



# North Carolina Statewide Multimodal Freight Plan

## *Maritime Profile*

*prepared for*  
North Carolina  
Department of Transportation

*prepared by*  
Cambridge Systematics, Inc.

*with*  
AECOM



February 2, 2017



*report*

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**February 2, 2017**



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## List of Acronyms

AL	Alabama
C-TPAT	Customs-Trade Partnership against Terrorism
CAGR	Compound Annual Growth Rate
CBP	United States Customs and Border Protection
CCM	Consolidated Chassis Management
CCX	Carolina Connector Intermodal Rail Terminal
CIC	Cordele Intermodal Center
CIT	Charlotte Inland Terminal
CLNA	Coastal Carolina Railroad
CSXT	CSX Transportation
EDI	Economic Development Initiative
FAF	Freight Analysis Framework
FRRCSI	Freight Rail and Rail Crossing Safety Improvement
FY	Fiscal Year
G&W	Genesee & Wyoming
GA	Georgia
GAO	Government Accounting Office
GDP	Gross Domestic Product
GPA	Georgia Port Authority
GRAD	Georgia Ready for Accelerated Development
GTP	Global TransPark
I-###	Interstate ###
IIR	Incident Investigation Reports
ILP	International Logistics Park
ITRE	Institute for Transportation Research and Education
IWR	USACE's Institute for Water Resources
K Tons	Thousands of Tons
lb	Pounds
M	Millions
M-F	Monday to Friday

MAMaC	Mid-Atlantic Manufacturing Center
MLLW	Mean Lower Low Water
MLP	Master Limited Partnership
NC	North Carolina
NCDA	North Carolina Department of Agriculture
NCDOT	North Carolina Department of Transportation
NCRR	North Carolina Railroad
NCSPA	North Carolina State Ports Authority
NIT	Norfolk International Terminal
NS	Norfolk Southern
OSHA	Occupational Safety and Health Administration
PCS	PotashCorp
PIERS	Port Import/Export Reporting Service
PMT	Portsmouth Marine Terminal
PTIT	Piedmont Triad Inland Terminal
PWCS	Port of Wilmington Cold Storage
RIP	Rail Inland Port
Ro/Ro	Roll-On/Roll-Off
RR	Railroad
RTG	Rubber-Tired Gantry Crane
SC	South Carolina
SF	Square Feet
SMT	Sea Marine Terminal
STI	Strategic Transportation Investment Program
STIP	North Carolina's State Transportation Improvement Program
STS	Ship-to-Shore
TEU	Twenty-foot Equivalent Unit
TWIC	Transportation Worker Identification Credential
UK	United Kingdom
US or US	United States
USACE	United States Army Corps of Engineers
USD	United States Dollars
USDA	United States Department of Agriculture

USDOT	United States Department of Transportation
USGS	United States Geological Survey
VA	Virginia
VIG	Virginia International Gateway
VPA	Virginia Port Authority
WTRY	Wilmington Terminal Railroad





## 1.0 Overview

Moving forward, an understanding of the current condition of North Carolina's ports and those of its neighbors, observed trends, and future projections for the shipping industry is essential in the assessment and improvement of North Carolina's international freight flows. Included in this section is an outline of the document and key references used to produce up-to-date and accurate data aiding in the analysis of maritime freight transiting to and from North Carolina and through its ports.

### 1.1 Purpose

Maritime transport is one of the five key modes of freight movement and can be singularly used or, more typically, part of a multi-modal network. Detailed in this modal profile are the supply and demand sides of maritime transport as they relate to North Carolina's economy and other transport networks. Both the current state of the mode and how it is expected to evolve into the future are discussed with a focus on needs as well as opportunities.

### 1.2 Methods and Data Overview

The maritime modal profile is based primarily on the North Carolina Maritime Strategy (AECOM, 2012) which extensively described the mode and its integration within the state of North Carolina. Key concepts and background remain the same in this report whereas the data have been updated for this plan to reflect current conditions and forecasts. When possible, new datasets from the same sources have been acquired so the data were collected and processed in the same manner and are hence comparable to the data presented in the North Carolina Maritime Strategy. Table 1.1 shows a comparison of datasets used in the North Carolina Maritime Strategy and in this report.

**Table 1.1 Dataset Comparison**

North Carolina Maritime Strategy	Maritime Modal Profile
United States (US) Census Bureau	
Bureau of Economic Analysis	
US Army Corps of Engineers	US Army Corps of Engineers
IHS Global Insight: 2011 Forecast	Cambridge Systematics: Economic Forecast
Freight Analysis Framework (FAF) 3.1	FAF 4.1
Strategic Transportation Investment Program 3 (STI 3)	STI 4
Port Import/Export Reporting Service (PIERS) data	PIERS data
North Carolina State Ports Authority (NCSPA)	NCSPA
AECOM Delivered Cost Model	

Other key references drawn upon include the following:

- Stakeholder interviews and Freight Advisory Committee records conducted during this project

- 2015 Strategic Plan of the North Carolina State Ports Authority (2015)
- Comprehensive State Rail Plan (2015)
- Eastern Infrastructure Improvement Study: A Report to the North Carolina General Assembly (2015)
- Economic Contribution of the North Carolina Ports study by the Institute for Transportation Research and Education (ITRE) (2014)
- Evaluation of a Proposed Intermodal Terminal (CCX) in Rocky Mount (WSP|Parsons Brinkerhoff, 2016)

### 1.3 Section Organization

This first section includes an overview of the report, covering the purpose, methodology, and organization.

The next, and second, section of this report provides a look at the existing supply-side of maritime freight in North Carolina. The facilities at the state's ports as well as those of the three neighboring ports are discussed in terms of infrastructure and capacity. In addition, how these facilities connect to the broader transport system is shown. The second section also discusses which services are offered and the companies that provide those services.

The third section contains descriptions of the existing demand-side of maritime freight in North Carolina with a focus on network usage for maritime freight activities as well as performance with respect to the state's three neighbor ports: Norfolk, Virginia; Charleston, South Carolina; and Savannah, Georgia. The industries served and markets supported by maritime transport are outlined and the safety and security of ports and maritime transport is briefly covered.

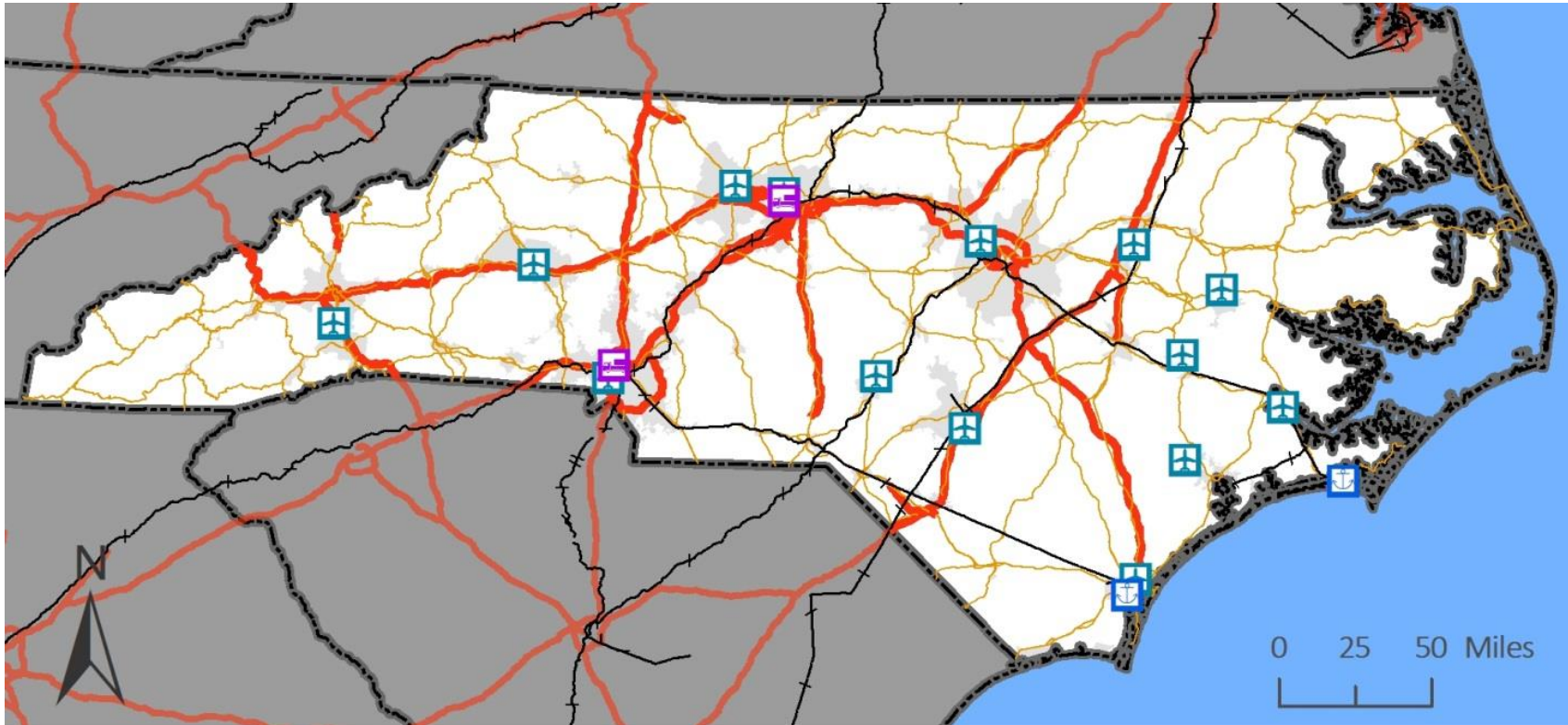
The fourth section identifies various trends and forecasts that will help establish future freight maritime markets and defines unmet needs in North Carolina.

The fifth, and final, section provides a needs assessment. This assessment identifies needs and opportunities for North Carolina's maritime trade based on cargo forecasts and emerging trends and markets.







## 2.0 Inventory – Supply

North Carolina's existing maritime infrastructure comprises more than its marine terminals and extends well beyond the state's coastal counties. State infrastructure supporting maritime trade includes its ports, waterways, highways, rail network, as well as inland production, logistics, and distribution centers (Figure 2.1) that serve maritime and other freight modes.

Figure 2.1 North Carolina Freight Nodes and Facilities



North Carolina Freight Nodes and Facilities

- |   |                 |   |                    |
|---|-----------------|---|--------------------|
|  | Inland Terminal |  | Railroad           |
|  | Port            |  | Interstate Highway |
|  | Airport         |  | US Highway         |



Source: AECOM/URS from ESRI, North Carolina Department of Transportation (NCDOT), North Carolina Department of Agriculture NCDA, and the US Geological Survey (USGS) ThematicMapping world borders dataset

## 2.1 Facilities

North Carolina’s ports depend not only on their respective design and infrastructure, but also on additional facilities such as Inland ports and mega sites that support maritime and other freight movement. Analysis of these facilities’ effectiveness to enhance North Carolina’s economic development requires the examination of the state’s infrastructure as well as an understanding of neighboring state ports and North Carolina’s competitiveness. Analyzed and compared in the following sections are the maritime facilities of North Carolina, Virginia, South Carolina, and Georgia.

### 2.1.1 North Carolina’s Ports

There are two deep sea ports in North Carolina, the Port of Wilmington and the Port of Morehead City, which are operated by the North Carolina State Ports Authority (NCSPA). They are compared in Table 2.1.

**Table 2.1 North Carolina Port Infrastructure**

Infrastructure/ Supply Facts	Wilmington	Morehead City
<b>Access</b>		
• Distance to sea buoy (miles)	26	4
• Air draft restriction (max. feet)	164	None
• Distance to interstate from gate (miles)	7.8	111
• Class I Rail Access	CSX	NS
• Rail Port Switching	Wilmington Terminal Railroad (WTRY of G&W)	Carolina Coastal Railway
• Rail Service	Heavy-lift & dimensional cargo: on-dock Container cargo: near-dock (on-dock possible)	Heavy-lift & dimensional cargo: on-dock
• Entrances	Two secured gates	One secured gate
<b>Size</b>		
• Acres	284	250
• Wharf (linear feet & # of berths)	6,800 & 9	5,500 & 9
• Depth (maximum feet)	42	45
<b>On-Site Facilities</b>		
	<ul style="list-style-type: none"> <li>• Container terminal</li> <li>• USDA-authorized fumigation</li> <li>• Covered dry bulk</li> <li>• Open storage dry bulk</li> <li>• Staging &amp; warehousing</li> <li>• Foreign Trade Zone 214</li> </ul>	<ul style="list-style-type: none"> <li>• Covered dry bulk</li> <li>• Open storage dry bulk</li> <li>• Staging and warehousing</li> <li>• Foreign Trade Zone 214</li> </ul>
<b>On-Site Cranes</b>		
	<ul style="list-style-type: none"> <li>• 4 rail-mounted STS container cranes, 165’ reach (18 containers)^</li> <li>• 2 rail-mounted STS container cranes, 120’ reach (13 containers)</li> <li>• 2 gantry cranes, 150-ton, 100-ton</li> </ul>	<ul style="list-style-type: none"> <li>• 1 bridge crane, 115’ outreach</li> <li>• 2 gantry cranes, 115-ton</li> <li>• 1 mobile crane, 125-ton</li> </ul>

Infrastructure/ Supply Facts	Wilmington	Morehead City
<b>Cargo Types Supported</b>	<ul style="list-style-type: none"> <li>• Intermodal containers</li> <li>• Breakbulk</li> <li>• Bulk</li> <li>• Roll-on/roll-off (Ro/Ro)</li> <li>• Project &amp; heavy lift</li> </ul>	<ul style="list-style-type: none"> <li>• Breakbulk</li> <li>• Bulk</li> <li>• Ro/Ro</li> <li>• Heavy lift</li> </ul>
<b>Military Use</b>	<i>Strategic Seaport</i>	<i>Strategic Seaport</i>

Sources: North Carolina Maritime Strategy (2012), 2015 Strategic Plan of the NCSPA (2015), NCSPA Facilities Guide (undated)

- Notes:
1. STS = Ship-to-Shore cranes are overhead cranes located at berths to load/ unload ships; they are usually rail-mounted so they can be moved along the wharf. RTG, or rubber-tired gantry cranes, are typically for stacking and moving containers around the yard.
  2. ^ = can serve ships as large as Post Panamax, \* = can serve ships as large as Super Post Panamax

The NCSPA handles containers, dry bulk<sup>1</sup>, and breakbulk<sup>2</sup> goods at the Port of Wilmington which is 26 miles upriver on the Cape Fear River. This port has an authorized channel depth along the Cape Fear River of 42 feet mean lower low water (MLLW<sup>3</sup>), while the depth of the ocean channel and inlet is authorized to 44 feet. The channel, however, has not been consistently maintained to this depth by United States Army Corps of Engineers (USACE).<sup>4</sup> In addition to depth limitations, the “S” curve shape of the Cape Fear River at the ocean entrance requires careful piloting for larger vessels, but has been proven to handle a post-Panamax ship. The Port of Wilmington also has an air draft restriction of 164 feet, which is the maximum height above the waterline of the vessel permitted to clear electrical lines that crisscross the channel. The turning basin in the Cape Fear River has recently been widened to 1,400 feet, which can accommodate post-Panamax vessels capable of transporting 8,000 to 10,000 twenty-foot equivalent units (TEU); the first such vessel docked in August 2016 (Figure 2.2).<sup>5</sup>

The Port of Wilmington Cold Storage (PWCS) facility began operations as a public refrigerated warehouse in late 2016. It is expected to add 100 jobs and have 11,000 pallet positions in a 3 million cubic foot warehouse. PWCS offers services of warehousing, blast freezing, import/export, transportation, rail service and cross docking, and United States Department of Agriculture (USDA) inspection services.<sup>6</sup>

The Port of Morehead City is located approximately four miles from the Atlantic Ocean and has a 45-foot MLLW deep channel from the sea buoy. It has nine berths with approximately 5,500 feet of wharf and

<sup>1</sup> Bulk cargo is loose cargo (dry or liquid) that is shoveled, scooped, forked, mechanically conveyed or pumped in volume directly into a ship’s hold. Examples handled by North Carolina ports include woodchips, phosphates, sulfur, cement, and aggregate.

<sup>2</sup> Breakbulk cargo is non-containerized general cargo stored in boxes, bales, pallets or other units to be loaded onto or discharged from ships or other forms of transportation. Examples handled by North Carolina ports include wood pulp (in rolls), raw rubber, steel, and lumber.

<sup>3</sup> MLLW = the average height of the lowest tide recorded at a tide station each day during the recording period.

<sup>4</sup> NC Maritime Strategy stakeholder input from USACE, July 1, 2011

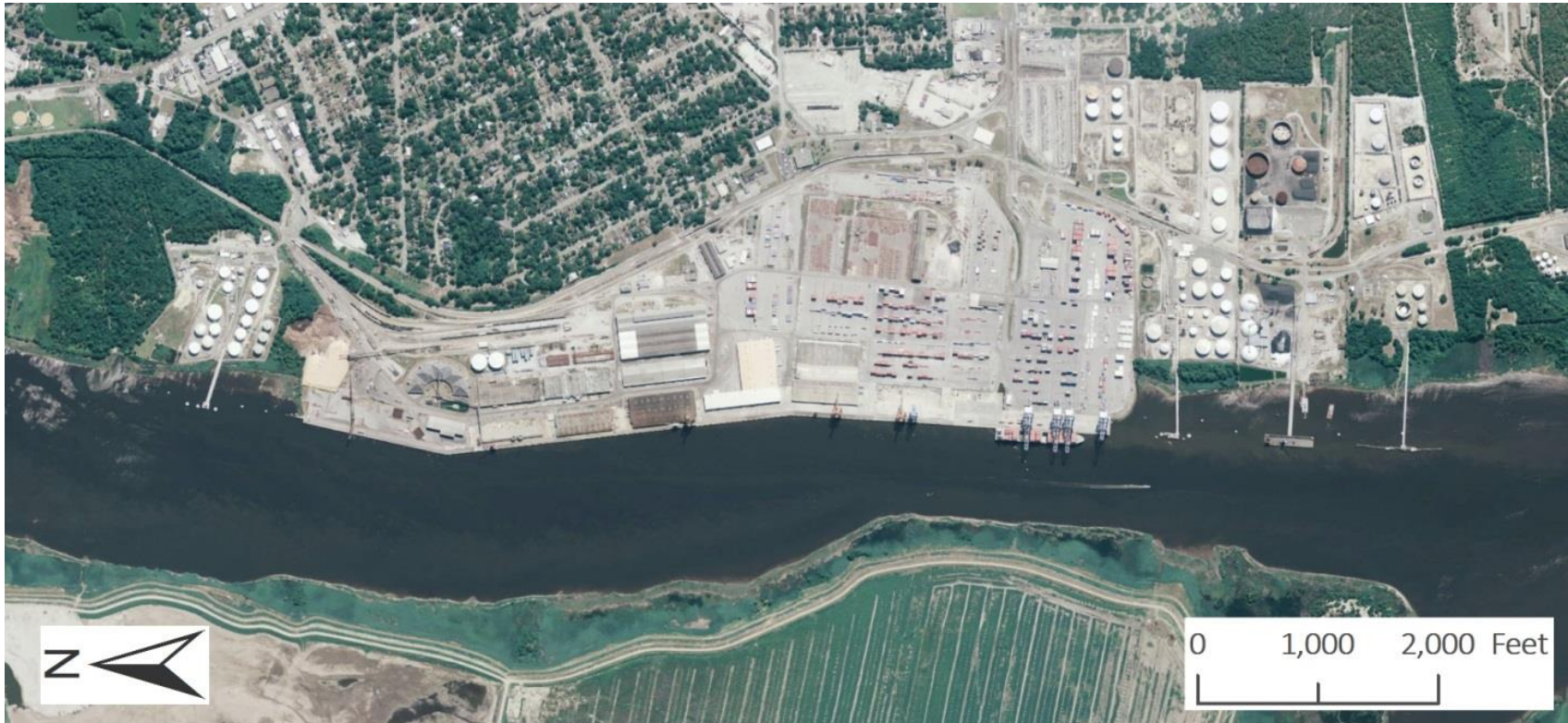
<sup>5</sup> <http://www.ncports.com/news/news-releases/north-carolina-ports-completes-turning-basin-project-welcomes-8200-teu-vessel-wilmington/> Accessed 8/10/2016, vessel docked on 8/7/2016.

<sup>6</sup> <http://pwcold.com/> Accessed 8/14/2016

handles both breakbulk and bulk cargo at its existing facilities. Radio Island, which is part of the Port of Morehead City, is located across the Newport River from the port and includes approximately 150 acres of land suitable for port industrial development. Figure 2.3 shows the location of the Port of Morehead City and Radio Island.



Figure 2.2 Port of Wilmington Aerial



Port of Wilmington Aerial

Source: NAIP (2015)





Figure 2.3 Port of Morehead City Aerial



Port of Morehead City Aerial

Source: NAIP (2015)



### 2.1.2 North Carolina's Neighbor Ports

North Carolina imports and exports are handled primarily through ports in Virginia, South Carolina, Georgia, and North Carolina. The Port of Wilmington competes for the container market with peer ports on the United States (US) east coast, including Norfolk, Virginia, Charleston, South Carolina, Savannah, Georgia, and to a lesser extent, Jacksonville, Florida. For the non-container market, the extent of competition varies based on the type of cargo handled and proximity of importer/exporter to the port location. Therefore, the regional ports identified as peers to North Carolina ports include Norfolk Virginia, Charleston South Carolina, and Savannah Georgia. These peers were selected for evaluation and comparison based on the following factors:

- Similar location in the southeastern US: all of the ports selected are likely to directly serve North Carolina shippers and the emerging Piedmont Atlantic Megaregion is composed of core metropolitan areas, including Birmingham, AL, Atlanta, GA, and two in North Carolina – Charlotte and Raleigh-Durham
- All have interstate landside access to major North Carolina market areas without passing one of the other peer ports
- All are designated as strategic military ports
- They are the leading ports for North Carolina waterborne exports
- They handle the same freight types as the North Carolina facilities, facilitating comparison

These regional ports are compared in Table 2.2 and the North Carolina port details are in Table 2.1. Note, future, near-term construction projects at the regional ports are discussed in section 5.1.1.

North Carolina's ports rank the closest and farthest among the regional peers in terms of distance to the ocean. Morehead City has a highly advantageous location that is closest to the ocean and nearly the best water depth—only Norfolk is currently deeper. Wilmington, by contrast, is the most distant from the ocean. In terms of water depth, it ranks at the bottom among its peers, tied with Savannah.

The handling facilities at North Carolina's ports are more limited than those of its peers in terms of the variety of freight types that can be handled, but this is changing. Although both refrigerated cargo and roll-on/roll-off (Ro/Ro) can be shipped via North Carolina, the facilities are currently more limited than those at other ports and North Carolina port facilities lack specialized equipment to make such operations more efficient. The range of bulk commodities that can be handled is similarly limited. Fortunately, as discussed in Section 2.1.1, Port of Wilmington Cold Storage recently opened.

North Carolina's ports have the most limited hours of operation among the regional peers with Wilmington operating Monday through Friday (M-F) 8 am - 12 pm and 1 pm - 4:30 pm for the container terminal and Morehead City open M-F 8 am – 4 pm. While this has the benefit of containing operating costs, it also limits shippers' ability to access the port and deliver multiple truckloads in a day—ultimately constraining volumes and making other ports more attractive in terms of trucking costs and ability to move containers.

**Table 2.2 Summary of Regional Peer Port Characteristics**

Characteristic	Norfolk	Charleston	Savannah
<b>Landside Characteristics</b>			
<b>Employment (300 miles)</b>	24,385,081	12,485,153	14,540,810
<b>Employment (500 miles)</b>	46,705,178	31,630,102	26,769,378
<b>Jobs supported throughout state*</b>	374,600	187,600	369,000
<b>Annual economic contribution to state*</b>	\$60.3 B economic impact to state	\$53 B economic activity	\$20.4 B income \$84.1 B revenue \$2.3 B state/local taxes
<b>Distance to interstate from gate</b>	5.8 miles to I-264	2.5 miles to US 17 and I-26	5.6 miles to I-95 from Garden City Terminal 1.2 miles to I-16; 10 miles to I-95; 1.5 miles to I-516 from Ocean Terminal
<b>Rail access</b>	CSX and NS service to Hampton Roads; NS and CSX service to Norfolk via Suffolk and the Commonwealth Railway	CSX and NS service to Union Pier, Columbus Street, North Charleston and Veterans; On-terminal rail yards at Columbus St. and North Charleston	CSX and NS service to Garden City and Ocean Terminal; On-terminal ICTF at Garden City
<b>Port Characteristics</b>			
<b>Distance to sea buoy (miles)</b>	18	16	20
<b>Depth (maximum feet at MLLW)</b>	Norfolk International Terminal (NIT): 50 (with authorization to dredge to 55) VIG: 55	45 (harbor channel and dockside)	Garden City Terminal: 42
<b>Air draft (feet)</b>	No Restriction	186 (Wando Welch) 155 (North Charleston)	185
<b>Type of facilities</b>	Bulk Grain Container Ro/Ro Breakbulk Refrigerated cargo	Container Ro/Ro Breakbulk Bulk Refrigerated cargo Cruise	Container Ro/Ro Breakbulk Bulk Refrigerated cargo Cruise
<b>On-site cranes</b>	8 STS container cranes, 231' reach (25 containers)* 14 STS container cranes, 201' reach (22 containers)* 6 STS container cranes (17-container reach)* 1 STS container crane (12-container reach) 7 rubber-tired gantry cranes 30 rail-mounted gantry cranes	6 STS container cranes, 197' reach* 4 STS container cranes, 190' reach* 6 STS container cranes, 145-146' reach^	16 STS container cranes (22-container reach)* 6 STS container cranes (17-container reach)^ 2 gantry cranes, 175-ton 7 gantry cranes, 100-ton 1 barge crane, 500-ton
<b>Operational Characteristics</b>			
<b>Military use</b>	Yes-- Strategic Seaport (Hampton Roads)	Yes--Strategic Seaport	Yes--Strategic Seaport

Characteristic	Norfolk	Charleston	Savannah
<b>Gate hours of operation</b>	NIT: M-F 5am - 6pm; Sa 7am – 12pm		
	VIG: M-F 5am - 6pm; Sa 7am – 12pm	Container gates: 7am - 6pm	GCT Gate 3: M-Th 7am -6pm; F 7am–5pm
	NNMT: M-F 7am – 11am; 12pm – 4pm	Breakbulk gates: 8am - 12pm; 1pm - 5pm	GCT Gate 4: M-F 7am - 6pm; Sa 8am – 12pm; 1pm – 5pm
	Portsmouth Marine Terminal (PMT): M-F 8am – 5pm		

Sources: AECOM team analysis, NCDOT rail maps, individual port web sites. Longitudinal Employer-Household Dynamics (<http://onthemap.ces.census.gov/> interactive tool used for 2014 employment numbers)

Notes: 1. STS = Ship-to-Shore cranes are overhead cranes located at berths to load/ unload ships; they are usually rail-mounted so they can be moved along the wharf. RTG, or rubber-tired gantry cranes, are typically for stacking and moving containers around the yard.  
 2. ^ = can serve ships as large as Post Panamax, \* = can serve ships as large as Super Post Panamax  
 3. \* = refers to the state where the port is located: Virginia for Norfolk, South Carolina for Charleston, and Georgia for Savannah.

Port of Virginia. Located in the Hampton Roads area near the entrance of the Chesapeake Bay and operated by the Virginia Port Authority (VPA). The key marine terminals include: Norfolk International Terminals (NIT), Virginia International Gateway (VIG), Newport News Marine Terminal, and Portsmouth Marine Terminal (PMT). VIG is the former APM terminal – an automated container terminal; it is privately owned but operated by VPA through a 20-year long-term lease signed in 2010. Also in this area are the Kinder Morgan bulk terminals that handle coal, other dry bulk cargo, and liquid bulk (petroleum, chemicals, and ethanol). This is one of the deepest ports on the US east coast because of the naval facilities in the region; it is 50 feet deep and can be dredged to 55 feet. This and the other peer ports are served by both Class I railroads – Norfolk Southern (NS) and CSX.

Port of Charleston. This port is 16 miles from the open ocean and is maintained at a depth of 45 feet; deepening is planned in the future. There are air draft restrictions (bridges) to reach some of the terminals. Landside, cargo can reach interstate highways in 2.5 miles and the port is served by both CSX and NS with on-terminal rail yards at two locations. Charleston’s facilities are spread among five existing facilities with a sixth one under construction. It serves all types of cargo and cruise lines.

In November 2015, area cold storage was expanded by 81,000 square feet to 136,000 square feet at the New Orleans Cold Storage facility in North Charleston.<sup>7</sup>

Port of Savannah. As with many east coast ports, it recently received its first post-Panamax vessel with a capacity of 10,000 TEUs in July 2016.<sup>8</sup> The container terminal has a depth of 42 feet MLLW but the harbor is currently being deepened. The port has a 1,500-foot turning basin. The Garden City Terminal,

<sup>7</sup> <http://www.scsps.com/news/new-orleans-cold-storage-expansion-grows-charlestons-cold-storage-capacity/> Accessed 9/6/2016.

<sup>8</sup> <http://www.gaports.com/Media/PressReleases/TabId/379/ArtMID/3274/ArticleID/74/Savannah-sees-first-vessel-through-expanded-Panama-Canal.aspx> Accessed 9/6/2016. The MOL Benefactor moved approximately 3,000 containers at the Garden City terminal of GPA and was also to stop at Norfolk and New York/New Jersey.

Georgia Port Authority's (GPA) container port, consists of 1,200 acres with 9,693 feet of berth area for containerized cargo, 600 feet of berth for liquid bulk, 1.2 M square feet of warehousing (with 68 K sq. ft. cold storage), and 3,378 feet of rail sidings.<sup>9</sup> The Ocean Terminal is 200.4 acres dedicated to breakbulk and Ro/Ro cargo with 5,768 feet of waterfront consisting 5 berths and 4 slips. This terminal also has more than 1.4 M square feet of transit sheds and warehouse space along with 11,100 feet of rail sidings.<sup>10</sup>

### 2.1.3 Inland Support Facilities

Inland ports, intermodal rail facilities, and logistics sites support the distribution of waterborne goods in the port locality. These facilities may be used to perform tasks that package or repackage goods, load containers, and transfer containers between truck and rail. Tasks such as receiving, processing, customs requirements, inspection, and handling for cross-dock shipment may also be performed at an inland port. Many functions previously performed dockside may be transferred to inland sites, thereby relieving demand for the limited area on or near a marine terminal. These facilities in North Carolina and the neighboring states are listed in Table 2.3 and key ones are discussed next.

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<sup>9</sup> <http://www.gaports.com/portofsavannah/GardenCityTerminal.aspx> Accessed 9/6/2016.

<sup>10</sup> <http://www.gaports.com/portofsavannah/OceanTerminal.aspx> Accessed 9/6/2016.

**Table 2.3 Inland Ports and Mega Sites by State**

State	City	Name	Status	Size (acres)	Facility Type*	Cargo Type	Rail Access	Associated Sea Port
Virginia	Front Royal	Virginia Inland Port (VIP)	Existing since 1989 with 39 major companies near VIP	161 (8.5M SF of buildings)	SMT	Containers	NS dedicated, 5x/day	Norfolk
	Dublin	Virginia TradePort	Existing	Data not available	MLP	Data not available	12 miles to NS yard in Radford, VA	Norfolk
	Greensville County	Mid-Atlantic Manufacturing Center (MAMaC)	Proposed	1,545	EDI, certified mega site	n/a	CSX mainline with spur, NS nearby	n/a
	Richmond	Meadowville Technology Park	Existing	1,300	mega site	n/a	None	Port of Virginia
	Charlotte	Charlotte Inland Terminal	Existing	16	SMT	Containers	8 miles to NS terminal, 1 mile to CSX terminal	Wilmington
	Chatham County	Chatham-Siler City Advanced manufacturing site	Existing	approx. 1800	Megasite, NC Certified		NS	Wilmington
	Greensboro	Piedmont Triad Inland Terminal	Existing, dormant	Data not available	SMT	n/a	CSX, NS terminals 6 miles away	Wilmington
North Carolina	Greensboro	Greensboro-Randolph Megasite	Under development	1,480	mega site, KPKG certified		NS	Wilmington
	Kinston	Global TransPark	Existing	2,500	MLP	Air Cargo	Short-line RR spur into NCRR	Morehead City
	Edgecombe County	Kingsboro-Rose Mega Site	Existing	1,307	EDI, mega site	n/a	CSX line borders property	Norfolk or Morehead City
	Leland	International Logistics Park (ILP)	Existing, NC Certified Site	1,029	EDI, mega site	n/a	CSX at Mid-Atlantic LC is closest	Wilmington
	Leland	Mid-Atlantic Logistics Center	Potential site: new, across from	1,025	EDI	n/a	CSX connection	Wilmington



State	City	Name	Status	Size (acres)	Facility Type*	Cargo Type	Rail Access	Associated Sea Port
			ILP					
	Lenoir	Caldwell-Lenoir Transload Facility	Existing trans-load & consolidation center	Approx. 5	RIP	Data not available	Short-line RR interchanges with NS	n/a
	Navassa	1690 Royster Road	Potential site: new, undeveloped	53	EDI	n/a	CSX	Wilmington
	Navassa	Lincoln Industrial Site	Potential site: new, undeveloped	280	EDI	n/a	CSX	Wilmington
	Navassa	Old Mill Road Site	Potential site: new, undeveloped	256	EDI	n/a	CSX line borders property	Wilmington
	Northwest	Northwest Rail Site	Potential site: new, undeveloped	135	EDI	n/a	CSX line borders property	Wilmington
	Rocky Mount	Carolina Connector (CCX)	Proposed	500+	Intermodal Terminal	Containers	CSX	Wilmington,
Union County	Project Legacy	Proposed	5,000	EDI	n/a	CSX	Wilmington	
Tennessee	Memphis	Port of Memphis	Existing, massive	37 freight terminals, 15 river miles	MLP	Containers, Bulk, Breakbulk	BNSF, CSX, CN, Illinois Central, NS, UP	Multiple
	Chattanooga	Enterprise South	Existing (Volkswagen automotive assembly)	1,600 (+1,400 coming)	certified mega site	Automobiles for North America	CSX & NS	n/a
	Clarksville	Commerce Park	Under development, companies include Dow Corning, Hemlock	1,187	certified mega site	Data not available	Short line access	n/a
	Rossville	Memphis Regional	Private NS facility	4,100	RIP	Containers	NS	Memphis

State	City	Name	Status	Size (acres)	Facility Type*	Cargo Type	Rail Access	Associated Sea Port
South Carolina		Mega Site	under construction					
	Stanton	West TN Megasite Advantage Auto Park	Potential site: for sale by TVA	1,720	certified mega site	Likely Ro/Ro for automobiles	CSX rail access	n/a
	Dillon County	Inland Port	Proposed April 2016					
	Greer	Inland Port Greer	Existing, Opened Oct 2013	38 acres currently, 100 acres when complete	Inland Port	Containers/ BMW cars	NS	Charleston
	Santee	Jafza Magna Park	Being developed	1,322	EDI	Data not available	CSX branchline	Charleston, Savannah
	Clarendon County	I-95 Mega Site	Existing, land for sale	1440	certified mega site	Data not available	None	Charleston, Georgetown
	Chester County	Carolinas I-77 Mega Site	Private	1,152	certified mega site	Data not available	On-site short line, 12 mi. to Class I	n/a
	Dillon County	I-95 Industrial Mega Site	Land for sale	1,920	mega site	Data not available	CSX	Charleston
	Kershaw County	Central South Carolina Megasite	Existing	1,426	certified mega site	Data not available	On-site	Charleston
	Orangeburg County	See text for site names and details	Multiple sites proposed	Approx. 1,100	mega site	Data not available	Varies by site	n/a
Graniteville	Sage Mill East Site	Potential site	1,380	certified mega site	n/a	NS	Charleston, Savannah	
Georgia	Bainbridge	Port Bainbridge	Existing	107	SMT	Dry & Liquid Bulk	CSX	Savannah
	Columbus	Port Columbus	Existing	14	SMT	Liquid Bulk	NS	Savannah
	Cordele	Cordele Intermodal Center	Existing. Opened on 7/1/2011.	40, expandable to 1,200	SMT	Containers	Heart of Georgia RR to GA Central to CSX	Savannah
	Augusta	Augusta Corporate Park	Potential site	1,734	GRAD site	n/a	NS rail access	Savannah
	Cook County	South Cook Industrial	Potential site	2,000	GRAD site	n/a	NS rail spur	Brunswick



State	City	Name	Status	Size (acres)	Facility Type*	Cargo Type	Rail Access	Associated Sea Port
		District						
	Newton County	Stanton Springs	Potential site	1,618	GRAD site	n/a	None	Savannah
	Baldwin County	Sibley Smith Industrial Park	Potential site	1,643	GRAD site	n/a	None	Savannah
	Baldwin County	Milledgeville-Baldwin County Industrial Park	Potential site	414	GRAD site	n/a	none	Savannah
	Barrow County	One University Parkway-Statham	Potential site	360	GRAD site	n/a	none	Savannah
	Barrow County	Park 53 Industrial/Technology Complex	Potential site	288	GRAD site	n/a	none	Savannah
	Barrow County	University Parkway/Stan Coley Property	Potential site	78	GRAD site	n/a	none	Savannah
	Bartow County	Highland 75-White	Potential site	707	GRAD site	n/a	none	Savannah
	Bibb	Airport East Industrial Park-Macon	Potential site	264	GRAD site	n/a	none	Savannah
	Murray County	Appalachian Regional Port	Scheduled to Open 2018	42	Inland Port	Scheduled to hold 50k containers with plans to double in 10 years	CSX	Savannah

Note: RR = railroad, NS = Norfolk Southern Railway or Norfolk Southern Corporation, NCRR = North Carolina Railroad Company, CSX = CSX Corporation, GRAD = Georgia Ready for Accelerated Development, EDI = Economic Development Initiative, SMT = Sea Marine Terminal, MLP = Master Limited Partnership, RIP = Rail Inland Port.

