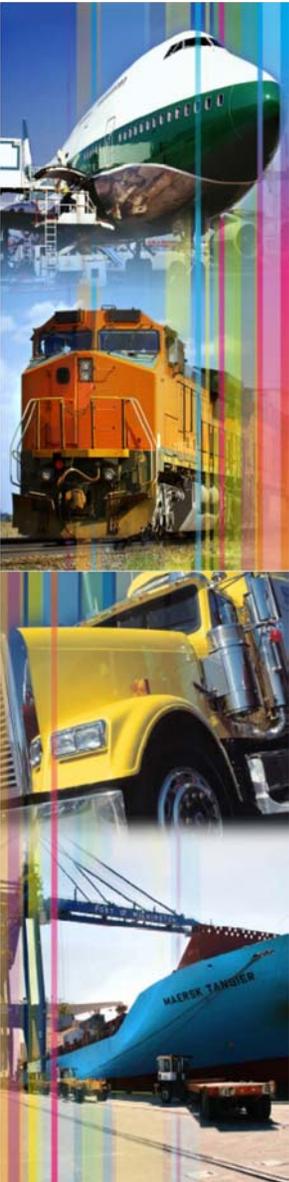
Left pie chart (556 million tons):
- Inbound, 140,968, 25%
- Intrastate, 200,448, 36%
- Outbound, 97,002, 18%
- Through, 117,983, 21%

Right pie chart ($691 billion):
- Inbound, $237,741.40, 29%
- Intrastate, $161,890.55, 19%
- Outbound, $264,456.14, 32%
- Through, $162,474.55, 20%

FHWA, FAF 4

Inbound Freight Tonnage, 2012

FHWA, FAF 4

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Outbound Freight Tonnage, 2012

FHWA, FAF 4

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Total Freight Demand, 2012

Tonnage

Air 0.06%
Other 0.03%
Multiple modes & mail 2.72%
Water 1.65%
Pipeline 6.80%
Rail 13.14%
Truck 75.60%

Value

Water 1.17%
Air 3.08%
Other 0.12%
Pipeline 1.12%
Multiple modes & mail 11.87%
Rail 2.66%
Truck 79.99%
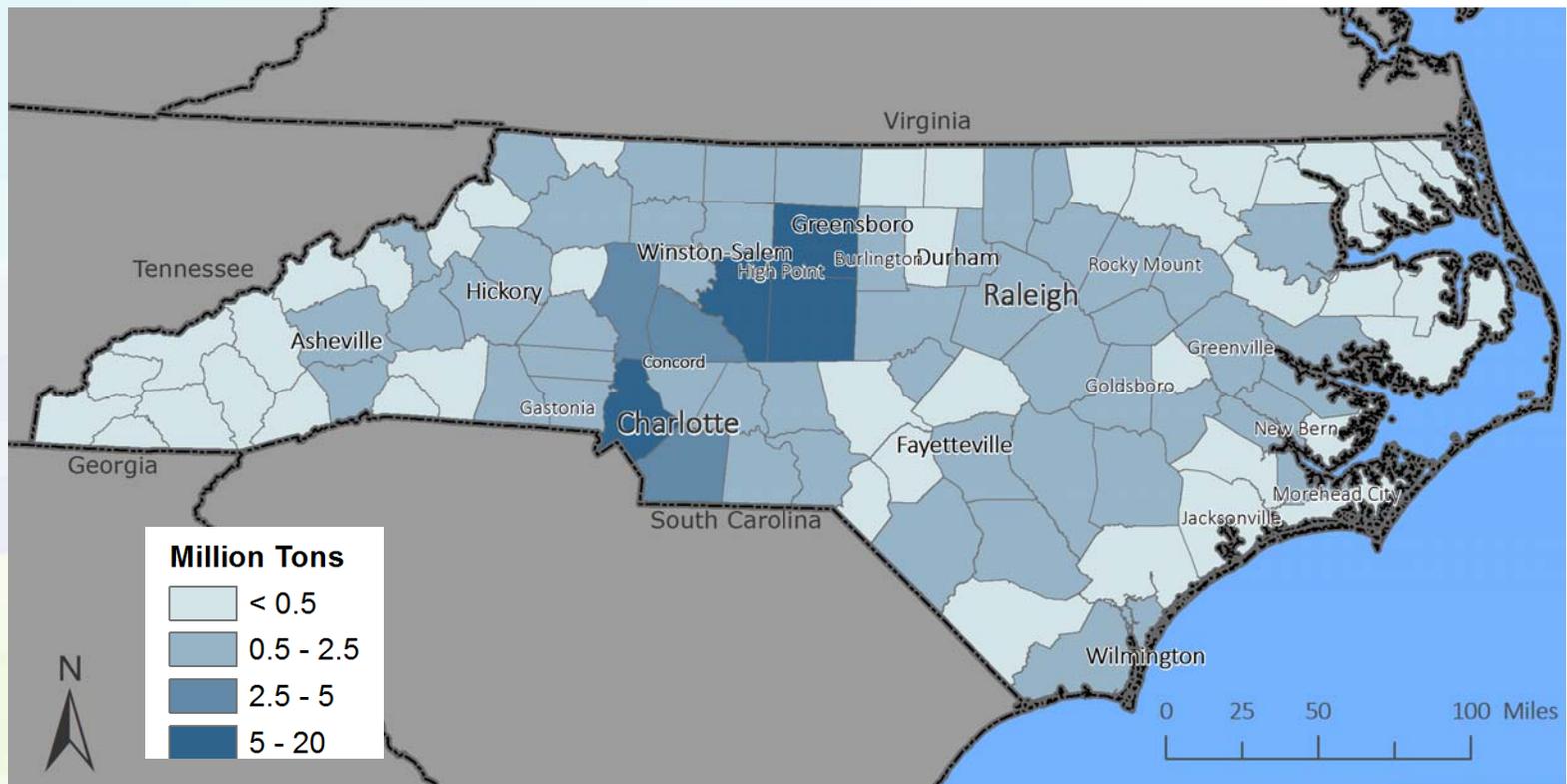
FHWA, FAF 4

CAMBRIDGE SYSTEMATICS
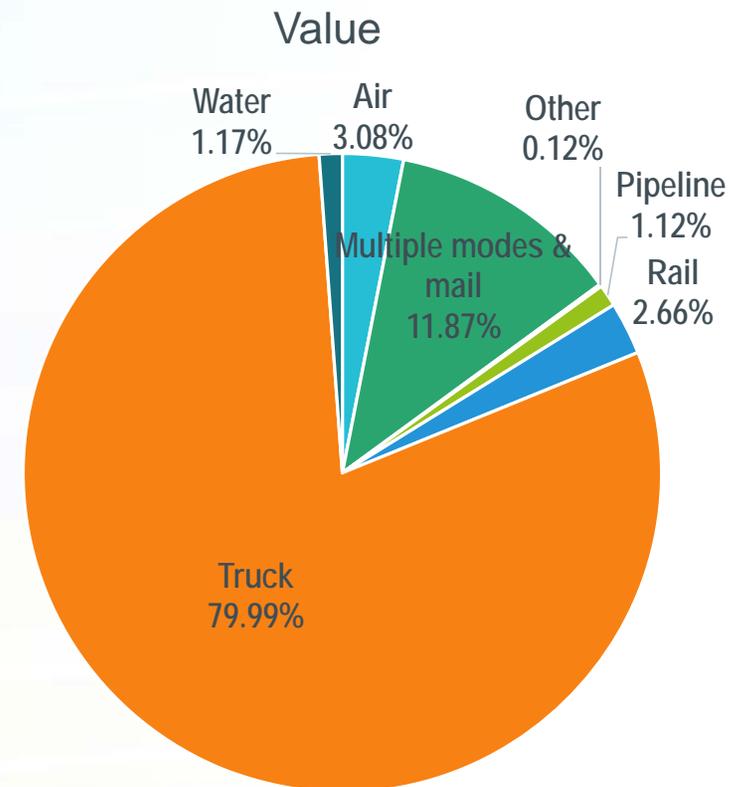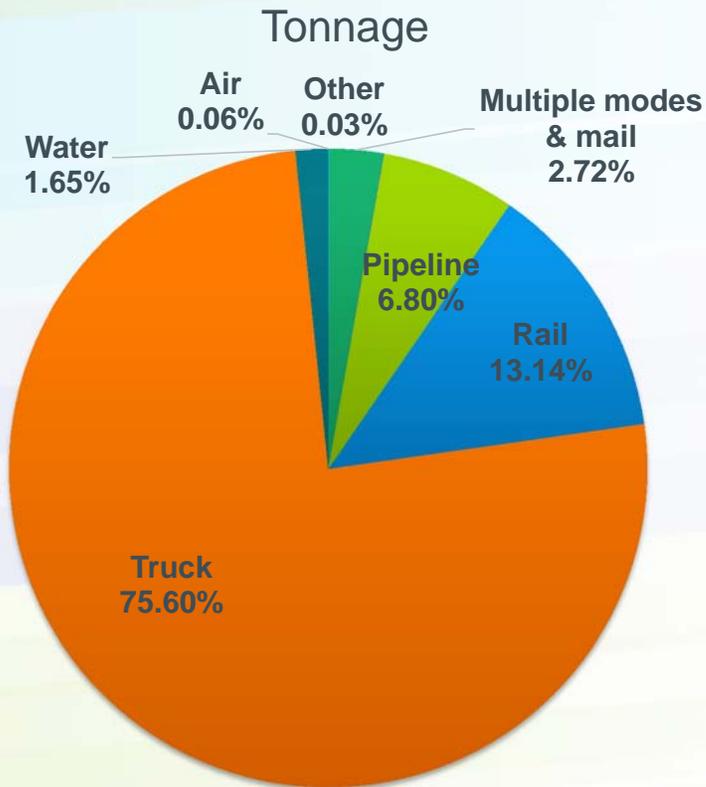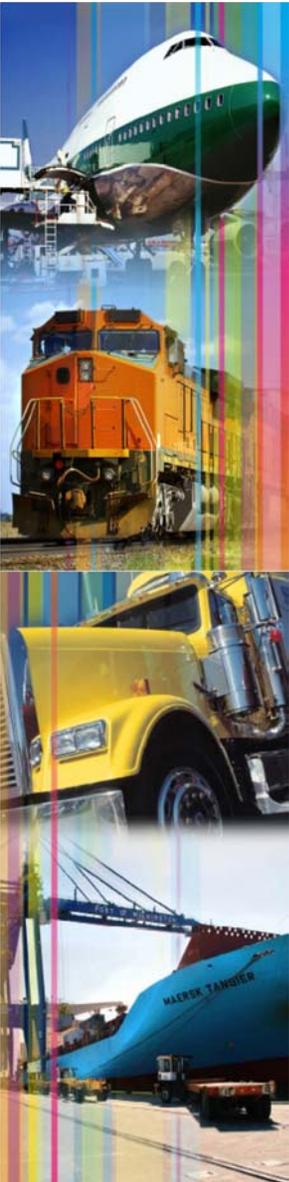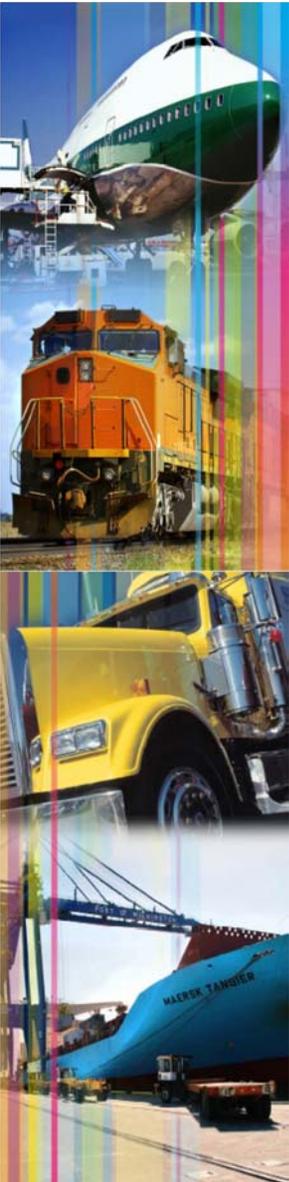
Freight Demand Growth, 2012-2045

	Inbound	Intrastate	Outbound	Through	Total
■ tons_2012	140,968	200,448	97,002	117,983	556,400
■ tons_2045	204,421	270,392	172,410	181,217	828,440