## North Carolina's Inland Terminals

Owned by NCSPA, and operated by FSI, Inc. since May 2, 2016, Charlotte Inland Terminal (CIT) is a 16-acre site that is Customs-Trade Partnership against Terrorism or C-TPAT certified and bonded by US Customs and Border Protection. The facility provides storage space for approximately 400 stacked containers and 300 containers on chassis. NCSPA offers "Sprint" container service via truck to and from the Port of Wilmington, Charlotte, and beyond. CIT has access to I-77 and I-85 for trucking. CIT is not directly accessible by rail. The CSX Charlotte intermodal terminal is approximately one mile away and the NS intermodal facility is approximately eight miles from CIT. Thus, FSI will start draying containers to/from the CSX terminal to the CIT for delivery/pickup when the Queen City Express between Wilmington and Charlotte starts operating weekly in the second quarter of 2017.<sup>11</sup>

The Piedmont Triad Inland Terminal (PTIT) is located in Greensboro, North Carolina. It is an existing site that is currently dormant. The PTIT property is currently being leased to a private company for its use. CSX and NS have terminals approximately six miles from PTIT; however, there are rail spurs within one mile.

## Regional Intermodal Facilities, Logistics Centers, and Mega Sites

### CSX Charlotte Intermodal Terminal

CSX operates an existing intermodal terminal west of downtown Charlotte. The existing facility has an annual capacity of 122,000 lifts.<sup>12</sup> This facility is currently operating near capacity.

### Charlotte Regional Intermodal Facility

NS has an existing 200-acre intermodal yard in Charlotte with an annual lift capacity of approximately 200,000 containers.<sup>13</sup> This terminal is located at the Charlotte-Douglas International Airport. The facility opened in December 2013 to replace NS's older and capacity-constrained yard north of uptown Charlotte.

### NS Greensboro Intermodal Terminal

NS also maintains an intermodal terminal in Greensboro, from which they have recently initiated six-day-a-week double-stack intermodal service serving container ports at Hampton Roads, Virginia.

### Global TransPark

Global TransPark (GTP) is an industrial site located in Kinston, North Carolina with 5,775 acres of industrial-permitted land nearby. It is owned by the State of North Carolina and has a focus on aerospace, logistics, and industrial activities. GTP is designated as a foreign trade zone and it has some sub-zones. The site has access to four modes of transportation: air, road, rail, and sea. Road connections include US 70 and US 258. A 5.7-mile spur connects GTP to the North Carolina Railroad (NCRR) mainline, thereby enabling a

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<sup>11</sup> NCSPA outreach interview August 17, 2016

<sup>12</sup> A lift is the loading of one container or trailer on or off a railcar. Source: CSX Intermodal Facility Expansion, Twenty-Year Impact Analysis, January 2014

<sup>13</sup> <http://www.cltairport.com/News/Pages/IntermodalFacilityFastFacts.aspx> Accessed 11/1/2016

connection to the Port of Morehead City; Gulf & Ohio Railways was contracted with in late 2015 to operate the spur.<sup>14</sup>

GTP's anchor tenant is Spirit AeroSystems, which has developed a \$200 million, 600,000 square foot manufacturing facility on 304 acres, from which Spirit fills airframe orders to Airbus and Gulfstream. Spirit was incented with a 100-year, \$100 annual ground lease.

GTP developments and operations have been funded through a combination of public (federal and state) and private sources. For the last nine fiscal years since its initial operation, GTP has received state funding to support annual operations; the most recent operations funding has been \$1.28 million per year. In return for this state investment, the North Carolina Department of Commerce<sup>15</sup> estimates the following economic benefits to the state due to tenant operations:

- \$27.5 million annual contribution to 13-county regional gross domestic product (GDP), including \$16.3 million in taxes
- \$52.9 million statewide economic impact
- \$583.9 million projected statewide economic impact in 2014, including \$26.2 million in future tax revenues from existing GTP tenant operations and future Spirit operations

With rail connections and a functioning intermodal facility (proposed) GTP seeks to model itself after Virginia Inland Port. Targeted industries include: aerospace and aviation manufacturing; high-tech manufacturing; logistics services; emergency response; and defense and security. GTP seeks greater strategic coordination and alignment with NCRR and NCSPA. Infrastructure and development proposed for the medium- and long-term future would include additional land acquisition, new Spine Road, transload facility, rail expansion, improved Interstate, and rail connection to the Port of Wilmington.

### **Lenoir Transload Facility**

The Lenoir Transload Facility, also called the Caldwell County Trans-Load Facility, opened in 2008 in Lenoir, North Carolina near US 321 and Southwest Boulevard. It has a total planned capacity of thirty-six 60-foot railcars. The Caldwell County Railroad Company, a short-line, serves the facility with 22.7 miles of track between Hickory and Valmead, North Carolina. This rail line interchanges with the Asheville to Salisbury NS secondary mainline. This facility was jointly purchased by Caldwell County and the City of Lenoir in 2014 and a limited liability company was created to manage it.<sup>16,17</sup>

### **Virginia Inland Port (Fort Royal)**

The Virginia Inland Port (VIP) at Front Royal, Virginia, was opened in 1989 to draw container business from the Ohio Valley and away from the Port of Baltimore by providing a direct Norfolk Southern rail connection to Norfolk International Terminals (NIT). The inland port is owned and operated by VPA. The site offers nearby

<sup>14</sup> <http://www.newbernsj.com/article/20151203/NEWS/151209714>, Accessed 9/11/2016

<sup>15</sup> Per North Carolina Global TransPark Authority Strategic Plan (December 2010)

<sup>16</sup> [http://www.cityoflenoir.com/vertical/Sites/%7B20F8132D-8ED4-4B80-9072-44AB85A12D12%7D/uploads/2014\\_After\\_Action\\_Memos.pdf](http://www.cityoflenoir.com/vertical/Sites/%7B20F8132D-8ED4-4B80-9072-44AB85A12D12%7D/uploads/2014_After_Action_Memos.pdf), Accessed 9/9/2016

<sup>17</sup> [http://www.verdantebioenergy.com/wp-content/uploads/2014/04/29136-Verdante\\_Final.pdf](http://www.verdantebioenergy.com/wp-content/uploads/2014/04/29136-Verdante_Final.pdf), Accessed 9/9/2016

highway access connection to I-66 and I-81. Rail service between VIP and NIT, which is 220 miles away, includes a minimum of five trains per day and also serves the NS Chesapeake, Virginia facility. Major commodities handled at this facility include auto parts, logs/lumber, paper products, poultry, retail items, and rubber/plastics. VIP is a US Customs Recognized Port of Entry and a Foreign Trade Zone. This inland port has attracted at least 24 warehousing and distribution centers to the area.

### **Georgia Inland Ports**

Georgia has three major inland ports, all linked to the Port of Savannah for deep sea service. Two, Port Bainbridge and Port Columbus, are owned by the GPA. Port Bainbridge, operated by GPA, serves both dry and liquid bulk commodities on 107 acres and offers both short- and long-term storage in on-site transit sheds and warehouses. Port Bainbridge is served by two interstates (I-10 and I-85), CSX, and barge. Port Columbus handles liquid bulk on 14 acres on the Tri-Rivers system. It is served by highway, NS railroad, and barge.

Cordele Intermodal Center (CIC), opened in July 2011, was developed as a public-private partnership. The facility includes rail service by three carriers and direct interstate access, on a 40-acre parcel. As of this writing, CIC can be expanded to 1,200 acres. Ultimate rail lift capacity will be 100,000 lifts at full build out. CIC offers chassis operations, which are purported to be able to save shippers 40 percent in dray costs. CIC connects to the GPA Garden City Terminal via a 200-mile rail line.

Aside from the existing centers, Georgia has listed over 50 potential sites for industrial or logistical use.

### **South Carolina Inland Ports**

South Carolina opened its first inland port in October, 2013, in Greer. It currently operates on a 38-acre campus 212 miles from the Port of Charleston. The facility has plans to grow to 100 acres over the next few years. Norfolk Southern Rail is the exclusive rail provider. The capacity for the port will be 100,000 lifts at full build out; in its first fiscal year it completed 58,000 lifts and 75,000 in its second year.<sup>18</sup> The Greer port offers a chassis pool onsite with maintenance.

### **Additional Planned Logistics Centers and Inland Ports**

#### **Carolina Connector Intermodal Terminal (planned)**

CCX, or the Carolina Connector, is an intermodal terminal planned by CSX in Rocky Mount, North Carolina. The facility will provide approximately 500 acres adjacent to CSX's A-line, east of I-95 and just east of US 301. The immediate area may develop into a full intermodal logistics center with shared resources and value-added services available. This project is scheduled to be opened in 2020.

#### **Greensboro-Randolph Mega Site (planned)**

The Greensboro-Randolph Mega Site is a KPKG certified, 1,480 acre site located in Randolph County with Greensboro as a close neighbor. The site is 10 miles from I-85 via US 421. The site is also served by a Norfolk Southern Rail corridor. NCRP plans to buy 100 acres of land that borders the mega site.

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<sup>18</sup> 2016 North America Inland Port Logistics Annual Report, CBRE Research

### Chatham-Siler City Advanced Manufacturing Site

Chatham-Siler City Advanced Manufacturing Site is a North Carolina certified site at approximately 1,800 acres. The site is served by Port of Morehead City, Port of Wilmington, and Port of Charleston. An NS rail line is available on the east side of the property.

### Legacy Park Mega Site (planned)

Project Legacy is a development proposed by the Union County Partnership for Progress, a public-private economic development organization. The site is located near the planned Monroe Connector and Bypass project on US 74 and would comprise 5,000 acres of industrial and commercial development, including several rail-served tracts. The site in Union County is adjacent to the existing CSX rail line.

### Kingsboro-Rose Mega Site (planned)

The Carolinas Gateway Partnership of Rocky Mount, North Carolina, is promoting a 1,307-acre industrial area in Edgecombe County, North Carolina, called the Kingsboro-Rose Mega Site. Based on a 2006 study by the Center for Regional Economic Competitiveness, rubber products were identified as a potential growth market for economic development in the area. This site is served by rail (CSX) and highway (US 64). I-95 is approximately ten miles away via US 64.

### International Logistics Park

International Logistics Park (ILP) in Leland, North Carolina is a joint economic development venture of Brunswick and Columbus counties in southeastern North Carolina. It is within 16 miles of the Port of Wilmington via US 74 and I-140. It is an undeveloped mega site that has highway access but no direct rail access. The site is a North Carolina certified mega site.

### Mid-Atlantic Logistics Center (planned)

On the other side of US 74/76 across from ILP is the Mid-Atlantic Logistics Center which is a privately-owned facility. In addition to the road access noted for ILP, this site has access to a CSX rail line. It is zoned for light industrial and the economic development commission is looking for “rail-dependent logistics businesses such as plastics or furniture manufacturers.”

### Brunswick Industrial River Park (planned)

This 900-acre site with 400 developable acres is located along I-140, the Cape Fear River, and the Brunswick County side of the border with New Hanover County in Navassa, North Carolina. It is less than 10 highway miles from the Port of Wilmington. It is zoned heavy industrial and is within 0.5 miles of a CSX key branch line; a spur extends to the southeast part of the property.

### Planned Inland Ports in Neighboring States

Jafza South Carolina, LLC, has plans to develop a logistics, manufacturing, and distribution park on 1,322 acres in Santee, South Carolina (Orangeburg County). The inland port would handle, store, and transload containers arriving at the Port of Charleston and destined for the US east coast and Midwest. Proposed storage capacity is 660,000 TEUs. Highway improvements to the site are currently underway, including

extension of SH301 and connections from SH301 to I-95, which recently received US Department of Transportation (USDOT) TIGER III funding.

Three mega sites are under development: Chester County (Carolinas I-77 Mega Site), Dillon County, and Kershaw County.

The success of the Greer inland port in South Carolina has sparked an April 2016 proposal for a 2<sup>nd</sup> inland port in Dillon County.

The Appalachian Regional Port will augment the Port of Savannah in 2018. A \$19.7M spending package to construct it was approved by the Georgia Ports Authority in July 2016. It will be sited on 40 acres in Chatsworth (Murray County) with rail service by CSX and rubber-tired gantry cranes for on-site cargo transfers.

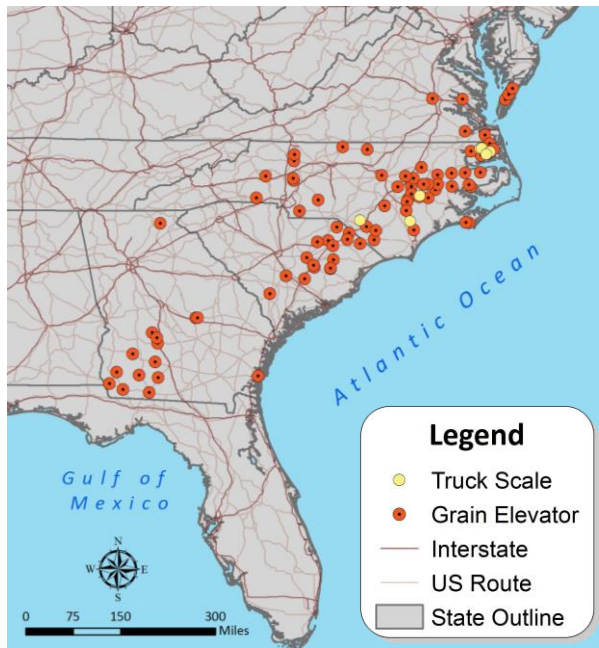
#### *2.1.4 Rail Yards*

In addition to the intermodal terminals identified above, CSX and NS maintain several rail yards in North Carolina. CSX maintains transfer terminals and service bulk terminals in Winston-Salem, Raleigh, Charlotte, and Wilmington. CSX's major rail yards are located in Hamlet and Rocky Mount. NS maintains rail terminals in Raleigh, Winston-Salem (bulk transfer), and Asheville as well as a rail hub in Linwood.

#### *2.1.5 Grain Elevators and Truck Scales*

Inland grain elevators and truck scales are important assets to support transport of goods to port for export. The locations of both privately-owned and public grain elevators are shown in Figure 2.4. The locations of highway truck scales are also shown.

**Figure 2.4 Location of Truck Scales and Grain Elevators in North Carolina and Surrounding States**



Source: AECOM/URS from (1) USDA (2010). Directory of Export Elevators at Export Port Locations including Facility Data. Grain Inspection, Packers and Stockyards Administration (GIPSA), Federal Grain Inspection Service. (2) <http://yellowpages.aol.com/grain-elevators/nc/>, (3) <http://www.ncscorp.com/nscportal/nscorp/Customers/Industrial-Products/Agriculture/grain-directory.html> Grain Customer Directory, North Carolina Elevator Grain Facilities, and (4) North Carolina of Ag-USA Market News, Raleigh, North Carolina, Stephen Beasley Market Reporter, [http://www.ncagr.com/market/mktnews/RA\\_GR110.TXT](http://www.ncagr.com/market/mktnews/RA_GR110.TXT)

## 2.2 Freight Significant Corridors

Maritime freight generally transits in water and over land, with water transport often being in between two land trips. Therefore, when considering key freight corridors for North Carolina’s maritime freight, water and land networks are addressed.

Goods movement patterns in the US have emerged to optimize the supply chain based on sources of goods and consumer market locations. A fully functioning system of ports of entry, transportation links, and distribution nodes is needed to bring goods to market. This has led to a transportation strategy focused on “gateways” that facilitate the entry of goods and “corridors” that provide reliable capacity to transport goods and “support facilities” that sort, handle, and distribute goods.

For example, reliability of transit time is critical for delivery of containerized goods. By affording “time-certain” delivery, the container supply chain – including ship, train, and truck – serves as a virtual warehouse, thereby reducing warehousing requirements. To avoid congestion-related transportation costs and delays, shippers and shipping lines are drawn to ports of call that provide access to transportation networks (highway and rail facilities) and distribution centers with adequate capacity and a record of time-certain delivery.



Increasingly, transportation providers – including air and seaports, departments of transportation, railroads and facility operators – are collaborating to implement multi-state or multi-party strategies for gateway and corridor development.

### 2.2.1 Marine Networks

The longest section of an international freight trip is likely the travel time and distance of crossing one or more oceans to deliver freight from one country to another. Water routes specific to the US coastline as well as the crucial linkage of the Atlantic and Pacific Oceans via the Panama Canal are next described along with a brief mention of the Suez Canal's recent expansion.

#### Domestic Marine Corridors

In domestic US waters, a network of marine highway corridors have been designated that align with nearby US interstate highways, for example, Marine Highway 95 (M-95) parallels I-95. These marine corridors can be seen in Figure 2.5. Within the network are both deep sea corridors serving ocean-going foreign and domestic ships (short sea shipping) as well as river corridors serving primarily barge traffic, such as up and down the Mississippi River.

**Figure 2.5 Map of Short Sea Shipping Routes in the United States**



Source: North Carolina Maritime Strategy (2012)  
([www.marad.dot.gov/ships\\_shipping\\_landing\\_page/mhi\\_home/mhi\\_home.htm](http://www.marad.dot.gov/ships_shipping_landing_page/mhi_home/mhi_home.htm))

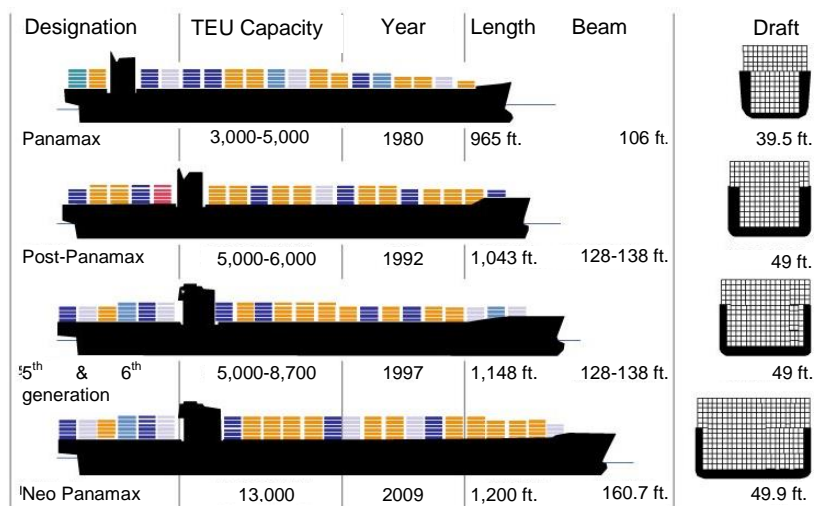


## Panama Canal Expansion

The new Panama Canal was inaugurated with the first vessel transiting the canal on June 26, 2016<sup>19</sup> and the first vessel to call on an east coast port arriving at the Port of New York and New Jersey on July 8, 2016.<sup>20</sup> Locally, the Yang Min Unity (a post-Panamax container ship with 8,200 TEUs) called on the Port of Wilmington on August 7, 2016 because two recent projects were completed – the Panama Canal expansion and the widening of the Port of Wilmington’s turning basin.<sup>21</sup>

The Panama Canal can now allow more and larger (deeper draft, wider, and of greater capacity) ships to pass through this key trade link between Asia and the US east coast. The expansion comprised the addition of a second, larger set of locks allowing for transit “Neo Panamax” ships that have nearly three times the carrying capacity of current Panamax ships (Figure 2.6). Perhaps more importantly, the new parallel locks significantly increase the capacity of the canal. With high vessel demand, transit through Panama Canal had required an average four days of canal water time (including actual canal transit and wait time) and caused vessels to queue for up to ten days during peak shipping seasons. Vessels carrying passengers or high-value goods often paid extra to jump the queue.

**Figure 2.6 Container Vessels Capable of Transit through the Panama Canal**



Source: Adapted from [www.globalsecurity.org](http://www.globalsecurity.org)

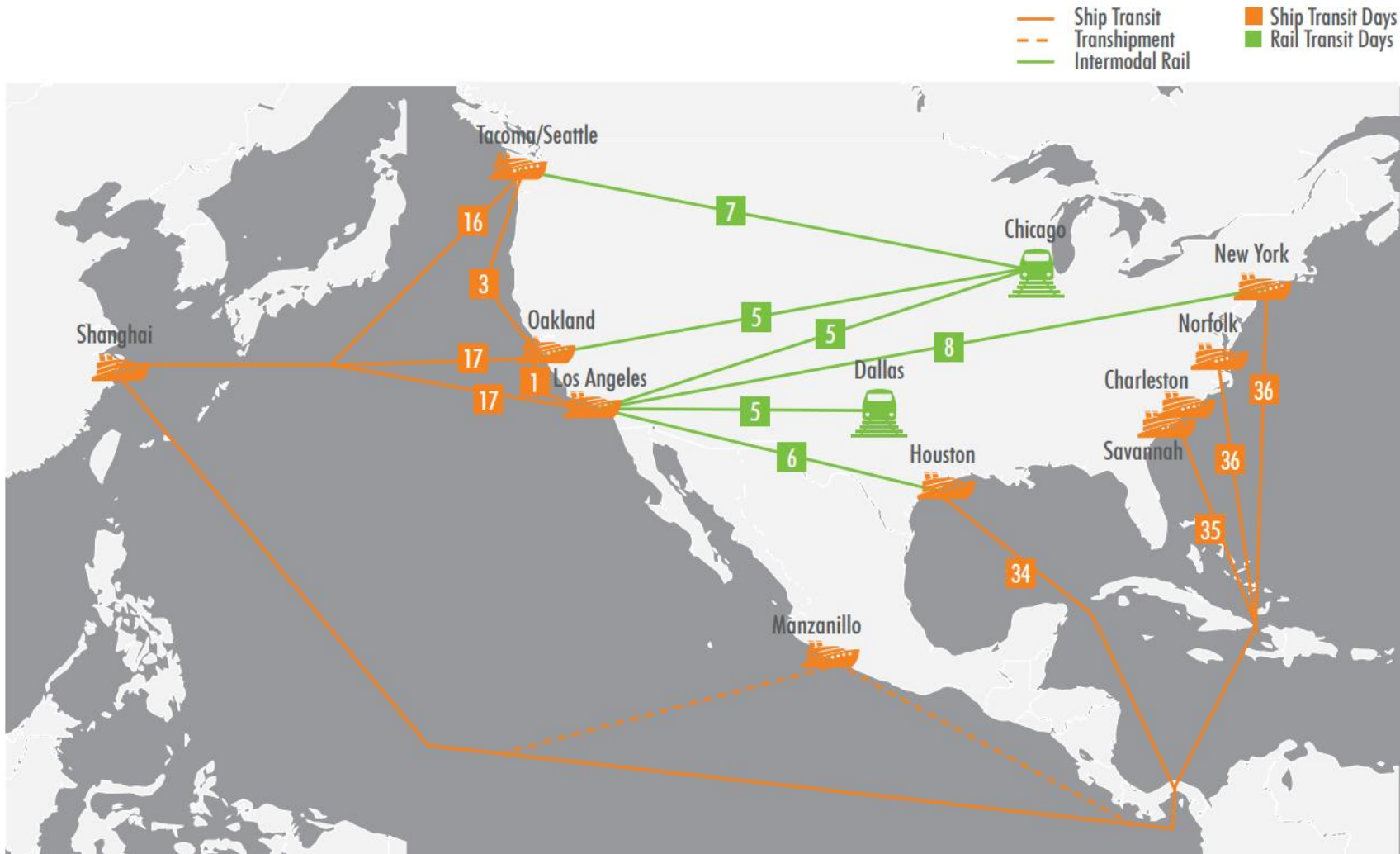
For a reference point, consider that maritime-based trips between Shanghai and the US east coast can range in length from approximately 25 to 36 days, as shown in Figure 2.7. Sailing east from Shanghai, vessels can either dock on the US west coast and use a land bridge to reach the east coast, or follow the all-water route through the Panama Canal. The travel times via the former are faster, but likely more expensive than the latter and the tradeoff may or may not be warranted based on the commodity.

<sup>19</sup> <http://www.dredgemag.com/July-August-2016/ACP-Marks-Opening-of-Expanded-Panama-Canal/> Accessed 8/14/2016.

<sup>20</sup> <http://www.dredgemag.com/July-August-2016/EAST-COAST-PORTS-WELCOME-POST-PANAMAX-VESSLS-AS-EXPAND-ED-CANAL-OPENS/> Accessed 8/14/2016.

<sup>21</sup> <http://www.ncports.com/news/news-releases/north-carolina-ports-completes-turning-basin-project-welcomes-8200-teu-vessel-wilmington/> Accessed 8/12/2016.

Figure 2.7 Shanghai to the US East Coast – Overland vs. All-water Routes



Source: Image from 2016 North America Seaports and Logistics Annual Report, CBRE Research; data from IMS Worldwide, Inc.

## Suez Canal Expansion

The current focus on the Panama Canal results from the dominance of Asia in the US container trade. With a potential trade shift to India and other parts of Asia, the Suez Canal may become a more significant consideration in the size of vessels that serve the US east coast. The Suez Canal has no locks, and therefore no vessel length restrictions. Ships with a maximum draft of 68.9 feet and beam of nearly 200 feet can navigate the Suez Canal (neo Panamax or super post-Panamax vessels). And, to increase its competitiveness and offer improved two-way travel, the Suez Canal completed an extension in August 2015; a parallel waterway 45 miles in length was created and dredged to depth of 79 feet to accommodate vessels with a 66-foot draft.<sup>22</sup> The regional ports are currently called on by vessels coming through the Suez Canal; however, super post-Panamax ships have not called on North Carolina ports and its ports cannot currently support these vessels. The peer ports currently have or have ordered super post-Panamax cranes to service these huge vessels.

### 2.2.2 Domestic Land Networks

In the southeastern US, highways and railways provide the land transport access to market. The goods movement characteristics of these two systems are described below.

#### Highway

Goods originating from or destined for use in North Carolina are transported primarily by truck. The state and regional network of interstate, state, and local highways substantially support the movement of goods throughout the state and between the state and its international trading partners.

Truck routes within North Carolina comprise Interstate Highways, United States Highways and State Highways, as well as four-lane divided roadways. North Carolina's Strategic Transportation Corridors, Statewide Logistics Plan and Seven Portals Study each recognize important corridors within the state's highway network. Review of the state highway network serving in-state port facilities and providing access to ports in the neighboring states of Virginia, South Carolina, and Georgia identifies the following primary highway routes for waterborne truck freight within North Carolina:

- I-40 serving Port of Wilmington, the Triangle Region, and Greensboro from east and west
- I-85 serving Charlotte, Greensboro, and the Triangle Region from north and south
- I-95 serving Lumberton, Fayetteville, and Benson from north and south
- I-26 providing access from western North Carolina to Port of Savannah and to Port of Charleston
- I-73/1-74 providing access from Greensboro to Port of Charleston
- I-77 providing access from Charlotte and western North Carolina to Port of Savannah and to Port of Charleston

<sup>22</sup> <http://www.cnn.com/2015/08/07/egypt-unveils-suez-canal-extension-with-pomp-filled-ceremony.html> Accessed 9/13/2016

- US 17 providing access along eastern North Carolina to Port of Wilmington, Camp Lejeune, Morehead City, as well as Port of Charleston to the south and Port of Norfolk to the north
- US 70 serving Morehead City, Kinston, and the southern Triangle Region
- US 74/US 76 serving Lumberton and Port of Wilmington
- NC 24 serving Fayetteville and Morehead City

### I-95 Corridor Coalition

Interstate 95 comprises nearly 2,000 miles of interstate highway from Maine to Florida (Figure 2.8). The I-95 Corridor Coalition brings together key entities and agencies such as state and local transportation departments, transportation authorities, transit and rail agencies, port authorities and railroads who have established a collaborative vision plan. NCDOT is an active member of the I-95 Coalition, which plans and advocates for projects that will advance multi-state passenger and freight mobility needs of this primary highway backbone along the Atlantic seaboard.

**Figure 2.8 I-95 Corridor**



Source: I-95 Corridor Coalition

## Rail

Efficient freight rail service is an important component of inland distribution for market opportunities that include large or heavy loads, containerized goods, or transport of goods beyond a cost-efficient trucking distance. For the most part, North Carolina's rail network offers sufficient capacity to accommodate additional rail trips across most of the state. The completion of several projects under development such as the Pembroke Turn and the Fayetteville Connector will improve the operational efficiency of the rail network.

Current freight rail network within the state of North Carolina comprises more than 3,200 miles of rail trackage owned by 22 railroads. Two Class I<sup>23</sup> railroad companies, CSX and NS, operate approximately 77 percent of the state's rail system<sup>24</sup>. Short lines and switching companies operate on the remainder of the system. The US Military owns rail rights-of-way to two North Carolina facilities. The rail network is shown in Figure 2.9.

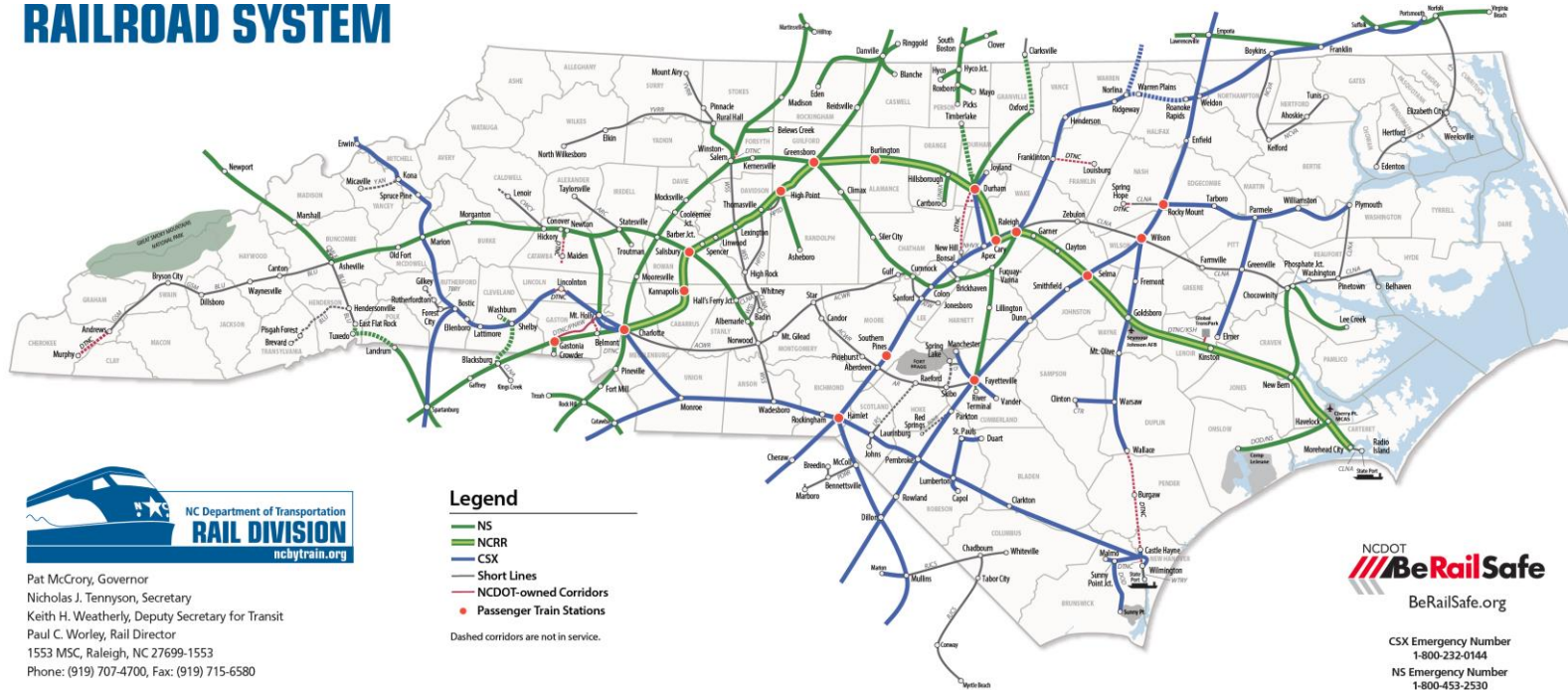
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<sup>23</sup> A Class I railroad carrier is defined as a railroad with annual operating revenues (based on 2005 statistics) over \$319.2 million.

<sup>24</sup> 2006 North Carolina Waybill Analysis Executive Summary

Figure 2.9 North Carolina Rail Network

# RAILROAD SYSTEM



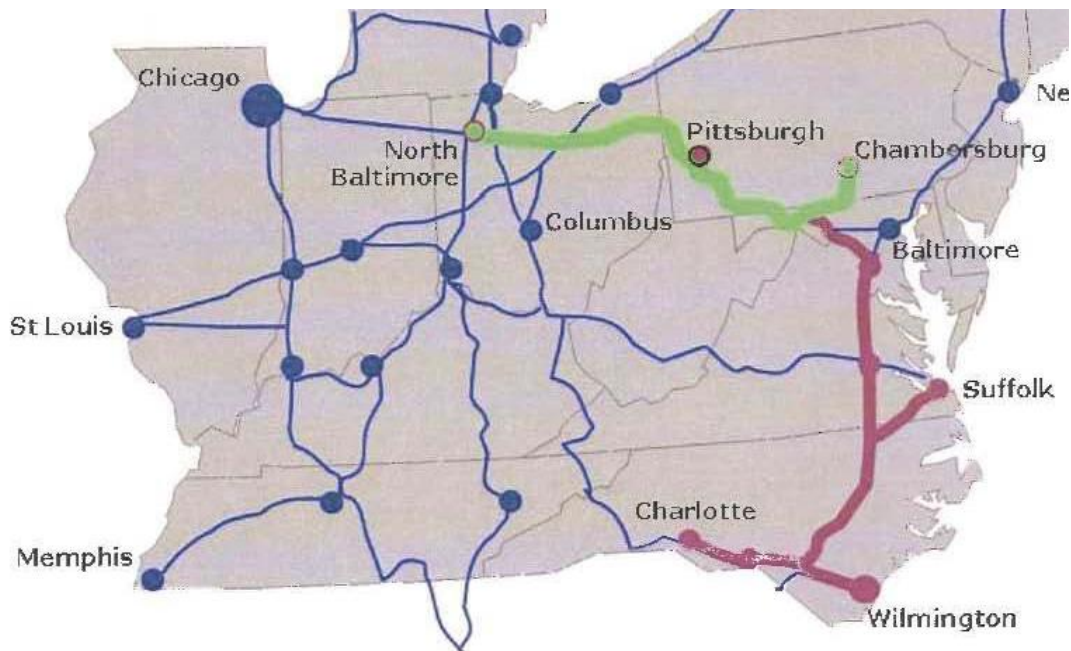
Source: [https://connect.ncdot.gov/resources/RailPoliciesDocument/NCRailMap\\_Directory\\_September%202016.pdf](https://connect.ncdot.gov/resources/RailPoliciesDocument/NCRailMap_Directory_September%202016.pdf) Accessed 11/1/2016.



## National Gateway

The National Gateway is a partnership between CSX, USDOT, and various state departments of transportation to better connect mid-Atlantic seaports to Midwest population centers (Figure 2.10). Key freight rail corridors included in the program include the I-95/I-81 corridor between North Carolina and Baltimore, Maryland, the I-70/I-76 corridor between Washington DC and northwest Ohio, and the I-40/Carolina Corridor between Wilmington, North Carolina and Charlotte, North Carolina. Among the National Gateway projects identified in North Carolina is proposed expansion of the existing CSX Charlotte intermodal terminal; advancement of this project requires that rail-related traffic impacts within Charlotte be satisfactorily addressed. Also, the planned Rocky Mount intermodal terminal and hub (CCX) will allow North Carolina to benefit from the improvements that have been made and are being made on the National Gateway Corridor. Virginia was recently awarded a FASTLANE grant to for the Atlantic Gateway. The improvements will resolve bottlenecks north of North Carolina on the network and will allow for more fluid freight movements coming to the Southeast, specifically the future Rocky Mount terminal.

**Figure 2.10 National Gateway Corridor**



Source: CSX, from Phase 1 National Gateway Clearance Initiative Environmental Assessment, 2010.

## Crescent Corridor

The Crescent Corridor<sup>25</sup> is a 2,500-mile Norfolk Southern (NS) rail corridor supporting the supply chain from Memphis and New Orleans to New Jersey. Shown in Figure 2.11, the corridor includes NS' two primary rail lines paralleling I-85 through North Carolina and other Atlantic states and paralleling I-40/I-81 in eastern Tennessee. NS is planning and implementing a series of focused improvements to move more freight -- and move it faster. Program components include new intermodal facilities in Memphis, Tennessee, Birmingham, Alabama, and Greencastle, Pennsylvania. Some projects have been advanced in partnership with USDOT as well as state and local governments.

<sup>25</sup> The Crescent Corridor website, <http://www.thefutureneedsus.com/crescent-corridor/>

Figure 2.11 Crescent Corridor



Source: <http://www.thefutureneedsus.com/crescent-corridor/>

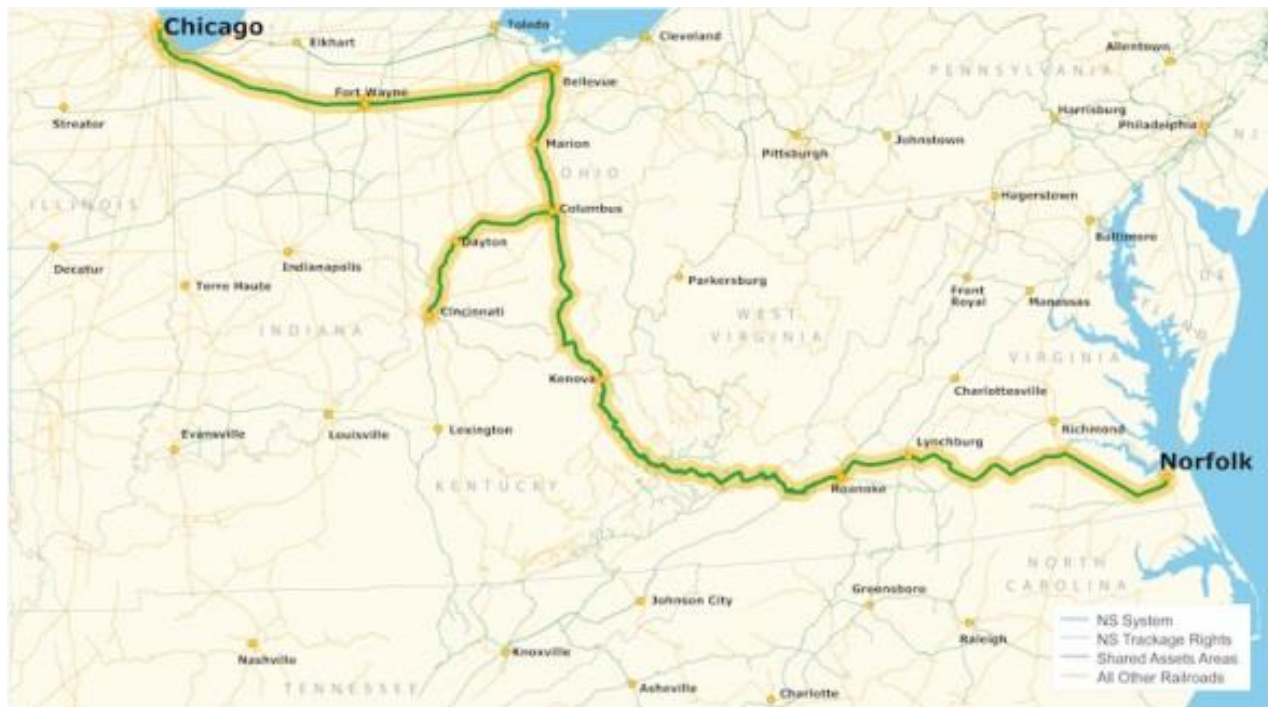
### Heartland Corridor

Norfolk Southern’s Heartland Corridor<sup>26</sup> provides access for intermodal trains carrying double-stacked containers along the high-speed, high-capacity NS line from VPA terminals in Norfolk, Virginia, to population centers and inland intermodal facilities in the US Midwest, as seen in Figure 2.12. The program, which was completed in September 2010, included total investment of \$191 million shared between NS and federal and state government, included a new intermodal terminal at Columbus, Ohio, and clearance improvements to allow for movement of double-stack containers along its full length. The improvements are estimated to have cut 250 miles and one day of transit time between VPA terminals and the Midwest destinations in Ohio and Chicago.

<sup>26</sup> Heartland Corridor website, <http://www.thefutureneedsus.com/project-updates/heartland-corridor/>



Figure 2.12 Heartland Corridor



Source: <http://www.thefutureneedsus.com/project-updates/heartland-corridor/>

### 2.2.3 Multimodal Freight Network Serving Maritime

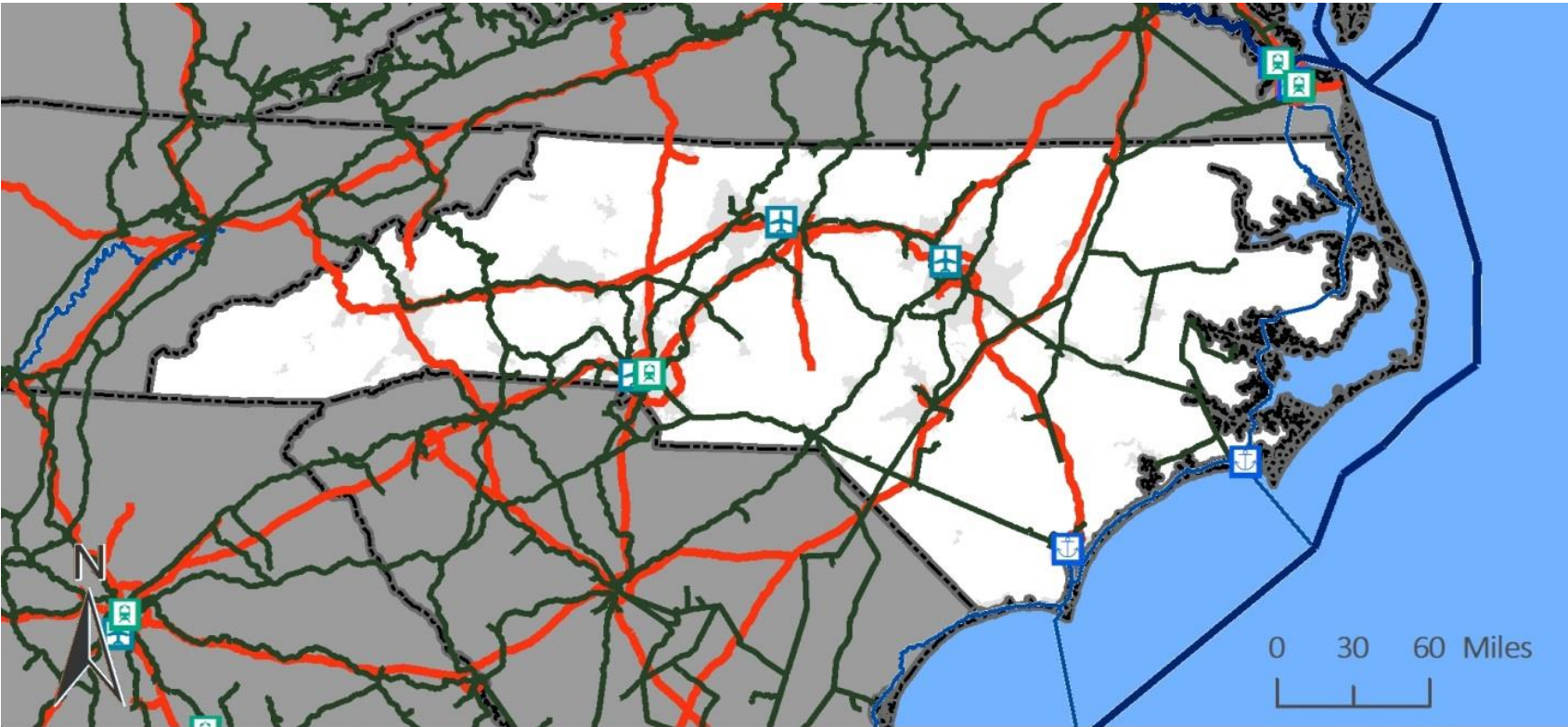
The domestic marine, road, and rail networks described above combine, as shown in Figure 2.13, to create the National Multimodal Freight Network which serves North Carolina's freight transport needs.<sup>27</sup> This is the network, as designated by the government, which is essential to efficiently move freight from producers and suppliers to consumers. In addition to the primary facilities, there are key "last mile" facilities.

According to the Bureau of Transportation Statistics, within the National Highway System and North Carolina's borders, there were freight intermodal connectors to two port terminals, four truck/rail facilities, nine airports, and five truck/pipeline terminals as of 2014.<sup>28</sup>

<sup>27</sup> This network also includes airports; however, these are less frequently tied to maritime transport.

<sup>28</sup> Freight Facts and Figures 2015 (USDOT: BTS)

Figure 2.13 Interim National Multimodal Freight Network



Interim National Multimodal Freight Network

-  Rail\_Connectors
-  Ports
-  Airport
-  Marine Highways
-  Highways
-  Railways
-  Inland and Coastal Waterways



## 2.3 Capacity

In maritime freight, ports are the gateways facilitating the entry of goods. Each port, based on its size, location, surrounding development, and access has capacity limits (Table 2.4). In addition, depending on the equipment and personnel, each port can process cargo at a certain rate (Table 2.5).

**Table 2.4 Regional Ports Capacity**

Cargo Capacity	Wilmington	Morehead City	Norfolk	Charleston	Savannah
<b>Intermodal containers (TEUs)</b>	600,000	0	3,630,000	3,230,000	4,500,000
<b>Breakbulk (Tons)</b>	1,470,000	1,080,000	6,820,000	4,030,000	7,440,000
<b>Bulk (Tons)</b>	2,220,000	2,730,000	0	100,000	2,110,000
<b>Ro/Ro (Units)</b>	Unknown	Unknown	320,000	200,000	1,070,000

In terms of physical capacity, the Port of Savannah has the largest container capacity at 4.5 million twenty-foot equivalent units (TEUs). The other neighbor ports can accommodate more than 3 million TEUs each, whereas Wilmington currently has space for 600 thousand TEUs. A similar story exists for breakbulk cargo, with Savannah outpacing the other regional ports with a capacity of more than 7.4 million short tons, followed by the other neighbor ports. The two North Carolina ports, even combined, still have less breakbulk capacity than any of the neighbor ports. But, the North Carolina ports top all regional ports in bulk cargo capacities, each at well over 2 million short tons. Finally, although North Carolina ports have the capabilities and can move Ro/Ro cargo (the military often will), this is a lesser focus than for the neighbor ports that presently serve automobile manufacturers as well as other heavy vehicle manufacturers.

**Table 2.5 North Carolina Port Capacities**

Infrastructure/ Equipment	Wilmington	Morehead City
<b>Equipment</b>	Four dock cranes, 18-container reach Two dock cranes, 13 container reach Mobile reach stackers Two gantry cranes (100- & 150-ton capacities) Lift trucks, 52,000 lb. max capacity	One bridge crane, 115' outreach Two gantry cranes (115-ton capacities) One mobile crane, 125-ton capacity Lift trucks, 70,000 lb. max capacity
<b>Facilities</b>		
<ul style="list-style-type: none"> <li>• Modern shiploader (dry bulk)</li> <li>• Open storage dry bulk</li> <li>• Covered dry bulk</li> <li>• Rail car storage*</li> </ul>	800 tons/hour transfer rate 1,000 tons/hour transfer rate 256 rail cars	Two berths, 3,000 tons/hour max loadout rate 800 tons/hour transfer rate 1,000 tons/hour transfer rate 350 rail cars

Infrastructure/ Equipment	Wilmington	Morehead City
<b>Overall Cargo Capacity</b>		
• Intermodal containers	600,000 TEU	0 TEU
• Breakbulk	1,470,000 Tons	1,080,000 Tons
• Bulk	2,220,000 Tons	2,730,000 Tons
• Ro/Ro	Unknown	Unknown

Sources: North Carolina Maritime Strategy (2012), 2015 Strategic Plan of the NCSPA, NCSPA Facilities Guide, G&W interview, CNLA call. Note: \* rail car storage for Morehead City is the maximum number of cars that can be on-site for operations; 200 cars on Radio Island and 100-150 at the main port.

Further increasing its ability to process containers in the immediate future (starting in second quarter 2017), intermodal service will be re-instituted at Wilmington with CSX’s Queen City Express operating between Wilmington and Charlotte; it will offer non-stop, double-stacked, overnight service once per week carrying 100 containers. One extra train per week for wood pellet movement began in the fall of 2016, and two more trains for wood exports are expected to begin running in late 2017 or early 2018.<sup>29</sup>

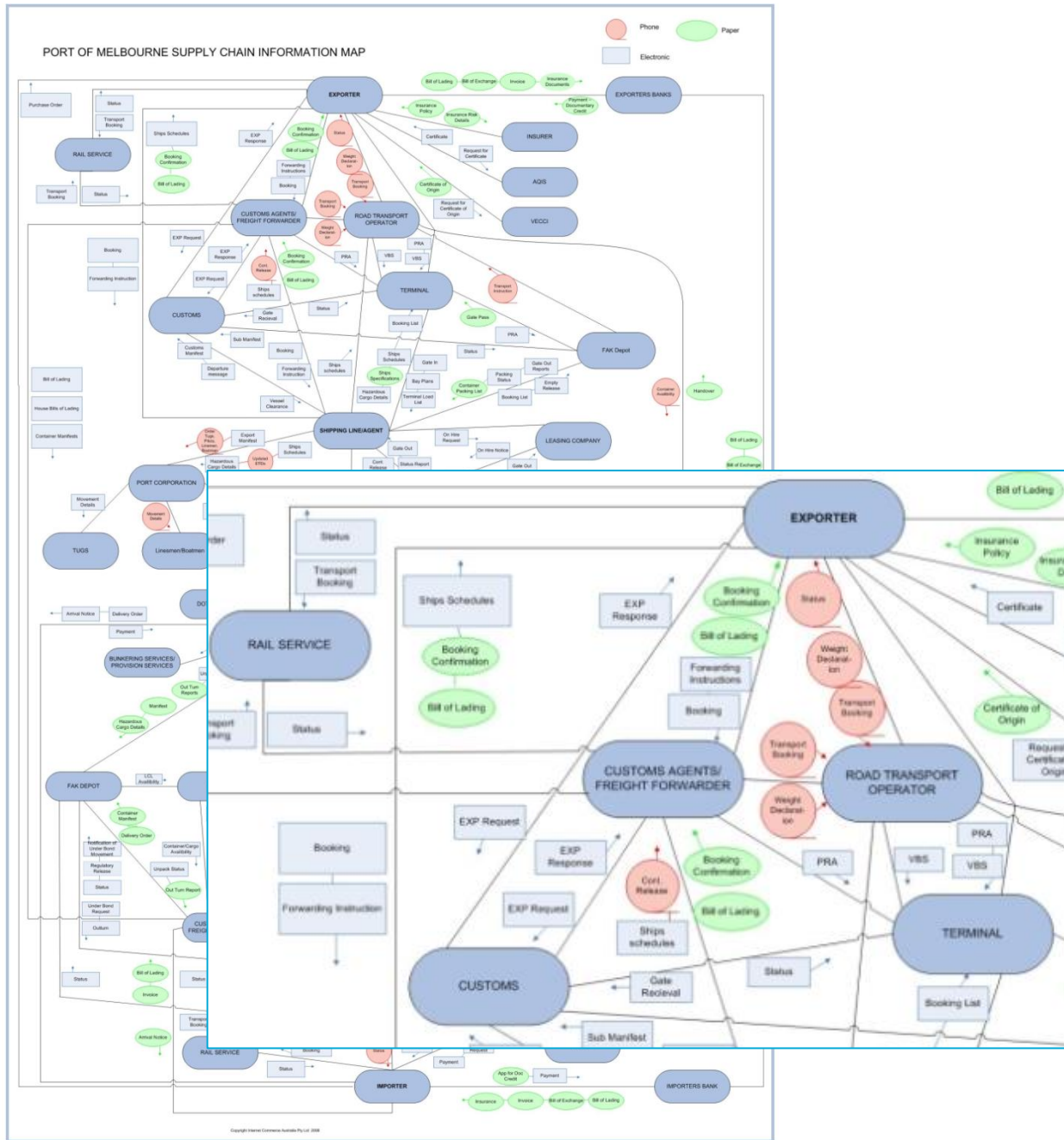
## 2.4 Services & Service Providers

Conducting international trade by moving goods through a port requires a variety of service offerings that add value to the commodity in transport. A helpful guide to the supply chain (and its myriad of steps) at one port is shown in Figure 2.14 for the Port of Melbourne. As shown in this figure, moving goods via water requires a series of steps of the administrative paperwork nature/information flow (manifest, bill of lading, invoice, bookings), physical tasks (weighing, inspections, customs, stevedoring), and personnel (planners/schedulers, freight forwarders, shipping line agents, vehicle operators, etc.). So, there are a host of services and service providers to be considered with waterborne cargo. Another helpful graphic describing various entities is shown in Figure 2.15; it is from a recent report by the US Government Accounting Office (GAO) and lists the entities as well as their roles. Three categories of providers are briefly covered here: marine-side, on-port, and land-side. Of import is that each service may alter the efficiency and/or cost of a cargo move thereby affecting a shipper’s choice of port and land-side mode.

<sup>29</sup> <http://www.ncports.com/news/news-releases/north-carolina-ports-completes-turning-basin-project-welcomes-8200-teu-vessel-wilmington/>. Accessed on 8/11/2016. And G&W interview on 7/27/2016. Correspondence with NCSPA on 1/31/2017.




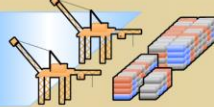






Figure 2.14 Example Port Supply Chain (Port of Melbourne)



Source: [https://www.commerceplus.net.au/support/Port\\_of\\_Melbourne\\_Supply\\_Chain\\_Information\\_Map?action=AttachFile&do=get&target=PortOfMelbSupplyChain2.jpg](https://www.commerceplus.net.au/support/Port_of_Melbourne_Supply_Chain_Information_Map?action=AttachFile&do=get&target=PortOfMelbSupplyChain2.jpg) Accessed 8/11/2016.

**Figure 2.15 Entities Involved in Shipping Cargo via Ports**

Entity	Description	Role in the supply chain
 <p><b>Shippers</b></p>	<p>The consumer or business providing goods for shipment, or as defined by the Federal Maritime Commission (FMC), an ocean transportation intermediary (non-vessel-operating common carriers).</p>	<p>Shippers make transportation choices—such as where and how to ship goods—based on firm and commodity attributes such as market value, costs, geography, perishability, time-sensitivity, and inspection requirements. Shippers consider total logistics costs, transit time, and reliability in their supply chain and operational decision-making.</p>
 <p><b>Ocean carriers</b></p>	<p>For profit entities that own and operate the ships that move cargo from one port to another. These entities may also own or lease the containers that cargo is shipped in. They frequently operate in alliances with other carriers. Ocean common carriers frequently establish collective agreements, filed with and monitored by the FMC, to discuss and agree on common pricing policies or to jointly provide shipping services.</p>	<p>Ocean carriers select which ports and terminals to call on and formulate their routes based on a number of factors, including overall port capacity, profitability, shipper demand, and other business objectives. Ocean carriers may charge shippers fees to rent out containers and late fees if containers are not returned after a certain period of time.</p>
 <p><b>Port authority</b></p>	<p>Public entities created by a state, county, or city that own and manage port property, including land and physical assets, which may extend beyond maritime. Typically governed by a board or commission elected regionally or appointed by an elected official.</p>	<p>Port authorities develop and strategize maritime assets, for example, choosing to specialize in handling certain commodities or types of cargo. They compete with one another domestically and internationally to secure and maintain leases with marine terminal operators and to attract vessel calls from ocean carriers.<sup>a</sup></p>
 <p><b>Marine terminal operators</b></p>	<p>Entities that may operate terminals at multiple ports or have affiliations with ocean carriers. The FMC defines marine terminal operators as providers of wharfage, dock, warehouse, or other marine terminal facilities to ocean common carriers moving cargo in the ocean-borne, foreign commerce of the United States. They often participate in marine terminal operator agreements, filed with and overseen by the FMC, whose members collectively engage in cooperative working arrangements or discuss and regulate rates or conditions of service.</p>	<p>Marine terminal operators lease facilities (e.g., a terminal) from port authorities and coordinate all cargo operations and other maritime related functions (such as operating the equipment that loads and unloads ships). They depend on ocean carriers' ships calling on their facilities for revenue. Terminal operators are also responsible for "calling" and contracting labor. Marine terminal operators may charge storage fees (demurrage) when a container is not picked up by a shipper after a certain period of "free" time.<sup>b</sup></p>
 <p><b>Labor</b></p>	<p>Workers (labor) engaged in longshore division work, such as crane and equipment operators, marine clerks, and mechanics. Their employment conditions, including rates of pay, hours, worker safety provisions and protections, are statutorily mandated or negotiated in labor contracts.</p>	<p>Labor is responsible for the clerical functions associated with the receiving, delivering, checking, tallying, inventorying, etc. of cargo and the physical loading and unloading cargo on and off of ships for transport into and out of the terminal. Labor is also responsible for the maintenance and repair of cargo handling equipment (including, but not limited to, the maintenance and repair of most chassis used to transport cargo to and from the terminal).</p>
 <p><b>Truckers</b></p>	<p>Truckers are truck operators, often owner-operators, who are paid by the number of pick ups and drop offs they make (commonly referred to as "turns"), or employees of licensed motor carriers.</p>	<p>Truckers transport containers between port terminals and other intermodal facilities, such as railyards and warehouses. Many are dispatched by larger trucking companies, while others work independently.</p>
 <p><b>Chassis leasing company</b></p>	<p>Third-party leasing companies now own the majority of container chassis—truck trailer beds hooked up to truck cabs designed to accommodate specific shipping container sizes (typically 20, 40, or 45 feet long). Ocean carriers once owned chassis, but recently got out of this line of business.</p>	<p>These companies rent chassis to truckers or long-term lease chassis to shippers, truckers, and others for the movement of ocean carrier's shipping containers to and from a terminal.</p>
 <p><b>Rail operators</b></p>	<p>For profit entities that own, maintain, and manage the railroad infrastructure and equipment they are dependent upon for carrying cargo. Freight railroads are divided into three groups, called classes, based upon their annual revenues.</p>	<p>Rail operators transport cargo to and from shippers and the terminals, using railroads located on-dock, near-dock (&lt;5 miles from port), and off-dock. Class I railroads, which are the largest railroads generally focus on providing long-haul freight services, whereas smaller or regional Class II and III railroads often provide the first and last mile of rail freight movement.</p>

Source: GAO. | GAO-17-23

Source: West Coast Ports: Better Supply Chain Information Could Improve DOT's Freight Efforts (GAO 17-23 published Oct 2016) (<http://www.gao.gov/assets/690/680719.pdf> Accessed 11/1/2016)

### 2.4.1 Marine-side Providers

In the international arena, there are several companies that own and operate ships to transport cargo. As discussed in detail later in section 4.2.1, shipping lines can operate independently or group themselves in alliances to transit shipping lanes and meet market demand for sailing frequencies.

In the local arena, specialty operators (such as river pilots and tug operators) are commonly needed to carefully maneuver the large vessels up and down narrow rivers with ever-changing contours caused by currents, shoaling, and dredging.

## 2.4.2 On-port Providers

### General

To physically load/unload cargo from docked ships and move it around the port, stevedores and crane operators are essential. The former are union laborers that tether and secure cargo on vessels as well as unload it. In the southeast US, most states are right-to-work states so most other port workers are non-union laborers. In the case of North Carolina, all the crane operators are port employees giving the port more freedom to be agile as markets change. Other key personnel include port security and gate operators.

### Value-added Services

Depending on the cargo moving through a particular port terminal, differing value-added services may be offered on-port. These enable a port to distinguish itself from others because of a specialty service that caters to a particular industry while also giving it another revenue stream. Such services offered at either Morehead City or Wilmington are as follows:

- Cleaning reefers (pre-tripping)
- Stuffing containers
- Fumigation of cargo
- Intense cleaning of warehouses for a commodity (such as for fluff pulp)
- Wood chipping on-site
- Storage – such as in warehouses, transit sheds, tanks
- Refrigeration services (cold storage, blast freezing, USDA inspection services)

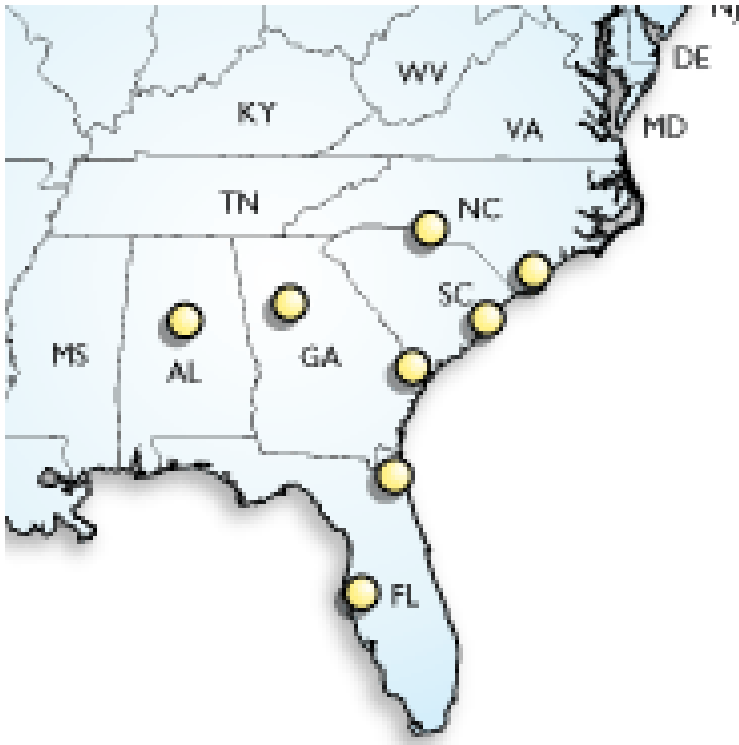
### Chassis

An on-port and land-side service is the leasing of chassis. A shipping container can be unloaded from a ship and loaded onto a chassis pulled by a truck tractor to dray the container to its final destination. Chassis were originally supplied by steamship companies, but nowadays in the US they are handled by leasing companies. Therefore, drivers must obtain a chassis to conduct a container move. A concept called the “gray” chassis pool is a way to efficiently share and distribute chassis among users of various ports in a region. For example, the GPA has an agreement with a company (South Atlantic Chassis Pool of Consolidated Chassis Management, or CCM) that has a fleet of chassis it allows any trucking line to use if they serve a port terminal in the southeastern US.<sup>30</sup> This same pool covers the Port of Wilmington, the Charlotte rail terminals of NS and CSX, terminals associated with Charleston, and facilities as far south as Tampa, Florida and far west as Birmingham, Alabama. At Norfolk there is a separate group, the Hampton Roads Chassis Pool. See Figure 2.16 for more information.

<sup>30</sup> <http://www.gaports.com/Media/PressReleases/TabId/379/ArtMID/3274/ArticleID/82/GPA-extends-%E2%80%98gray%E2%80%99-chassis-pool-agreement.aspx> Accessed 9/6/2016.



**Figure 2.16 South Atlantic Chassis Pool**



Source: <http://www.ccmpool.com/Chassis-Pools/SACP.aspx>

### 2.4.3 Land-side Providers

Once off-port, transport of cargo is typically handled by the Class I railroads and/or truck drivers that are either performing short drays or long-haul moves. Each of these modes is covered in greater detail in the Modal Profile – Rail and Modal Profile – Highway documents as part of this project, respectively.

Transport, storage, and distribution are often done land-side beyond port property where land is cheaper and less constrained. Charleston and Savannah have significant numbers of nearby warehouses and distribution facilities; for example, the South Carolina Ports Authority lists warehouses near the Port of Charleston totaling approximately 8.4 M square feet.<sup>31</sup>

<sup>31</sup> <http://www.scsipa.com/wp-content/uploads/port-of-charleston-area-warehouses.pdf> Accessed 11/1/2016.

## 3.0 Network Usage and Performance

North Carolina's main maritime assets are the Port of Wilmington and the Port of Morehead City. Both ports are designated as strategic seaports, capable of simultaneously handling commercial and military requirements. There are only 15 such ports nationwide. The state's maritime assets extend beyond the port properties, however. The NCSPA also operates inland terminals in Charlotte and in the Piedmont Triad region in Greensboro. NCSPA also owns a small boat harbor in Southport.

Separate from the NCSPA terminals, there are additional privately owned marine terminals along the Cape Fear River. For more information on these terminals, please refer to the [North Carolina Maritime Strategy](#) (AECOM, 2012).

### 3.1 Activity/Demand

The two North Carolina Ports, located at Wilmington and Morehead City, offer services for a variety of commodity types. Whether it is containers, bulk, break-bulk, or Ro/Ro, one of the ports can handle all goods. The NCSPA provides records of historic activity at each of the ports for numbers of vessel calls, tonnages handled, and types of cargo<sup>32</sup>. Major commodities are also listed. The sections below summarize the activity at the ports for imports and exports for 2003-2016 as reported by the NCSPA.

#### 3.1.1 Port of Morehead City

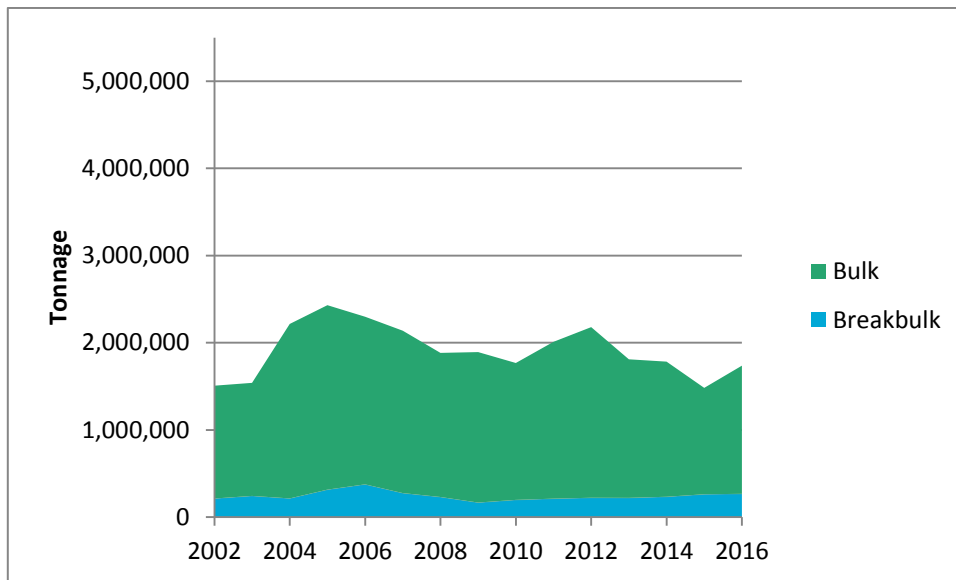
The Port of Morehead City is one of the deepest ports on the East Coast of the United States, and is located only four miles from the ocean. The port is served by rail and truck; it sees a ship approximately once every three days and a barge daily. The commodities imported at the Port of Morehead City over the past five years (2010-2015) include sulfur, rubber, metal products, scrap metal, and ores and minerals. On the exports side, phosphate, woodchips, metal products, and military materiel are the top commodities.

Total tonnage through the Port of Morehead City has remained relatively steady ranging from 1.5 million to 2.4 million tons from 2002-2016. Over the past five years, the total tonnage has hovered around 1.8 million tons, having not reached 2 million since 2012. The tonnage is all bulk and breakbulk, as containers are not handled at Morehead City. The tonnage trends for bulk and breakbulk cargoes are shown in Figure 3.1.

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<sup>32</sup> Port of Morehead City Port Statistics, <http://www.ncports.com/port-of-morehead-city/port-statistics/>; Port of Wilmington Port Statistics <http://www.ncports.com/port-of-wilmington/port-statistics/>

**Figure 3.1 Tonnage through the Port of Morehead City, 2002-2016**



Source: NCSPA

The trend shows that the majority of goods handled at Morehead City are bulk (85 percent by weight), with a smaller share of breakbulk. The breakbulk consists of scrap metal, military material, and vehicles.

Barges are heavily used at the Port of Morehead City to transport phosphate for export as fertilizers. The phosphate comes from PotashCorp (PCS) phosphate mines in Aurora, North Carolina and is barged to the Port of Morehead City. PCS has a longterm contract with the Port of Morehead City for the storage and export of phosphate rock, phosphoric acid, purified acid, and phosphate feed which is used as liquid and solid fertilizers and animal feed supplements, and other food and beverage products and metal treatment compounds<sup>33</sup>. PCS is an anchor tenant at Morehead City and while PCS also uses rail and truck to transport products, barge access and service is important to their operations.

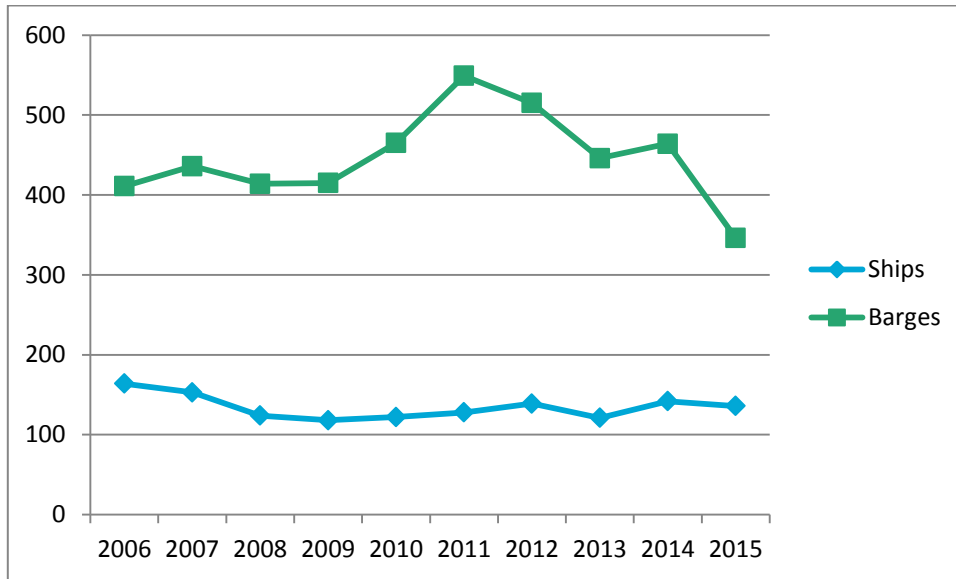
Volumes at this port have been gradually dropping over the past 10 years (2004 to 2013), falling from about 2.2 million tons to 1.8 million tons in 2013, although there is volatility over the time span. Rail freight carloads (measured as interchanged cars with the Carolina Coastal Railway at the port) have declined over 50 percent between 2010 and 2013.

Coincident with the gradual drop in volumes, ship calls are down from 168 in 2004 to 121 in 2013. Unlike container ships, bulk vessels have not grown in size over the past decade. Barge traffic at the port has increased strongly over the same period, from 250 to 446, but the barge traffic is heavily tied (not exclusively) to one tenant which has its own terminal off the port (PCS). As shown in Figure 3.2, approximately 75 percent of vessel calls at the Port of Morehead City are barges. PCS has long-term leases on shipping terminals in Morehead City and Beaufort, North Carolina, through which the company receives and stores raw materials and finished products. Barges and tugboats are used to transport solid products,

<sup>33</sup> PotashCorp, *Aurora Facilities & Investments*, <http://www.potashcorp.com/about/facilities/phosphate/aurora/>, accessed August 4, 2016.

phosphoric acid, and sulfur between the Aurora facility<sup>34</sup> and shipping terminals. Raw materials and products, including sulfur, are also transported to and from the Aurora facility by rail<sup>35</sup>. Existing reserves for the Aurora facility would permit mining for about 33 years. If deposits covered by permits are classified as resources, the mine life could extend to over 50 years, confirming that this is a long-term opportunity for North Carolina.

**Figure 3.2 Vessel Calls at the Port of Morehead City, 2006-2015**



Source: NCSPA

On the import side, rubber is consistently among the top cargoes handled at the port. While this is an important commodity, overall tonnages are down compared with historical volumes. Tonnages ranged between 132,000 and 142,000 tons in the period 2011 to 2013. By contrast, import tonnages of rubber ranged between 175,000 and 250,000 in the period between 2003 and 2006. Asphalt used to be among the top five commodities but volumes have declined and no longer rank highly. Volumes of ores and minerals have also gradually declined. While import volumes of these commodities have fallen, new import commodities have not been attracted to the port.

On the export side, phosphate dominates the port activity, accounting for over 80 percent of volumes. The balance of export activity is driven by a mix of wood chips, metal products, occasional military shipments, and other small volumes.

Adding pressure to the port’s bulk and breakbulk business is the growing trend toward containerization of these traditional bulk commodities. Some grains such as soybeans and dimensional lumber are increasingly utilizing containers in addition to traditional bulk methods of transit, driven by customers’ preference for better protection during transit and lower shipping rates made possible by larger container ships. Grain, wood and paper pulp, and wood products of all types are core bulk commodities tied to the industrial structure of North Carolina’s economy.

<sup>34</sup> PotashCorp’s facility in Aurora, NC is a large open pit mine and chemical plant for phosphate products.

<sup>35</sup> Summary of PCS operations drawn from 2010 10K report and supplemental filings with the US SEC. Report accessed at [http://www.potashcorp.com/annual\\_reports/2010/media/PotashCorp\\_10-K\\_110225.pdf](http://www.potashcorp.com/annual_reports/2010/media/PotashCorp_10-K_110225.pdf).

One cargo that cannot be containerized, and may prove to be a growth opportunity, is project cargo. For instance, the NCSPA recently imported wind turbine components including bases, hubs, and engines for a wind farm in Elizabeth City, North Carolina. Shipments started in May 2016 and all of the bases have been delivered; the hubs are expected to complete delivery by the end of 2016. They are part of Amazon Wind Farm US East, which will take up 22,000 acres and aims to have 104 turbines operating by the end of 2016. Approximately 100 base pieces were imported through Wilmington before the operations moved to the Port of Morehead City, where the remaining 316 base pieces were imported. The move was in part due to the availability of barges at Morehead City. The components are manufactured by Gamesa, a Spanish company that is coordinating the shipments, assembly, and commissioning of the towers. The wind turbine blades will be imported from the Port of Virginia. Parts arriving at the Port of Morehead City were trucked and barged to Edenton, North Carolina for staging before moving to the farm. Trucked parts required special permits and police escorts, and caused local traffic delays when they were transported during weekday mornings.

The Port of Morehead City considers this part of its “white glove customer service” specialized breakbulk capabilities. Successful shipments and transfers such as those to Edenton could pave the way for future imports of wind turbine equipment. Such a specialization would support not only jobs at the port, but also construction and long-term operations employment for the regions surrounding the wind farms. The site in Pasquotank County was already employing 200 in May 2016 for foundations and electrical work. With the potential for off-shore farms in addition to wind farms on land, there is upside potential for growth in this emerging industry, particularly if the parts can be manufactured domestically.<sup>36,37</sup>

### 3.1.2 Port of Wilmington

The Port of Wilmington is located on the southeastern coast of North Carolina, 26 miles up the Cape Fear River. The port is served by CSX rail and truck, and sees an average of one ship per day, while barges are infrequent at about two every month. Imports at the Port of Wilmington include chemicals, grains, fertilizers, cement, and chemicals. The top exports are forest products, woodchips, wood pulp, food, and general merchandise.