FHWA, FAF 4

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Top 10 Commodities, Tons

FHWA, FAF 4

CAMBRIDGE SYSTEMATICS
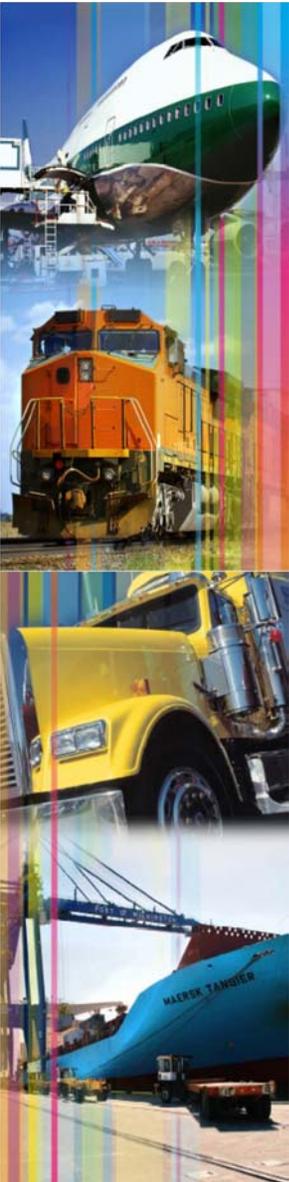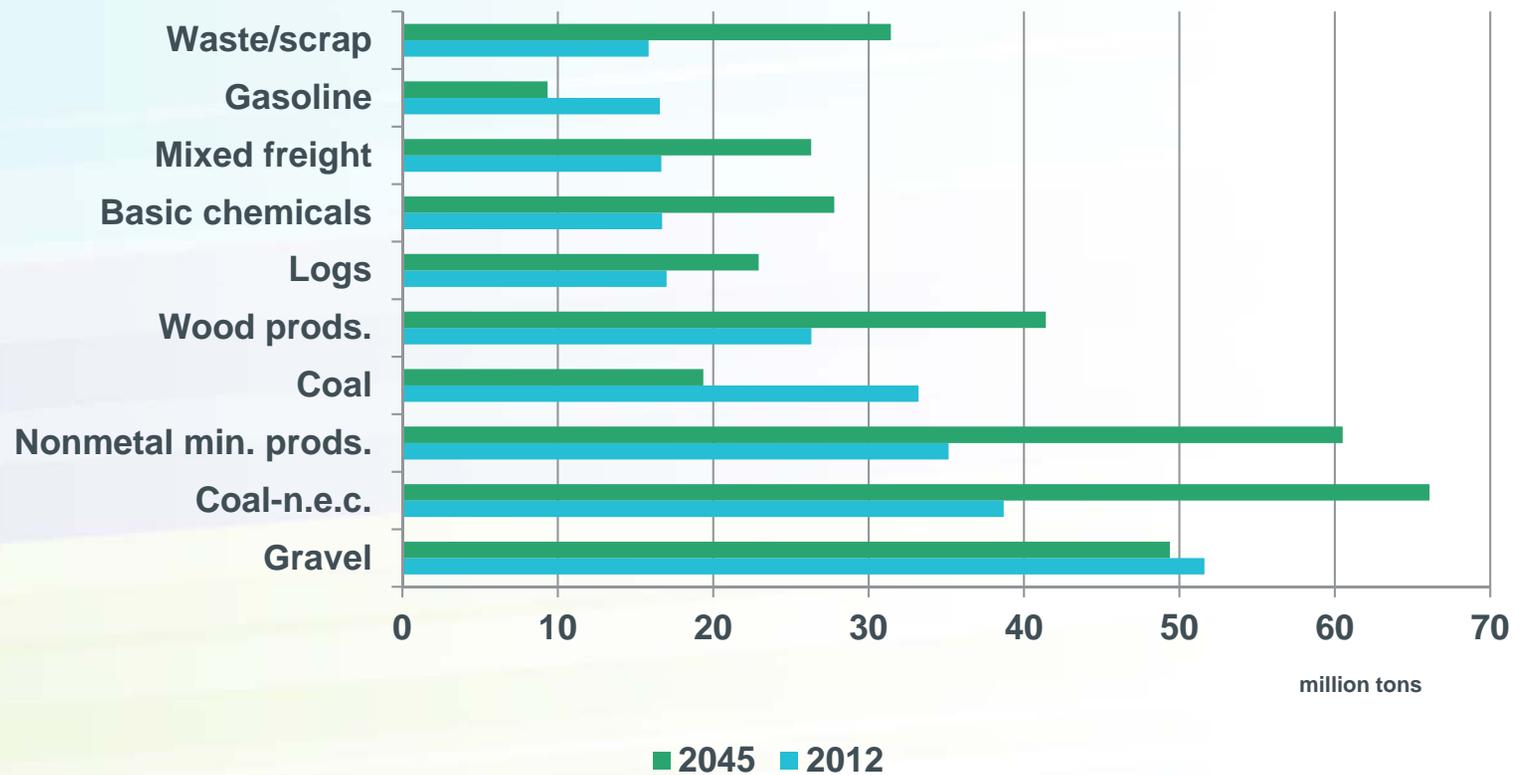
Top 10 Commodities, Value

billion dollars

FHWA, FAF 4

■ 2045 ■ 2012

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IDENTIFICATION OF PRIMARY FREIGHT NETWORK

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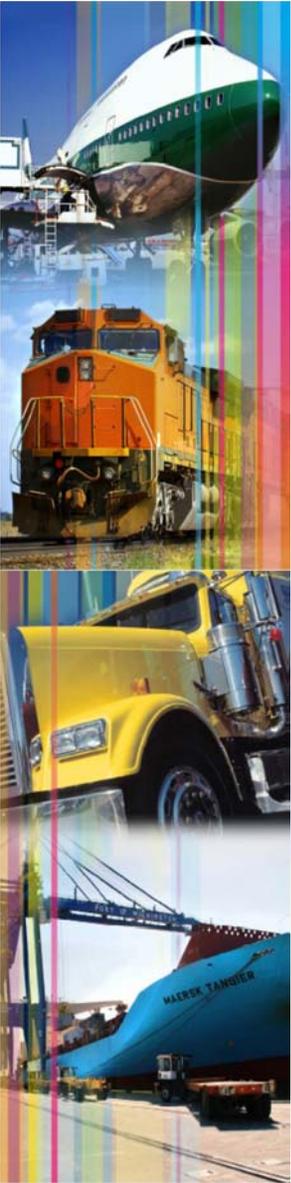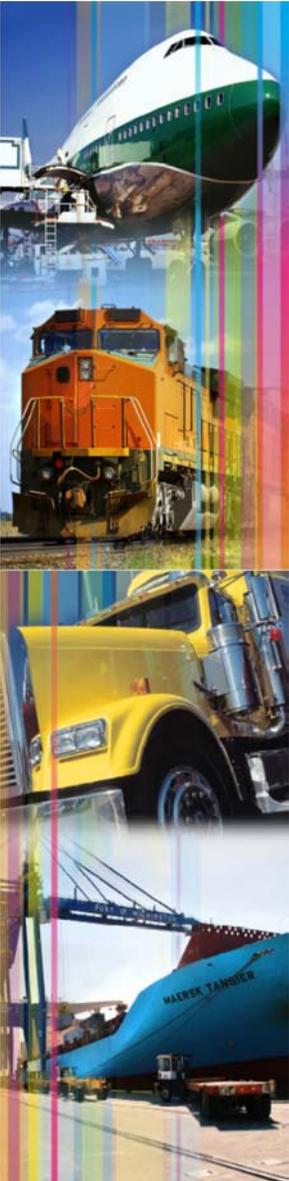
National Highway Freight Network

➤ **Primary Highway Freight System (PHFS):** Highways identified as the most critical highway portions of the U.S. freight transportation system consisting of 41,518 miles, including 37,436 Interstate miles and 4,082 miles of non-Interstate roads.

➤ **Other Interstate portions not on the PHFS:** Remaining portion of Interstate roads not included in the PHFS.
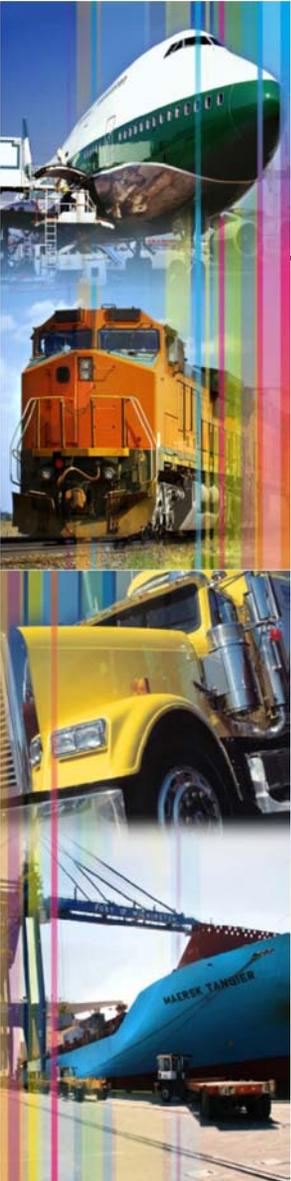
National Highway Freight Network

➤ **Critical Rural Freight Corridors (CRFCs):** Public roads not in an urbanized area which provide access and connection to the PHFS and the Interstate with other important ports, public transportation facilities, or other intermodal freight facilities.

➤ **Critical Urban Freight Corridors (CUFCs):** These are public roads in urbanized areas which provide access and connection to the PHFS and the Interstate with other ports, public transportation facilities, or other intermodal transportation facilities.

National Highway Freight Network

U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations

LEGEND

NHFN Features

Primary Highway Freight System (PHFS) (approx. 41,518 miles)

Remainder of the Interstate System (not part of PHFS) (approx. 9,511 miles)

Border Crossings

December 2015
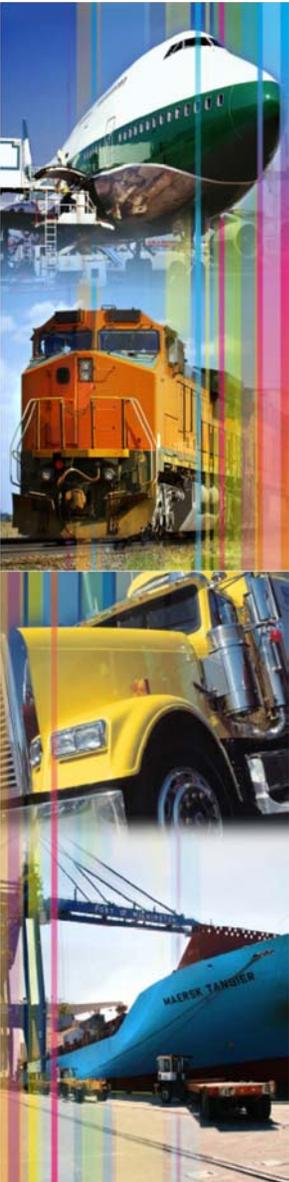
National Highway Freight Network: North Carolina

LEGEND

NHFN Features

- Primary Highway Freight System (PHFS)
- Remainder of the Interstate System (not part of PHFS)
- Border Crossings
- Cities
- State Capital
- Airport
- Port Terminal
- Truck/Pipeline Terminal
- Truck/Rail Facility
- Water
- Census Urbanized Areas

0   30   60   Miles
0   60   120   Kilometers

U.S. Department of Transportation,
Federal Highway Administration,
Office of Freight Management and Operations