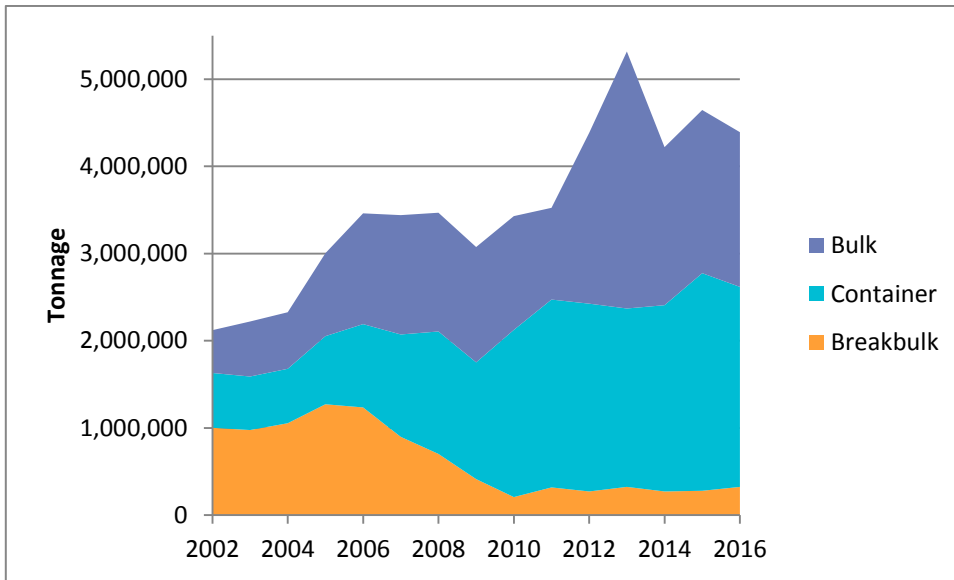
Total tonnage through the Port of Wilmington has more than doubled from 2 million tons in 2002 to 4.4 million tons in 2016 (Figure 3.3). In 2013, tonnage hit a record high of 5.3 million. Most of the tonnage is accounted for in containers (52 percent in 2016).

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<sup>36</sup> Harvey, Anna, “Ports authority officials fans of wind turbine section shipments,” *The Carteret County News-Times*, May 20, 2016, [http://www.carolinacoastonline.com/news\\_times/article\\_4258c872-1e9c-11e6-aca3-bb68fdb73809.html](http://www.carolinacoastonline.com/news_times/article_4258c872-1e9c-11e6-aca3-bb68fdb73809.html), Accessed 9/13/16.

<sup>37</sup> Hawley, Jon, “Wind energy blows into area – piece by mammoth pieces,” *Daily Advance*, May 26, 2-16, <http://www.dailyadvance.com/News/2016/05/26/Wind-energy-blows-into-area-piece-by-mammoth-piece.html>, Accessed 9/13/16.

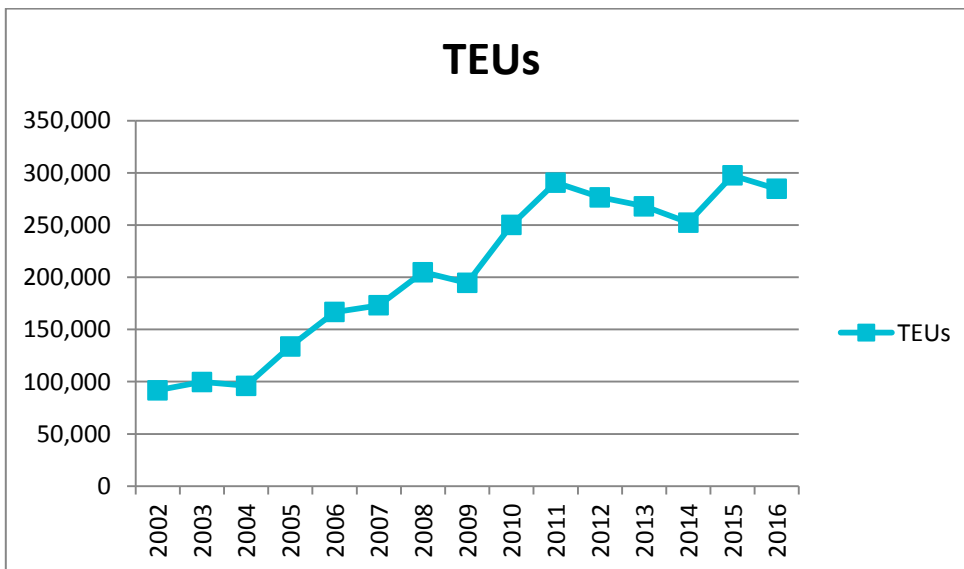
**Figure 3.3 Tonnage through the Port of Wilmington, 2002-2016**



Source: NCSPA

Since 2002, container traffic through the Port of Wilmington has increased three-fold from 91,000 TEUs to 284,000, an increase of 310 percent in 15 years (Figure 3.4). According to the North Carolina Ports Facilities Guide (NCSPA, 2015), the container terminal has a maximum capacity of 600,000 TEUs per year. The NCSPA has indicated that there is ample capacity for more container operations at the port<sup>38</sup>.

**Figure 3.4 Growth in Container Traffic at the Port of Wilmington, 2002-2016**



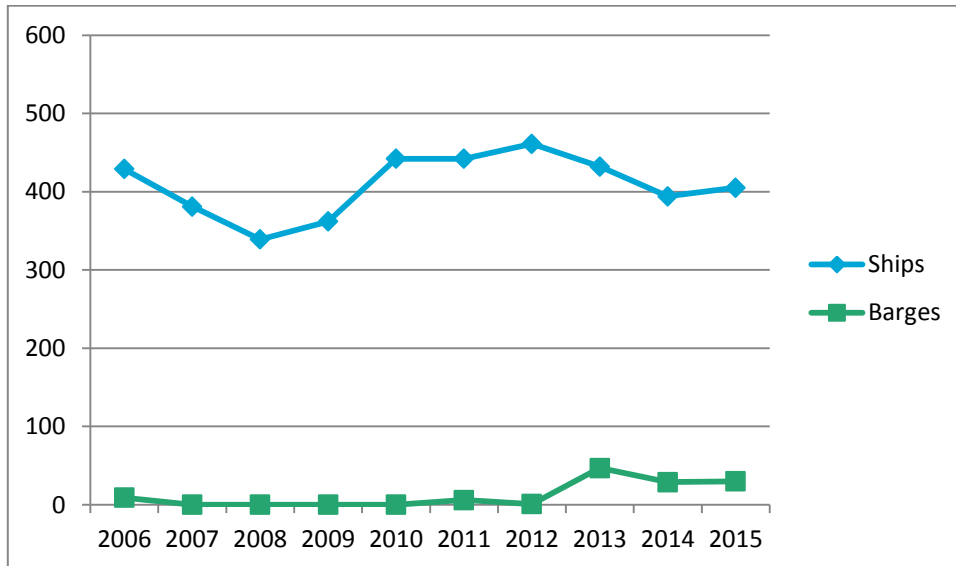
Source: NCSPA

<sup>38</sup> North Carolina State Ports Authority, *Container Terminal*, <http://www.ncports.com/port-of-wilmington/container-terminal/>, Accessed 8/4/16.

While the number of TEUs serviced at the Port of Wilmington has been historically small compared to neighbor ports (see Figure 3.14), this may change with the forthcoming intermodal service. In the short term, this is the Queen City Express, and in the mid term it is the opening of the CCX intermodal terminal in Rocky Mount.

As shown in Figure 3.5, approximately 93 percent of vessel calls at the Port of Wilmington are ships, with barge operations being limited at the port. For comparison in 2015, Savannah handled 2,205 vessels, Charleston had 2,066 vessel calls, and Norfolk handled 1,997 vessels.<sup>39</sup>

**Figure 3.5 Vessel Calls at the Port of Wilmington, 2006-2015**



Source: NCSPA

## 3.2 Industries that Rely on Waterborne Imports and Exports

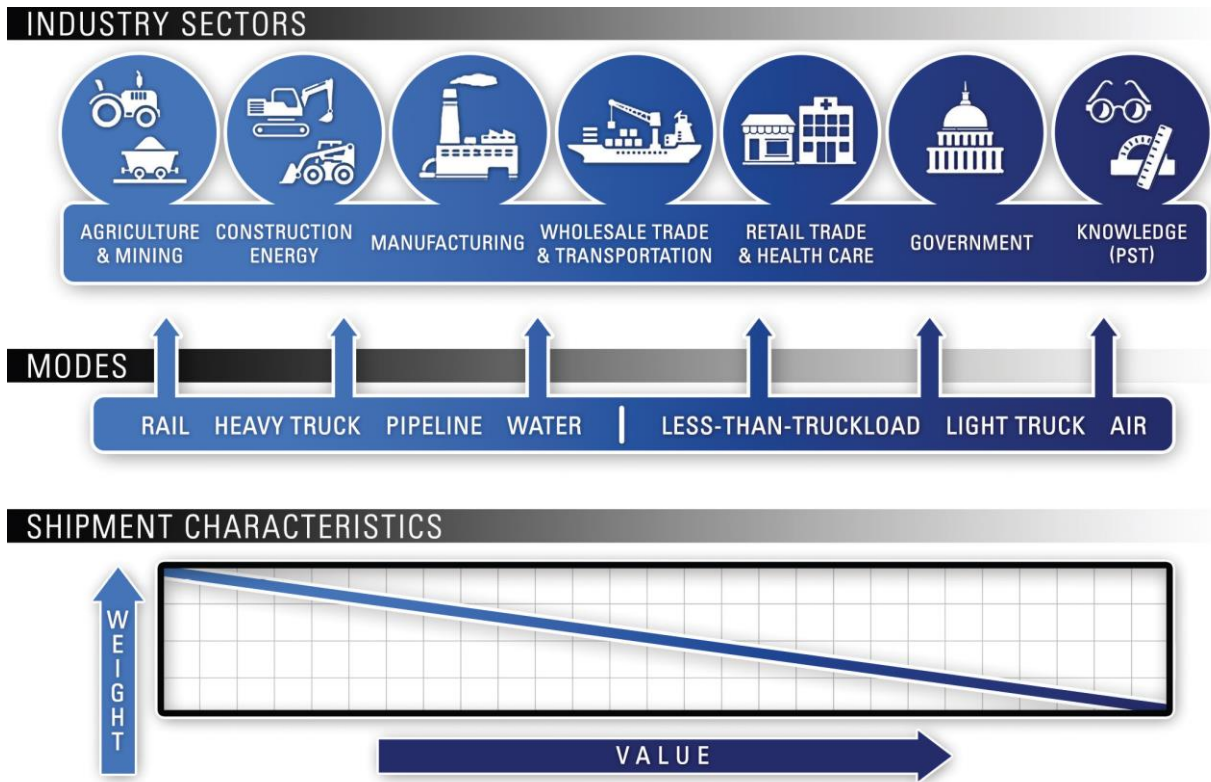
Although the US and North Carolina economies are much less dependent on goods production than they once were, waterborne trade remains vital for certain industries. Maritime freight to and from North Carolina is dominated by agricultural, manufacturing, mining/aggregates, and forest products. The dominant shipper locations are 1) sites where the commodity is grown, logged, or mined, 2) where it is processed or manufactured, and 3) distribution sites/centers where products and commodities are aggregated for more efficient shipment.

The following chart (Figure 3.6) provides a basic overview of the relationship between some of the major industry sectors and their primary mode of goods movement, and the correlation between tonnage and value. As shown, products of mid-value and tonnage such as manufacturing and wholesale trade and transportation are ideal for travel by water. North Carolina's agriculture and mining industries are typically rail-dependent and also are exported by ship.

<sup>39</sup> <http://www.gaports.com/Portals/2/Market%20Intelligence/FY15%20Annual%20Vessel%20Calls.pdf>, <http://www.scspsa.com/wp-content/uploads/scports-factsheet.pdf>, <http://www.portofvirginia.com/about/port-stats/>



**Figure 3.6 Typical Industry Sectors and Modes of Travel**



Source: Maryland Strategic Goods Movement Plan (2015)

### 3.2.1 Agriculture and Forestry

North Carolina is a particularly diverse agricultural state; nearly every county is active in some type of production. The state produced \$13.1 billion in 2014, with livestock, dairy, and poultry accounting for 67.4 percent and crops for the remaining 32.6 percent.<sup>40</sup> The maps illustrate regions for the state’s dominant agricultural commodities and for wood products. These locations are large rural areas not concentrated as with urban economies. While there may be year-to-year variation in the amount of acreage planted with a particular crop, it is unlikely that the major growing areas will move over time. Thus, the current growing patterns are a good indication of the location of future agriculture and forestry production. North Carolina’s highest value agricultural exports are tobacco, live animals/fish, meat/seafood, and other agricultural products. The highest volume of agricultural exports is wood products, other agricultural products, and meat/seafood. In 2012 (and 2015), wood accounted for about 42 percent of total agricultural exports by volume.

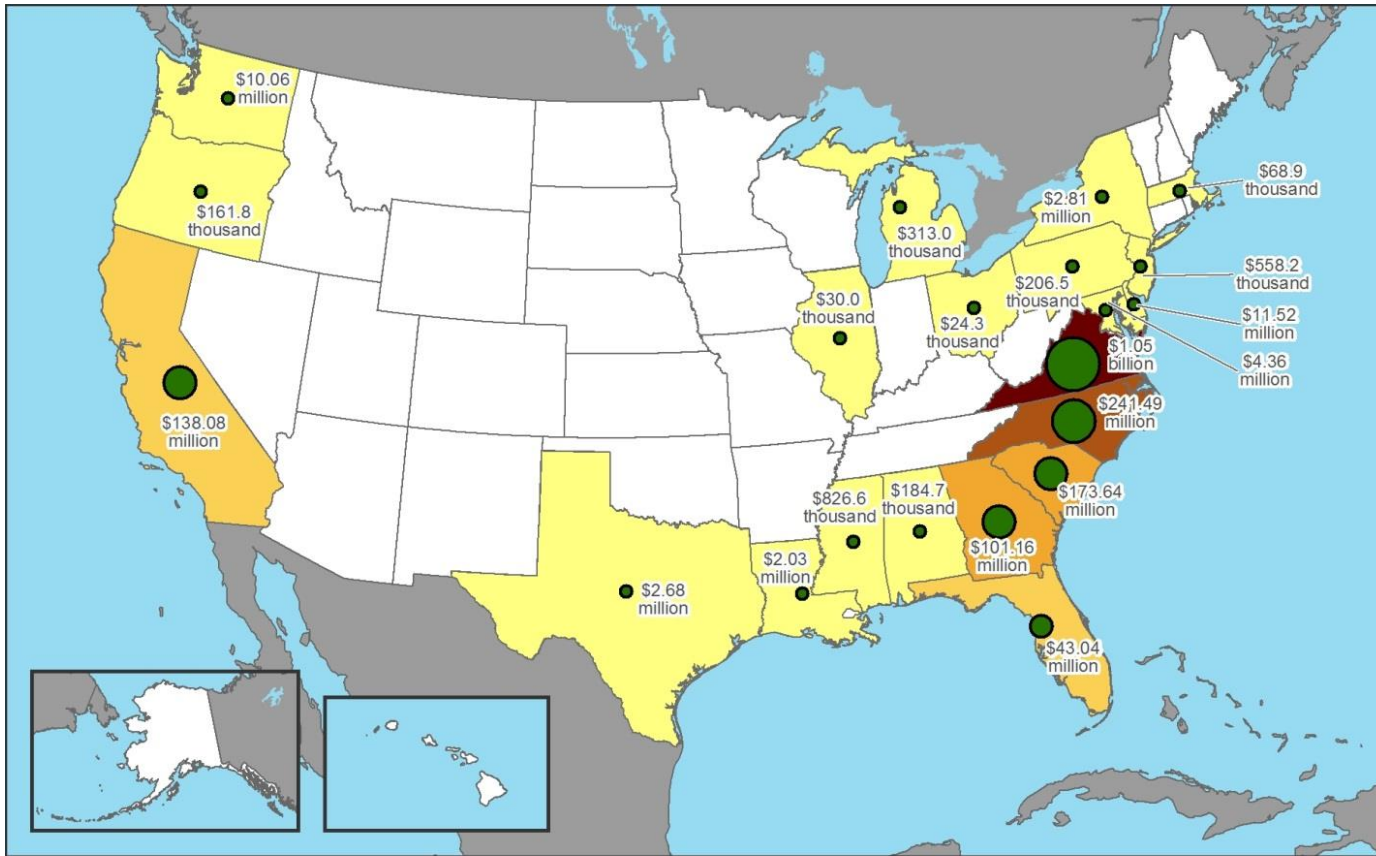
Roughly 82 percent of North Carolina’s agricultural and forestry production in 2012 was exported by water, according to national freight statistics<sup>41</sup>; as of 2015, this rose to 85 percent. As is evident in Figure 3.7

<sup>40</sup> North Carolina Agricultural Statistics, 2015, page 15.

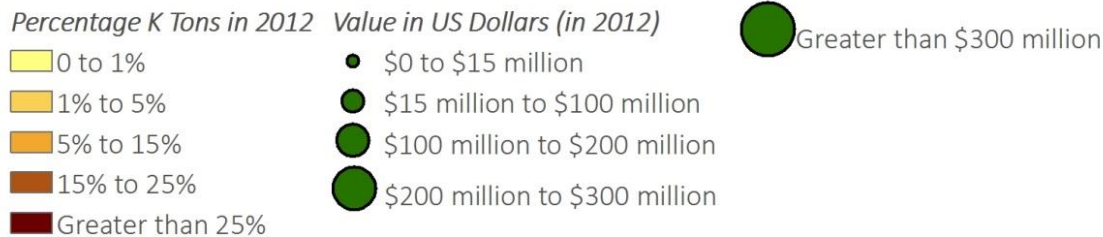
<sup>41</sup> Freight Analysis Framework 4.1

showing year 2012 data, although North Carolina's agricultural producers use ports in a variety of states, their own in-state facilities are used most often.

**Figure 3.7 Waterborne Agricultural Exports from North Carolina by State of Departure**



Waterborne Agricultural Exports from North Carolina by State of Departure

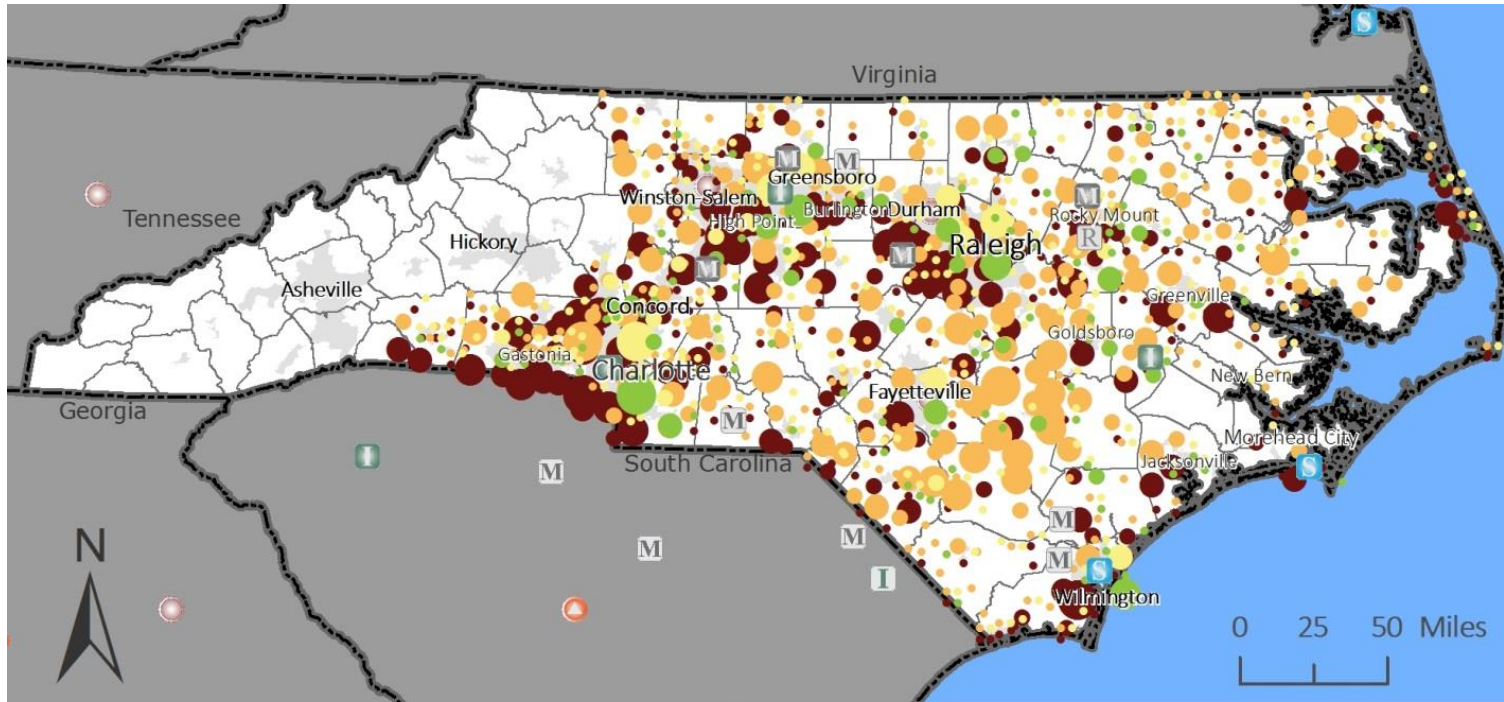


Source: AECOM, assembled from Freight Analysis Framework (FAF) 4.1 and USGS ThematicMapping

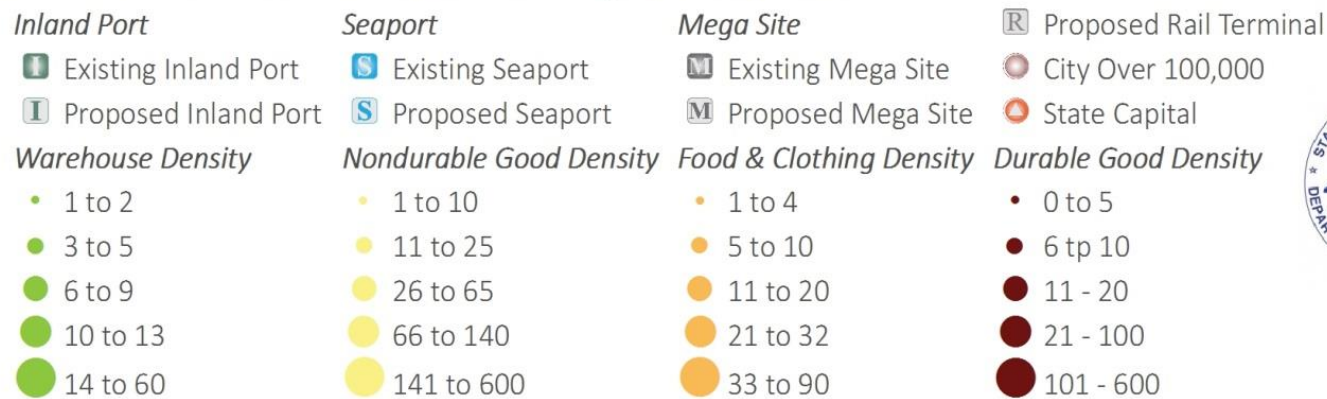
### *3.2.2 Manufacturing and Distribution*

Manufacturing location patterns in the state reflect a tradeoff between proximity to urban labor markets, with higher-cost land and proximity to the source of inputs or final markets, with lower transportation costs for inputs or the final delivered product. Figure 3.8 provides the density of large manufacturing and distribution firms for areas across the state (firms or public establishments with 25 or more employees were included). The figure illustrates the areas of the state with concentrations of manufacturing, and therefore, the location of firms that would be most likely to export or import by ocean trade. Unfortunately, the major manufacturing areas are not located near the state's ports.

**Figure 3.8 Locations of North Carolina Manufacturing and Distribution**



Locations of North Carolina Manufacturing and Distribution



Source: AECOM from ESRI, NCDOT, InfoUSA

### 3.3 Markets Served

Import and export movement through the ports plays a major role in a state's economy. This section will provide a breakdown of the origins and destinations of imports and exports that pass through North Carolina's ports and an analysis of regional port volumes and utilization levels. By understanding the economic trends of North Carolina's ports, a more customized understanding of the state's maritime needs can be achieved.

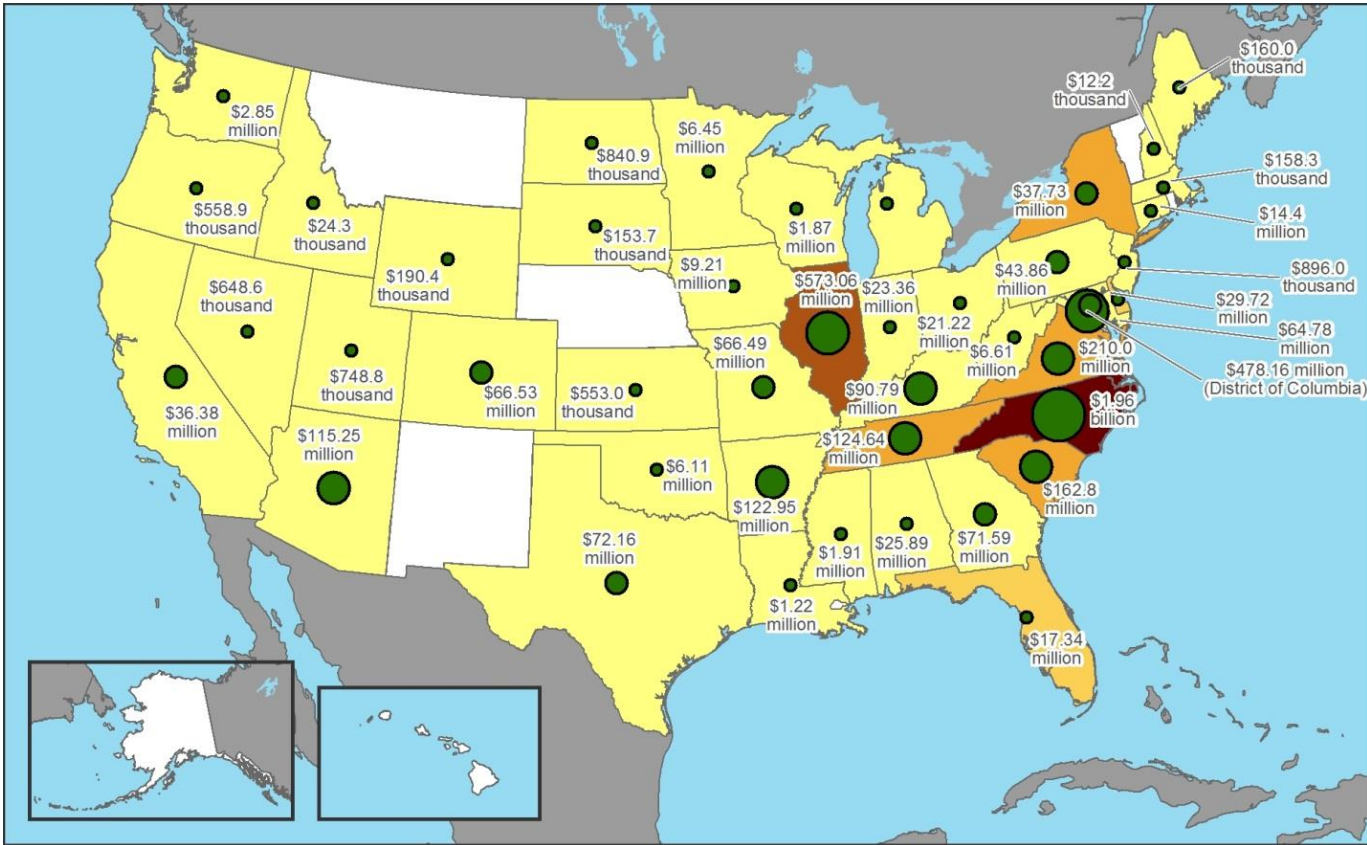
#### 3.3.1 North Carolina's Role in National Imports/Exports

Shippers beyond North Carolina's border also use the state's port facilities. When exports are measured by volume, in-state shippers use the ports the most, followed by shippers from Illinois, South Carolina, Virginia, and Tennessee (FAF 2012). When exports are measured by value, again North Carolina shippers use the ports the most, followed by Illinois shippers (see Figure 3.9). And despite the health of the state's facilities, shippers in Florida, Virginia, New York, and South Carolina still rank among the top state customer bases for North Carolina's ports. Therefore, freight from other states must first be transported via other modes to access the North Carolina ports highlighting the need for efficient multimodal freight transport options. While freight data coding issues could change individual rankings, the overall trend indicates that North Carolina shippers are the overwhelming leaders in exports from the state's own ports. Port selection is influenced by factors beyond proximity, which includes total delivered cost, frequency of carrier service, variety of origins and destinations, and other business advantages offered by ports in other states.

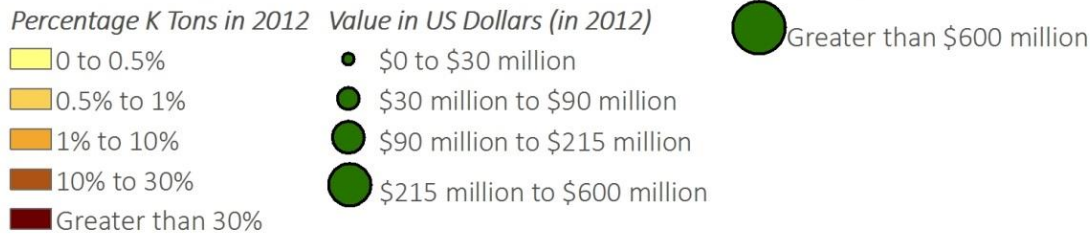
On the import side, more than 70 percent of all foreign imports destined for North Carolina traveled by water, primarily through ports in other states (FAF 2012) as seen in Figure 3.10. Seven states account for almost 90 percent of North Carolina's waterborne imports: Virginia, South Carolina, California, Georgia, Maryland, Florida, and North Carolina. As shown in Figure 3.11, North Carolina was the top destination for imports handled by the Port of Norfolk in 2011.



**Figure 3.9 Waterborne Exports through North Carolina Ports by State of Origin**



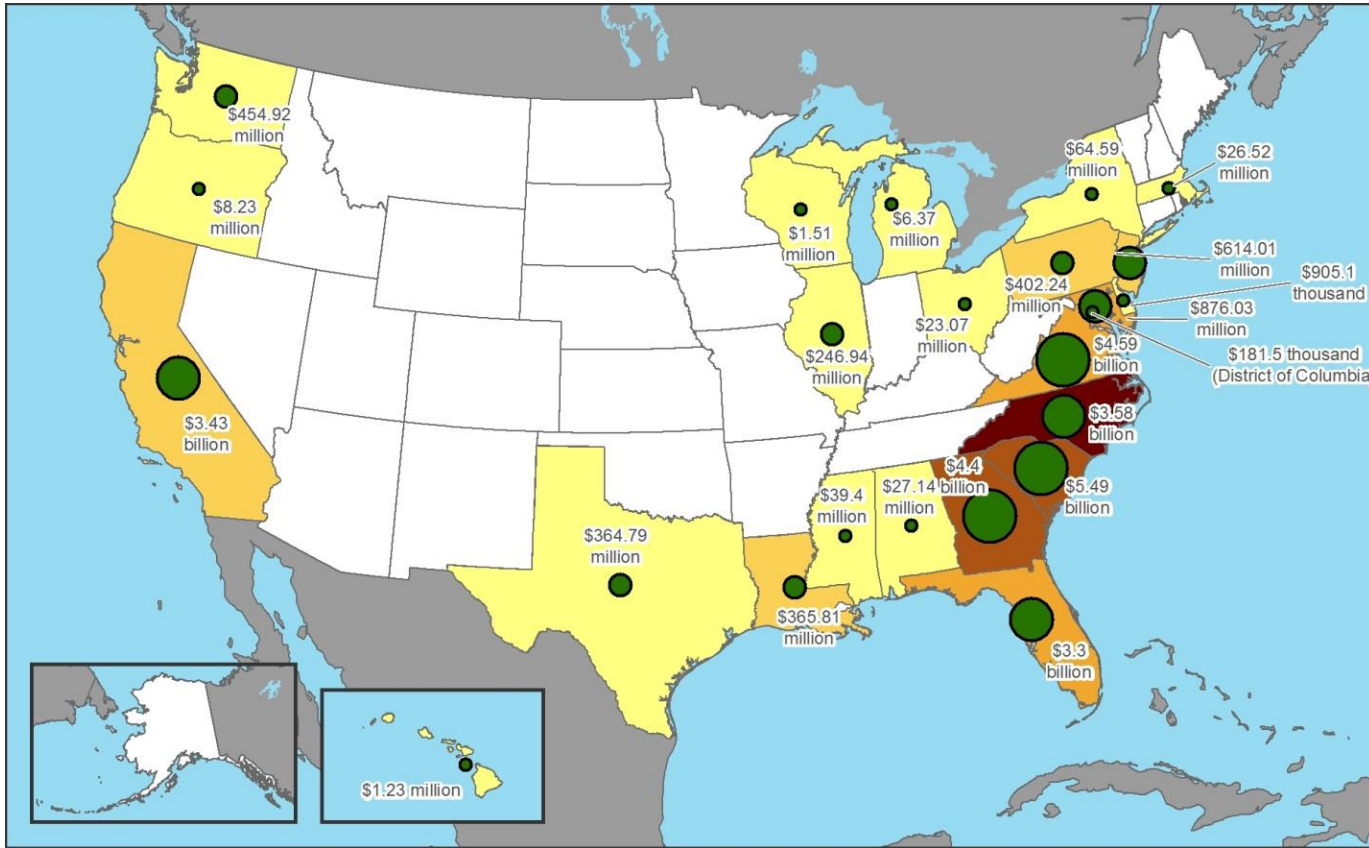
Waterborne Exports through North Carolina Ports by State of Origin



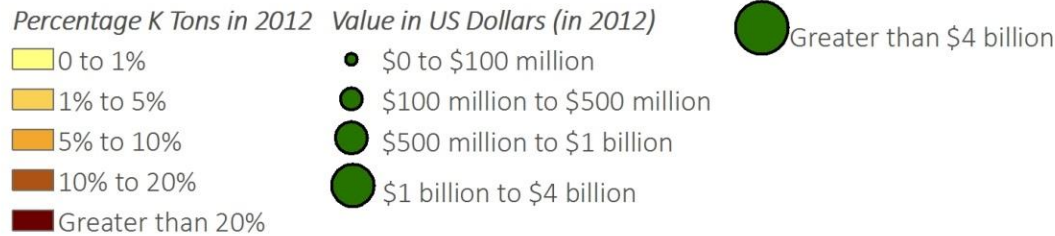
Source: AECOM, assembled from FAF 4.1 and USGS ThematicMapping



**Figure 3.10 States of Entry for Waterborne Imports Destined for North Carolina**

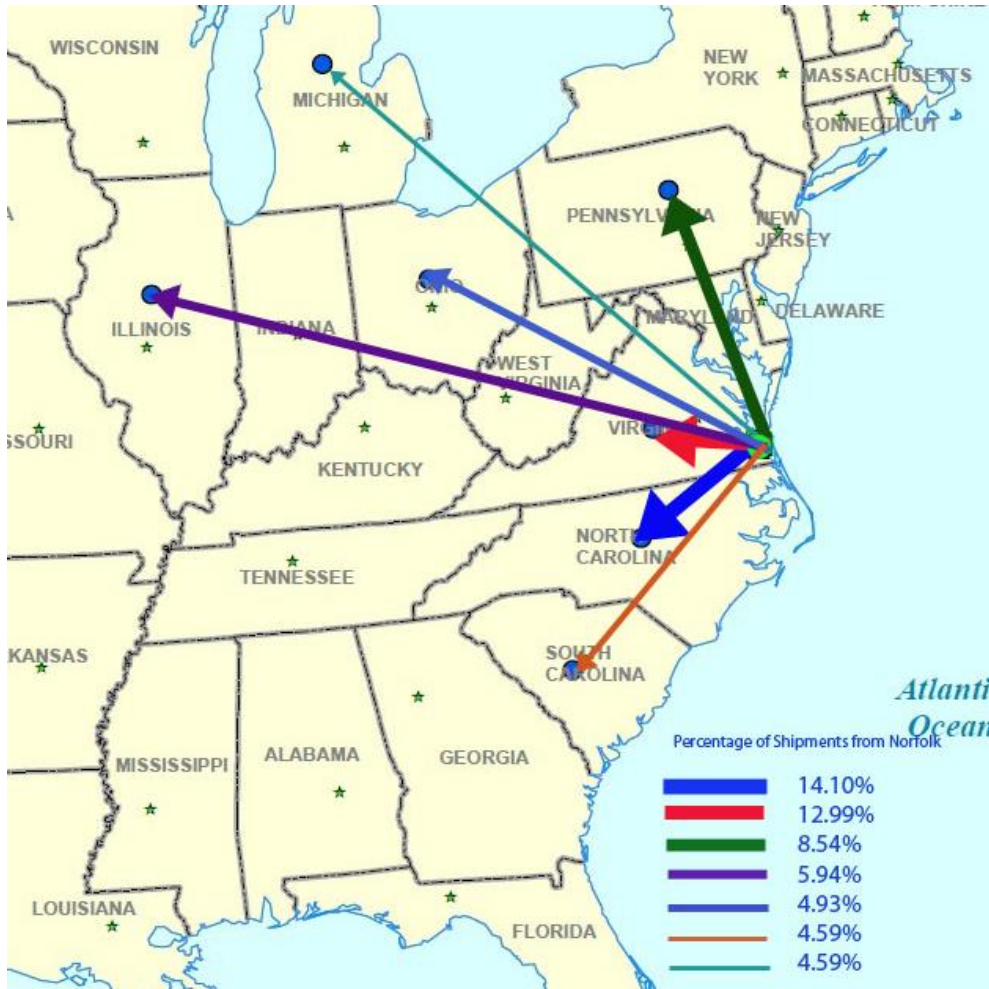


States of Entry for Waterborne Imports Destined for North Carolina



Source: AECOM, assembled from FAF 4.1 and USGS ThematicMapping

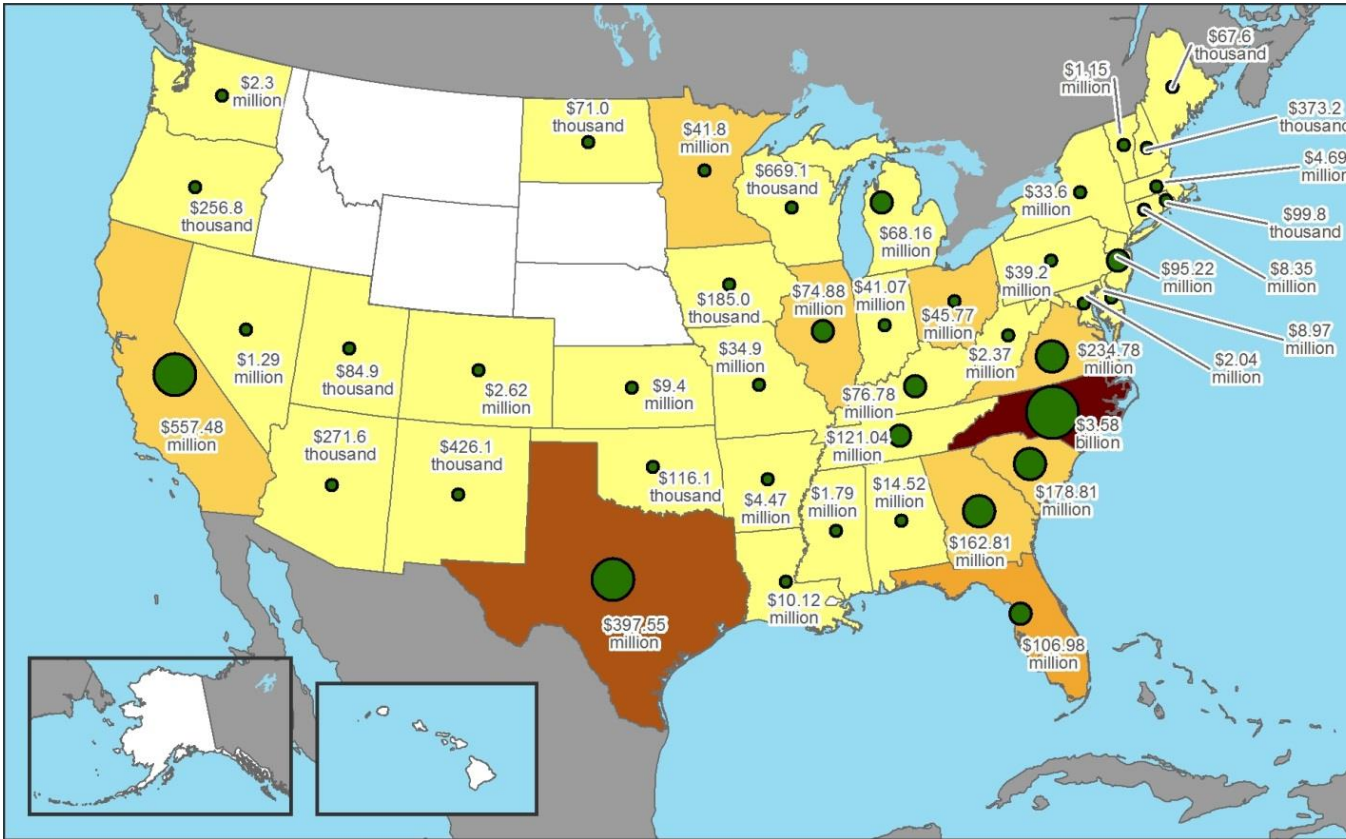
**Figure 3.11 Top Destinations of Imports Arriving through Port of Norfolk**



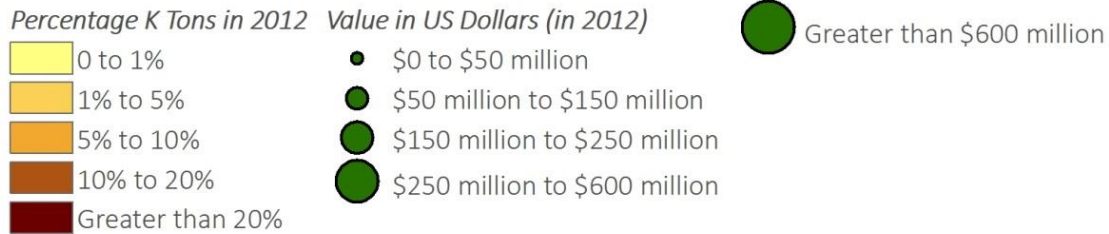
Source: Delcan, *Private Data for Public Purposes*, AASHTO Special Committee on Intermodal Transportation & Economic Expansion, Richard Mudge PhD, Delcan (October 14, 2011)

Among those shipments that enter the US through North Carolina’s ports, the majority are destined for consumption in North Carolina. Illinois, Texas, and Florida are other major import customers for the state’s port facilities (Figure 3.12).

**Figure 3.12 Waterborne Imports through North Carolina Ports Destined for Other States**



Waterborne Imports through North Carolina Ports Destined for Other States

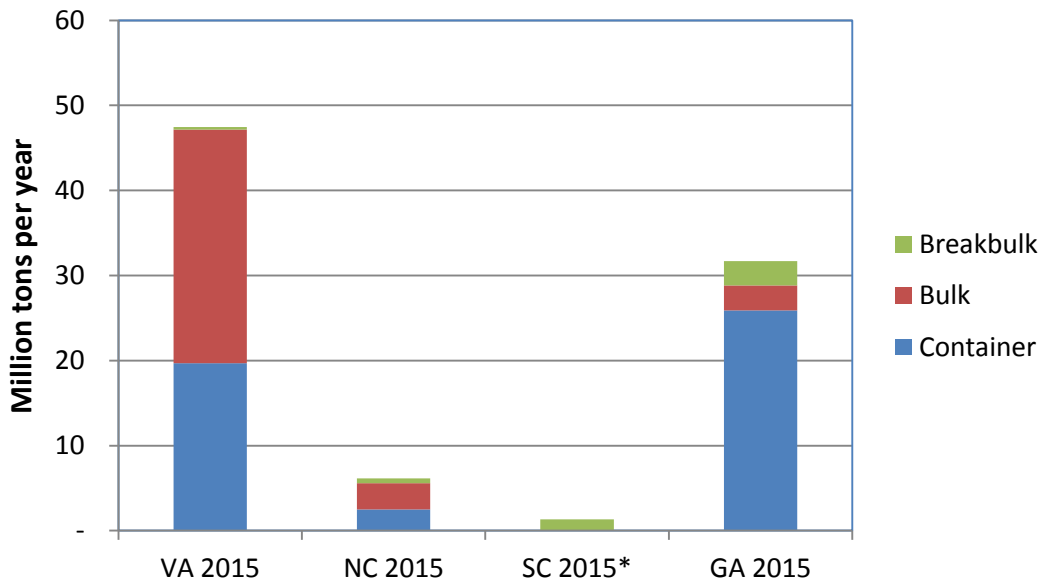


Source: AECOM, assembled from FAF 4.1 and USGS ThematicMapping

### 3.3.2 Regional Ports Compared

As compared to ports in Virginia and Georgia, North Carolina’s ports handle the lowest total tonnage across all cargo modes (containerized, bulk, and breakbulk) as shown in Figure 3.13. South Carolina does not record containerized tonnages, so an accurate comparison to North Carolina’s ports is not possible. In aggregate, the disparity is overwhelming; however, more detailed review identifies commodity-specific information that is important to understand each port’s strengths and capabilities. While Virginia ports handle a very large volume of bulk cargo, this figure is dominated by coal exports. Excluding coal, North Carolina demonstrates an overall strength in the handling of bulk cargos as compared to neighboring states. North Carolina’s handling of breakbulk cargo is also a relative strength among the regional ports. Across containerized cargo (Figure 3.14), however, North Carolina ports handle only a small share of containers destined for the region.

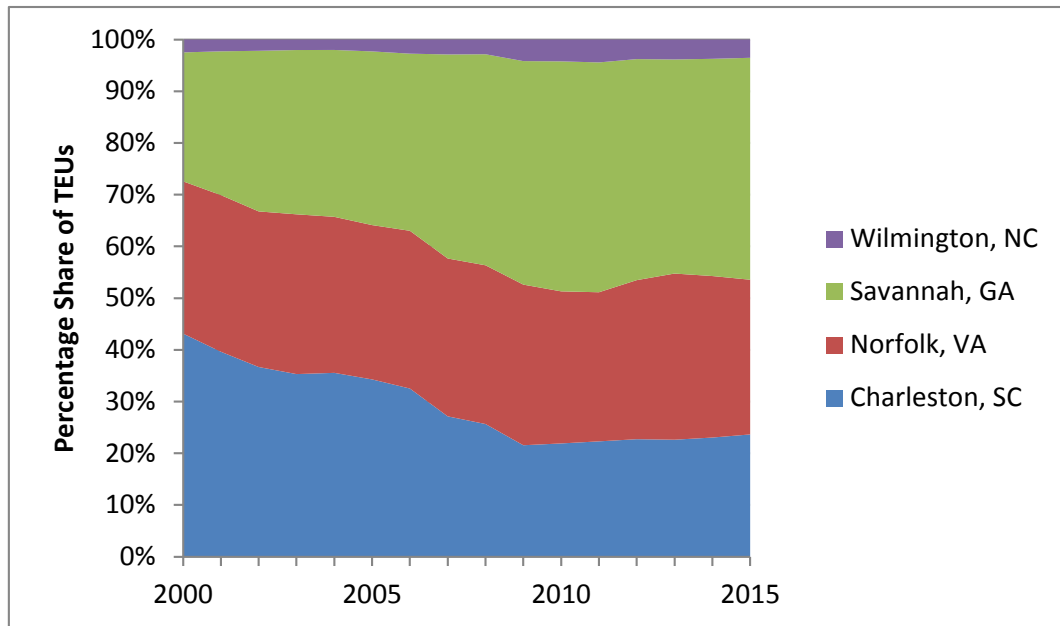
**Figure 3.13 Commodity Volumes at Regional Ports**



\* South Carolina does not record containerized tonnages and does not handle bulk cargo.

Source: AECOM, from NCSPA data and port websites

**Figure 3.14 Container Volumes at Regional Ports**



Source: AECOM, from MARAD container ports data, 2000 to 2015

An in-depth review of the existing and planned facilities at regional ports was conducted to determine the extent of potential capacity available in the North Carolina maritime market area for handling various types of containerized and non-containerized cargo. Table 3.1 summarizes peer ports' capacity utilization based on the independent evaluation of terminal capacity for each cargo type vs. actual amount of cargo handled in 2015. It should be noted that terminal capacities vary by day due to commodity types, stacking and sorting efficiencies, and other terminal geometry factors. As a result, the capacity numbers should be considered as ballpark figures.

**Table 3.1 Regional Ports Capacity and Utilization**

	Containers (TEU)	Breakbulk (Tons)	Bulk (Tons)	Ro/Ro (Units)
<b>Wilmington North Carolina</b>				
Terminal Capacity	600,000	1,470,000	3,220,000	
2015 throughput	297,612	279,322	1,871,299	
% Utilization	50%	19%	58%	
<b>Morehead City North Carolina</b>				
Terminal Capacity	n/a	1,080,000	2,730,000	
2015 throughput		262,634	1,220,052	
% Utilization		24%	45%	
<b>Norfolk VA</b>				
Terminal Capacity	3,630,000	6,820,000	50,000,000	320,000
2015 throughput	2,549,270	295,720	27,486,630	49,773
% Utilization	70%	4%	55%	16%



	Containers (TEU)	Breakbulk (Tons)	Bulk (Tons)	Ro/Ro (Units)
<b>Charleston SC</b>				
Terminal Capacity	3,230,000	4,030,000		300,000
2015 throughput	1,970,000	1,340,000		268,694
% Utilization	61%	33%		90%
<b>Savannah GA</b>				
Terminal Capacity	4,500,000	7,440,000	3,550,500	1,070,000
2015 throughput	3,667,439	2,835,032	2,958,835	714,000
% Utilization	81%	38%	83%	67%

Source: AECOM, from port data (<http://www.aapa-ports.org/unifying/content.aspx?ItemNumber=20921>, [http://pilotonline.com/business/ports-rail/coal-exports-weak-start-locally-could-signal-trend/article\\_e6fa4e35-47f1-5908-89e4-8488ecf6bbf2.html](http://pilotonline.com/business/ports-rail/coal-exports-weak-start-locally-could-signal-trend/article_e6fa4e35-47f1-5908-89e4-8488ecf6bbf2.html), <http://automotivelogistics.media/intelligence/ports-get-extra-lift-rise-imports>, <http://www.gaports.com/Media/PressReleases/TabId/379/ArtMID/3274/ArticleID/10/GPA-ACHIEVES-RECORD-TEUS-TONNAGE-RAIL-AND-RORO-IN-FY15.aspx>)

At 19 percent, breakbulk capacity utilization at Wilmington is lower than at Morehead City. Each of the other peer ports, particularly Norfolk, has significant unused breakbulk capacity.

Besides Norfolk, the North Carolina ports have the greatest bulk handling capacity, with approximately 52 percent of it used. This measure, however, omits that bulk facilities can be specialized (chemicals and aggregates in this case) and that the capacity at North Carolina's ports does not directly address the need to handle key bulk commodities within the state. The capacity utilization masks the mismatch between facilities and key markets that could use the port.

Finally, in terms of dedicated Ro/Ro facilities, North Carolina has not entered this market; although, it can accommodate certain types of Ro/Ro ships. The other peers have at least some capability in this market, with the greatest regional capacity in Savannah.

### 3.3.3 Global Partners

North Carolina's trading partners are geographically diverse. Major export regions include Eastern Asia, Europe, Canada, and a variety of Asian and Latin American destinations. The mix is similarly diverse on the import side, led again by Eastern Asia and Europe. This diversity is favorable as it shields the state from an economic downturn in a particular region of the world economy.

The listing below ranks and compares the state's import and export partners overall (that are using any port of entry to the US with an ultimate origin/destination in North Carolina) against the leading origin and destination for trade traversing through the state's own ports. On the import side (Table 3.2), three import partners top the two lists, albeit in different orders – Eastern Asia, Europe and the Rest of Americas. On the export side (Table 3.3), Eastern Asia fills the top spot with Europe and SW & Central Asia filling in second and third, in some order, on both lists. This suggests that North Carolina shippers choose to use an out-of-state port to reach some of their leading trade partners due to the availability of ship calls, storage/equipment availability, or other factors.



**Table 3.2 International Origin Regions of Waterborne Imports to North Carolina (2015, by tonnage)**

Imported to North Carolina through All Ports	Imported through North Carolina Ports
1. Eastern Asia	1. Europe
2. Europe	2. Rest of Americas
3. Rest of Americas	3. Eastern Asia
4. Southwest and Central Asia	4. Southwest and Central Asia
5. Canada	5. Africa
6. Southeast Asia and Oceania	6. Southeast Asia and Oceania
7. Africa	7. Canada
8. Mexico	8. Mexico

Source: FAF 4.1

**Table 3.3 International Destination Regions of Waterborne Exports from North Carolina (2015, by tonnage)**

Exported from North Carolina through All Ports	Exported through North Carolina Ports
1. Eastern Asia	1. Eastern Asia
2. Europe	2. Southwest and Central Asia
3. Southwest and Central Asia	3. Europe
4. Rest of Americas	4. Southeast Asia and Oceania
5. Southeast Asia and Oceania	5. Rest of Americas
6. Africa	6. Africa
7. Mexico	7.
8. Canada	8.

Source: FAF 4.1

### 3.4 Level-of-Service

The operation and level-of-service, or efficiency possible within the current state of each port, depends on a number of moving pieces. The activities at each port rely on physical constraints of facilities, policy decisions on commodities served and operating hours, worker and equipment productivity, weather, and numerous other factors that may or may not be controllable. Two key measures of port efficiency commonly used are, 1) how long a truck turn takes to complete at a given port, and 2) how many containers can be moved between a ship and the shore in an hour.

Bottlenecks in the adjacent landside transportation networks also affect port operations. Bottlenecks are defined here as temporary situations that cause a loss of time and/or money in the supply chain. Conversely, constraints are fixed issues that require a change or upgrade in infrastructure, policy, or other change that affects the freight move. An example of a bottleneck would be a stalled train on a single track line, a broken traffic signal, or no available container cranes to service an incoming ship.

On the other hand, a constraint would be narrow tunnels impacting the ability for ports to accept oversize or overweight project cargo, low utility lines and bridges restricting air drafts into a port, or track sections that cannot handle the 286,000 pound car weights. The constraints can be best illustrated by comparing North Carolina ports to the regional peer ports. As a result of bottlenecks and constraints, the ports' levels-of-service are directly affected by issues both in and out of the ports' control.

In this section we have summarized two measures of port efficiency across the regional ports and then some of the bottlenecks and constraints experienced by the North Carolina ports.

### 3.4.1 Port Efficiencies

Both port efficiencies elaborated upon here are tied to container moves. Since bulk and breakbulk cargo are less common across the ports and vary widely in the required equipment, it is difficult to compare apples-to-apples unless a specific commodity is tracked.

### 3.4.2 Truck Turn Times

A truck turn is basically the amount of time (in minutes) it takes for a truck to enter, conduct business, and leave a port facility. For example, to pick up a container, a truck turn requires a truck to enter a port and be processed through the gate, possibly pick up a chassis on-site, have a container loaded onto the chassis, be weighed, and then be processed and inspected at the gate to exit. This is a single truck turn as only one container is touched. A dual or import/export truck turn is one when a truck is both delivering and picking up a container, in either order, so two containers are touched. Three parts of this process, gate entry, loading, and gate exit times can vary based on level of automation at a port. Note that the turn times are partially contingent upon the size of the terminal facility and how far the truck must be driven – so a smaller port like Wilmington is likely to have shorter turn times than a larger port, unless that larger port sets up gates for each terminal to reduce on-port distances and hence times.

The truck turns at North Carolina's Port of Wilmington and its peer ports are compared in Table 3-4. Overall, Wilmington has the fastest average truck turn times at 18 and 30 minutes for single and dual turns, respectively.<sup>42</sup> Charleston touts a 23-minute average truck turn and more than 40 container crane moves per hour. And to further decrease turn times and increase efficiency, the South Carolina Port Authority began use of GO! Port in June 2016. The advanced gate system is for motor carriers at the Wando Welch and North Charleston Terminals and acts much like an airline kiosk system for booking cargo and being advised on where to pick it up or drop it off on-terminal. The Port of Savannah has average truck turn times of 30 minutes for a single move and under an hour for a dual move at the Garden City Terminal. Lastly, truck turns at the Port of Virginia vary by terminal and are posted weekly, with the average turn time being approximately 50 minutes for the month of August 2016; however, whether this is for a single or a dual turn is not specified. The shortest average turn times were at PMT (40-50 minutes) and longest at VIG (50-60 minutes) for that same month.

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<sup>42</sup> "With best-in-class efficiencies, North Carolina Ports is able to handle an influx in container volumes while completely avoiding congestion. With 45 net crane moves per hour in each of its post-Panamax cranes, coupled with average truck turn times of 18 minutes for a single move and 30 minutes for a dual move, the Port of Wilmington's high vessel and terminal productivity keeps vessels on schedule and reduces inventory and logistics costs." <http://www.ncports.com/news/news-releases/north-carolina-ports-completes-turning-basin-project-welcomes-8200-teu-vessel-wilmington/> Accessed on 8/11/2016

**Table 3-4 Average Truck Turns by Port**

Port	Single Truck Turn	Import/Export Truck Turn
Wilmington	18 minutes	30 minutes
Charleston	23 minutes	< 60 minutes
Savannah (Garden City Terminal)	30 minutes	< 60 minutes
Norfolk	50 minutes (single and dual combined)	

Sources: <http://savannahnow.com/exchange/2015-05-16/savannahs-port-positioned-perfect-storm-growth>, <http://www.scspsa.com/cargo/>, <http://www.portofvirginia.com/pdfs/Weekly%20Metrics.pdf>, NCSPA interview.

### 3.4.3 Crane Rates and Berth Productivity

Back in 2010, the three neighbor ports considered here were compared based on their ship-to-shore crane rates. Charleston averaged 40 moves per hour, Savannah averaged 37 moves per hour, and the three terminals at the Port of Virginia averaged approximately 32 moves per hour in 2009.<sup>43</sup> These same ports were compared in 2013 by the Journal of Commerce using a measure called “berth productivity”<sup>44</sup>; using calendar year 2012 data, Savannah rated 60 container moves per hour, Charleston rated 56, and Norfolk rated 54. And at the individual terminal level, Wando Welch in Charleston had the highest rate at 65 moves per hour, followed by Garden City in Savannah at 60, NIT in Virginia at 54, and North Charleston at 51 moves per hour.<sup>45</sup> Berth productivity rates are likely to increase as larger Suez class cranes are installed at some ports and as the number of cranes servicing a given vessel is maximized.

### 3.4.4 Bottlenecks

At Morehead City, a bottleneck to the movement of goods from inland to the port is the rail line through town. It is a built-up corridor requiring slow train speeds for miles. A concern for community relations, but not a strong operational bottleneck for the rail freight is the flip-side of this issue. The rail line divides downtown Morehead City in two, and though trains are infrequent, they block a number of at-grade crossings when moving through town. This is of particular concern during the summer, as tourism at the Crystal Coast is an important industry, and bad traffic may convince some visitors to not return.

The movement of large and oversize cargos is not incompatible with the industrial base of the surrounding communities, though the truck and rail traffic can create bottlenecks as the cargo moves through the community. This can be mitigated by directing such traffic to specific routes and by communicating with the public about when and where such loads will be moving to permit the general public to avoid these routes when possible.

<sup>43</sup> [https://www.odu.edu/content/dam/odu/offices/economic-forecasting-project/docs/2010\\_SOR\\_Container\\_Ports.pdf](https://www.odu.edu/content/dam/odu/offices/economic-forecasting-project/docs/2010_SOR_Container_Ports.pdf) Accessed on 9/13/2016

<sup>44</sup> The number of total container moves (on-load, off-load, and re-positioning) divided by the number of hours during which the vessel is at berth (time between berth arrival, or “lines down” and berth departure, or “lines up”), without adjustments for equipment and labor down time. ([www.joc.com/port\\_productivity](http://www.joc.com/port_productivity))

<sup>45</sup> [http://www.joc.com/sites/default/files/u59196/Whitepapers/Port\\_productivity/portProductivity\\_whitepaper.pdf](http://www.joc.com/sites/default/files/u59196/Whitepapers/Port_productivity/portProductivity_whitepaper.pdf) Accessed 9/13/2016

At-grade crossings are also inconvenient at the Port of Wilmington, where switching activities cause backups frequently near the port’s south entrance. It is not uncommon to see a number of trucks bound to/from the port lined up on access roads as they wait for trains to move over the crossings.

### 3.4.5 Constraints

As noted in Section 2.1.2, North Carolina’s Port of Wilmington is furthest from the open ocean (26 miles), while Morehead City is the closest (4 miles) when compared to the regional peers. In terms of water depth, Wilmington, along with Charleston and Savannah, have deepened, or are planning to deepen access and, as of August 2016, all regional ports of interest can now accommodate the post-Panamax ships, at least at high tide. With post-Panamax ships now reaching the US east coast regularly via the Panama Canal, differences in water depth are more critical in determining current competitive advantage and in positioning the ports for continued post-Panamax opportunities. Thus, properly maintaining federal funding for ports is key, especially for depth maintenance (dredging funding and frequency). In this year of 2016 there is currently a Harbor Maintenance Trust Fund Reform Act moving through congressional committees; however, it is unknown whether it will reach the Senate and House floors for a vote. Distribution of funds for area ports from the last major outlay are listed in Table 3.5.

**Table 3.5 USACE Expenditures on Regional Harbor Projects, FY1999 to FY2008**

Harbor	10-Year Harbor Maintenance Trust Fund Expenditures
Savannah	\$123,447,085
Norfolk	\$96,059,577
Charleston	\$75,709,695
Wilmington	\$69,060,101

Source: Congressional Research Service, Harbor Maintenance Trust Fund Expenditures, January 10, 2011

The port facilities at Wilmington and North Charleston are most restricted by vertical clearances (air drafts of 164 feet and 155 feet, respectively) – and each handles container cargo. The former is restricted because of overhead power lines and the latter because of a bridge. Overhead power lines are also a constraint at the Port of Morehead City as they crisscross the property thus affecting moves such as those of large project cargo.

River channel width can be a further constraint. With the widening of the turning basin at Wilmington, larger vessels can access the port. However, the Cape Fear River channel itself is too narrow to accommodate the passing of large vessels so the staging of them is critical.

### 3.4.6 Port Competitiveness

The surrounding business base (measured by employment) in close proximity to the ports (within 300 miles) is the smallest for the North Carolina ports; each of the regional peers has a greater density of economic activity to generate trade. The ranking changes, however, at a broader 500-mile radius. Both Morehead City and Wilmington have larger markets compared to Savannah and Charleston. Only Norfolk’s market density exceeds that of North Carolina at a 500-mile radius.

The handling facilities at North Carolina's ports are more limited than the peers in terms of the variety of freight types that can be handled. Although both refrigerated cargo and Ro/Ro can be shipped via North Carolina, the facilities are more limited than those at other ports and North Carolina port facilities lack specialized equipment to make such operations more efficient. However, opening soon at the Port of Wilmington is a refrigerated cargo warehouse with value-added functionality. The range of bulk commodities that can be handled is similarly limited.

As mentioned earlier, North Carolina's ports have the most limited hours of operation among the regional peers. While this has the benefit of containing operating costs, it also limits shippers' ability to access the port and deliver multiple truckloads in a day—ultimately constraining volumes and making other ports more attractive in terms of trucking costs and ability to move containers.

Specific constraints were investigated as part of the Eastern Infrastructure Study (AECOM, 2015) for the Port of Morehead City. The port is currently not well positioned to handle containerized goods and significant investments would be required to allow it to compete for such cargoes. There is one container crane located at Morehead City currently; however, hard-standing areas for container storage are limited. Although the channel has comparatively deep water (45 feet) and three berths with equivalent depth, the quay lengths are not sufficient to accommodate container ships of 5,000 TEUs or more. The port's other berths have estimated depths ranging from 35 to 41 feet, sufficient to accommodate bulk and breakbulk ships<sup>46</sup>.

Radio Island is located east of and adjacent to the main port area and has been used for liquid bulk activities in the past and retains this legacy infrastructure. Some limited residential development has taken place on a portion of the island as well, introducing an incompatible land use into this industrial hub. The balance of Radio Island offers an expansion opportunity for port operations as market conditions warrant.

At present, North Carolina grain shippers cannot ship bulk grain from their in-state ports. Those that export typically ship to Norfolk. This is because the North Carolina ports do not currently have publicly available bulk-grain handling equipment, though other bulk commodities are handled at the ports. The *North Carolina Maritime Strategy Study* (AECOM, 2012) examined the potential for adding a bulk-grain facility at the port and concluded that this was an investment that would yield a positive return to the state. Soybean exports account for 10 percent of North Carolina's agricultural exports; adding in wheat and feed grains and products, and the combined grain total rises to 18 percent of the state's exports and about \$490 million for the state's economy. A bulk-grain handling market opportunity was evaluated as part of the Maritime Strategy Study and found to offer a positive return on investment.

Both ports have partnerships with private wood pellet producers—Enviva at the Port of Wilmington and International WoodFuels at the Port of Morehead City. There is a large expansion underway in Wilmington with Enviva domes (\$30 million) and associated infrastructure under construction at the port. The domes are 170 feet tall, pressurized, and humidity-controlled. Enviva will haul wood pellets from four facilities to the port; Sampson County in North Carolina is truck-served and the other three facilities are rail-served.<sup>47</sup> Current operations are designed for 60 percent rail and 40 percent truck. Exports to the UK will start in October 2016.

Beyond bulk grain and bulk wood pellets, for which handling equipment and rail improvements are required, no market opportunities were identified as precluded by the surrounding infrastructure. As part of the

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<sup>46</sup> Port Business Case Study, report prepared for the North Carolina State Ports Authority, February 2011, pp. 1-11.

<sup>47</sup> All could likely be rail-served if Wallace-Castle Hayne segment re-opened.

stakeholder outreach conducted for the Eastern Infrastructure Study (AECOM, 2015), no firm or industry reported that rail or road access kept them from locating in eastern North Carolina and using the Port of Morehead City.

Although no physical capacity or congestion constraints on the port's market development were identified, several broader concerns were identified. These include the following:

- The absence of a publicly articulated direction and plan for the Port in terms of a Master Plan.
- A poor image among the local host community and no clear articulation of the contribution that the port makes to the local economy.
- Conflicts between automotive and pedestrian traffic and the port's road and rail traffic.

The port's master plan was last updated in 2002. Though the NCSPA issued a strategic plan in 2015<sup>48</sup>, much has changed in the North Carolina economy and in the maritime shipping industry with respect to the Port of Morehead City, and the strategic plan does not delve into specifics at either port. The absence of a more current master plan at the Port of Morehead City that articulates a clear direction for the port and a program of investments amid conflict with the local community creates uncertainty about the port's future priorities and direction among shippers/investors who might consider investing here. With uncertainty, there is greater risk and lower investor confidence—collectively hindering port investment and related economic development. Moreover, the port has a modest footprint. A master plan would permit the port to ensure that it was making the best use of available space. The 2015 Strategic Plan acknowledges the potential for import and export growth at the Port of Morehead City and that landside highway access should be improved, but the emphasis on increasing handling of oversize cargo could cause additional congestion through downtown and therefore continued conflicts with the community.

### 3.5 Safety & Security

Safety has always been an important part of everyday operations at ports. However, as the world has increasingly gotten figuratively smaller due to improved technologies and interconnectivity, ports have had to pay more attention to security threats from new sources. Those sources might include terrorism, computer system hacking, stowaways, unauthorized drone activity, and theft.

Due to privacy and potential security threats, ports do not publicly release the number of security or safety incidents that occur on the premises. However, the Occupational Safety and Health Administration (OSHA) records incidents and inspections. According to OSHA reporting, the Port of Wilmington had three violations in 1985 as a result of a fatality from an overturned forklift<sup>49</sup>. No other reports were found for the Port of

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<sup>48</sup> NCSPA, 2015 Strategic Plan of the North Carolina State Ports Authority, <http://savethecape.org/stcwp1/wp-content/uploads/PDFs/2015%20Strategic%20Plan.pdf>; Accessed August 15, 2016.

<sup>49</sup> Inspection Detail, United States Department of Labor, [https://www.osha.gov/pls/imis/establishment.inspection\\_detail?id=14999650](https://www.osha.gov/pls/imis/establishment.inspection_detail?id=14999650), Accessed 8/11/16



Wilmington. At the Port of Morehead City, a number of violations were found in 1993 and a fatality in 1992 from falling lumber<sup>50</sup>.

Safety issues rising from sea-level rise and inclement weather may include port employees' increased risk of lightning strike while operating machinery; flooding on port; risk of overturning machinery or commodities from high winds; damage to products and machinery from hail and high waters; risk of fire due to high winds or falling debris across power lines.

Increased use of containers at the Port of Wilmington has resulted in a decrease in theft of goods across the freight movement. Bulk goods like wood pellets and aggregate are not containerized and can therefore be stolen, though theft of any significant volume of these products would be difficult due to the weight and fenced perimeters at the port facilities.

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<sup>50</sup> Inspection Detail, United States Department of Labor, [https://www.osha.gov/pls/imis/establishment.inspection\\_detail?id=17467689](https://www.osha.gov/pls/imis/establishment.inspection_detail?id=17467689), Accessed 8/11/16.

## 4.0 Future Performance/Long-Term Trends

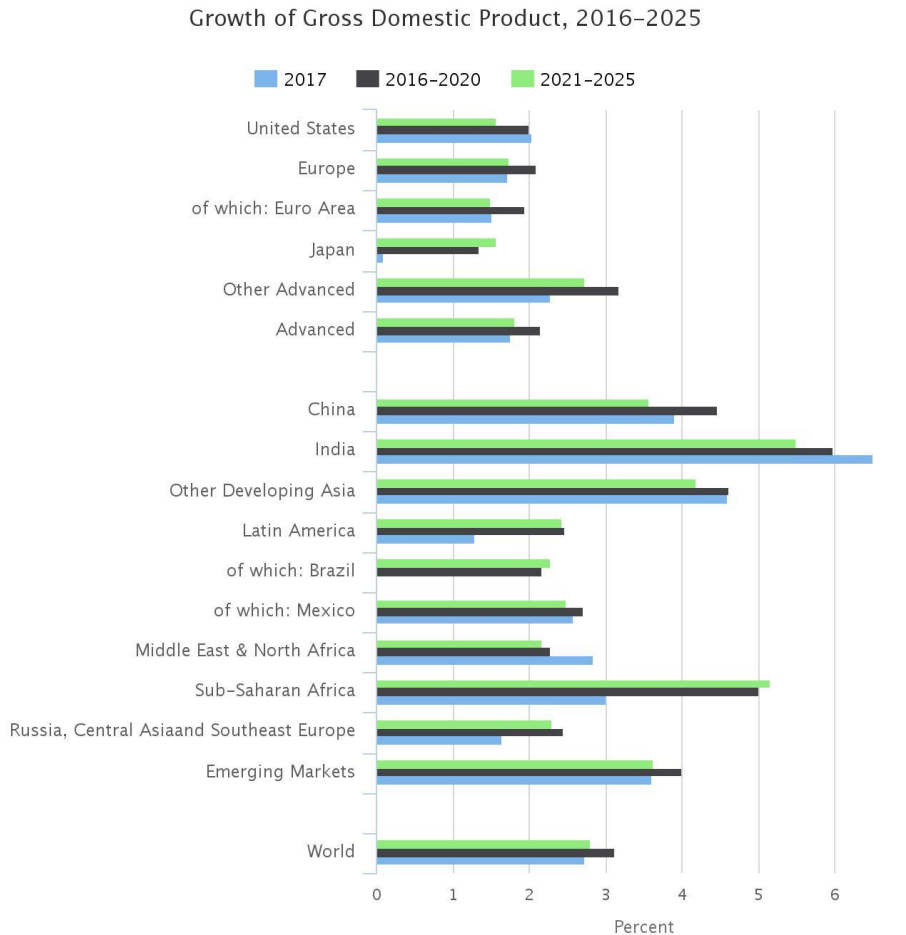
### 4.1 Future Activity/Demand in North Carolina

There are many factors that could impact activity at the ports in North Carolina. These include changes in market activity across the globe, changes to the type of cargo handled at the ports, and population and employment in North Carolina.

#### 4.1.1 Global Market Growth

Economic projections indicate that the pace of economic expansion and associated demand for goods among North Carolina’s key trade partners will strongly outpace the expansion of the US economy in coming decades (Figure 4.1). The ability to connect with these foreign economies and capitalize on this market potential through the exchange of resources, goods, and products represents an important economic development opportunity.

**Figure 4.1 Growth in Global Economy Anticipated to Outpace US Growth**

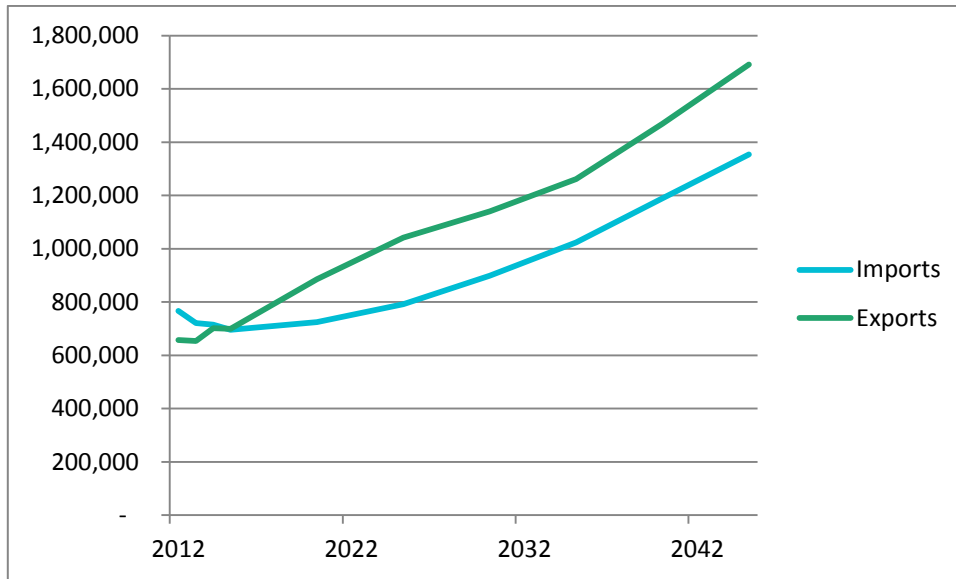


*Note: Projections are based on trend growth estimates, which “for the period 2016–2020” are adjusted for remaining output gaps. Europe includes all 28 members of the European Union as well as Switzerland, Norway, and Iceland. Other advanced economies are Australia, Canada, Israel, Hong Kong, South Korea, New Zealand, Singapore, and Taiwan Province of China. Southeast Europe includes Albania, Bosnia and Herzegovina, Macedonia, Serbia and Montenegro, and Turkey. Source: The Conference Board Global Economic Outlook 2016, May 2016.*

Source: Conference Board Global Economic Outlook 2016

Projections of imports and exports by commodity were obtained from Federal Highway Administration’s FAF tool (Figure 4.2). The projections are trend forecasts, meaning that they do not project a business cycle, but rather project long-term trends based on expectations for US and Southeast regional industrial and population growth, as well as global growth trends. The projections are only for waterborne trade; they cover 42 commodities, and are based on a year 2045 unconstrained forecast.

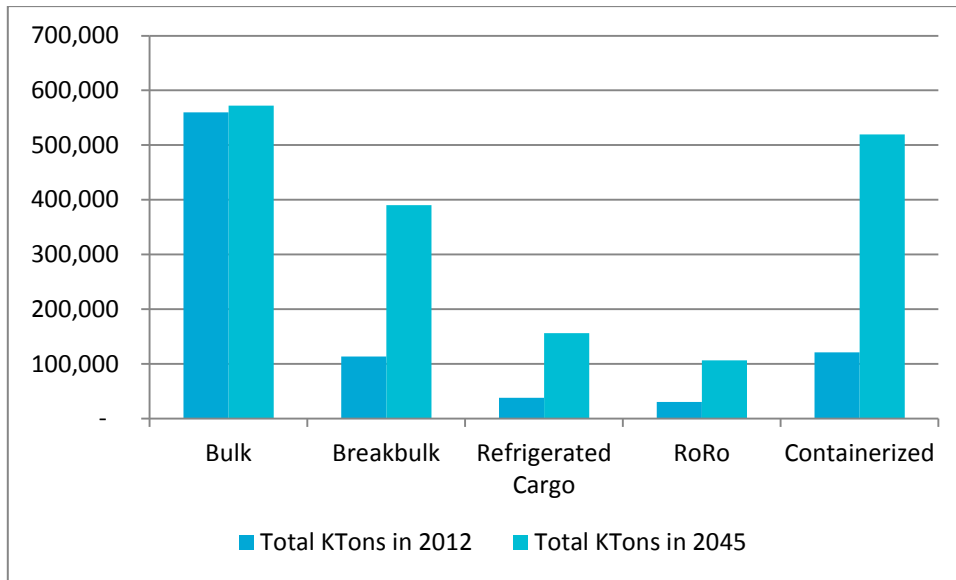
**Figure 4.2 Forecasted Growth for Waterborne Imports and Exports in the US**



Source: FAF 4.1

When evaluated by commodity type – containerized, bulk, breakbulk, and Ro/Ro – the forecasted demand for waterborne imports and exports in the US identifies stronger growth for some commodities than others (Figure 4.3 and Figure 4.4).