December 2015
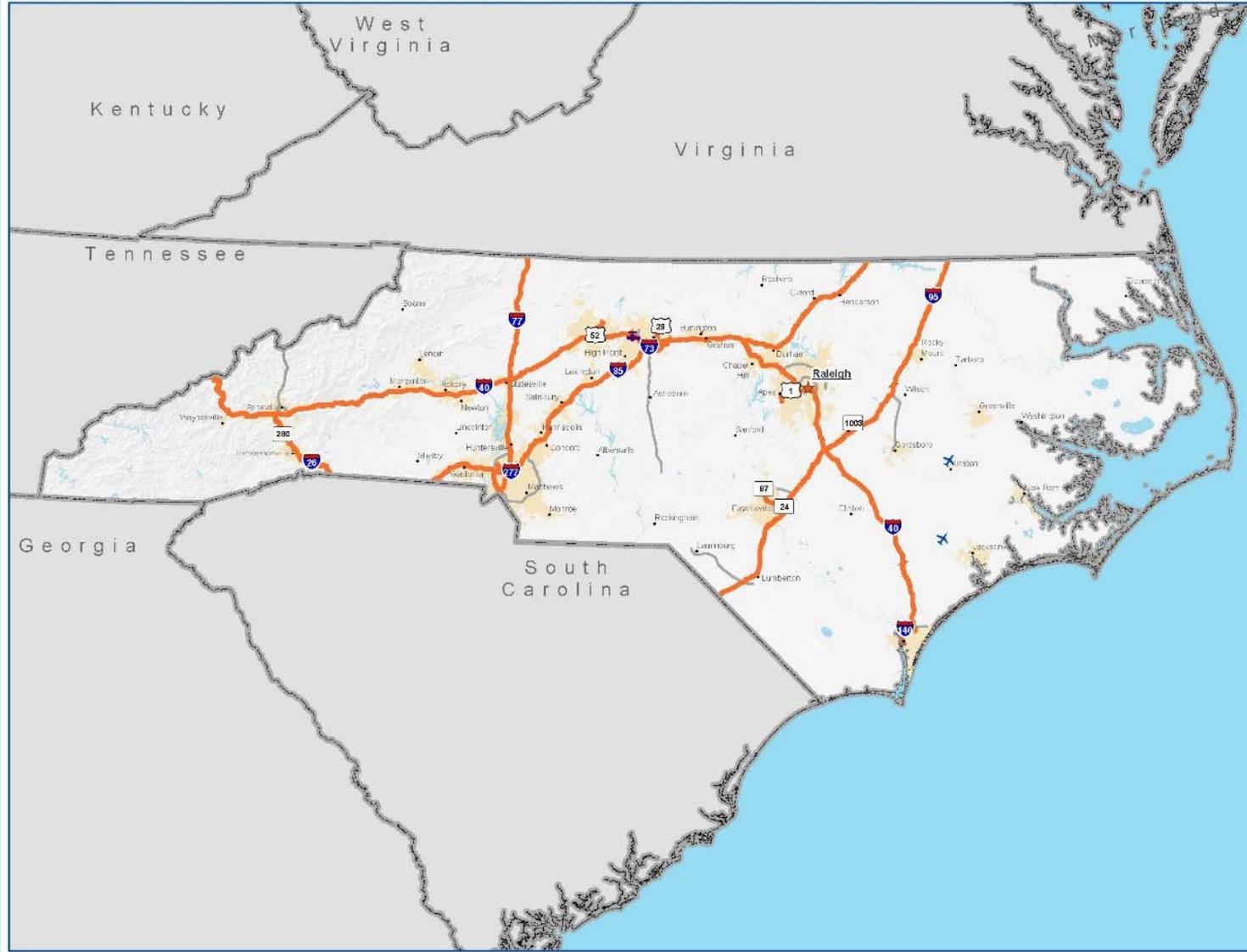
North Carolina's Portion of PHFS

→ PHFS – 1034.31 miles

→ Non-PHFS Interstate – 179.43 miles

→ Percentage of total PHFS – 2.49%

→ CRFC – 206.86 miles

→ CUFC – 103.43 miles

CAMBRIDGE SYSTEMATICS
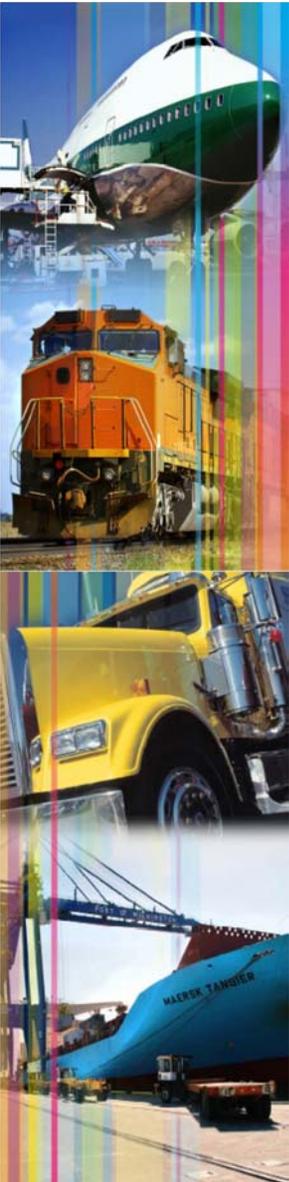
Identifying State PHFN

- National PHFN

- Critical urban corridors – MPOs responsible for designating

- Critical rural corridors – NCDOT responsible for designating

- Other critical state corridors

Discussion on criteria for designating NC's PFHN

Potential Criteria for Selecting PHFN Facilities

➤ Truck volume

➤ Truck percentage

➤ Intermodal connections

➤ Industries served

➤ Strategic commodities/supply chains

➤ Emerging economies

CAMBRIDGE SYSTEMATICS
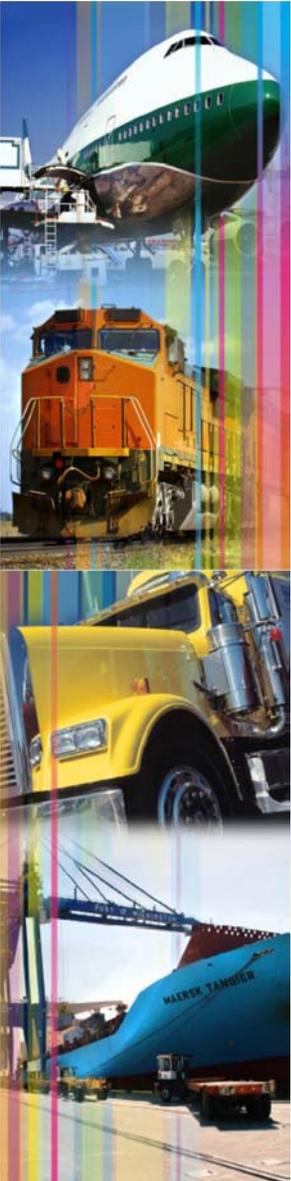
ON-GOING TASKS AND SCHEDULE
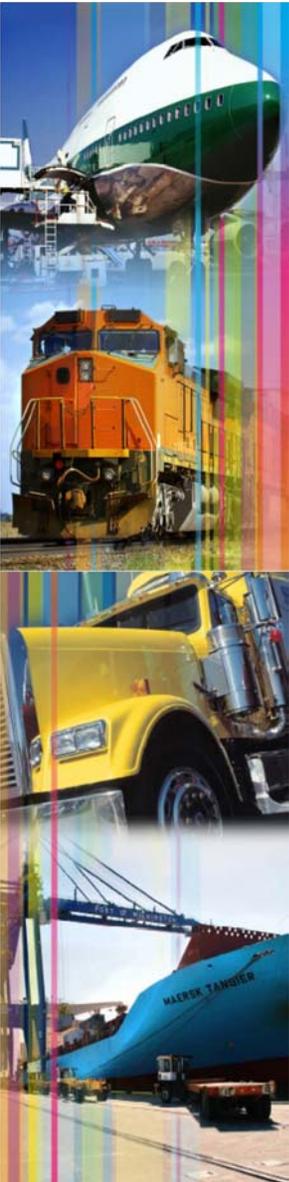
On-Going Tasks

➤ Stakeholder interviews - July to September

➤ Needs assessment - October
  » Existing conditions and State Freight Profile - Aug
  » Future conditions – September
  » Needs and deficiencies - October

➤ Economic and supply chain analysis – October

➤ Board of Transportation briefing – Sept 7

➤ Next FAC – mid Sept/Oct

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North Carolina Multimodal Statewide Freight Plan – Freight Advisory Committee Meeting 2

Highwoods Conference Center
416 Gallimore Dairy Road, Greensboro, NC

July 20, 2016

In Attendance

Name	Organization
Freight Advisory Committee Members/Representatives	
Charles H. W. Edwards	NCDOT
Dinesh S. Dave`, Ph.D.	Appalachian State University
Doug Chellman	Lowe's
Durwood Laughinghouse	Norfolk Southern Railway
Jake Cashion	NC Chamber
John H. Sutton	Lenovo
Loretta Barren	FHWA
Mike Rutan	Mid-Carolina RPO
Jon Lyon	Evonik
Sandra Stepney	NCDOT Rail Division
Tom Carroll	Vulcan Materials Company
William Lucas	Caterpillar
NCDOT Project Management Staff	
Terry Arellano, PE	NCDOT Transportation Planning Branch
Heather Hildebrandt	NCDOT Transportation Planning Branch
Cambridge Systematics Team	
Paula Dowell	Cambridge Systematics (CS)
Lisa Destro	Cambridge Systematics (CS)
Eddie McFalls	AECOM / NCDOT Rail Division
Other Organizations	
Lydia McIntyre	Greensboro MPO
John Kim	PART
Scott Rhine	PART

Minutes

Introductions and NCDOT Update

Charles Edwards (NCDOT Director of Logistics Strategy) welcomed everybody and introduced the meeting agenda. The members and of the FAC and Statewide Freight Plan NCDOT staff and consultant team introduced themselves.

Truck Parking Study

Charles Edwards provided a brief overview of the Truck Parking Study that NCDOT is also undertaking, in addition to the Statewide Freight Plan study. The Truck Parking Study is on a tighter schedule and has to be completed by the end of 2016 and results presented to the legislation in February 2017. Centralina COG has also undertaken an in-depth truck parking study already.

CSX Carolina Connector (CCX) Announcement

Eddie McFalls (NCDOT Rail Division / AECOM) provided an overview of the recent announcement by CSX to build a new intermodal terminal in Rocky Mount, the Carolina Connector (CCX). CCX will serve the Raleigh-Durham market and serve as regional intermodal hub within CSX's hub and spoke intermodal strategy. The Queen City Express will provide intermodal rail service on the CSX network between the Port of Wilmington and CSX's intermodal terminal in Charlotte. CCX will employ 149 direct jobs and will generate $310 million in public benefits for NC. An example of a similar operation is the North Baltimore, OH operation. Funding coming from the State will be for rail infrastructure via the STI process.

Freight Plan Update

Cambridge Systematics' Paula Dowell (Project Manager for the Statewide Freight Plan) presented on the role of freight in the State's economy, including NC employment and population trends, and tying economic trends to commodity trends provided an overview of the exiting and forecasted freight flows in NC. Highlights include:

- NC has had one of the fastest growing populations in the nation

- Employment: 1.5 million jobs or 33% are in freight dependent industries

- Key industries in NC with a location quotient > 1[1] are: food manufacturing, chemical manufacturing, plastics and rubber manufacturing, and trucking.

- Federal Highway Administration's Freight Analysis Framework (FAF) Version 4 was used to obtain NC freight flows by mode and commodity, including 2045 unconstrained forecast.

- Baseline forecast assumes current trends continue into the future.

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[1] An LQ is used to quantify which industries in a region are concentrated when compared to the nation as a whole. The state's and nation's industries are compared by dividing the state's employment share within a particular industry by the nation's employment share within the same industry. If the LQ is greater than 1, the industry has a higher concentration in the state than the nation.

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- CS developed process to disaggregate the FAF data to county level, as it is available only for 4 geographic regions in the NC. The initial disaggregation to county level Origin-Destination freight flows has been completed and CS is now conducting validation.

Additionally, Paula Dowell presented on the Freight Plan's task to identify of the primary freight network. What is currently already been included in the National Highway Freight Network by FHWA, and how the State has been assigned a number of miles to select its Critical Urban and Rural Freight Corridors.

CS' Paula Dowell opened the meeting for general discussion regarding the criteria for designating NC's Primary Highway Freight Network which will include: the NC portion of the national PHFN already selected, the critical urban and rural corridors NCDOT, and CAMPO (Capital Area Metropolitan Planning Organization) and CRTPO (Charlotte Regional Transportation Planning Organization) are responsible for designating, and other critical state corridors. The discussion generated many insightful comments, questions and suggestions. These comments are summarized below:

- Eddie McFalls (NCDOT/AECOM) asked if new interstates will be automatically added to the Primary Highway Freight System (PHFS). Loretta Barren (FHWA) responded yes, they will be added to the Non-PHFS Interstate network but not to the PHFS Interstate network because that system has been approved by Congress in December 2015 and can only be changed every five years with Congressional approval.

- NC Chamber's Jake Cashion asked about the definitions for rural and urban areas. Also commented on how the Chamber is trying to bridge the urban and rural divide in the State by designating areas that are not in metro regions but are not entirely rural as "non-metro."

- Norfolk Southern's Durwood Laughinghouse commented on the importance that the state thinks regionally in coordination with neighboring states since goods movements do not stop at state lines. Charles Edwards (NCDOT) mentioned how the I-95 Corridor Coalition has important case studies of regional transportation planning. CS' Paula Dowell also commented on the supply chain focus that the Freight Plan will have and how this supply chain analysis will show a dependence on different locations across state borders.

- Additional criteria that could be considered when selecting PHFN facilities: is there funding availability to do this project?

- Strategic Transportation Corridors would be a good place to start when selecting PHFN.

- Lowe's Doug Chellman mentioned the importance of using current freight rates in the study, due to the fact that the model for urban deliveries and pickups is changing, and the speed of service requirements in their industry has changed rates.

Paula Dowell closed out the Freight Plan Update presentation by sharing ongoing tasks and next steps.

PART Presentation – Development of the Piedmont Triad Regional Model (PTRM)

PART's Scott Rhine presented on the development of the regional travel demand model and how they are currently coordinating to develop a freight component in the model (freight touring model), the data needs and development phases, progress made and next steps. The PTRM

will be one of a few travel demand models in the nation to have a freight touring component incorporated.

Closing Remarks and Next FAC Meeting

Charles Edwards (NCDOT) encouraged and stressed the importance of private sector participation in the freight planning effort.

Terry Arellano (NCDOT Planning Branch) thanked all the FAC members for their attendance and announced the next FAC meeting will be mid September or October.

The project team would like to include a private sector site tour and/or presentation in the next FAC meeting. FAC members were asked for input or suggestions on potential locations.

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Piedmont Triad Regional Model (PTRM)

Development of the Triad Freight Touring Model

NC Statewide Freight
Advisory Committee
July 20, 2016

What is PTRM

What does it represent

Piedmont Triad Regional Model (PTRM)
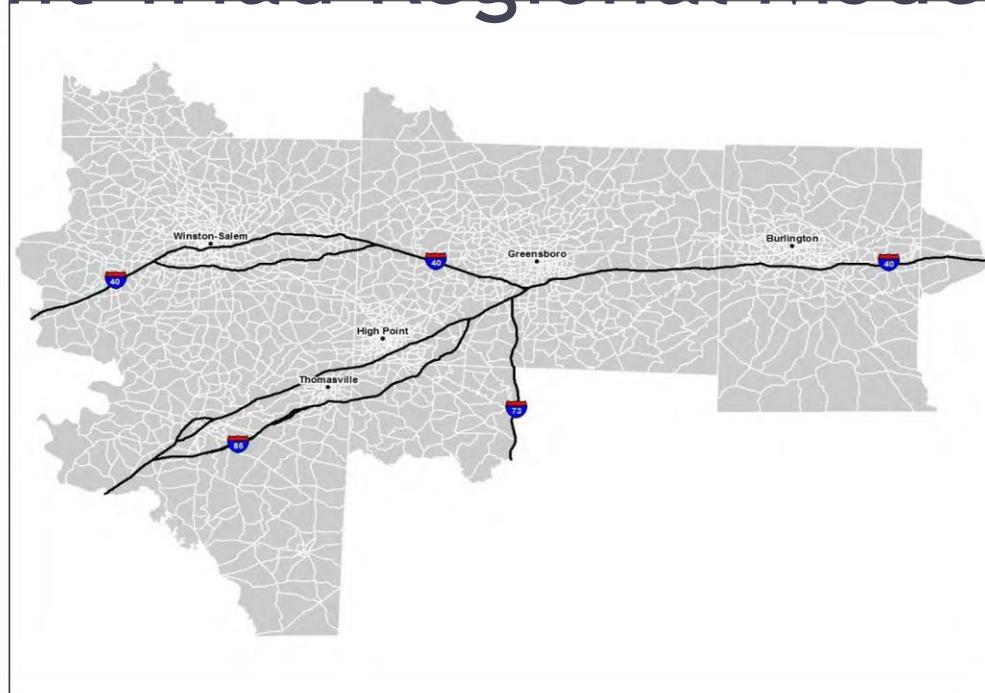
- Official Travel Demand Model for the Region
  - NCDOT, and the 4 MPO's of the Triad
  - First adopted in 2002
  - Enhanced, Expanded, Improved, Invested over the past 14 years to replicate the most accurate travel behavior and forecasted travel demand in the Triad.

Basis for Freight Study in Piedmont Triad

The Regional Context

NC Freight Flows

2040 Exports 14.5M tons / $49.2 Bn / 150% growth

2040 Domestic 43.4M tons / $558.5Bn / 15% growth

2040 Imports 5.7M tons / $20.4Bn / >200% growth
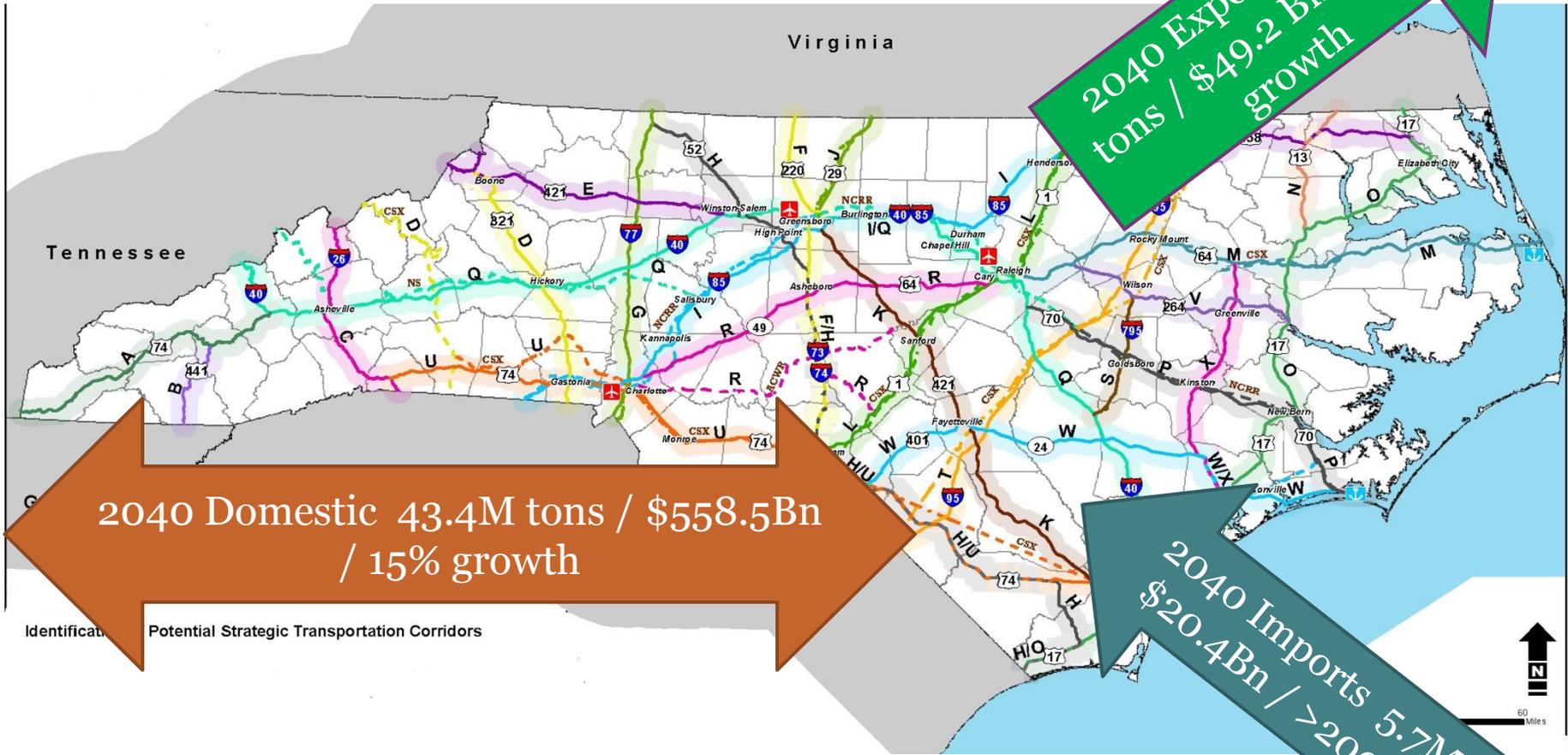
Freight and the Triad

- Goods movement and the economy
- Considering Freight in Transportation Planning
- Role of Freight in the Triad
  - One of the worlds largest transportation and logistics clusters
  - Region is growing through diversification
  - I-85/I-40 gateway to major hubs in the north and south
  - Some of the highest truck flows in North Carolina
- Region is taking bold steps to understand freight and logistics

Coordination of Activities

- 2012 Triad MPO's incorporated a coordinated and consistent Freight Planning section in their respective Long Range Transportation Plans (LRTP's)

- 2013 PTRM Model Team began seeking funding opportunities to develop a freight component in the travel demand model

C20 Evaluation Plan for
Winston-Salem MPO

SHRP2 C20: Freight Demand Modeling and Data Improvement Implementation Support Task

Submitted to:

US Department of Transportation:
Federal Highway Administration

Piedmont Triad Freight Development

Phase 1
- Freight facilities database
- Freight survey data collection

Phase 2
- Develop advanced freight model
- Integrate with existing PTRM

Phase 3
- Travel diary data collection
- Estimate freight model with local data
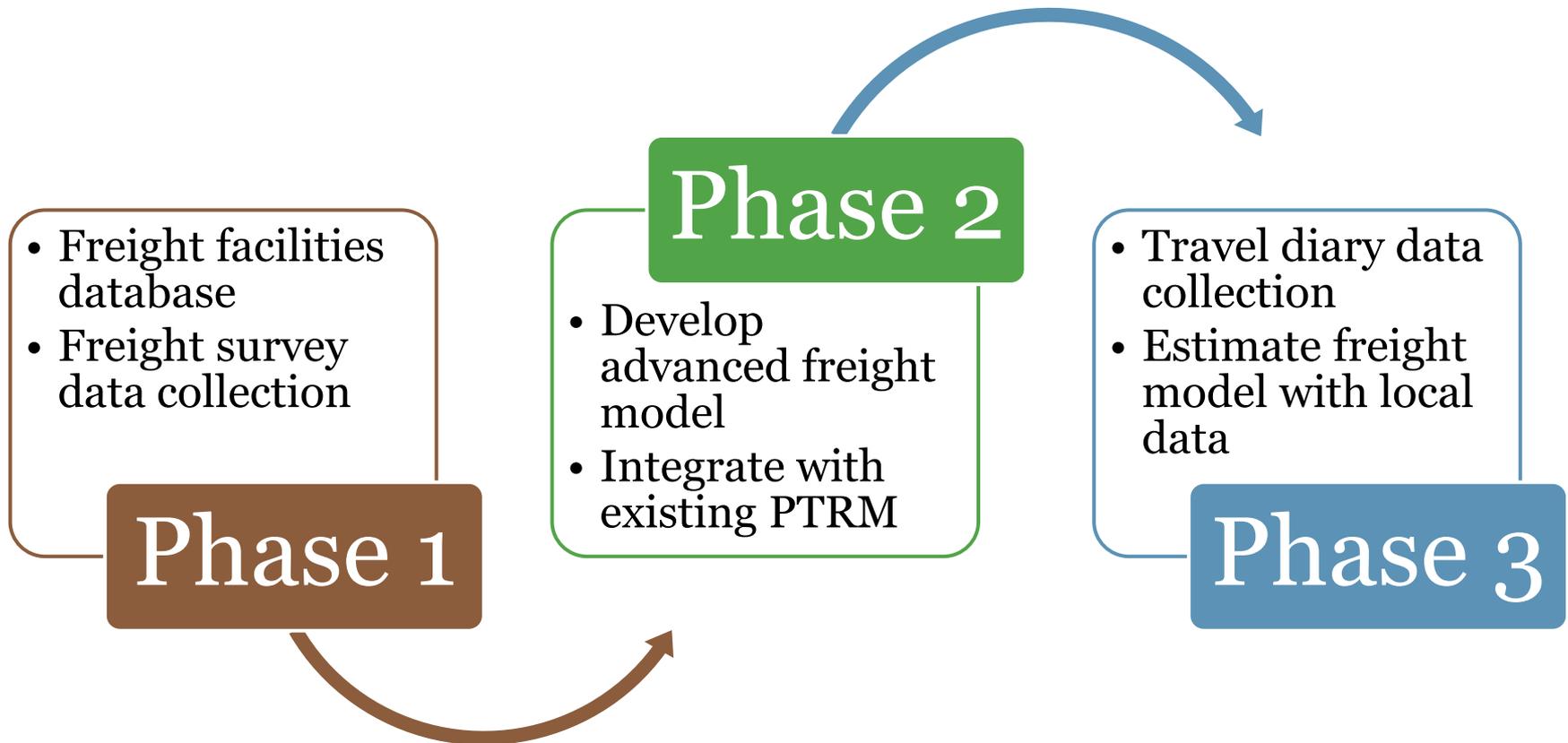
Phase I
Project Management

Funding, Initiation and Management

Funding

SHRP2 C20

- Competitive grant process applied for WSMPO on behalf of the region.
- Awarded for Freight Demand Modeling and Data Improvement - $150,000.
- Goal – Provide a road map for improved freight data sets and freight modeling practices.