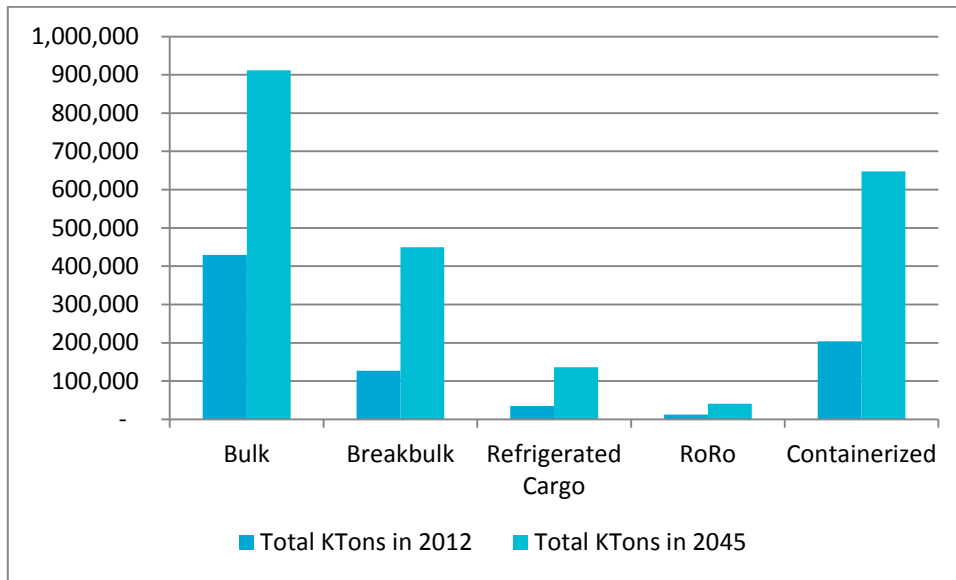
**Figure 4.3 Forecasted Growth for Waterborne Imports to the US by Commodity Type**



Source: FAF 4.1

Note: Commodities may overlap in shipment type, so there is some double-counting

**Figure 4.4 Forecasted Growth for Waterborne Exports from the US by Commodity Type**



Source: FAF4.1

Note: Commodities may overlap in shipment type, so there is some double-counting

### 4.1.2 North Carolina Market Growth

Based on shift share and location quotient analysis and markets described in the *North Carolina Maritime Strategy* (AECOM, 2012), the following candidate market opportunities were selected for further development: bulk, breakbulk, refrigerated cargo, Ro/Ro and oversized cargo, containers, wood, chemicals and phosphates, military materiel, and grain. Wind power was identified through the stakeholder interviews and is consistent with the state’s competitiveness in metals and machinery and falls within Ro/Ro and oversized cargo. Of note, many of the scenarios outlined here employ resources from rural areas; as much of the state’s growth takes place in its metropolitan areas, maritime investment is a way of supporting continued economic growth in the state’s rural areas.

### Statewide Maritime Projections

The projected cargo activity at North Carolina’s ports is based on 2012 and 2045 data from the Federal Highway Administration’s Freight Analysis Framework (FAF) version 4.1, which estimates national and international freight activity. Since 2012, the NCSPA has had an increase in activity and port development that is not fully captured in the FAF projections. As a result, NCSPA has developed independent projections of container traffic at the Port of Wilmington and total tonnage increases for the state’s maritime commodities, as shown in Table 4.2, respectively. Table 4.2 compares the NCSPA forecasts with FAF 4.1, though the commodity descriptions between the two sources do not match exactly. For that reason, only the growth rates for FAF 4.1 commodities that matched closely are displayed. The NCSPA growth projections are for 2015-2020 and were developed by applying Journal of Commerce forecasts for containerized imports and exports to data from the USACE Waterborne Commerce Statistics Center Report, PIERS data, and existing volumes. Because the NCSPA forecasts are port-specific, they may be more reliable in the short-term and could affect the trajectory of long-term activity at the ports; however, the following sections of the chapter use FAF forecasts due to the degree of detail available for commodity types, mode and direction of travel, forecast year, and for consistency with other sections of the report. For more details on the NCSPA’s forecasts of containers and the bulk and breakbulk markets, please refer to the 2015 Strategic Plan of the North Carolina State Ports Authority.

**Table 4.1 NCSPA Projected Containerized Trade Growth for NC Ports**

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020
Imports	6.8%	6.7%	6.9%	6.9%	6.9%
Exports	3.2%	3.3%	3.4%	3.4%	3.4%

Source: JOC Five-Year Horizon, September 2014 (with assumptions by NCSPA for FY 2019 and FY 2020)

**Table 4.2 Comparison of NCSPA and FAF 4.1 Projected Commodity Growth for NC Ports**

Commodity	NCSPA Projected Growth Rate (2015-2020)	FAF 4.1 Imports through NC Ports (2012-2045)	FAF 4.1 Exports through NC Ports (2012-2045)
Coal coke/other bulk	2.0%		-37.0%
Asphalt, tar and pitch	2.5%		
Fertilizers	2.0%	-2.2%	0.5%

Commodity	NCSPA Projected Growth Rate (2015-2020)	FAF 4.1 Imports through NC Ports (2012-2045)	FAF 4.1 Exports through NC Ports (2012-2045)
Chemicals and related products (including PCS and Vopak)	2.0%	4.7%	5.5%
Rubber and gums	5.0%	4.5%	3.6%
Fuel wood / pellets	35.0%		
Wood chips	2.0%		
Wood in the rough / logs	2.0%	-21.6%	5.8%
Lumber / dimensional	2.0%		
Pulp and waste paper	4.0%	4.2%	3.2%
Soil, sand, gravel, rock, and stone/aggregate	2.0%	-0.2%	0.6%
Sulfur/liquid PCS	0.0%		
Cement and concrete	2.5%		
Pig Iron/DRI	2.0%		
Steel/bridge girders	2.0%		
Grain	2.8%	-6.0%	3.1%
Vehicles and parts	3.5%	2.3%	2.2%
Aircraft and parts	2.0%		
Ships and boats	2.0%		
Other	2.0%		

Source: NCSPA 2014, FAF 4.1

Note: Commodities do not necessarily match between FAF 4.1 and NCSPA

By 2045, maritime cargo tonnage is expected to double, from more than 8 million tons in 2012 to over 17 million tons. This is an overall growth of 109 percent, with an annual growth rate of 2.26 percent over the 33-year period. Import and export tonnage is expected to grow at similar rates, with imports increasing to over 9 million tons and exports increasing to over 7 million tons (Table 4.3).

**Table 4.3 Projected Maritime Cargo Activity in North Carolina, by Direction, 2012-2045**

Direction	2012 K Tons	2045 K Tons	Total Growth	Annual Growth
Imports	5,683	9,851	73%	1.68%
Exports	2,778	7,866	183%	3.20%
<b>Total</b>	<b>8,461</b>	<b>17,717</b>	<b>109%</b>	<b>2.26%</b>

Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

Most of the top imported maritime freight commodities in 2045 are expected to increase in tonnage and value from 2012 levels. Basic chemicals and plastics/rubber are projected to be the top two imported commodities



in 2045, jumping one and five spots respectively from the 2012 rankings. Fertilizers are expected to drop in ranking, but remain in the top ten. Plastics/rubber and machinery will make up 30 percent of the projected total value of imports in 2045, totaling over \$7 billion (Table 4.4).

**Table 4.4 Projected Top 10 Maritime Cargo Commodities at North Carolina Ports, 2045 Imports**

Commodity	Rank Change (2012-2045)	2045 K Tons	% of Total	2045 Value (M\$)	% of Total
Basic chemicals	1	2,561	26%	1,879	8%
Plastics/rubber	5	1,134	12%	3,607	15%
Base metals	1	898	9%	843	3%
Nonmetallic minerals	2	762	8%	95	0%
Furniture	9	586	6%	1,736	7%
Machinery	4	572	6%	3,572	15%
Articles-base metal	2	534	5%	1,023	4%
Fertilizers	-7	498	5%	194	1%
Textiles/leather	6	359	4%	2,072	9%
Other agricultural products	17	357	4%	242	1%

Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

The top maritime exported freight commodities are expected to shift very little from 2012 to 2045, with all expected to increase in tonnage and value. Wood products and newsprint/paper are projected to be the top two exported commodities, moving up one spot each and downgrading fertilizers from the first to fourth spot. The top ten exported commodities make up 26 percent of the projected exported value in 2045 for a total of \$5.6 billion (Table 4.5).

**Table 4.5 Projected Top 10 Maritime Cargo Commodities at North Carolina Ports, 2045 Exports**

Commodity	Rank Change (2012-2045)	2045 K Tons	% of Total	Total M\$ in 2045	% of Total
Wood prods.	1	1,795	23%	391	2%
Newsprint/paper	1	1,218	15%	738	3%
Waste/scrap	1	1,172	15%	768	4%
Fertilizers	-3	1,037	13%	463	2%
Logs	3	555	7%	252	1%
Textiles/leather	-1	353	4%	1,063	5%
Meat/seafood	0	305	4%	437	2%
Plastics/rubber	-2	285	4%	1,190	6%
Animal feed	1	200	3%	201	1%

Commodity	Rank Change (2012-2045)	2045 K Tons	% of Total	Total M\$ in 2045	% of Total
Other agricultural products	2	140	2%	465	2%

Source: FAF 4.1

Note: excludes NCSA projections for 2015-2020

The following sections provide FAF projections for freight handled at North Carolina ports by freight type, followed by some projections for commodities that are important to the state.

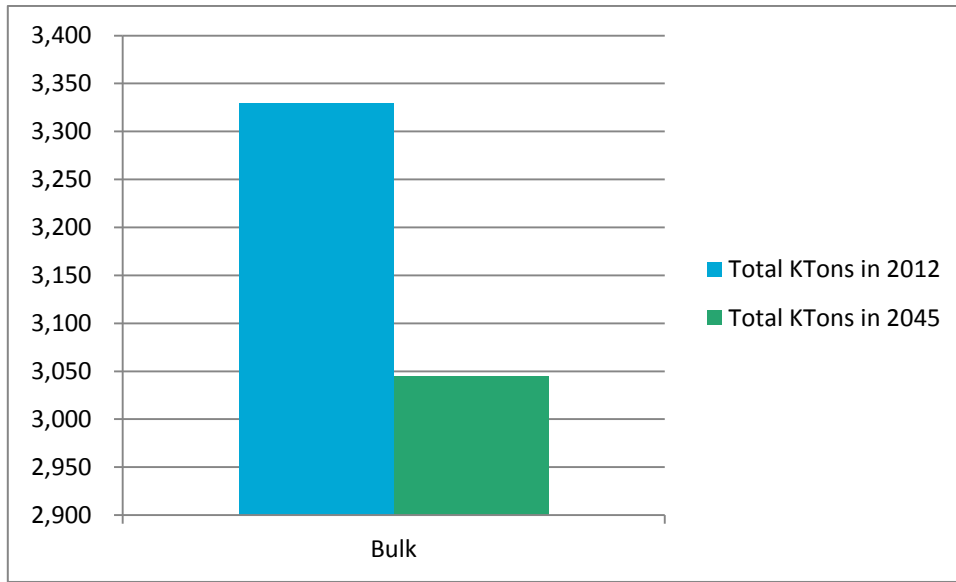
## Bulk Cargo

FAF shows that growth forecasts for bulk commodities from North Carolina's ports are between -0.3 percent (imports) and 1.2 percent (exports). (See Figure 4.5 and Figure 4.6.) As shown in Figure 4.5, bulk imports are not anticipated to have the same growth that is expected in the exports market. According to the *North Carolina Maritime Strategy* (AECOM, 2012), under a pessimistic or low growth scenario, existing bulk facilities within the regional peer ports could theoretically handle forecasted bulk volumes through 2040, while a more optimistic overall market demand for bulk products would require additional capacity to handle regional demand as soon as 2020.

Because bulk facilities are often dedicated to a single commodity type, the imbalance between demand and capacity may be more distinct or severe for specific commodities. Bulk products are also expensive to transport on land over large distances, so ports farther from production or extraction sites may not be economically feasible alternatives. Such a mismatch in location or capability and specific shipper needs would be consistent with the perception of North Carolina's agricultural shippers; that there is a shortage of regional bulk export terminals to handle their products.<sup>51</sup> Particularly for key North Carolina commodities such as forestry and agricultural products, profit margins are thin, making these commodities highly sensitive to differences in shipping costs. Investments to improve the landside travel time and reliability can change the relative costs between shipping locations in North Carolina's favor.

<sup>51</sup> *NC Maritime Strategy* agricultural shippers workshop, held August 16, 2011.

**Figure 4.5 Bulk Imports through North Carolina Ports**

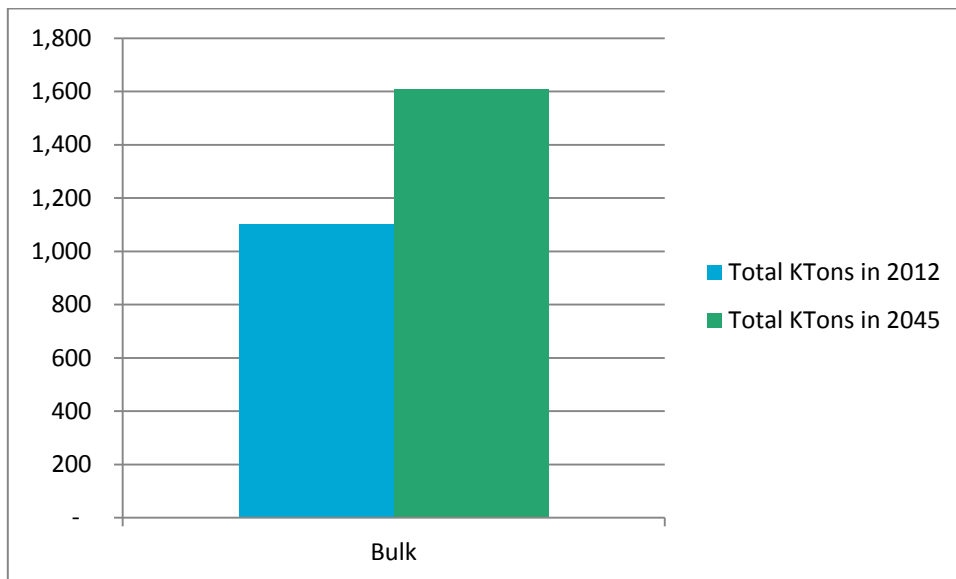


Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

The bulk import market's growth is heavily tempered by the decline in imported gasoline, cereal grains, and fertilizers through North Carolina ports. All three products have negative growth rates from 2012-2045.

**Figure 4.6 Bulk Exports through North Carolina Ports**



Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

Assuming constant growth over 2012-2045, bulk imports and exports will not exceed capacity (2,220,000 tons at Wilmington, 2,730,000 tons at Morehead City) by 2045. Therefore, no additional bulk facilities and

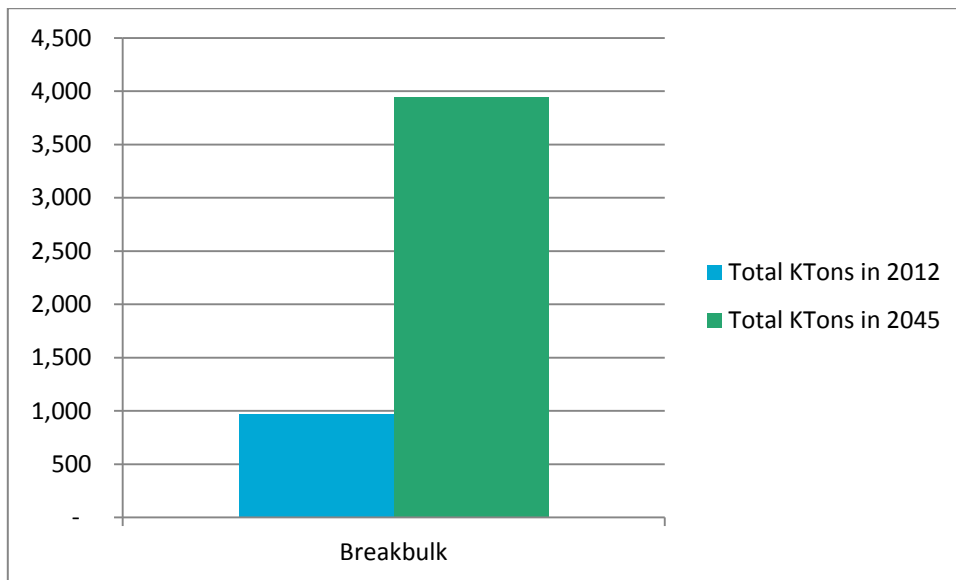
infrastructure are needed to accommodate the projected tonnages that are expected to be handled at North Carolina ports through 2045, all else held equal.

### Breakbulk Cargo

As a generalized commodity type, breakbulk products can be handled across numerous facilities, so estimated overall capacity within the region is high – estimated at nearly 25 million annual tons<sup>52</sup> across the regional ports. Terminals, equipment, and storage facilities can be readily adapted to handle a variety of goods that do not require special handling or storage. Where specialized equipment or storage facilities are required, however, the demand-to-capacity ratio may be quite different. North Carolina producers of heavy and oversize cargo have identified a need for terminals that can move this cargo.<sup>53</sup> Heavy or oversize goods are also expensive to transport on land over long distances, so ports farther from manufacturing sites may not be economically feasible alternatives. Warehouse and storage facilities for commodities that require temperature or climate control were also identified as a local need.

The breakbulk market includes products like chemicals, wood, and metals. Overall, breakbulk exports are expected to show a compound annual growth rate (CAGR) of 4.3 percent from 2012-2045, while the imports show growth of 2.9 percent (Figure 4.7 and Figure 4.8).

**Figure 4.7 Breakbulk Exports through North Carolina Ports**



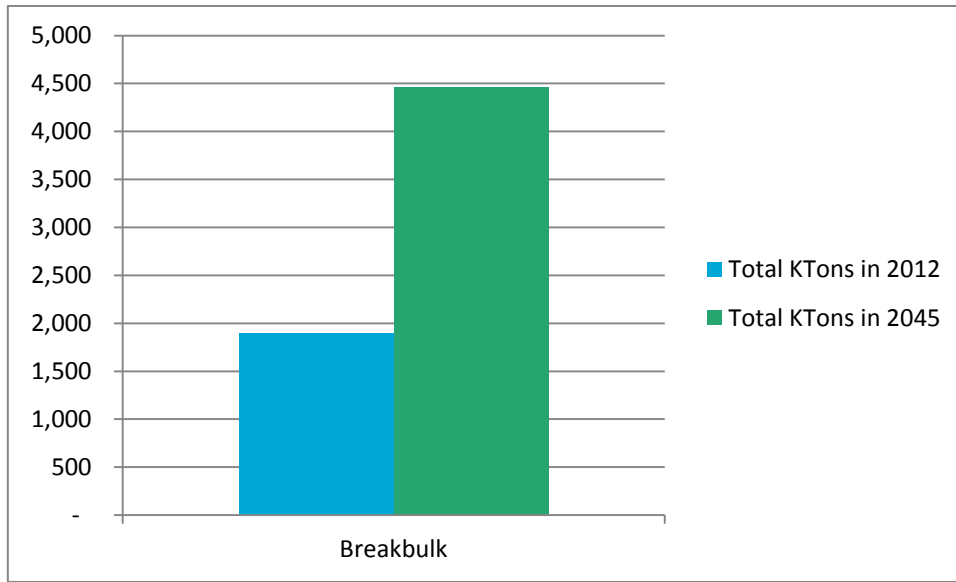
Source: FAF 4.1

Note: excludes NCSA projections for 2015-2020

<sup>52</sup> From AECOM BERTHA and PRECAP analysis, *North Carolina Maritime Strategy* (AECOM, 2012)

<sup>53</sup> Bulk and breakbulk shippers workshop, held October 21, 2011, *North Carolina Maritime Strategy* (AECOM, 2012)

**Figure 4.8 Breakbulk Imports through North Carolina Ports**



Source: FAF 4.1

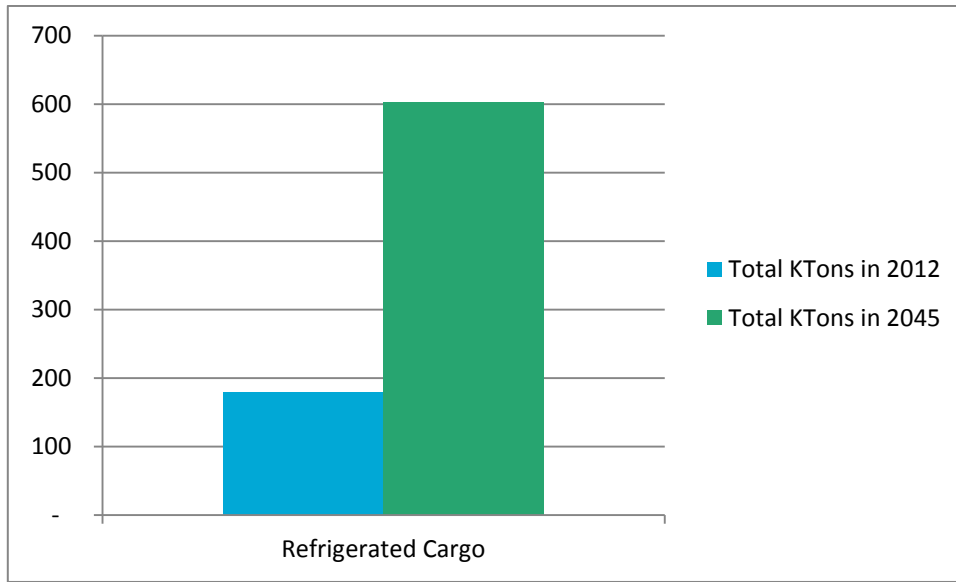
Note: excludes NCSPA projections for 2015-2020

### Refrigerated Cargo

The ability to handle refrigerated cargo supports the export of a variety of the state’s agricultural commodities, from specialized manufacturing inputs that require low temperatures, to food imports to serve the region’s growing population (Figure 4.9 and Figure 4.10). Key agricultural commodities served by this investment include the state’s exports of poultry, pork, and seafood. Sweet potatoes, too, benefit from temperature control. North Carolina is the nation’s leading producer of sweet potatoes. Refrigeration supports imports, as well. North Carolina-based shippers who participated in the stakeholder workshops held as part of the *North Carolina Maritime Strategy* (AECOM, 2012) study noted that they imported specialized textiles and rubber products through out-of-state ports because the requisite facilities were not available in-state. Shippers reported using the Port of New Orleans and other ports specifically for this reason; the requisite facilities to keep the commodity at a proper temperature were not available at the North Carolina port facilities. The region’s growing population creates a healthy market for imported fruits and vegetables and other perishables such as flowers. These imports would pair well with the state’s existing strengths in exporting agricultural products requiring refrigeration such as sweet potatoes, frozen poultry, and meat.

In capitalizing on this opportunity, the port’s access to non-traditional food retailers such as Target and Wal-Mart, in addition to chain grocery store distribution centers, helps in attracting an import perishable foods operator. North Carolina has demonstrated success in attracting grocery distribution centers, like the Save-A-Lot distribution center in Lexington and Food Lion’s expansion of its Dunn distribution center in 2011. The ability to handle refrigerated cargo thus supports important existing North Carolina industries and manufacturers, but also offers the potential to increase the flow of imports through the ports, offering important truck backhaul opportunities, and potentially expanding the range of carriers that call on North Carolina’s ports, all of which provides upside potential to the import projections.

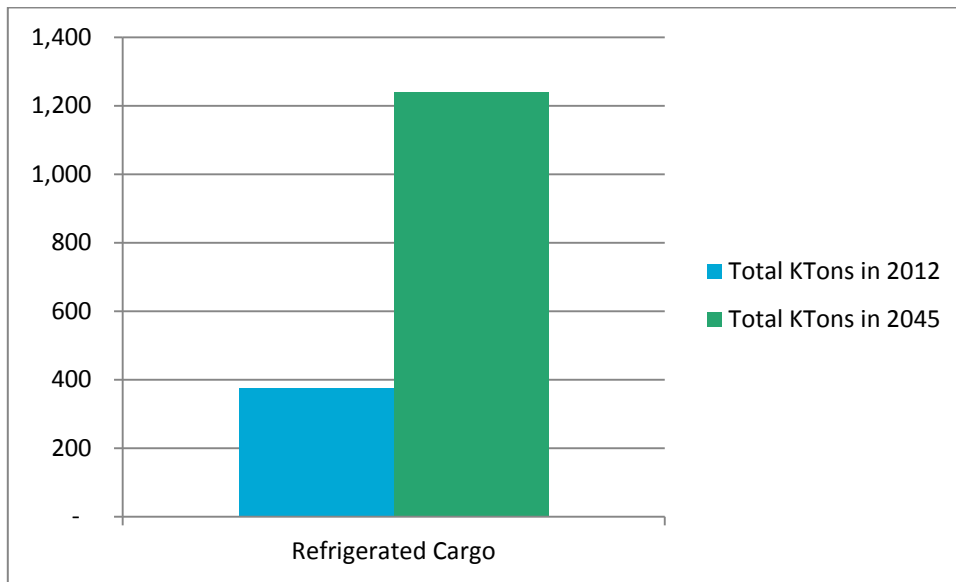
**Figure 4.9 Potential Refrigerated Cargo Exports through North Carolina Ports**



Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

**Figure 4.10 Potential Refrigerated Cargo Imports through North Carolina Ports**



Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

Regional demand for import and export of containerized goods is projected to grow at a compound annual growth rate of 3.7 to 4.1 percent through 2045. Available container capacity at southeastern US ports is also expected to grow during this period.

The most significant driver of the ability for North Carolina maritime infrastructure to meet the goods movement needs of certain industries may be investments in specialized equipment to accommodate some



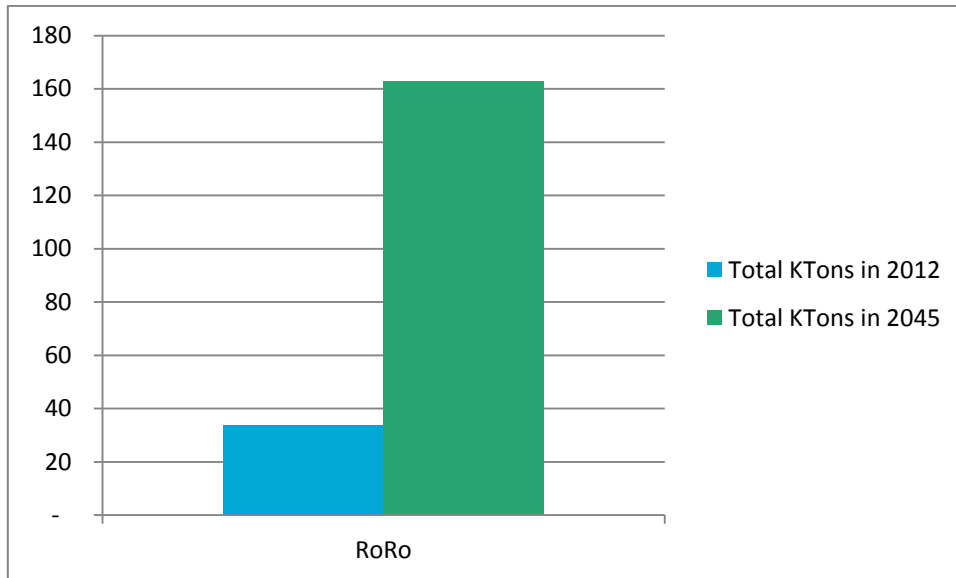
of the state's key exports and market opportunities. Provided that there is the requisite equipment and capacity to handle freight, relative costs are the next important driver of diversion potential. Ensuring that shippers can maintain their profit margins by removing impedances on landside access between ports and population centers may encourage higher use of North Carolina ports for refrigerated cargoes.

### Ro/Ro and Oversize Cargo

The state's low costs of doing business make it an attractive location for producers of capital goods. Moreover, the state's competitiveness in metals and machinery supports the outlook for a growing capital goods industry. Ensuring that the state has the capability to handle large project cargoes supports important existing firms and industries such as the local military facilities as well as Spirit and Caterpillar. It also makes the state an attractive candidate for the relocation and expansion of other capital goods producers; these are attractive firms because they purchase significant inputs from their host economies, generating larger than average multiplier effects.

The Ro/Ro commodities include machinery, motorized vehicles, and transport equipment. For the purpose of evaluating available Ro/Ro capacity, the study team used these three commodities to be representative of the total Ro/Ro market. The requirements of heavy or oversize Ro/Ro cargo are not reflected in this analysis. This specialized segment of the Ro/Ro market would have more limited available capacity across North Carolina and its peer ports. Heavy or oversize goods are also expensive to transport on land over large distances, so ports farther from manufacturing or distribution sites may not be economically feasible alternatives. Ro/Ro imports and exports through NC's ports are expected to show annual growth of 4.2 to 4.9 percent from 2012-2045 with exports growing slightly faster than imports (Figure 4.11 and Figure 4.12).

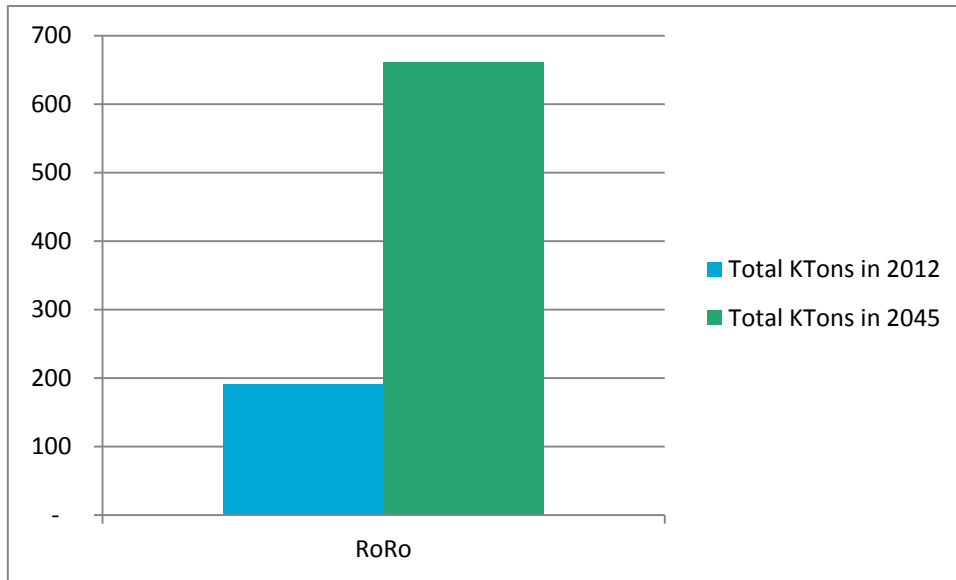
**Figure 4.11 Potential Ro/Ro Exports through North Carolina Ports**



Source: FAF 4.1

Note: excludes NCSA projections for 2015-2020

**Figure 4.12 Potential Ro/Ro Imports through North Carolina Ports**



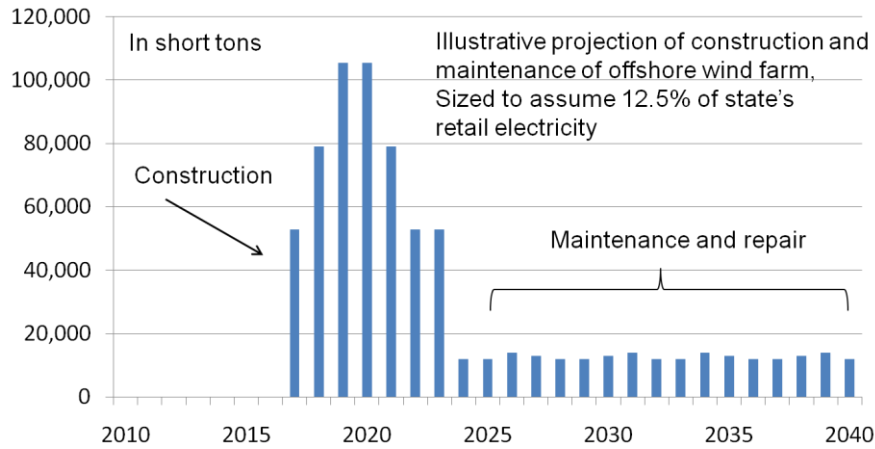
Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

As a subset of the Ro/Ro and oversize market, North Carolina is actively considering offshore wind power as a new industry. The US President has invited companies to bid for the opportunity to build wind farms off of the Outer Banks.<sup>54</sup> As a result, there is potential for the state’s ports to serve as the base of construction and operations. During the construction phase, North Carolina’s ports would be the focus for imports and exports of equipment and materials for the offshore site (similar to that discussed in section 3.1.1). Once built, the freight volumes would fall, but the ports would serve as a service base to maintain and operate the offshore facility. Finally, the presence of the large scale facility and the state’s low business costs could attract wind power manufacturers to the state, creating upside potential for equipment exports from the state. Figure 4.13 from the *North Carolina Maritime Strategy* (AECOM, 2012) study shows the potential demand at the ports for construction and operation of wind farms.

<sup>54</sup> Associated Press, “Bids Sought For Offshore Wind Power Off N.C.’s Outer Banks,” ENR.com, August 12, 2016, [http://www.enr.com/external\\_headlines/story?region=enr&story\\_id=I\\_iABbAWQywZS3z5alj97uXTAbHy-HQAECaHPruqeAgPmNygEmPOupSndTloPwZq4R-IF4C2GQ6YJZ38l0t8e4n0UqHiUhU0tZmg46NqQmhoFEJzWhZGjoj9CNWW2Un6b4Gvl6KzYjbWpzXhRovCsc4EVQ0tWBKjd6x0YTgprw\\*](http://www.enr.com/external_headlines/story?region=enr&story_id=I_iABbAWQywZS3z5alj97uXTAbHy-HQAECaHPruqeAgPmNygEmPOupSndTloPwZq4R-IF4C2GQ6YJZ38l0t8e4n0UqHiUhU0tZmg46NqQmhoFEJzWhZGjoj9CNWW2Un6b4Gvl6KzYjbWpzXhRovCsc4EVQ0tWBKjd6x0YTgprw*), Accessed 8/15/16.

**Figure 4.13 Wind Power Equipment and Components Opportunity for North Carolina**



Source: AECOM, from wind power equipment specifications

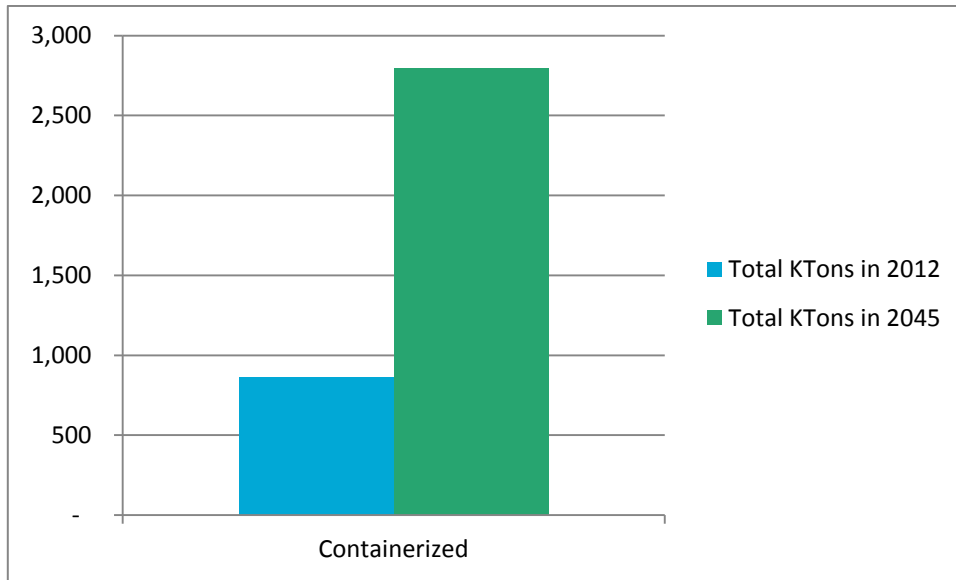
### Containerized Cargo

North Carolina added 1.5 million people between 2000 and 2010, one of only six states to add more than one million during the decade. To put that in perspective, 11 states have *total* populations less than 1.5 million—the number that North Carolina added in a decade. Moreover, the state’s metropolitan communities frame the northern segment of the emerging Piedmont Atlantic Megaregion. In short, the state is becoming one of the nation’s most populous states and is becoming part of a growing urban economy. This consumer market is attractive to retailers and will generate demand for a full range of consumer goods.

Container handling supports both export and import activity across a large variety of industries--everything from sweet potatoes and frozen chickens to consumer goods destined for local retailers (Figure 4.14 and Figure 4.15). Growth in container activity at the port would make North Carolina facilities more attractive ports of call for shipping lines, expanding the market reach for North Carolina producers, making it easier to secure containers, and creating scale economies.

Cost-effective delivery of containerized goods to North Carolina users and consumers of foreign products is not the only reason that the waterborne container market is important to the state. North Carolina producers that export their goods by container must transport – primarily by truck – their goods to the nearest port at which empty containers are available and regular overseas service by container shipping lines is provided. Development of the infrastructure and services to support a strong import container market will also support the competitiveness of containerized exports originating from North Carolina.