PTRM Budget

- PART 15%
- NCDOT 25%
- MPO's 60%.

Project Cost - $172,000

Phase I Project Findings

Data, Data and more Data

Freight Facilities Database

- 968 Facilities classified by type
  - Distribution center, intermodal facility, major shipper, retail
- Basic information available for most facilities
  - NAICS classification code, number of truck bays, primary commodity
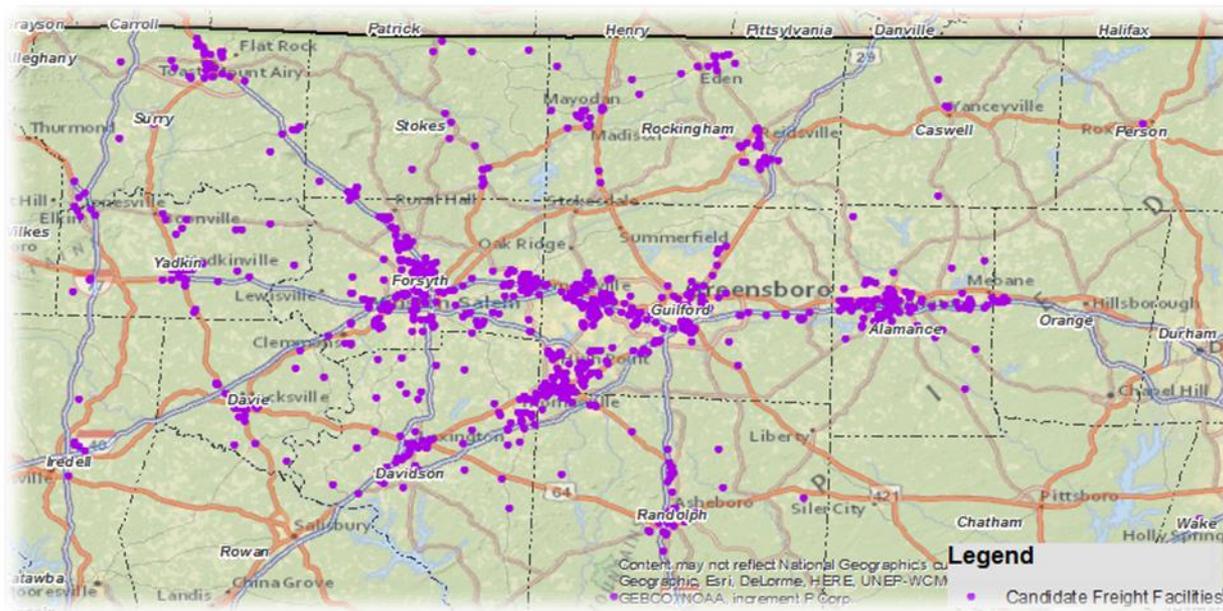
Database Benefits

Freight facilities by category
scaled by estimated Truck trips
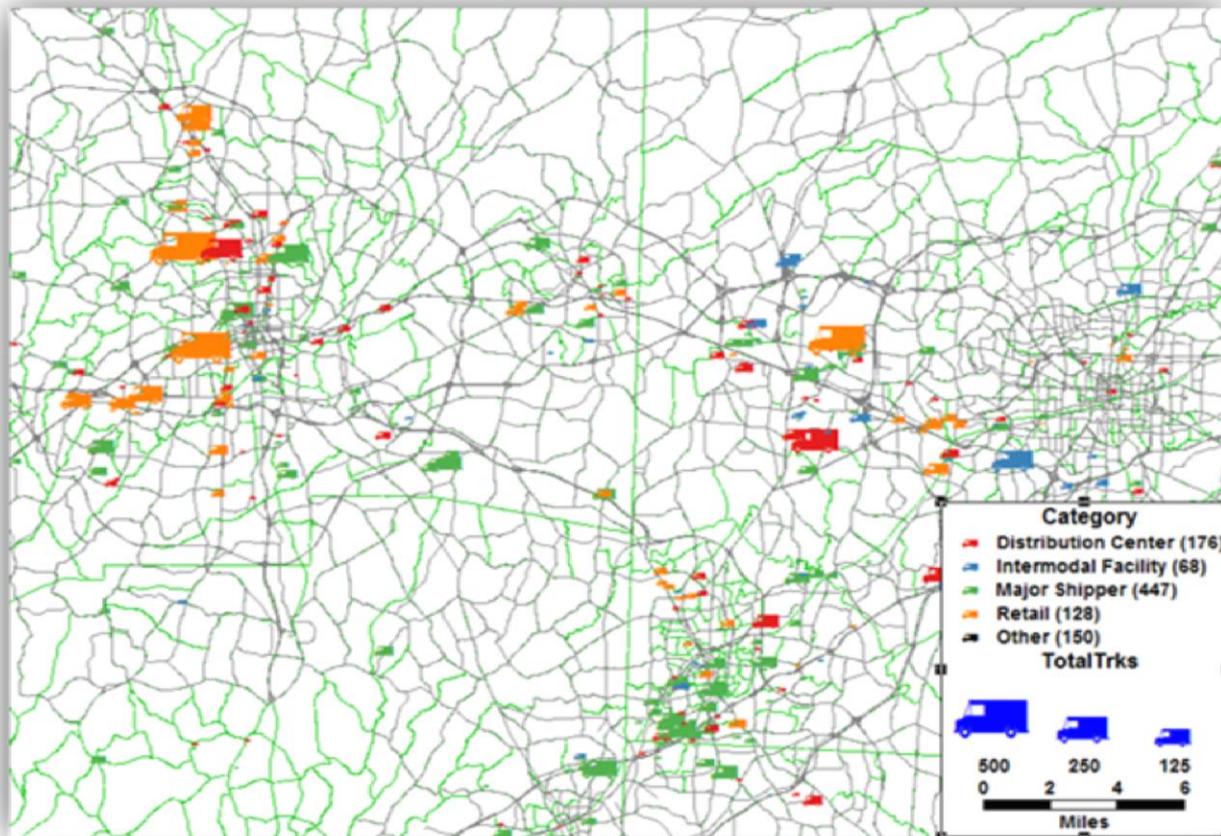
Example Data Record

RecordID	2775
County	Iredell
Type	Warehouse
Category	Distribution Cen
PTRM_NAICS_Group	Retail
FT_Empl	75
Bldg_SF	24000
TrkBays	0
IB_Comm1	Scrap metal
IB_Comm2	
IB_Comm3	
OB_Comm	Prcessed scrap metal
DailyTrk	80
Cntainer	20.00%
Conv5axl	50.00%
SingUnit	5.00%
Del_Vans	20.00%
OtherTrk	5.00%

Survey Results
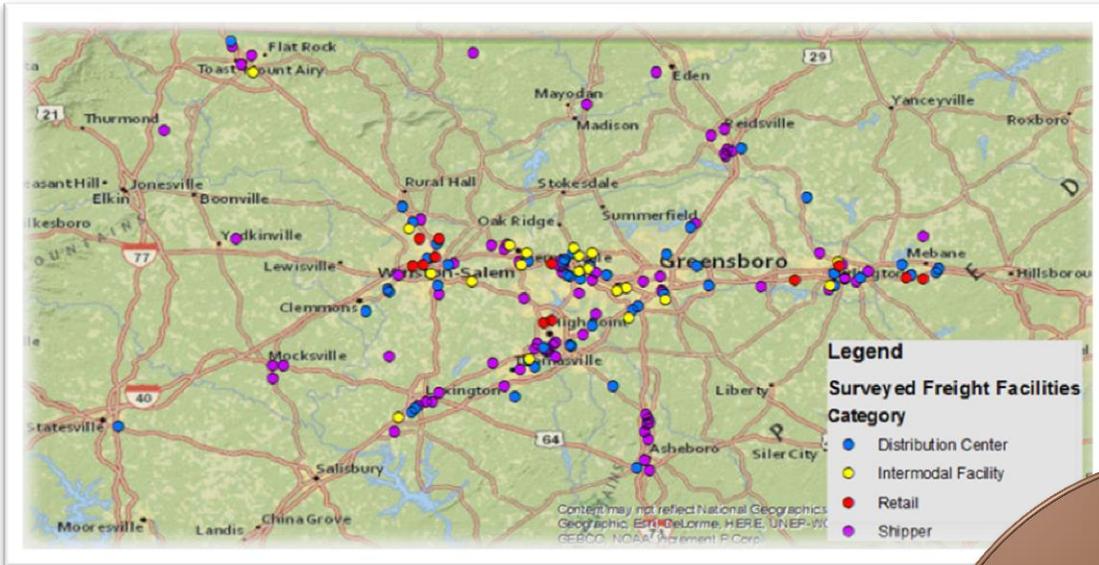
Over 800 Facilities visited, survey data for 158
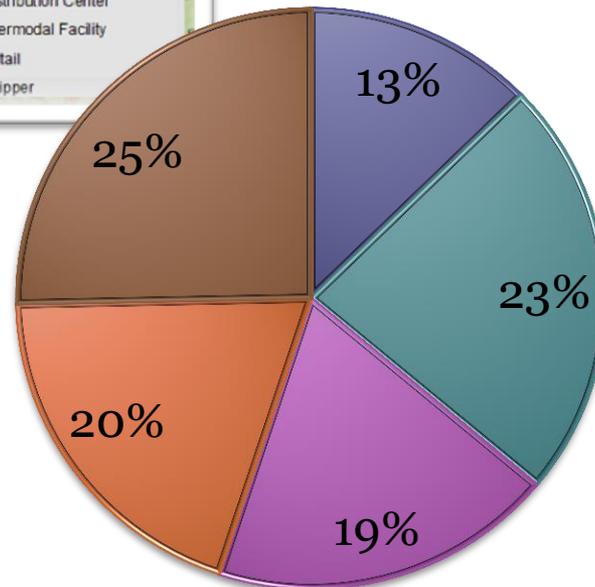
- BGMPO
- GMPO
- HPMPO
- WSMPO
- Other
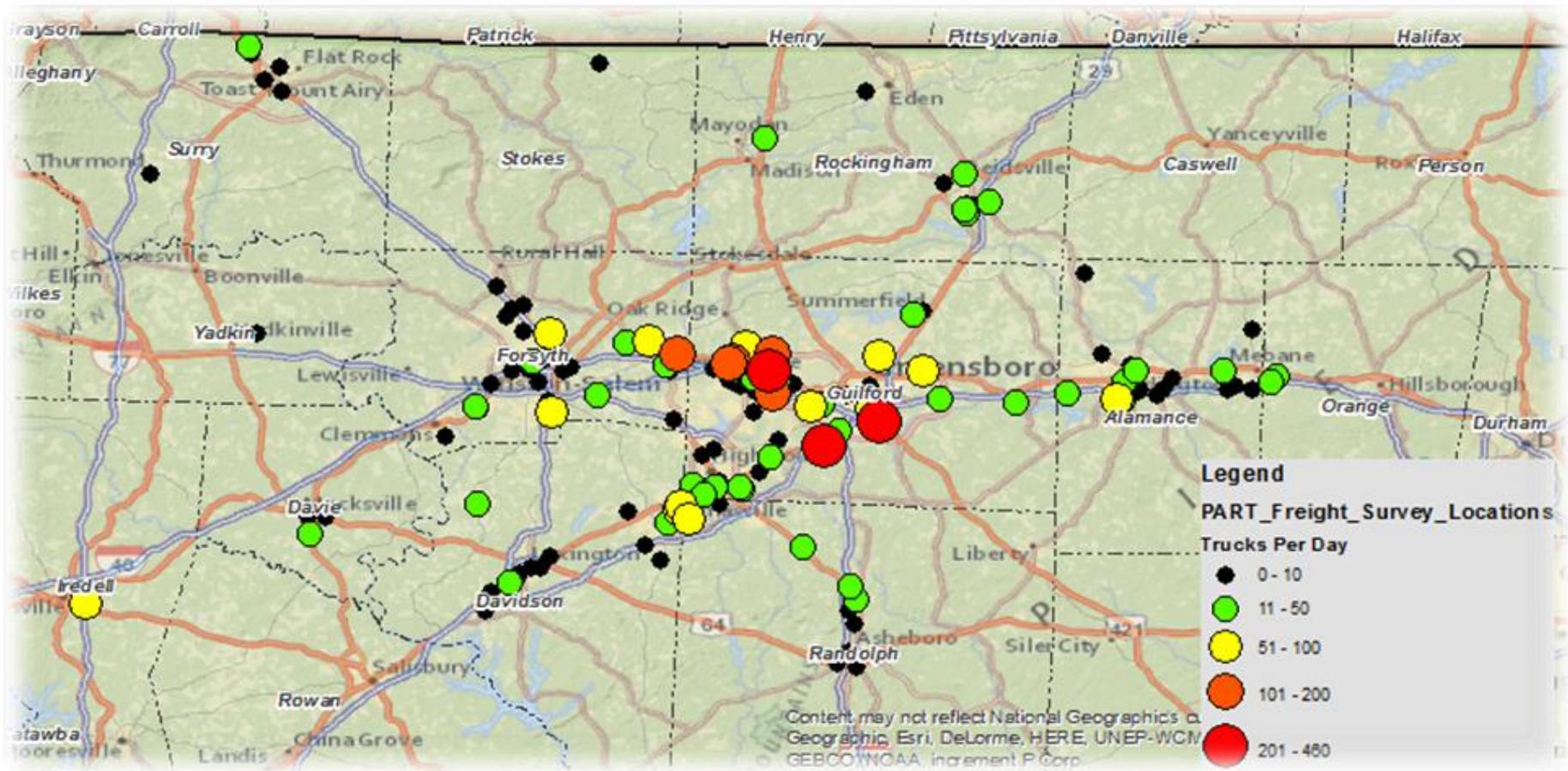
Existing Patterns

- Highest concentration of freight facilities in Guildford County followed by Forsyth and Alamance
- By Classification:
  - Major Shipper (~55%)
  - Distribution Centers (~21%)
  - Retail (~16%)
  - Intermodal (~8%) – highest average number of truck trips
- Strong relationships:
  - Building square footage and average truck trips
  - Number of truck bays and average truck trips
- Freight facilities tend to cluster

Phase I Lessons Learned

- Google Earth is a great tool to verify company names, number of loading docks etc.
- The best way to collect data is to go the company and request to speak with someone.

Phase II
Project Management

Funding, Initiation and Management

Funding

SPR	PTRM Budget
• No SHRP grant this time.	• PART 15%
• SPR funds spread over two years	• NCDOT 25%
• FY 17 $60K FY 18 $90K	• MPO's 60%.

Project Cost - $252,000

Project Initiation and Management

PTRM Model Team	PART
• RPF Development • Project meetings • Supplied data	• Held and managed contract with consultant • Coordinated project meetings • Supplied data • Presented findings to MPO's

Phase II Progress

Develop and Integrate Advanced Freight Model into PTRM

Piedmont Triad Freight Study

Phase 1
- Freight facilities database
- Freight survey data collection

Phase 2
- Develop advanced freight model
- Integrate with existing PTRM

Phase 3
- Travel diary data collection
- Estimate freight model with local data
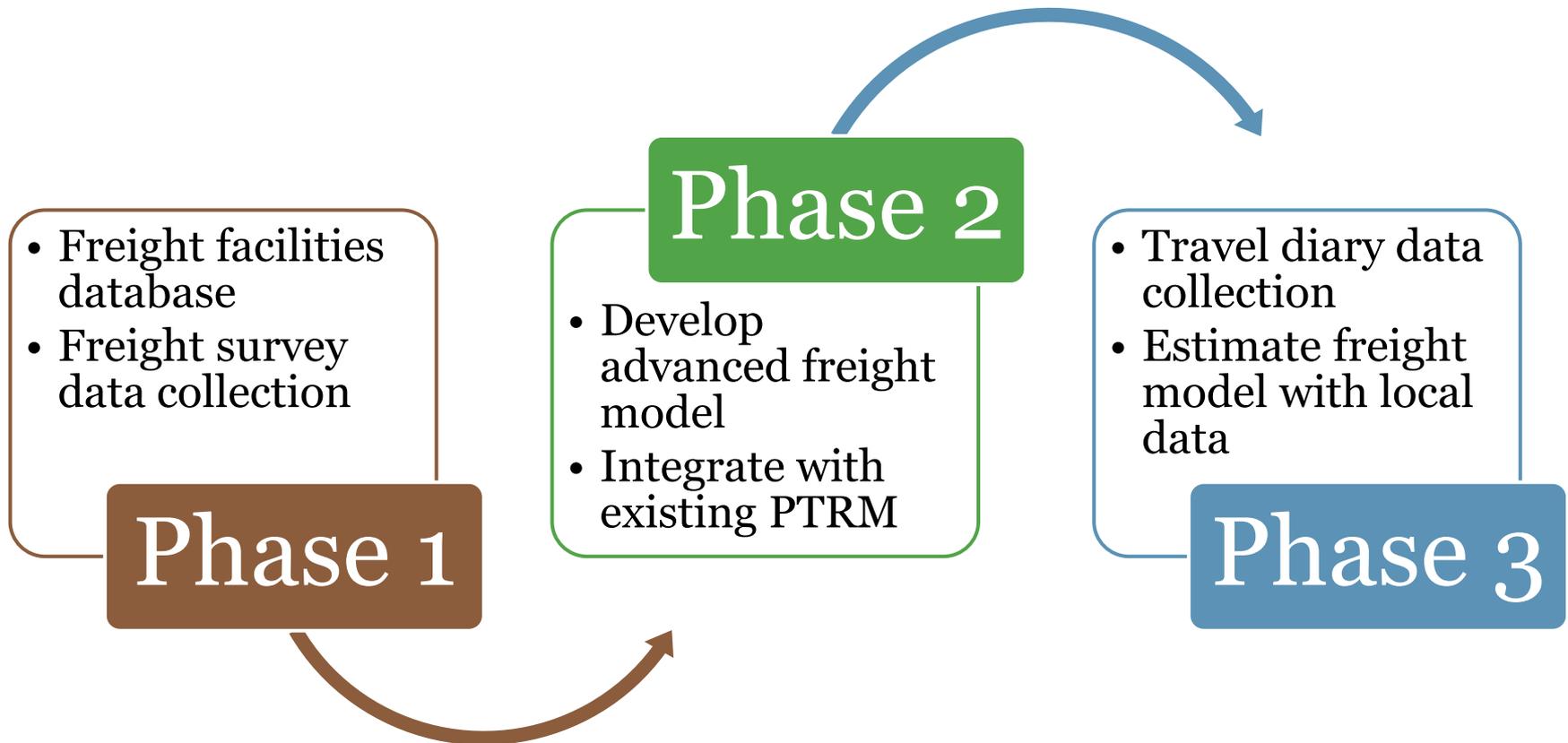
*Figure 2: Model System – Freight Model within PTRM*
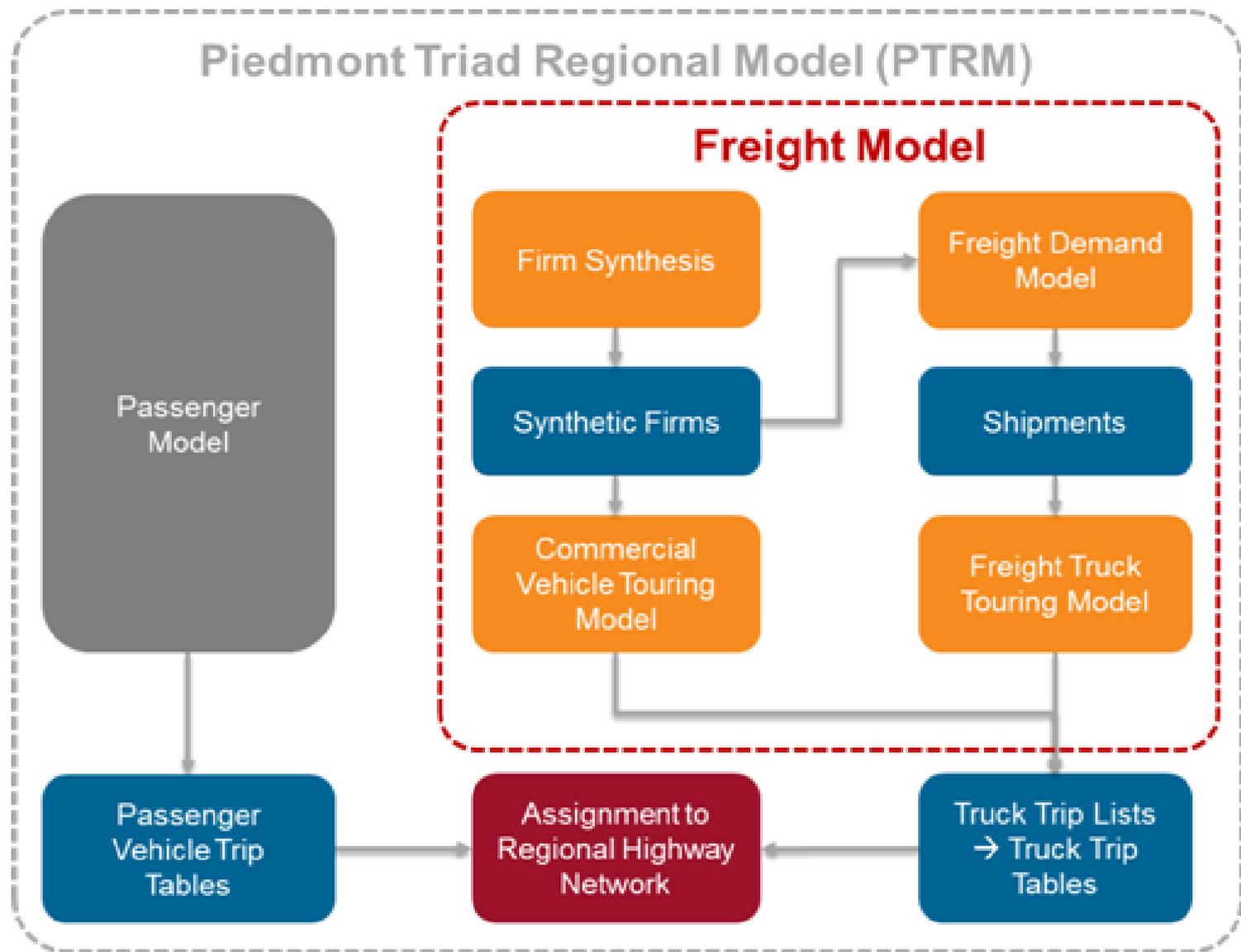
Commercial Vehicle Model Frame Work

Establishment Type
↓
Stop Generation
↓
Vehicle Assignment
↓
Expected Stop Duration
↓
Stop Clustering
↓
Arrival Time at First Stop
↓
Routing Sequence
↓
Intermediate Stop Choice
↓
Intermediate Stop Destination
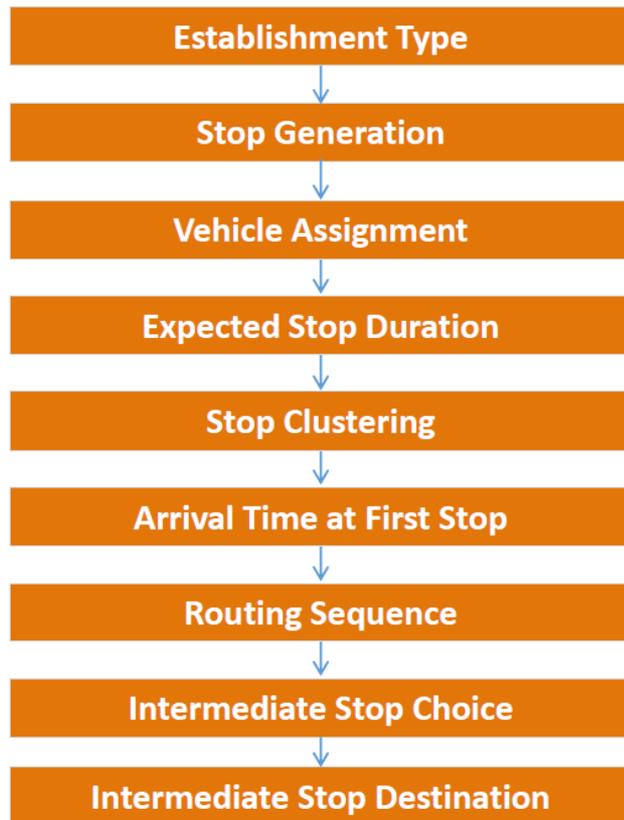
- Model of local commercial vehicle movement – all tours except for freight delivery to businesses
- Includes service calls and residential delivery by light, medium, and heavy vehicles
- Similar concept to tour building to the freight truck touring model
- Estimated using Ohio Establishment Survey data
- Currently being calibrated and validated for the Baltimore region by RSG