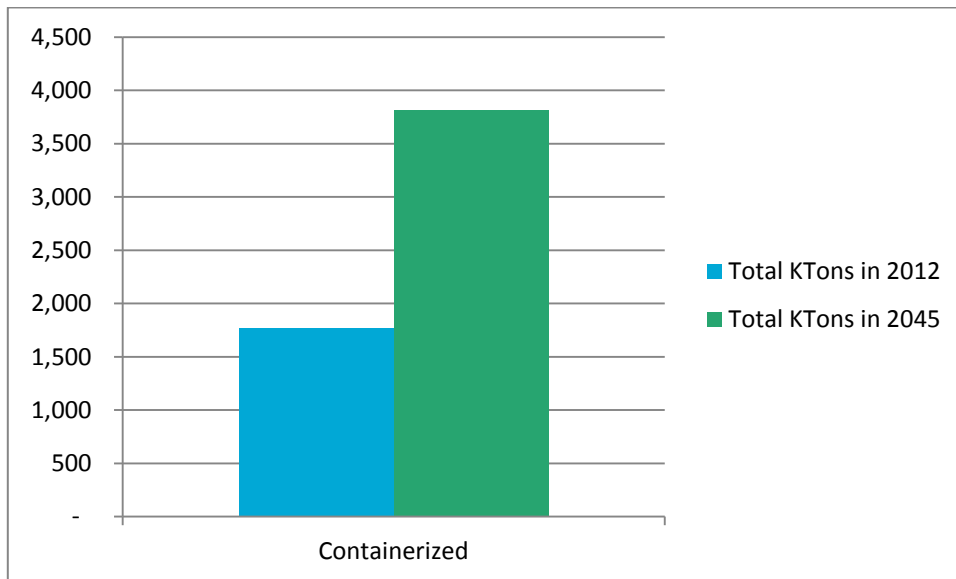
**Figure 4.14 Containerized Exports from North Carolina**



Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

**Figure 4.15 Containerized Imports to North Carolina**



Source: FAF 4.1

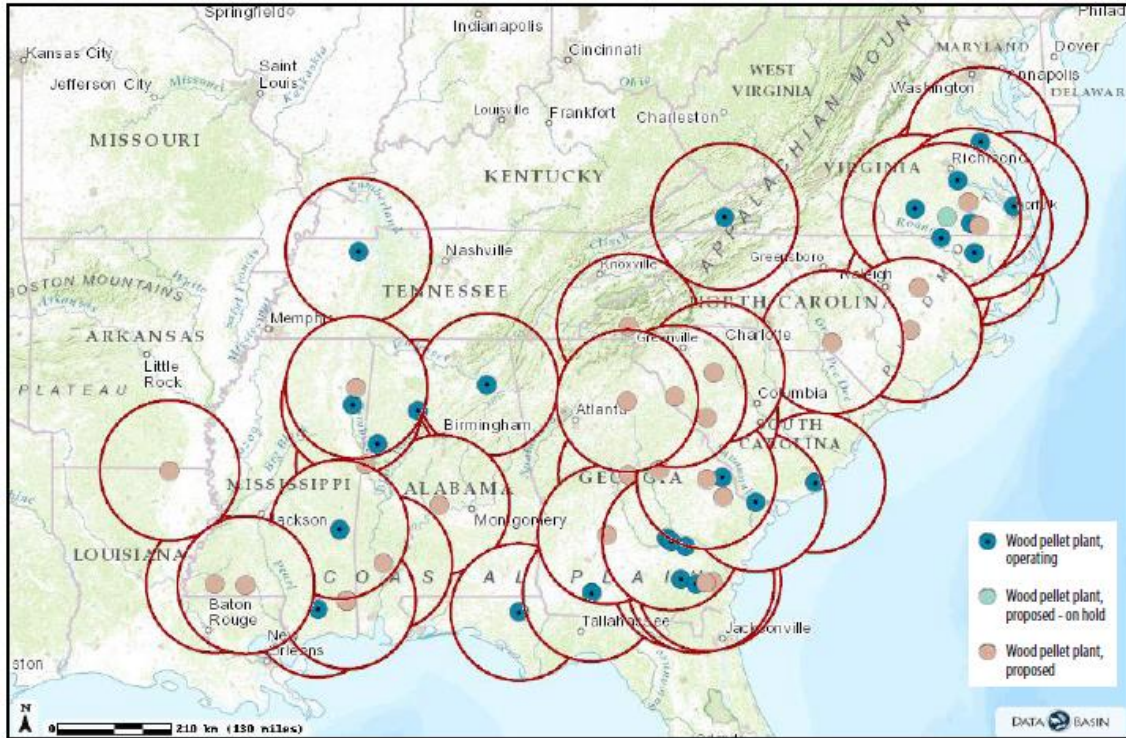
Note: excludes NCSPA projections for 2015-2020

### Wood Products

Heavy commodities such as wood and wood products are particularly sensitive to transportation costs. Potential for improved landside access and handling facilities at North Carolina’s ports supports this large industry’s ability to capture its maximum share of the world market. Support for this industry and opening up opportunities to capture the wood pellets market would bolster this industry.

The wood pellets industry is driven by the United Kingdom (UK) and European initiatives to convert energy sources to renewable ones. For example, in the UK, by the year 2020, 15 percent of energy consumption must be from forms of renewable energy (versus approximately 1 percent in 2007). Electricity supply must be 35 percent from renewable sources by 2020, in comparison to about 5 percent in 2007. This is creating a large market for wood biomass that cannot be met domestically. The map in Figure 4.16 shows the existing and proposed wood pellet plants in the region.<sup>55</sup>

**Figure 4.16 Existing and Proposed Wood Pellet Facilities in the Southeastern US, 2014**



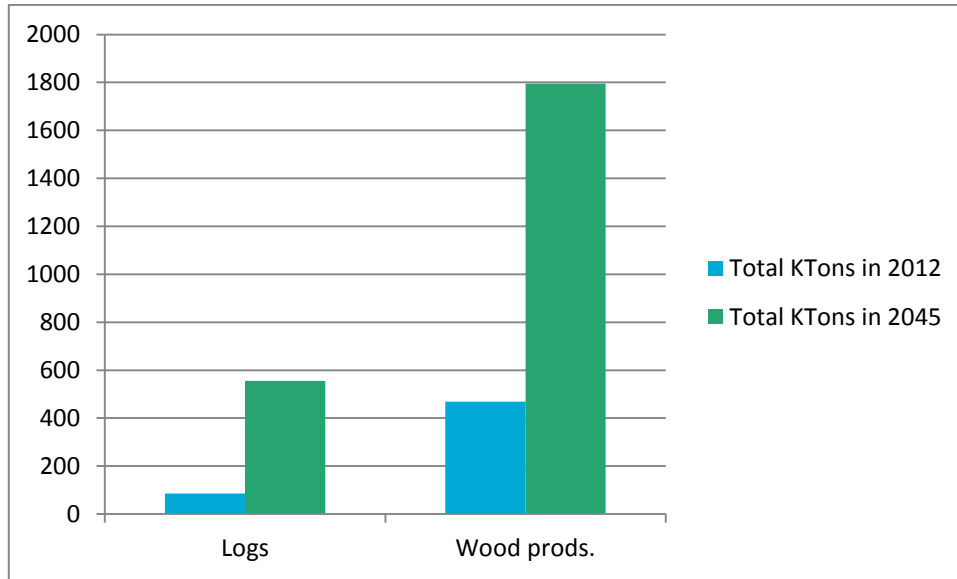
Source: Natural Resources Defense Council, In the US Southeast, Natural Forests are Being Felled to Send Fuel Overseas, October 2015.

North Carolina is well positioned in terms of resources to serve this market. A pellet facility near the Virginia state line, and the company’s purchase of a port terminal in Chesapeake, mean that this firm will export out of Virginia rather than North Carolina. The example, however, underpins the importance of transportation costs for this industry—favoring locations such as North Carolina with both the wood resource and port access. Both ports have recently developed facilities for exporting wood pellets and wood chips to Europe. At the Port of Wilmington, Enviva Wilmington Holdings, LLC, has built two domes to store up to 45,000 metric tons each of pellets, and a marine terminal for pellet export. The facility will serve product from Enviva’s plant

<sup>55</sup> Chavez, Karen, “Wood pellet industry creating confusion”, *Citizen-Times*, December 1, 2015, <http://www.citizen-times.com/story/news/2015/11/28/wood-pellet-industry-creating-confusion/76241058/>, Accessed 8/25/16

in Sampson County.<sup>56</sup> The Port of Morehead City also plans to export wood pellets for International WoodFuels, LLC, under a 20-year agreement<sup>57</sup> (Figure 4.17).

**Figure 4.17 Wood Products Exported from North Carolina Ports**



Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

### Chemicals and Phosphates

Chemicals are a major existing export for North Carolina’s port facilities and have solid export prospects going forward. The anchor for the state’s industry, PCS, has a longterm contract with the Port of Morehead City for the storage and export of phosphate rock, phosphoric acid, purified acid, and phosphate feed which is used as liquid and solid fertilizers and animal feed supplements, and other food and beverage products and metal treatment compounds<sup>58</sup>. PCS has potash mines in Aurora, North Carolina. The Aurora facility has a capacity of 1.2 million tonnes P205 of phosphoric acid per year; the company reports that it is the largest integrated phosphate mine and phosphate processing complex at one site in the world.

The company has long-term leases on shipping terminals in Morehead City and Beaufort, North Carolina, through which the company receives and stores Aurora facility raw materials and finished product. Barges and tugboats are used to transport solid products, phosphoric acid, and sulfur between the Aurora facility and shipping terminals. According to company reports, raw materials and products, including sulfur, are also transported to and from the Aurora facility by rail.

<sup>56</sup> Enviva, Port of Wilmington, NC, <http://www.envivabiomass.com/port-of-wilmington-nc/>, Accessed 8/25/16

<sup>57</sup> NCSPA, *State Ports Board Approves Wood Pellet Agreement for Port of Morehead City*, <http://www.ncports.com/news/news-releases/state-ports-board-approves-wood-pellet-agreement-port-morehead-city/>, Accessed 8/25/16

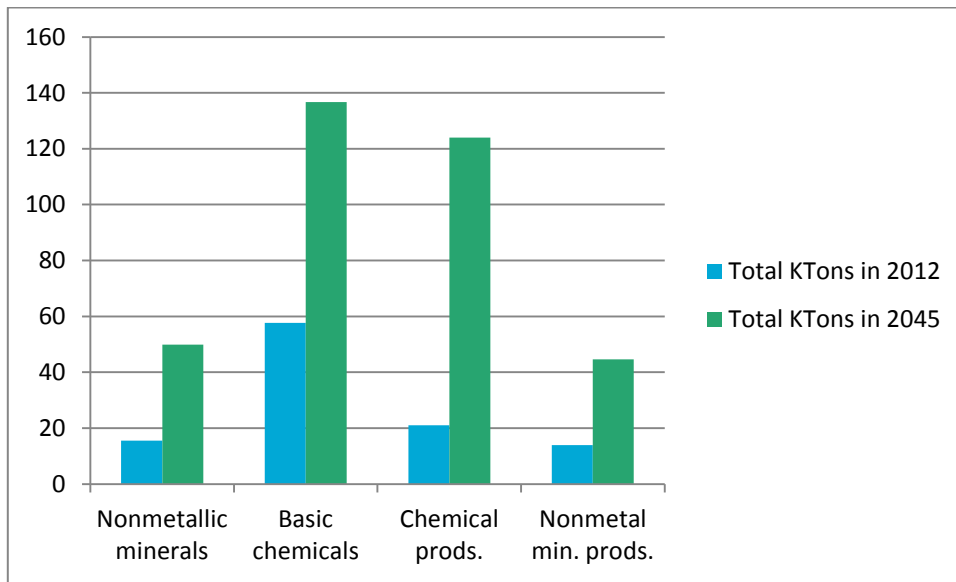
<sup>58</sup> PotashCorp, *Aurora Facilities & Investments*, <http://www.potashcorp.com/about/facilities/phosphate/aurora/>, accessed August 4, 2016.



Existing reserves for the Aurora facility would permit mining for about 30 years. If deposits covered by permits are classified as resources, the mine life extends to nearly 50 years, confirming that this is a long-term opportunity for North Carolina. State investments in pursuit of new maritime opportunities should be supportive of this existing market.

As seen in Figure 4.18, the outlook for exported chemical and phosphate products is good through North Carolina’s ports. Chemical products in particular show high growth, with a CAGR of 5.5 percent. Together, the products show a Compound Annual Growth Rate<sup>59</sup> (CAGR) of 3.7 percent, indicating strong markets through 2045.

**Figure 4.18 Exports of Chemicals and Phosphate Products from NC Ports**



Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

### Military Cargo

North Carolina has the third-largest active duty military population in the US and 10<sup>th</sup> largest reserve force,<sup>60</sup> distributed among seven military installations and 14 US Coast Guard facilities (Figure 4.19). Military facilities support over 416,000 workers, about 8 percent of total state employment, through direct military or Coast Guard employment or jobs supported by military installations in the state such as contractors or support services.<sup>61</sup>

<sup>59</sup> The CAGR is calculated  $((\text{Ending Value} / \text{Beginning Value})^{(1 / \text{Number of Years})}) - 1$

<sup>60</sup> Governing Data, Military Active-Duty Personnel, Civilians by State, <http://www.governing.com/gov-data/military-civilian-active-duty-employee-workforce-numbers-by-state.html>, Accessed 8/25/16

<sup>61</sup> Sara Nienow, Chris Harder, Tim Cole, and Anna Lea. “North Carolina’s Military Footprint: Current Economic Impacts and Projections for 2013” The Policy, Research, and Strategic Planning Division of the North Carolina Department of Commerce with assistance from Adam Cooper (REMI). June 2008.

**Figure 4.19 Military Depots and Military Bases in the Southeastern US**

Source: North Carolina Logistics Initiative, Military Growth Task Force

The US Military is investigating changes to its traditional equipment maintenance and reset functions to include an end-to-end Defense Logistics Organization. Challenges presented by shrinking budgets and mandated consolidation are forcing the examination of the equipment reset process, which includes: redeployment of equipment from overseas; assessment for heavy or light repair; transport to inland depots in Alabama and Georgia for rehabilitation or major overhaul; and return to base – primarily in North Carolina. Through its North Carolina Defense Logistics Initiative, the North Carolina East Region Military Growth Task Force has proposed changes in the marine reset logistics to redirect North Carolina-bound equipment through North Carolina ports to eliminate several hundreds of miles of equipment transport. The ports therefore should be sure to have the capacity and handling capabilities of oversize cargoes.

## Grain

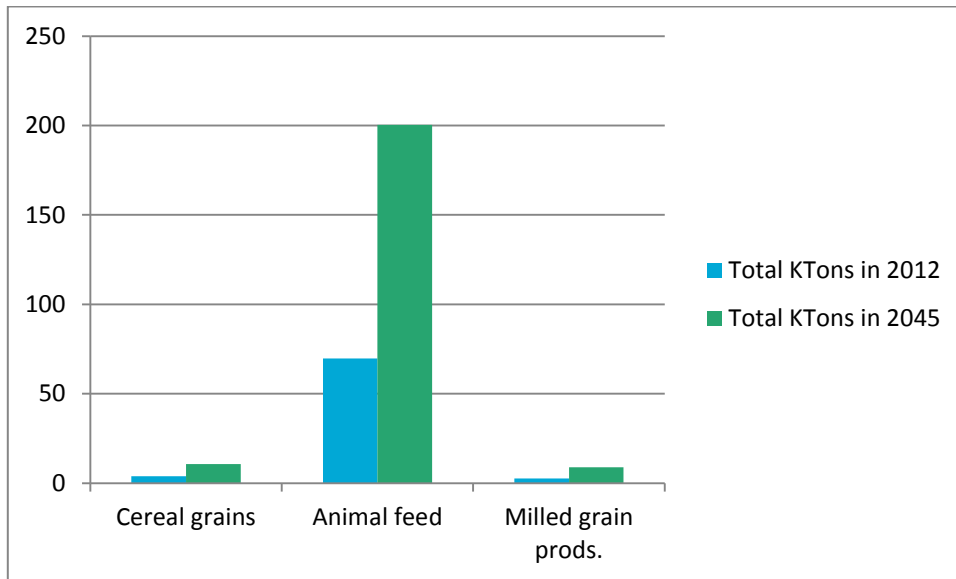
Soybean exports account for 11.8 percent of North Carolina's agricultural exports; adding in wheat and feed grains and products, and the combined grain total rises to 17.4 percent of the state's exports and about \$728 million for the state's economy in 2014<sup>62</sup> (Figure 4.20). As a result, market options are important for the state. North Carolina's soybeans are attractive to export customers because they tend to have higher protein and

<sup>62</sup> Based on 2014 data from North Carolina's Department of Agriculture Export Data, <http://www.ncagr.gov/markets/international/NCAgExportStatistics.htm>, Accessed 8/23/16.

oil content than the average bean grown nationally<sup>63</sup>. According to the *North Carolina Maritime Strategy* (AECOM, 2012) there are solid prospects for grain exports and growers reported in interviews that they could produce more than they currently do. Grain markets are seasonal; soybean producers, for example, market about 65 percent of their beans between October and December<sup>64</sup>.

The majority of North Carolina’s grain exports go out of neighboring state ports, adding to producers’ costs and paring back margins. Some travels by container through Wilmington. Even a small savings in transportation cost could yield significant savings for this industry, with multiplier effects for the North Carolina economy. Grain exports through North Carolina’s ports are projected to grow by 3.3 percent over 2012-2045 (Figure 4.20), while imports are projected to contract by 3.4 percent per year (Figure 4.21).

**Figure 4.20 Grain Exports from North Carolina Ports**



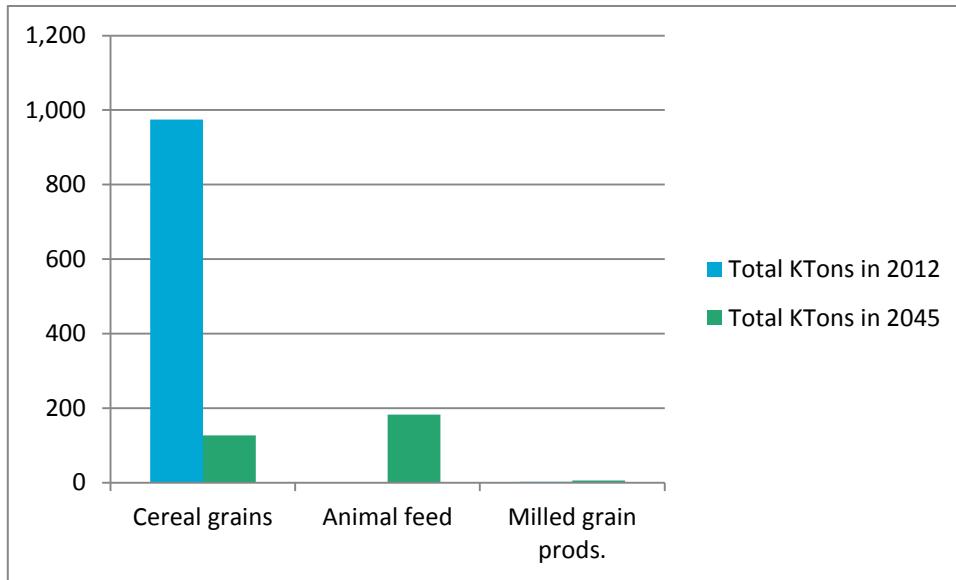
Source: FAF 4.1

Note: excludes NCSA projections for 2015-2020

<sup>63</sup> Stakeholder interviews for the *North Carolina Maritime Strategy* (AECOM, 2012) and reported in “Opportunities for Containerized Exports of North Carolina Soybeans,” a report to the North Carolina Soybean Producers Association prepared by Market Solutions LLC, September 2008

<sup>64</sup> Ibid.

**Figure 4.21 Grain Imports to North Carolina Ports**



Source: FAF 4.1

Note: excludes NCSIPA projections for 2015-2020

### 4.1.3 Population Growth in North Carolina

The future activity and demand for goods through North Carolina’s ports will primarily depend on the end users. Because much of the product imported through the ports is destined to stay in-state, the end users are the people who live and work in North Carolina. The populations of the coastal regions are most directly affected by the ports’ activity because populations living and working there are the closest in proximity to the ports and therefore are the most likely to use the ports. The goods produced in these regions are most likely to be reliant on imports from the ports and to use the ports to export goods across the globe. Residents and businesses in the central and western portions of the state are less reliant on the ports in North Carolina due to the accessibility to other ports in the region, such as Charleston, Savannah, and Norfolk.

Population change is a key contributor to economic growth and transportation demand, as increases in population create demand for goods and services. In conjunction with the expanding demand for goods and services, population impacts the number of passenger and freight trips through the North Carolina transportation system.

Of the prosperity zones in North Carolina, the North Central and Southwest zones are the most populous and make up 45.9 percent of the population of North Carolina (23.6 percent, and 22.3 percent respectively). These are also the two fastest growing regions, having grown from 2005 to 2015 at rates of 24.7 percent, and 22.5 percent respectively. Driving the population growth in North Carolina, these districts are the most urban in nature. Included in the north central region is the Raleigh-Durham metropolitan area. The southwest region includes the Charlotte metropolitan area. The two least populous prosperity zones are the northeast and northwest. Together they make up 11.5 percent of the population of North Carolina. These regions are the slowest growing in the state, reflecting growth from 2005 to 2015 of 5.6 percent, and 3.1 percent respectively, and contain areas that tend to be rural in nature.

From 1990 to 2035, the populations of the north central and southwest regions are expected to grow by 136 percent and 128 percent respectively, while over the same time period the population of North Carolina is expected to increase by 82 percent.

The southeast, western, and the Piedmont-Triad regions all have slower growth in population, but still exceed the national average. The population growth for the southeast, western, and Piedmont-Triad regions from 1990 to 2015 is expected to be 77 percent, 59 percent, and 52 percent respectively. The three slowest growing prosperity zones are the Sandhills, northeast, and northwest regions. While growing at a considerably slower rate than the rest of the State of North Carolina, their population growth is proximate to national growth levels. The population of the Sandhills region is expected to increase by 37 percent, while the northeast and northwest regions are expected to grow by 33 percent and 30 percent, from 1990 to 2035.

The northeast region, one of the slowest growing regions in the state, is on the coast and potentially affected by the state's ports more directly than any other region except for the southeast, which is one of the faster growing regions. As the rural nature of the northeast and southeast regions means they are likely agriculture-dependent, easy access to the ports is important for products such as imported grain and fertilizers that support livestock, poultry, and crop production, as well as exports of containerized soybeans, pork and poultry, wood products, and phosphates. For more details on the population trends in the state, please refer to the *Economic Base Analysis* technical report for this project.

## 4.2 Trends and Implications of Growth

### 4.2.1 Trends Impacting Maritime Trade

Several trends are occurring nationally and across the globe that could impact the amount and type of freight handled at the world's ports. The sections below summarize trends that could impact ports in North Carolina.

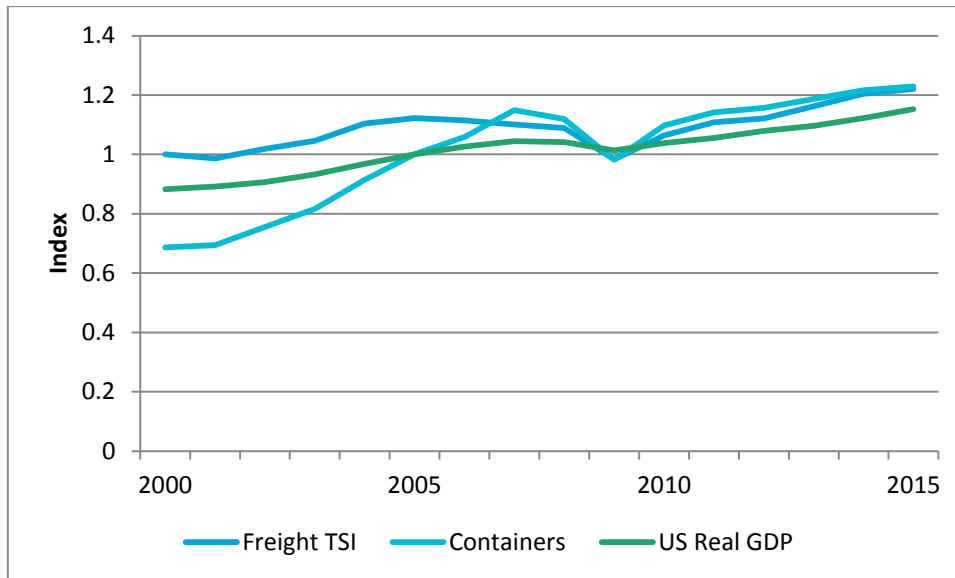
#### Global Move towards Containerization

The use of shipping containers was initiated in the late 1950s. With modest but growing container use in the 1960s and 1970s, it was really in the 1980s that fully functional container terminals began to take hold. From 1980 onward, the use of containers to import and export goods was a true revolution in freight handling. Containers offered security of transport and logistical efficiencies that had not previously existed. The efficiency of intermodal – ship to rail – container cargo is even more dramatic, cutting dwell times in the port by 50 percent or more.

Due to efficiency of handling, the use of containers has expanded beyond use for consumer goods. Containers can also reduce cargo damage and loss associated with multiple handlings of traditional bulk and breakbulk goods. Today's containerized goods include such items as furniture, auto parts, toys, computers, cotton, paper, animal feed, scrap, and soybeans.

Measured by TEU, container volumes handled at US ports generally track gross domestic product (GDP). Growth in containerized shipments has outpaced overall freight growth in the US since 2007 (Figure 4.22).

**Figure 4.22 Growth in US Waterborne Foreign Containerized Trade, Overall Freight, and Real GDP**



Source: US Bureau of Trade Statistics, MARAD, Bureau of Economic Analysis

Note: GDP and TEUs indexed to 2005 = 1.0

## Global Shipping Alliances

There are currently four major global shipping alliances between maritime carriers, but they are constantly evolving. They include 2M, Ocean 3, G6, and CKYHE with the member shipping lines shown in Figure 4.23. As of next year, G6 and CKYHE will expire and a new alliance will form, called The Alliance<sup>65</sup>, which will be made of three firms from each<sup>66</sup>. However, The Alliance may now fall through because on August 31, 2016 one of the potential members, Hanjin Shipping, went into receivership (filed for bankruptcy) with 128 of their 141-ship fleet operating. In the short-term, since Hanjin is the seventh largest shipper in the world, this causes a disruption in cargo flows with over 70 ships denied access to ports (because they cannot pay the port fees to unload) and/or being seized for payment. According to the Korea International Trade Association in an article on Fortune.com, “Hanjin vessels were carrying cargo worth 16 trillion won belonging to some 8,300 cargo owners.”<sup>67</sup> Moreover, The Alliance is likely to be impacted by the November 2016 decision of three Japanese carriers to merge their container divisions to create the fifth largest fleet at 110 vessels.<sup>68</sup> The purpose of an alliance is similar to airline alliances: to allow customers to ship on a set schedule while requiring carriers to have fewer larger ships with limited sailings. The carriers therefore can carry more cargo

<sup>65</sup> The last major VSA (vessel-sharing agreement) is known as THE Alliance and is made up of Yang Ming Line, Hanjin Shipping, MOL, “K” Line, NYK Line, Hapag-Lloyd, and UASC.” <http://www.joc.com/special-topics/top-40-container-carriers> Accessed 8/29/2016

<sup>66</sup> Matasuda, Kiyotaka, Bloomberg, “Hapag-Lloyd, Five Asian Liners Form New Shipping Alliance,” <http://www.bloomberg.com/news/articles/2016-05-13/hapag-lloyd-5-asian-shipping-lines-said-to-form-new-alliance-io59xpeo>, May 13, 2016, accessed 8/24/16.

<sup>67</sup> <http://fortune.com/2016/09/06/hanjin-shipping-parent-company-fundraising/> Accessed 9/6/2016.

<sup>68</sup> <http://www.longshoreshippingnews.com/2016/11/japanese-carriers-nyk-mol-and-k-line-merge-container-divisions-into-5th-largest-box-line/> Accessed 11/7/2016.



without having to buy more ships to sail more routes. With fewer but larger vessels, carriers are only able to sail limited routes, which take increasingly longer to complete. Alliances allow for carriers to put customers' products on each other's vessels, thereby accommodating customers' needs more easily without having to purchase more ships to make the faster scheduled routes. The carriers therefore cover each other's routes.

**Figure 4.23 Current Shipping Alliances**



Source: Flexport.com

There are risks to customers using these alliances: first, there is the potential for price-fixing; second, with the constant changing of alliances, service and scheduling issues arise. Price fixing is possible as the alliance-members adjust departures for changes in demand, thereby reducing supply. However, the alliances are subject to regulations, and no price fixing has been found so far. A double-edged sword to the pricing issue is that the alliances combine the qualities of the members: when sending a product via 2M, you may pay to get Maersk on-time performance (around 82 percent) at the price of MSC service reliability (one of the lowest), and vice versa.<sup>69</sup>

Reductions in service and scheduling are a major concern for users, as paralleled by the airline industry which, through consolidation, has increased prices, charged fees for all sorts of services, and reduced customer service levels. The restructured alliances lead to larger entities and the perception of reduced service and choices for shippers. However, regulations may be able to maintain reliability, shipper satisfaction, and container flow.<sup>70</sup>

The alliances offer an opportunity to North Carolina's ports because customers have access to all alliance-member ships and ports of call. This potentially opens up the globe for import and export markets, but pricing and scheduling should be monitored as alliances change and the needs of North Carolina shippers mature.

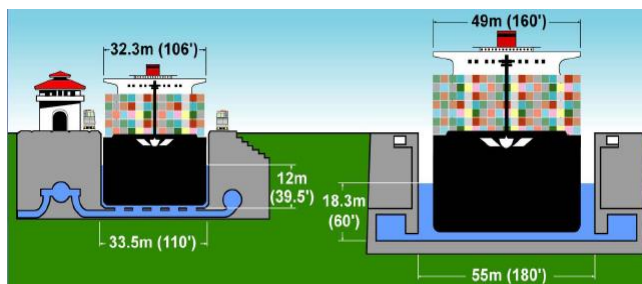
<sup>69</sup> Dan Wang, Flexport Blog, "A Guide to Ocean Alliances," <https://www.flexport.com/blog/what-are-ocean-alliances/>, Accessed 8/24/16

<sup>70</sup> GlobalTrade, "Ocean Shipping Alliances Impact U.S. Exporters", July 8, 2016, <http://www.globaltrademag.com/global-trade-daily/commentary/ocean-shipping-alliances-impact-u-s-exporters>, Accessed 8/24/16

## Implications of the Panama Canal

As mentioned in section 2.2.1, the recent expansion of the Panama Canal will allow more and larger (deeper draft, wider, and of greater capacity) ships to pass through this key trade link between Asia and the US east coast. With larger locks and greater capacity (Figure 4.24), the expanded Panama Canal has the potential to enhance the competitiveness of the all-water route between Asia and the US gulf coast and east coast (Figure 4.25); however, there has been much debate regarding the amount of Asia-Pacific cargo that will be diverted from US and Canadian west coast ports through the canal. Gulf coast and east coast marine ports stand to improve their share of the Asia-Pacific trade volumes if they can provide adequate navigation depth, in-port handling capacity, and fast, reliable rail and highway connections from North American production centers (for exports) to end consumer markets (for imports).

**Figure 4.24 Cross-Section of Previous (left) and New (right) Locks of the Panama Canal**



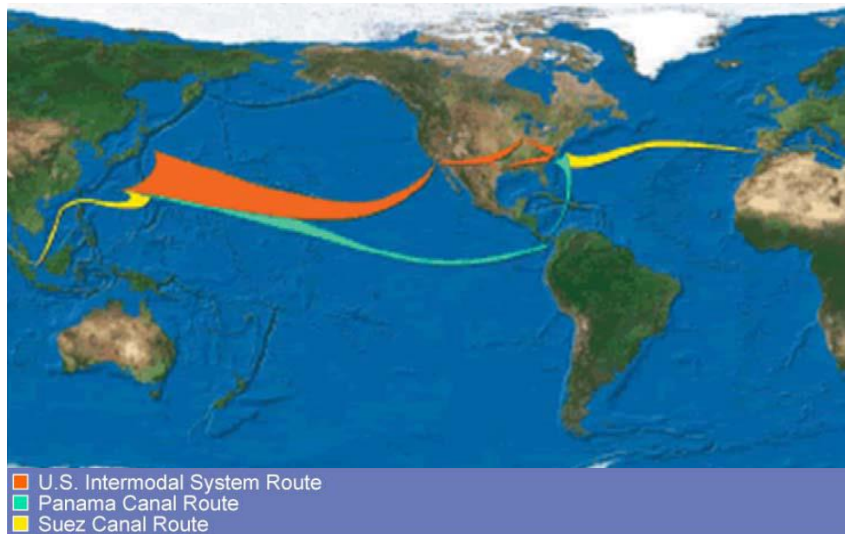
Source: Lloyds Register

Today's Asia-Pacific trade routes have developed over more than two decades to provide a highly-efficient gateway and corridor for containerized imports into the US from China and other north Asian countries. For example, the Ports of Los Angeles and Long Beach are the nation's first and second largest container ports and, together, the world's sixth largest port complex. These Southern California ports handle about 40 percent of all container imports into the US.<sup>71</sup> This includes more than five percent of waterborne imports destined for North Carolina.<sup>72</sup> Combined, the San Pedro Bay port complex comprises 2,300 acres of container terminals, including more than 30 berths and nearly 100 dock cranes capable of servicing Neo Panamax vessels, on-dock and near-dock intermodal facilities, along with dedicated rail connections such as the Alameda Corridor that offer these ports an unmatched capacity to move goods into the nation's Midwest population centers (Figure 4.25).

<sup>71</sup> MARAD DS\_ContainerPorts\_00to15 (released 2016-03-25), loaded containers only

<sup>72</sup> FAF 4.1 (and see **Error! Reference source not found.**)

**Figure 4.25 Routes Competing with the Panama Canal to the US East Coast**



Source: The Panama Canal Authority, <http://www.pancanal.com/eng/plan/documentos/propuesta/acp-expansion-proposal.pdf>

Price competition between the all-water Panama Canal route, which is today the less expensive alternative, and the traditional Asia-Pacific land-bridge route is expected to cause west coast ports and railroads to increase their efficiency and cost-effectiveness to maintain their container import volumes. The Panama Canal Authority is also expected to revise upward their tariff rate, which is based on ship capacity and load, to recoup their capital investment for expansion.

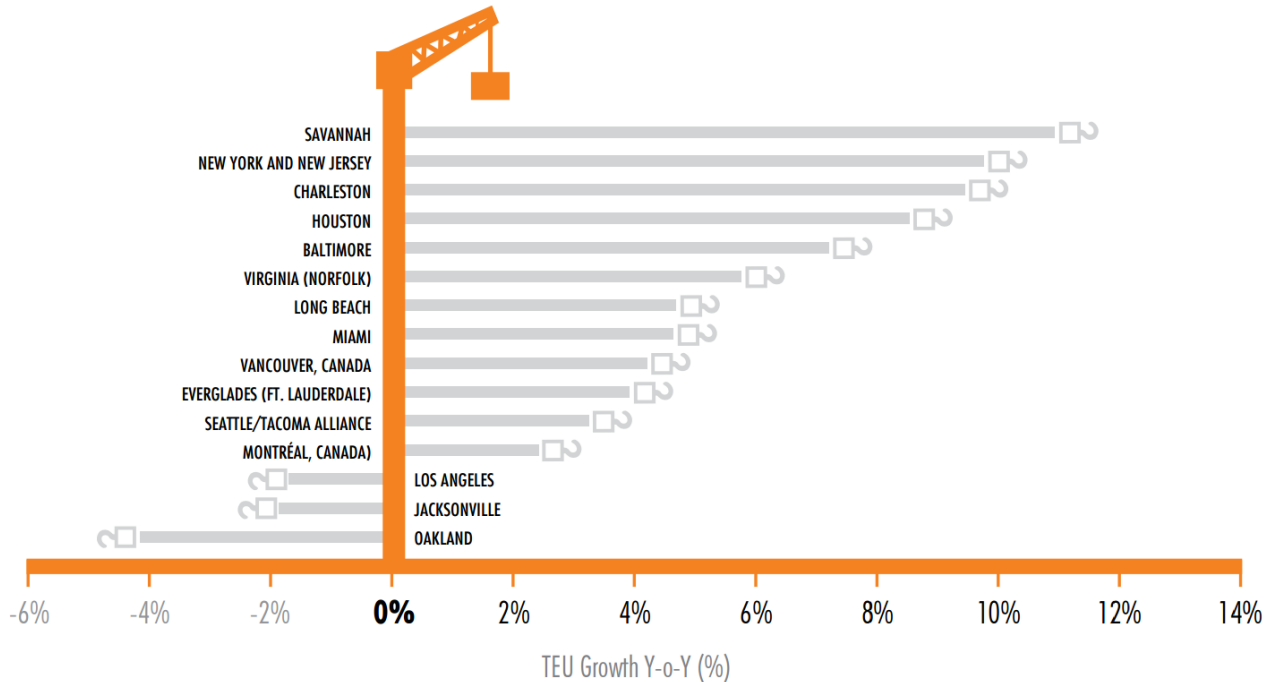
In consideration of the potential impacts of the Panama Canal on global shipping practices, the USACE Institute for Water Resources (IWR) conducted an analysis<sup>73</sup> to identify the potential impacts of the Panama Canal expansion on the economics of deep draft navigation projects in the US. The study identified factors affecting projections of volumes through Canal to the US east coast including vessel size, water transit cost, overall transit time, and potential shifting of manufacturing centers from the Far East to India. IWR concluded the size of vessels that may call on US east coast ports will depend not only on the capacity of the canal but also ocean service alternatives that include regional specialization or a hub-and-spoke network. Either of these options would use smaller vessels (as opposed to Neo Panamax) to serve local markets in the southeastern US. IWR recommended a follow-on study to assess US ports' capacity and ability to handle post-Panamax vessels, to examine the key variables driving port choice and the attraction/diversion of containers to different ports. The results of this analysis could be used to prioritize USACE investments in channel deepening and dredging.