Statewide Model vs. PTRM
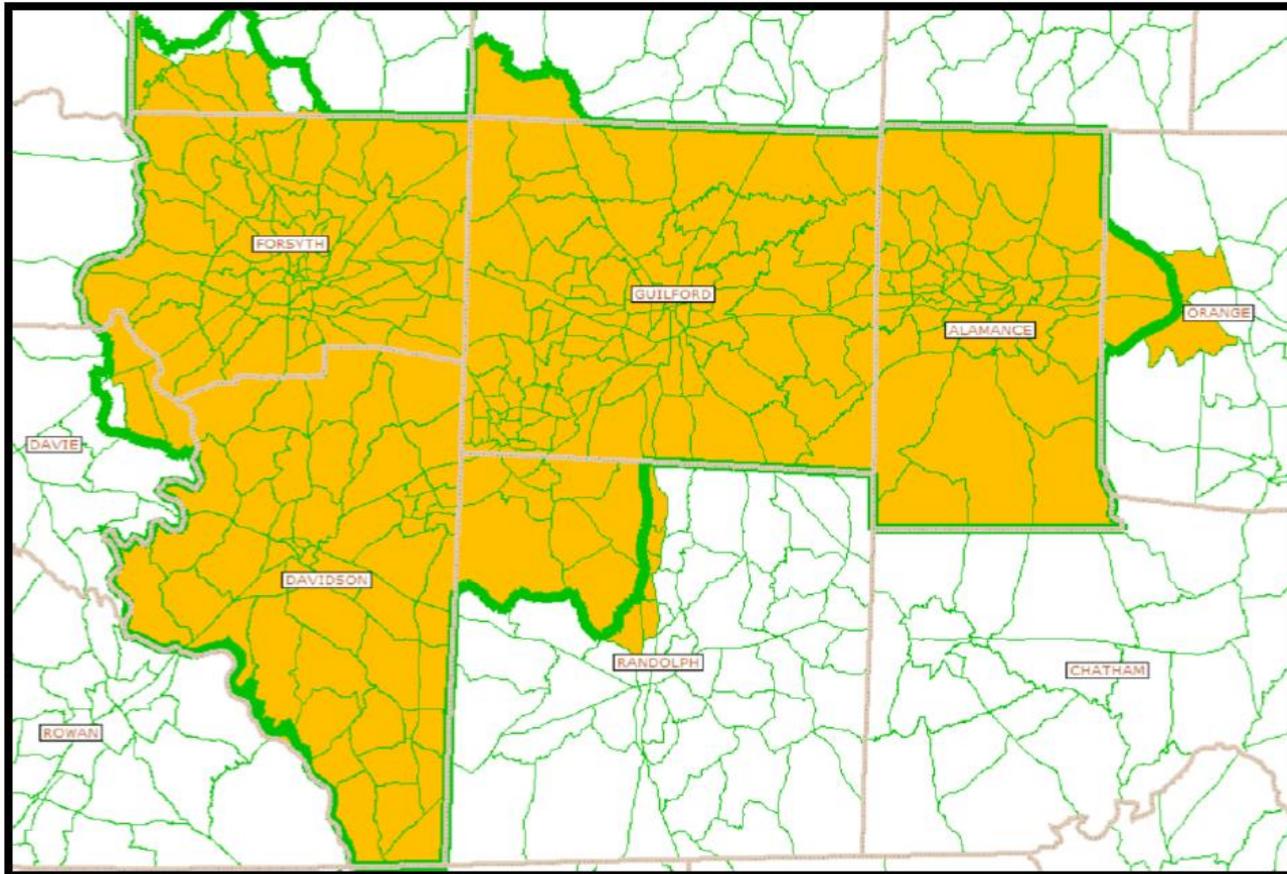
Data Gaps – Visual Review
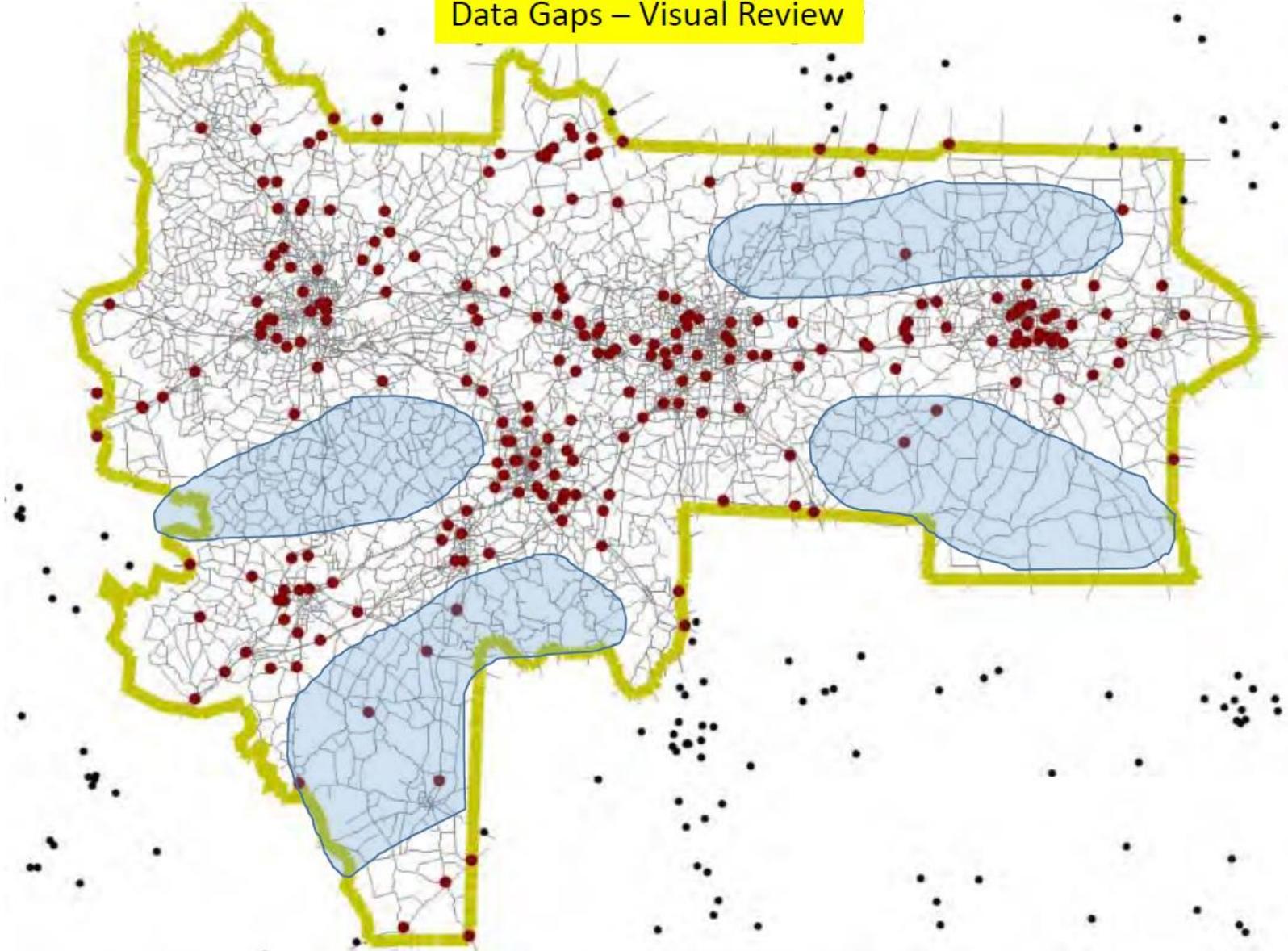
Ph. 1 Freight Centers by Number of Employees
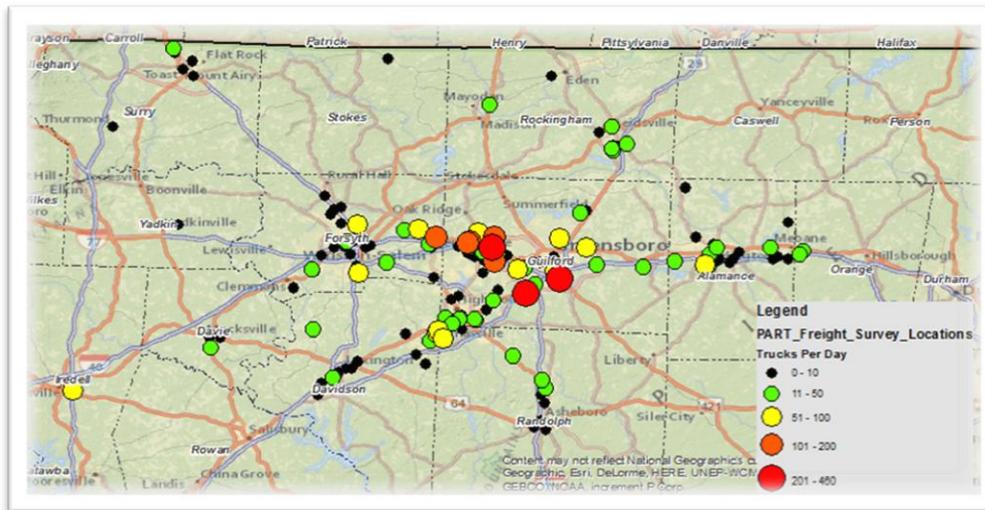
Ph. 2 Retail Establishments by TAZ
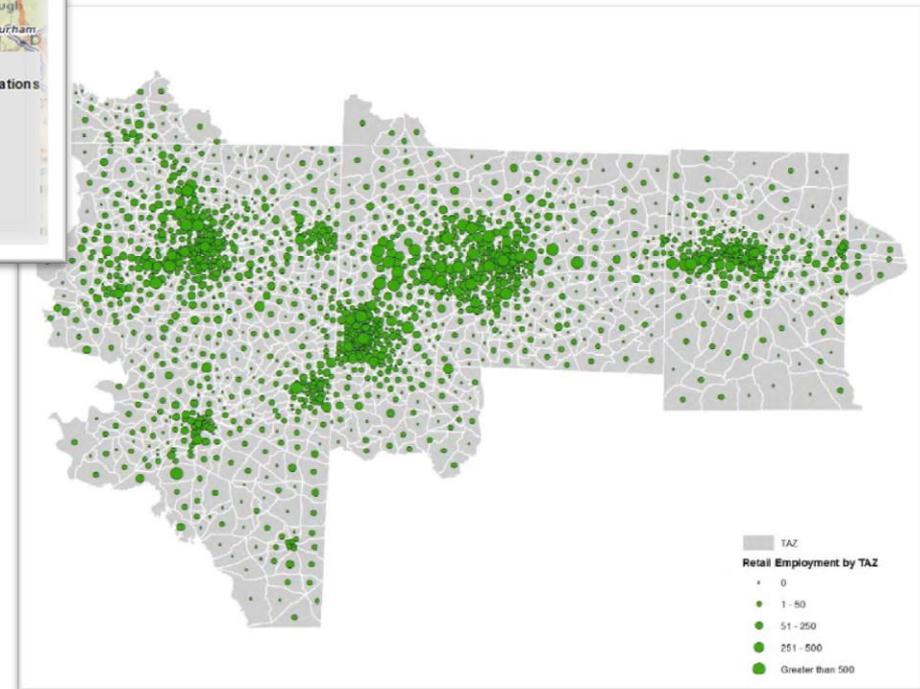
Employment Comparison Results

Comparisons of SE Data and InfoUSA Data
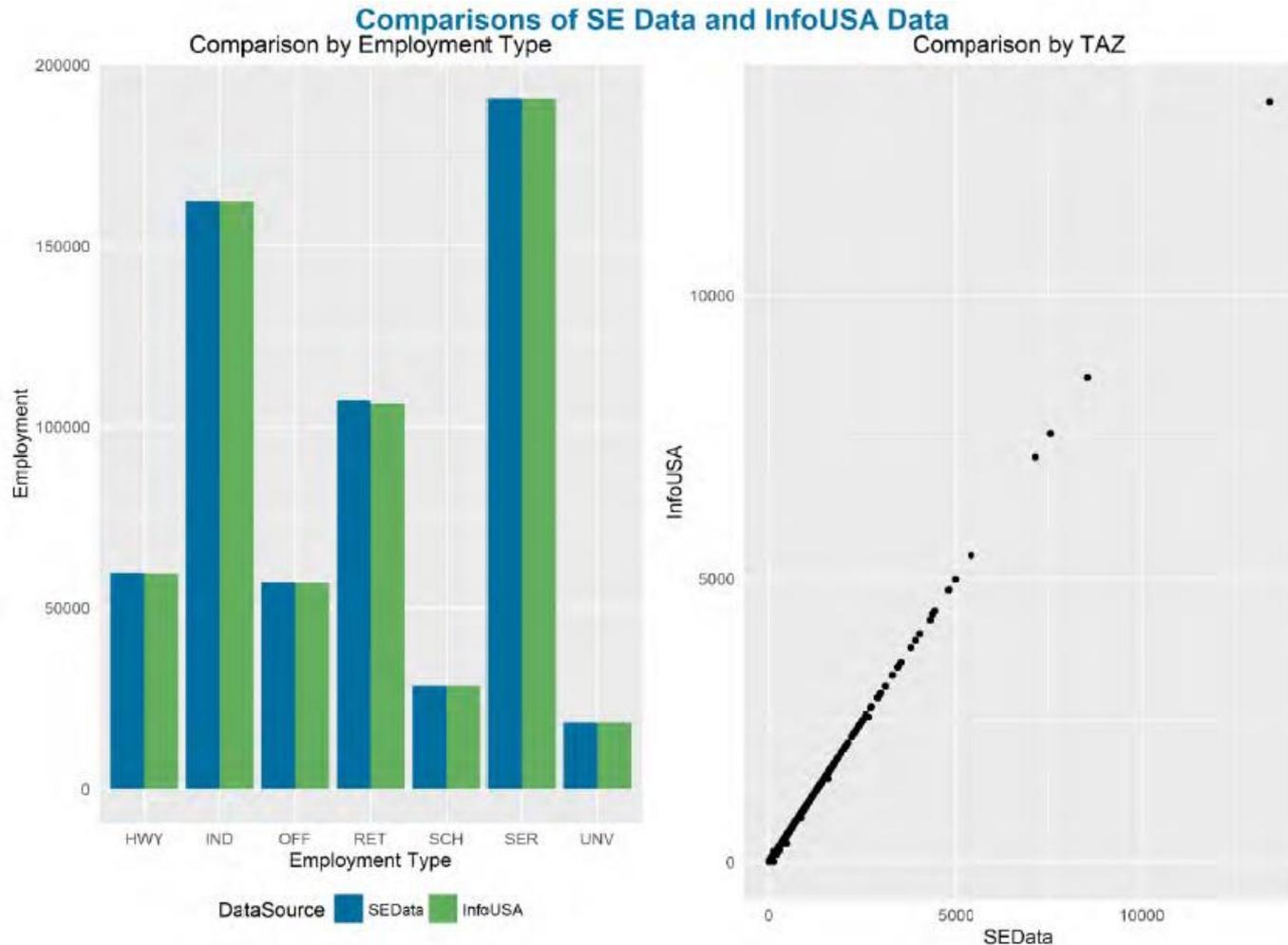
Freight Truck Touring Model Framework

Firm Synthesis and Shipment Demand

↓

Vehicle and Tour Pattern Choice

↓

Number of Tours and Stops in each Tour

↓

Stop Sequence and Stop Duration

↓

Tour Start Time

↓

Intermediate Stops

↓

Output Trip List
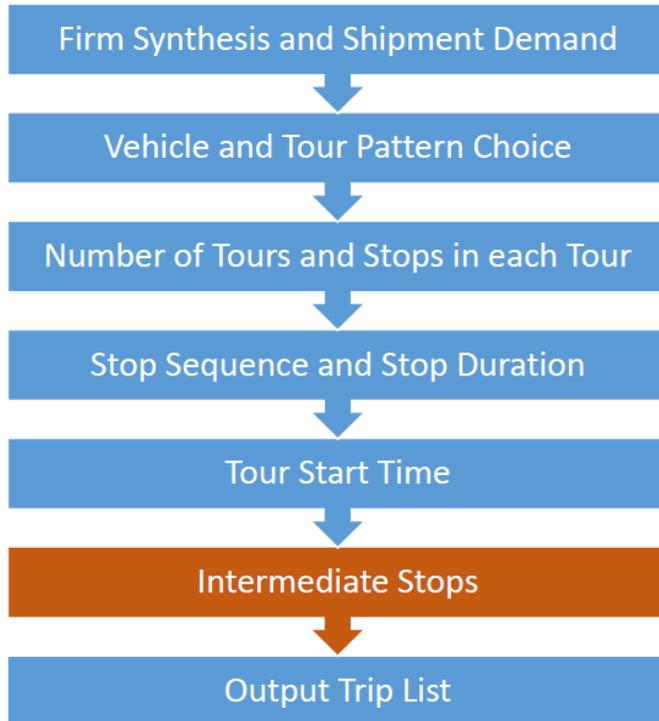
- Model of local freight delivery to businesses
- Includes medium and heavy vehicles
- Estimated using Texas Commercial Vehicle Survey, and initially implemented in Chicago for FHWA and CMAP
- Transferred and currently being calibrated and validated for the Baltimore region by RSG, with the addition of intermediate stop models

Freight Truck Touring Model Sequence
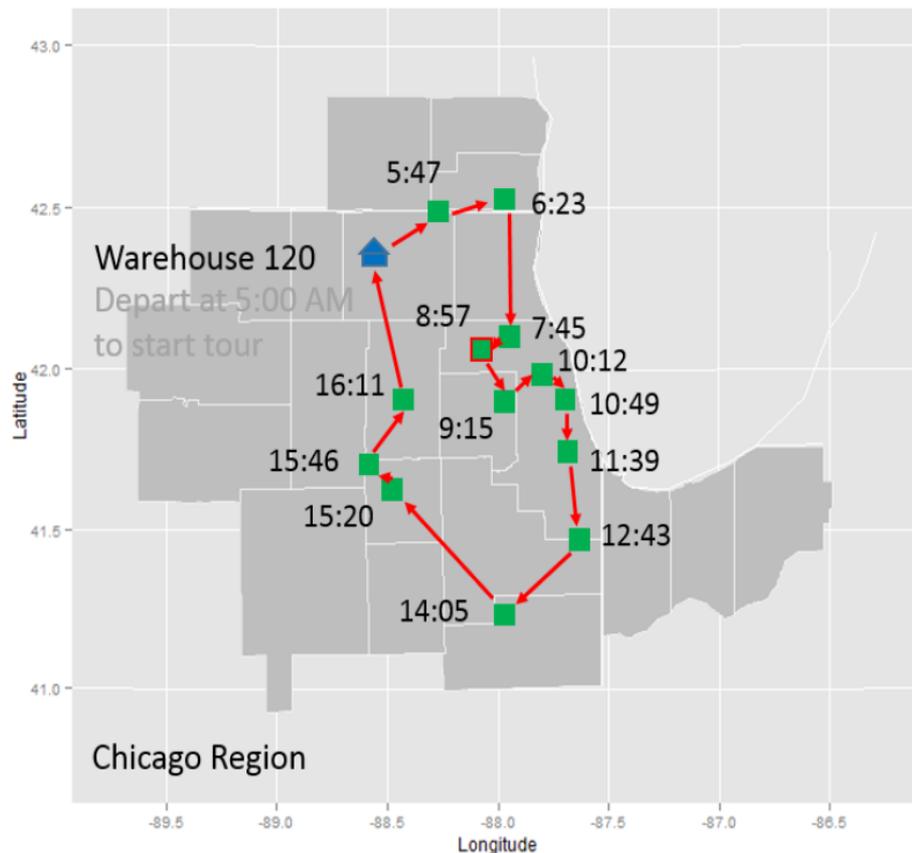
- Warehouse Selection
- Vehicle Choice & Tour Pattern
- All Shipments from a warehouse with the same vehicle type and tour type
- Number of Tours
- Stop Clustering
- Stop Sequencing
- Stop Duration
- Tour Start Time

Stop Sequencing Arrival

A portion of the model area
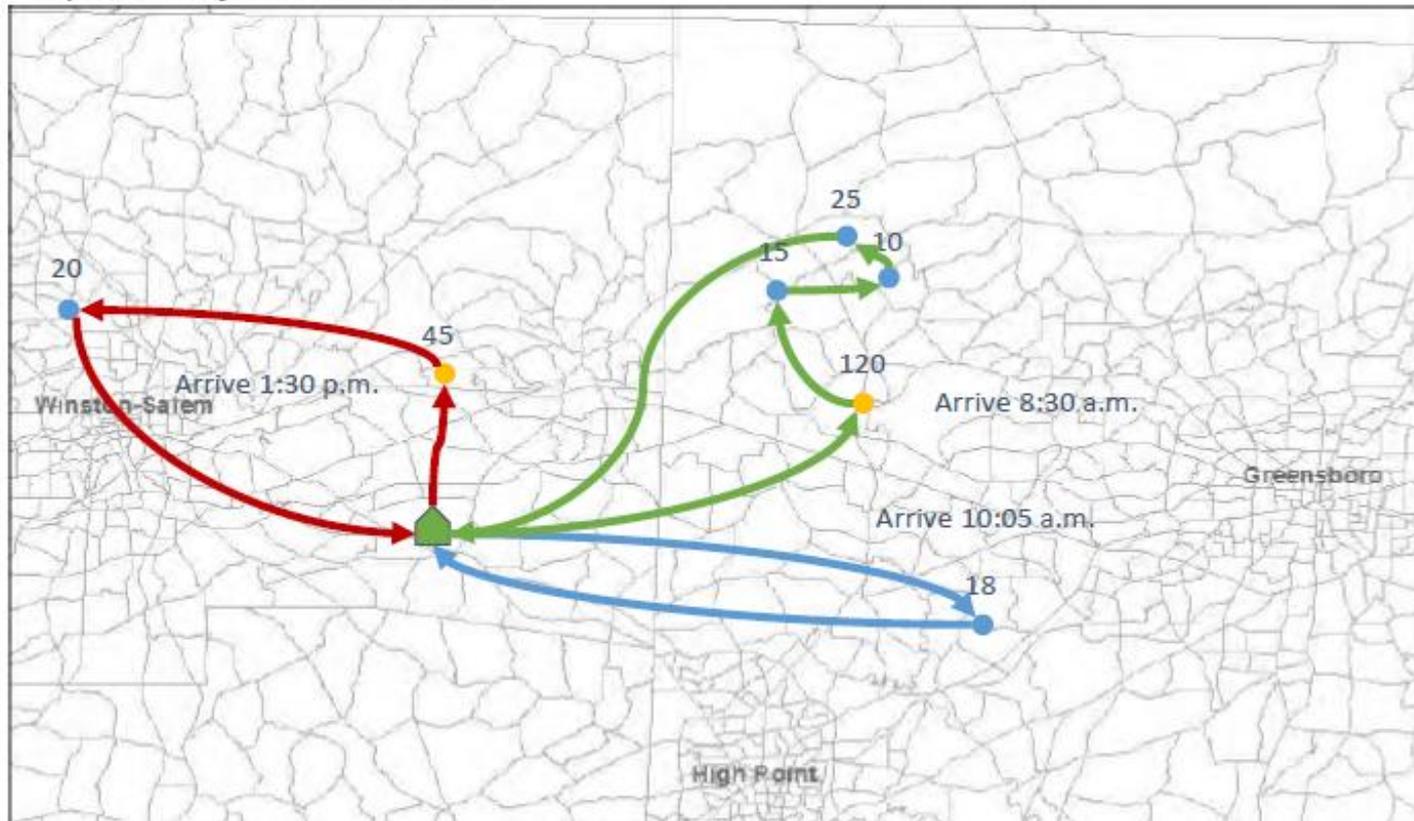
Phase II Lessons Learned (so far)

- State model vs. PTRM boundary mismatch
- Data gaps in traffic counts
- SE Data and INFO USA Data – Good Match

Current Status

- Development of Model Complete
- Fill in a few data gaps - August
- Begin Calibration - August and September

Take Home Message

What we have

Freight focused information system

Big picture benefit

Used to inform land use planning, transportation planning, and project prioritization

Specific applications

Investigate freight clusters

Estimate truck trips

Project prioritization

Inform land use and rezoning decisions

Identify characteristics supporting freight clusters

What comes next

Policy scenario analysis

Mode choice

Understanding of dynamics between congestion and freight

Impacts of land use decisions

Questions

Scott W. Rhine
Executive Director
Piedmont Authority for
Regional Transportation

scottr@partnc.org

John Kim, PhD
Regional Travel Demand Modeler
Piedmont Authority for Regional
Transportation

johnk@partnc.org