Notwithstanding the USACE-proposed analysis, many forecasts indicate that much of the anticipated shift of Asia traffic from west coast to east coast already occurred when ocean carriers sought to diversify their North American ports of call following Southern California work stoppages in 2002. The latest global forecast commissioned for the *North Carolina Maritime Strategy* (AECOM, 2012) projects that, while there is not expected to be a paradigm shift of Asian goods entering the US via east coast ports, some adjustment of

<sup>73</sup> IWR White Paper: The Implications of Panama Canal Expansion to US Ports and Coastal Navigation Economic Analysis (December 2008)

trade routes is expected. For example, in 2015 some cargo was rerouted from the west to east coast ports due to a labor disruption early in the year (see Figure 4.26). With regard to this labor issue, the two key parties have begun discussions in late 2016 to extend the current west coast longshoremen contract which expires mid-2019 to lower the risk of disruptions, thus maintain stable operations, and limit further cargo shifts to the east coast.<sup>74,75,76</sup> It is important to remember, however, that today's trade patterns will shift to match changes in global production and demand. Anticipated economic growth in India and Brazil, for instance, would de-emphasize the importance of the Panama Canal in reaching US markets.

**Figure 4.26 2015 Container Volumes Shifting to the US East Coast**



Source: 2016 North America Seaports & Logistics Annual Report, CBRE Research

Note: Y-o-Y = Year-over-Year

North Carolina's ports will need to monitor closely the upcoming changes to freight patterns and pricing as larger ships traverse the canal and adjust schedules for east coast ports that can accommodate them. For the state to remain competitive, NCSPA will need to maintain the current ship calls while seeking opportunities to serve any secondary markets that may not be accommodated at Neo-Panamax-ready ports.

<sup>74</sup> <http://www.americanshipper.com/main/news/west-coast-longshoremen-employers-discuss-contract-65916.aspx?taxonomy=Labor#hide> Accessed 11/7/2016.

<sup>75</sup> [http://www.joc.com/port-news/us-ports/us-importers-accelerate-asia-cargo-shift-east-coast-ports\\_20160512.html](http://www.joc.com/port-news/us-ports/us-importers-accelerate-asia-cargo-shift-east-coast-ports_20160512.html) Accessed 11/7/2016.

<sup>76</sup> [http://www.joc.com/port-news/us-ports/too-rosy-forecasts-import-gains-coming-us-east-coast-risky\\_20160919.html](http://www.joc.com/port-news/us-ports/too-rosy-forecasts-import-gains-coming-us-east-coast-risky_20160919.html) Accessed 11/7/2016.

## Reshoring of Manufacturing

There have been numerous discussions over the last few years of reshoring manufacturing back to the US. The reshoring has occurred as companies have realized that the benefits of offshoring production have diminished. A number of reasons have been cited as to why companies are moving facilities back to the US, including the following:

- Cost of foreign labor has increased
- Transportation costs have eroded margins
- Time required transporting products to the US
- Concerns with quality at foreign locations
- Difficulty in conducting research and development at a distant facility
- Reduction in fuel costs in the US due to increases in natural gas and oil production

While some estimates have identified that reshoring is creating as many jobs in the US as offshoring is losing, other estimates have indicated that there is still a net loss due to offshoring.

It is generally agreed that the manufacturing facilities that do return to the US are using advanced technologies that require less labor. Many of the trends in reshoring have been with the automobile industry and durable goods (e.g., appliances) – items which can be expensive to transport long distances.

According to data compiled by the Reshoring Initiative<sup>77</sup>, between 2010 and 2015 the southeastern US gained the most from reshoring, with North Carolina ranked fourth in the number of facilities and jobs gained from reshoring.

In addition to companies moving production facilities back to the US, foreign companies have also been building facilities in the US. These include car companies, such as Volkswagen and Honda, who are taking advantage of closer proximity to customers and tax incentives. While these companies may not necessarily be considered reshoring, it is consistent with the trend to manufacture products closer to their consumer base.

Overall, the products that are produced at reshored facilities tend to be used domestically, as opposed to shipping overseas. Therefore, as one of the prime recipients of companies reshoring and new foreign investment in the US, North Carolina may see a change in how freight is moved within the state, but it may not have a significant impact on ports in the state.

### 4.2.2 Opportunities for Growth in North Carolina Maritime Trade

In an increasingly global and interlinked economy, ports (air and sea) are gateways to the rest of the world. Although communication technology has made employees in many industries able to work in nearly any location, technology has yet to untether goods from the need for efficient access to sea ports, nor the

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<sup>77</sup> <http://reshorenow.org/blog/reshoring-initiative-data-report-reshoring-and-fdi-boost-us-manufacturing-in-2015/>

economy’s reliance on these commodities. Moreover, in a highly mobile global economy, sensitivity to cost is heightened.

Firms regularly assess their location as part of paring production costs and remaining competitive. Efficient port access for all types of goods - consumer goods as well as commodities - remains an essential element of an integrated logistics strategy. The southeast region of the US is expected to remain attractive to migrants in coming decades and driving population growth rates above the national average. Freight trends will follow. Data from the US Bureau of Transportation Statistics reports that shippers are routing more cargo through US South Atlantic and Gulf Coasts in order to more readily access these growing consumer markets<sup>78</sup>.

Investments in North Carolina port facilities and associated landside infrastructure have the potential to support and strengthen the state’s maritime trade by reducing import and export costs of North Carolina-based shippers. The potential to retain North Carolina freight that is currently exported through out-of-state ports is an important factor necessary to determine the potential for greater capture of the state’s trade flows and the associated reduction in shipping costs and ultimate realization of a maritime freight-focused economic development strategy.

For North Carolina, the potential benefits of maritime trade include expanded markets for North Carolina-based producers via exports, which support local jobs and a diverse state economy, and increased quality and choices available for consumers and business via imports, which support local competitiveness and quality of life.

In addition to the value of the exports and imports to North Carolina’s economy, the presence of the port facilities attract a variety of value-added services that support employment in industries such as trucking, rail, distribution, marine maintenance and repair services, and services to facilitate the trade transaction. The port activity also attracts industries that use heavy imported goods and bulk items such as manufacturing firms that employ the chemicals and forest products imported through the marine terminals in their production process, manufacturers assembling products from parts included in containerized cargo, and firms producing and consuming dry and liquid bulk cargo.

### Distribution Centers, Foreign Trade Zones, and Inland Port Developments

Regional distribution nodes, including logistic centers and inland ports, provide facilities for intermodal transfers, transloading, and warehousing for waterborne goods. At present, the vast majority of maritime-transported goods, to or from North Carolina, move through seaports in other states, most notably Norfolk, Virginia, Savannah, Georgia, and Charleston, South Carolina (Table 4.6).

**Table 4.6 Share of North Carolina Products Using another State's Ports, 2012**

Ports	Imports Destined for NC via	Exports from NC via
NC	39%	25%
SC	12%	20%

<sup>78</sup> Chambers, Matthew. December 2011. “The Changing Tide of U.S.-International Container Trade: Differences Among the U.S. Atlantic, Gulf, and Pacific Coasts,” BTS Special Report. SR-032.



GA	11%	19%
VA	10%	24%
MD	6%	2%
FL	5%	8%

Source: FAF 4.1

Reasons cited in the *North Carolina Maritime Strategy* (AECOM, 2012) for why North Carolina ports are not used to a greater extent include insufficient channel depth for serving larger oceangoing vessels, as well as inland congestion choke points, including in the areas of Charlotte and Greensboro where intermodal terminals are located. In addition, goods from the Charlotte area can reach the Port of Charleston in less time than the Port of Wilmington, and would have more vessel options. Thus, in the near term, inland port facilities in North Carolina are likely to handle significant cargo volumes that move through seaports of other states; however, growing volumes at North Carolina inland ports could bring about a critical mass that spurs justification of channel deepening and other infrastructure enhancements at North Carolina seaports. Combining inland port development with state export and import tax credits could enhance utilization of both the inland ports and the seaports of North Carolina.

One of the driving purposes of an inland port is to accommodate numerous functions of shipping that do not have to take place at or in close proximity to the water's edge. In addition to consolidation of cargoes, inland ports may include warehousing, cross-docking (unloading goods from incoming truck or rail units and loading them directly into outbound units with little or no storage in between), light manufacturing, truck and rail servicing, and storage of chassis and containers. Inland ports also free up limited terminal backland capacity and are not limited by gate hours of operation. With the US chassis provisioning model changing, as ocean carriers get out of this aspect, involvement in furnishing chassis may also be considered.

The aggregation of transportation assets and logistics services at a single location has the potential to reduce cost-to-market for manufacturers and shippers with similar transport needs. Benefits of logistics infrastructure – from road connections and airport access to industrial zoning and foreign trade zones (FTZ) – must be brought to the full awareness of potential users. Availability of value-added services (warehousing, distribution, handling, repackaging, and consolidation) may also be seen as essential. Some of the most successful inland ports in other states, such as the Virginia Inland Port at Front Royal, serve as US Customs-designated ports of entry and offer a full range of customs functions to customers.

Today, North Carolina's inland logistics centers, and the value-added services available there, are generally underused. Discussions with logistics providers as part of the *North Carolina Maritime Strategy* (AECOM, 2012) indicated that the benefits of North Carolina's six existing FTZs are not well-publicized. They suggest that successful strategies for distribution and logistics centers, including foreign trade zones, should include a coordinated marketing effort with the North Carolina Department of Commerce. Engagement of MPOs, local economic development commissions, and logistics providers is important to identify and target the needs of potential users. In some locations, distribution center infrastructure (for example, local road connections and industrial zoning) is already in place but has not been strongly marketed as part of a larger freight transportation strategy.

### Building upon North Carolina's Existing Industrial Strengths

North Carolina's competitive industries are a barometer of the state's resource and technical advantages; these are industries that are sources of particular strength for the state's economy and future job creation. It

is important that port investments support the needs of the state's most competitive port-using industries. Shift share analysis was applied to identify the state's competitive industries.

Through evaluation of the state's overall industry mix, the national share held by various North Carolina industries (location quotient), and the regional shift of this industry share to or from the state between 2004 and 2014, North Carolina has outperformed the rest of the nation in the following industries:

- Retail trade
- Manufacturing:
  - Chemical
  - Plastic and rubber products
  - Food
  - Computers and electronics

Also noted in the *North Carolina Maritime Strategy* (AECOM, 2012) is wood product manufacturing, which has a high location quotient and has suffered only a small negative regional shift out of North Carolina over the last decade. In addition, transportation equipment manufacturing and motor vehicle parts manufacturing have positive shift effects though small location quotients. This indicates some competitiveness, but they have not yet gained a foothold in the state's economy.

### Taking Advantage of North Carolina's Cost Structure

An important element in identifying industries that might flourish or falter in North Carolina is the cost structure of the state relative to competing regions. Investments in maritime infrastructure will improve access between the state's producers and the global economy, but if the state has a high cost of doing business, businesses will still select other locations and the port investment will not foster the desired economic development. The table below, as described in the *North Carolina Maritime Strategy* (AECOM, 2012), provides a summary of North Carolina's business costs relative to other states in the region, as developed by Moody's Analytics, a nationally-known economics research firm.

The total business cost is comprised of three components: unit labor costs, energy costs, and tax burden. Unit labor costs are a measure of labor compensation per dollar of output—wage costs adjusted for productivity. This is an important adjustment as firms are willing to pay higher costs for more productive labor, all else held equal. The energy cost component compares the average commercial and industrial electricity cost to the national average. Tax burden is measured as the total tax revenue as a percent of total income, indexed to the national effective tax rate. An index value of 100 means that the cost is equal to the US average cost. An index value of 105 by comparison means that the state's cost is 5 percent greater than the US average. An index value of 92 means the state's cost is 8 percent lower than the US average; that is, a producer in that state saves eight cents for every dollar of production cost relative to other producers in the nation<sup>79</sup>.

<sup>79</sup> The full methodological description of the Cost of Doing Business Index is provided in "2011 Cost of Doing Business Review," Moody's Analytics, updated April 2011 using available data as of December 2010.

As Table 4.7 shows, as of 2011, North Carolina has very favorable business costs. It ranks 50 out of 51 (50 states plus the District of Columbia) in terms of overall business costs. Only South Dakota has lower overall business costs. Of particular note, North Carolina has over a 10 percent cost advantage relative to its coastal peers of Virginia, South Carolina, Georgia, and Florida, and a 5 percent advantage over Tennessee. Looking at the individual components, both labor and energy costs are low relative to North Carolina’s neighbors—these are particularly important costs for manufacturers of capital goods and agricultural processors who are likely port users. What this means is that the cost structure of the state’s landside economy is not an impediment to attracting the economic development that would benefit from candidate port investments.

**Table 4.7 North Carolina’s Business Costs Relative to Nearby States**

State	Cost of Doing Business		Unit Labor Cost		Energy Cost		Tax Burden	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank
NC	84	50	83	49	81	34	94	30
VA	97	26	101	17	86	28	85	42
SC	95	28	100	22	86	29	80	47
GA	98	20	101	16	89	27	92	33
TN	89	41	89	46	96	20	78	48
FL	102	13	102	13	116	15	94	27

Source: Moody’s Analytics 2011 Cost of Doing Business Review. Updated April 2011 using the most recent available data as of December 2010. Rankings are out of 51 (50 states plus the District of Columbia). A rank of 51 indicates a location has the lowest cost; a rank of 1 indicates a location has the highest cost.

### 4.2.3 Industries with Regional Growth Potential

Market opportunities were also identified by considering the projected growth in the overall regional market—driven by a fast-growing urban concentration in the Piedmont-Atlanta megaregion, rising demand in China and other developing countries for US goods, and changes in shipping patterns.

Although building on North Carolina’s existing strengths is important, it is also necessary to assess what industries represent growing export markets for the region that might find North Carolina attractive and represent diversification or entirely new industries for the state. In this analysis, market opportunities are identified by both the projected volume of the trade flows to and from national ports and North Carolina ports and growth rates based on projections by FAF.

## Exports

### National Exports

On the national scale, fuel oils top the list of commodities projected to be exported by water in 2045, followed by other agricultural products and cereal grains (Table 4.8). The national exports are a gauge to compare against North Carolina’s exports – products that have high export tonnages nationally or are growing quickly may be good candidate markets for the ports to consider. While many commodities are likely handled at some of the larger ports like Norfolk and Savannah, North Carolina may be able to acquire a portion of the goods and therefore provide a strong anchor base to operations.

**Table 4.8 Leading Exports from the US**

Exports	Total K Tons in 2012	Total K Tons in 2045	CAGR
Fuel oils	108,165	238,472	2.4%
Other agricultural products	54,764	183,556	3.7%
Cereal grains	59,096	169,346	3.2%
Waste/scrap	46,647	164,003	3.9%
Coal	163,382	158,455	-0.1%
Basic chemicals	38,356	119,425	3.5%
Coal-not elsewhere classified	526	93,492	17.0%
Gasoline	29,737	59,477	2.1%
Plastics/rubber	13,972	54,781	4.2%
Other foodstuffs	11,891	51,459	4.5%

Source: FAF 4.1

**Exports from North Carolina**

Using data from FAF 4.1, the commodities exported through North Carolina by water with the top ten expected CAGRs from 2012-2045 are shown in Table 4.9. The majority of the commodities have low tonnages, like transport equipment, mixed freight, fuel oils, precision instruments, and alcoholic beverages. These are possible niche markets that could be good prospects for the ports, particularly the high value products like precision instruments. The export of chemical products likely includes phosphates, which is a major export through the Port of Morehead City.

As described in the *North Carolina Maritime Strategy* (AECOM, 2012), chemicals, metal products, rubber, machinery parts, wood products and food are among the major commodities for the NCSPA. Several of NCSPA's current key markets are projected to post strong growth over the next two decades. These are summarized below. Although aircraft is not a large flow, it is high-valued and a growing industry for North Carolina and mentioned specifically in interviews with shippers; it may fall within the precision instruments or machinery commodity groups.

**Table 4.9 Leading Export Prospects from North Carolina**

Exports	Total K Tons in 2012	Total K Tons in 2045	CAGR
Transport equip.	1	9	9.0%
Electronics	6	66	7.3%
Mixed freight	1	6	7.1%
Fuel oils	0	1	6.3%
Machinery	18	123	6.0%
Logs	86	555	5.8%
Precision instruments	3	18	5.8%
Chemical prods.	21	124	5.5%

Alcoholic beverages	0	1	5.1%
Waste/scrap	238	1,172	5.0%

Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

Looked at in terms of tonnages exported, the list is quite different, as only two commodities are on both lists: waste/scrap and logs. Table 4.10 shows the products that the region specializes in, such as woodchips and wood pellets, are some of the highest tonnages exported. The region also handles scrap metals, plastics/rubber, and wood pulp, logs, and agricultural goods. None of the commodities listed show a decline in tonnage over time; in fact, all of the products show positive CAGRs, with most showing over 4 percent growth. These are products that the North Carolina Ports should maintain as the anchors of port operations.

**Table 4.10 Top Export Commodities from North Carolina**

Exports	Total KTONs in 2012	Total KTONs in 2045	CAGR
Wood prods.	468	1,795	4.2%
Newsprint/paper	435	1,218	3.2%
Waste/scrap	238	1,172	5.0%
Fertilizers	878	1,037	0.5%
Logs	86	555	5.8%
Textiles/leather	91	353	4.2%
Meat/seafood	87	305	3.9%
Plastics/rubber	88	285	3.6%
Animal feed	70	200	3.2%
Other agricultural products	34	140	4.4%

Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

Wood products are projected to post strong growth, and wood pellets in particular are expected to continue to be a major product exported from the state. Facilities are under development at both North Carolina ports to serve the UK and other places in Europe. As a consequence of the Kyoto agreement, the international treaty calling for reductions to greenhouse gas emissions, the UK and other countries in Europe have converted some of their power plants to the use of biomass. Initial research suggests that European companies are willing to partner with US firms to develop the capability to source wood pellets.

Fertilizer remains a large market and posts growth over the forecast horizon, suggesting that it has the potential to remain an anchor for the port provided the company continues to use Morehead City. Tobacco, a traditional strength in North Carolina, is projected to grow from 2012-2045 with a CAGR of 1.0 percent, but shows low total volumes. North Carolina could still benefit if the US industry consolidated into North Carolina, but it is not a major freight opportunity for the state.

Agriculture is another opportunity, with solid export growth projected for the region. North Carolina agricultural shippers reported that they could ship much more than they currently send, citing transportation cost as limiting access to international markets. North Carolina’s agricultural exports posted solid growth, even during the recent global recession.

## Imports

### National Imports

On the national scale, crude petroleum tops the list of commodities projected to be imported by water in 2045, followed by machinery and nonmetal mineral products. The national imports are a gauge to compare against North Carolina's imports – products that have high import tonnages nationally or are growing quickly may be good candidate markets for the ports to consider. While many commodities are likely handled at some of the larger ports like Norfolk and Savannah, North Carolina may be able to acquire a small portion of goods and therefore a strong anchor base to operations. Goods like basic chemicals, plastics/rubber, base metals, furniture, machinery, and agricultural products are also projected to be some of the leading imported products at North Carolina's ports in 2045 (Table 4.11).

**Table 4.11 Leading Imports to the US**

Imports	Total KTONs in 2012	Total KTONs in 2045	CAGR
Crude petroleum	342,037	267,340	-0.7%
Machinery	17,792	73,855	4.4%
Nonmetal mineral products	15,501	71,943	4.8%
Basic chemicals	19,791	71,380	4.0%
Other agricultural products	12,819	66,444	5.1%
Base metals	26,173	63,318	2.7%
Furniture	9,074	61,847	6.0%
Other foodstuffs	15,870	61,092	4.2%
Plastics/rubber	13,428	56,009	4.4%
Fuel oils	65,235	51,745	-0.7%

Source: FAF 4.1

### Imports to North Carolina

According to NCSPA data, the following commodities have consistently ranked among the top commodities handled at the facilities in recent years: sulfur, metal products, rubber, scrap metal, chemicals, fertilizers, and ores and minerals. Several of NCSPA's current key markets are projected to post strong growth over the next three decades.

The commodities imported through North Carolina by water with the top ten expected CAGRs from 2012-2045 are shown in Table 4.12. Like the exports, the majority of the commodities had low tonnages in 2012. These are possible niche markets that could be good prospects for the ports, particularly the high value products like pharmaceuticals and precision instruments. Many of the commodities on the imports list are also on the exports list, which may indicate that the state is importing goods, providing value-added services, and sending them out as higher value products.

**Table 4.12 Leading Import Prospects to North Carolina**

Imports	Total K Tons in 2012	Total K Tons in 2045	CAGR
Animal feed	1	183	16.4%
Other agricultural products	3	357	15.6%
Pharmaceuticals	1	7	6.2%
Furniture	91	586	5.8%
Alcoholic beverages	13	79	5.7%
Mixed freight	0	1	5.5%
Precision instruments	6	29	4.9%
Electronics	55	253	4.8%
Chemical prods.	23	107	4.7%
Textiles/leather	81	359	4.6%

Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020

Coal is projected to be one of the largest single commodities imported via South Atlantic ports, particularly in Florida, but coal is not imported through North Carolina ports. While posting a CAGR of 4.5 percent from 2012-2045, the overall size of the market makes it an important opportunity for the ports—not because of the dynamics of the market itself, but because of the potential to increase market share. Because of the size of the market (8 percent of all imports to South Atlantic ports in 2045), even a small increase in market share would translate into a noticeable increase in volume for the ports.

Looked at in terms of tonnages imported to North Carolina, the list is somewhat different, with three commodities making both lists: furniture, other agricultural products, and textiles/leather. Table 4.13 shows the products that the region depends on, leading with basic chemicals. The region imports high volumes of rubber to serve the automotive industry and the numerous tire manufacturers in the region. Of the commodities listed, only one shows a decline in tonnage over time: fertilizers. All other products show CAGRs of over 2 percent, with most showing over 4 percent growth, indicating that the majority of commodities imported through the ports are expected to remain market strengths in the state for the foreseeable future.

**Table 4.13 Top Import Commodities to North Carolina**

Imports	Total K Tons in 2012	Total K Tons in 2045	CAGR
Basic chemicals	1,009	2,561	2.9%
Plastics/rubber	265	1,134	4.5%
Base metals	390	898	2.6%
Nonmetallic minerals	346	762	2.4%
Furniture	91	586	5.8%
Machinery	150	572	4.1%
Articles-base metal	176	534	3.4%
Fertilizers	1,028	498	-2.2%



Textiles/leather	81	359	4.6%
Other agricultural products	3	357	15.6%

Source: FAF 4.1

Note: excludes NCSPA projections for 2015-2020



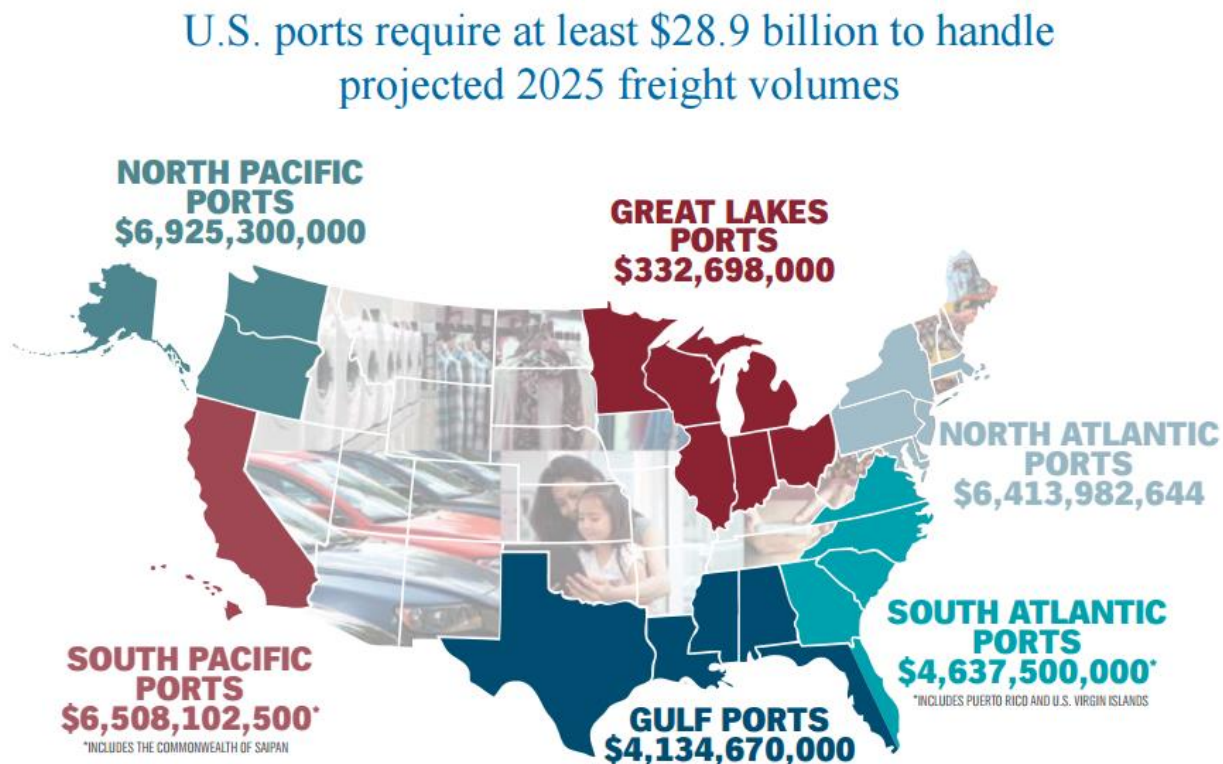
## 5.0 Needs Assessment

Development of the maritime industry to support the multimodal freight needs of North Carolina must address not only current needs but projected trends as well. Improvements at neighbor ports will influence steps necessary to remain competitive and/or complementary, and the upward trend of US freight volumes will put pressure on North Carolina’s maritime facilities while also providing economic opportunity. Analyzed in this section are the varying needs and issues that should be considered in future improvements.

### 5.1 Infrastructure

Across the US, ports compete for a market share of waterborne freight. And staying competitive requires maintaining and upgrading infrastructure. In 2015, the American Association of Port Authorities published a report, *The State of Freight*, based on a survey of their 83 US public port members which had a focus on port surface transportation infrastructure. Looking 10 years out to year 2025, it was estimated in the report (see Figure 5.1) that the South Atlantic ports would need \$4.6 billion worth of infrastructure improvements to meet the projected freight demand.

**Figure 5.1 US Port Infrastructure Needs to Serve Projected 2025 Freight Volumes**



Source: [http://aapa.files.cms-plus.com/StateofFreight\\_Report\\_final.pdf](http://aapa.files.cms-plus.com/StateofFreight_Report_final.pdf) Accessed 8/8/2016.

In a similar vein, the USACE has focused on port infrastructure needs because of their role in sustaining minimum channel depths. For instance, in consideration of the potential impacts of the Panama Canal on

global shipping practices, the USACE IWR conducted an analysis<sup>80</sup> to identify the potential impacts of the Panama Canal expansion on the economics of deep draft navigation projects in the US. The study identified factors affecting projections of volumes through the canal to the US east coast including vessel size, water transit cost, overall transit time, and potential shifting of manufacturing centers from the Far East to India. IWR concluded the size of vessels that may call on US east coast ports will depend not only on the capacity of the canal but also ocean service alternatives that include regional specialization or a hub-and-spoke network. Either of these options would likely employ smaller vessels (as opposed to Neo Panamax) to serve local markets in the southeastern US. IWR recommended a follow-on study to assess US ports' capacity and ability to handle post-Panamax vessels, to examine the key variables driving port choice, and the attraction/diversion of containers to different ports. The results of this analysis could be used to prioritize USACE investments in channel deepening and dredging. Such a study, however, has not yet been undertaken.

### 5.1.1 Coming Supply-Side Improvements at Neighbor Ports

With the above national and US east coast assessments, a look at what regional peer ports are planning is next discussed.

#### Port of Virginia

Expansion of container operations is planned for in Hampton Roads harbor by reclaiming the eastern part of Craney Island. It has been fully permitted at the time of this writing. When completed (between 2028 and 2040), it will be a semi-automated container terminal able to serve up to 50 percent of container volumes rail. Both CSX and NS will have on-dock rail access, accomplished by the Port of Virginia Gateway project that extends the Commonwealth Rail Line. The new terminal is expected to open in 2028 with a planned buildout in 2043 to handle approximately 10 million TEUs per year.<sup>81,82</sup> Further improvements at the Port of Virginia include completion in 2017 of a second Midtown Tunnel that accesses PMT. And the VIG shall be expanded from 231 to 291 acres, funded by the owners as a condition of the renegotiated lease with the port.

#### Port of Charleston

With container competition heightening, South Carolina received two new cranes in August 2016 that will go into service by December 2016; two more will be delivered in December 2017 as the Wando Welch Terminal undergoes modernization and strengthening.<sup>83</sup>

In addition, the State Ports Authority is currently building a new container terminal (Leatherman) in North Charleston. The first phase is 117 acres and will be completed in 2020 with an annual capacity of 628,000 TEUs; if the market demands it, the terminal can ultimately expand to handle 1.4 M TEUs per year. Also

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<sup>80</sup> IWR White Paper: The Implications of Panama Canal Expansion to US Ports and Coastal Navigation Economic Analysis (December 2008)

<sup>81</sup> [http://pilotonline.com/business/ports-rail/portsmouth-marine-terminal-could-be-ready-in/article\\_4b6f925f-b9fc-5526-9f71-90dae1114c1b.html](http://pilotonline.com/business/ports-rail/portsmouth-marine-terminal-could-be-ready-in/article_4b6f925f-b9fc-5526-9f71-90dae1114c1b.html) Accessed 9/12/2016.

<sup>82</sup> [http://www.vtrans.org/resources/150416\\_FINAL\\_Master\\_Rail\\_Plan\\_for\\_the\\_Port\\_of\\_Virginia-cvr.pdf](http://www.vtrans.org/resources/150416_FINAL_Master_Rail_Plan_for_the_Port_of_Virginia-cvr.pdf) Accessed 9/12/2016.

<sup>83</sup> <http://www.scspsa.com/news/sc-ports-authority-handles-largest-container-ship/> Accessed 9/6/2016.

coming online is a new road that will connect the terminal with I-26. In conjunction with this expansion, the Charleston Harbor as a whole is being deepened to 52 feet by 2019.<sup>84</sup>

Moreover, Palmetto Railways is constructing an intermodal facility nearby that should be completed in 2018 servicing both NS and CSX trains – the Intermodal Container Transfer Facility.<sup>85</sup> It is being designed to receive multiple trains a day of up to 10,000 feet long with direct access to the Navy Base Container Terminal (Figure 5.2).

**Figure 5.2 Proposed Intermodal Container Transfer Facility at Port of Charleston**



Source: <http://www.palmettorailways.com/overview.html>

## Port of Savannah

The Georgia Ports Authority has ordered eight neo-Panamax cranes to help Savannah compete for the growing container market on the east coast. By 2018, GPA plans to have 30 ship-to-shore cranes and the harbor is currently being deepened for an inner harbor depth of 47 feet and an outer harbor depth of 49 feet MLLW; this work should be completed by 2020.

### 5.1.2 North Carolina

Finally, zooming into the state and local levels, North Carolina’s infrastructure needs to serve waterborne freight are discussed in terms of the state’s vision, port area needs, and statewide transportation infrastructure needs.

<sup>84</sup> <http://www.postandcourier.com/article/20160326/PC05/160329570/1005/rock-on-port-x2019-s-future-terminal-gets-boost-from-canadian-quarry> Accessed 9/6/2016.

<sup>85</sup> <http://palmettorailwaysintermodal.com/> Accessed 9/6/2016.

With the understanding that our state’s transportation infrastructure plays a critical role in attracting and retaining businesses, while connecting people to jobs, healthcare, education, and recreation, the Governor’s 25-Year Vision for North Carolina was developed. Transforming North Carolina ports is one of the key elements in the Vision. The objectives outlined in the Vision are listed below:

- Include a recommendation in the Army Corps of Engineers Chief’s Report to deepen and widen our channels to support movements of the newest generation of shipping vessels.
- Develop intermodal train service at the Port of Wilmington.
- Continue to seek opportunities to develop intermodal facilities along the I-95 corridor to support freight shipping.
- Leverage public-private partnerships to complete the development of Radio Island, and support landside improvements in interstate quality connections and enhanced rail access to the Port of Morehead City.

Based on current operations, the existing facilities supporting the maritime industry in North Carolina need improvements to continue and improve service offerings. From the inventory discussed in Section 2 and the demand discussed in Section 3, the following needs and issues have been recognized.

**Table 5.1 North Carolina Infrastructure Needs**

Port of Wilmington <sup>86</sup>	Port of Morehead City <sup>87</sup>
<p>On-site:</p> <ul style="list-style-type: none"> <li>• Complete turning basin expansion</li> <li>• Complete cold storage facility</li> <li>• Finish wood pellet export facility</li> <li>• Expand container yard to service longer intermodal trains, adding trackage<sup>88</sup></li> <li>• Purchase additional cranes (2 STS container cranes, 100-gauge rail mounted in current budget)<sup>89</sup></li> </ul>	<p>On-site:</p> <ul style="list-style-type: none"> <li>• Further develop Radio Island (Ro/Ro or containers would be good cargo here)</li> <li>• Expand wood pellet export facility</li> <li>• Create and partially fund an ongoing dredging agreement with USACE<sup>90</sup></li> <li>• Replace aging cranes, add more (in near-term, purchase one \$6 million crane for breakbulk cargo)<sup>84</sup></li> <li>• Purchase a rail loader</li> <li>• Relocate scales, minimize need for re-weighing</li> <li>• Extend track into warehouse north of Arendell Street</li> <li>• Replace aging warehouses and transit sheds</li> <li>• Increase building setbacks near lower-numbered berths (for better rail access, crane movement)</li> <li>• Cover a portion of the rail yard to handle unloading of cargo in wet weather to enable Morehead City to better capitalize on its certification to handle organic grains</li> </ul>

<sup>86</sup> Interview with NCSPA on 8/17/2016

<sup>87</sup> Interview with NCSPA on 9/2/2016

<sup>88</sup> Interview with G&W on 7/27/2016

<sup>89</sup> 2015 Strategic Plan of the NCSPA, NCSPA FY17 Capital Budget

<sup>90</sup> 2015 Strategic Plan of the NCSPA



**Port of Wilmington<sup>86</sup>**

## Off-site:

- In Charlotte, potentially use the inland port as an additional place to build intermodal trains since CSX wants trains in/out in one day at Charlotte Intermodal Terminal<sup>91</sup>

## Roads:

- Retrofit on-ramp from northbound US 17/421 onto I-140 for safety
- Complete design/ construction of fourth river crossing
- Pursue highway-railroad grade separated access at the North Gate since separated access would improve safety, reduce vehicular congestion, and significantly increase rail capacity
- Pursue select State Transportation Improvement Program (STIP) projects

## Rail:

- Remove clearance issues that limit heavy lift and project cargo
- Open Wallace-Castle Haynes track to improve connection to CSX's new CCX intermodal terminal in Rocky Mount
- Investigate the feasibility of a new rail bridge across the Cape Fear River from the port connecting to the Brunswick County rail network. to remove port rail traffic from Wilmington as flows grow

**Port of Morehead City<sup>87</sup>**

## Off-site:

- Complete Gallants Channel Bridge project
- Push for Northern Carteret Bypass and/or Havelock Bypass so there is an alternate route to US 70
- Redesign intersection at Port's main gate (Arendell St / Port Terminal Rd) to reduce and/or eliminate oversized trucks' maneuvering issues upon exit that require blocking of on-coming traffic to complete a turn
- Pursue select STIP projects

## Rail:

- Study at-grade crossings for identifying improvements, reducing their numbers, and prioritizing implementation.
- Raise the Arendell Street bridge in front of the main port property to enable railroad car access underneath it to the north side of the port property, thereby creating a rail loop

North Carolina's State Transportation Improvement Program (STIP) includes funded projects totaling \$11.5 billion (highway construction plus right-of-way acquisition) to be implemented over the next seven years. Key projects currently funded in the STIP that will improve overall freight mobility within the freight corridors identified in section 2.2.2 include the following:

- Widening of I-40 in Davie, Forsyth, Orange, Durham, Wake, and Johnston counties [I-4744 (under construction), I-5111A, I-5111BA, I-3306A]
- Widening of I-85 in Mecklenburg, Cabarrus, Rowan, and Davidson counties, including the ongoing replacement of the Yadkin River Bridge [I-3802A, I-3802B, I-3803B]
- Construction of the final link in the I-485 Charlotte Outer Loop and widening of I-485 on the south side of Charlotte [R-2248E (under construction), R-4902 (2014)]
- Widening and upgrade of interchanges on I-95 from I-95 Business to I-40 in Cumberland, Harnett, and Johnston counties [I-4745A]
- Construction of US 70 Gallants Channel Bridge [R-3307]

<sup>91</sup> 2015 Strategic Plan of the NCSA



- Widening of US 258 in Onslow, Jones and Lenoir counties [R-2235]
- Widening of I-26 from US 25 to I-40 in Henderson and Buncombe counties [I-4400, I-4700]
- Construction of the US 74 Rockingham-Hamlet Bypass in Richmond County [R-3421]
- Additional upgrades to bring portions of I-73 / 74 to interstate standards between Rockingham and Greensboro [R-2606, I-5110]
- Widening of I-77 between Charlotte and Statesville, Mecklenburg and Iredell counties [I-3311E, I-4750A]
- Construction of the US 17 Hampstead Bypass in New Hanover and Pender counties [R-3300]
- Widening and bridge replacements on US 17 / US 74 / US 76 and replace bridges in Brunswick and New Hanover counties [R-3601]
- Widening and upgrade of US 17 between Jacksonville and New Bern in Onslow and Craven counties [R-2514B]
- Construction of the US 70 Bypass of Havelock, Craven County [R-1015]
- Construction of the US 70 Bypass of Goldsboro, Wayne County [R-2554]
- Construction of the Monroe Connector and Bypass in Mecklenburg and Union counties [R-2559, R-3329]
- Additional capacity and safety enhancements on US 74 in Mecklenburg County [U-2509A]
- Construction of the Cape Fear Skyway and Wilmington Bypass Project [U-4738]
- Widening of NC 24 in Cumberland, Sampson, and Duplin counties [R-2303A, R-2303B, R-2303C, R-2303D]
- Upgrade south end of Chowan Bridge to US 17 Business, Bertie, Chowan counties [R-5731]
- US 17 widening from New Bern to just south of Williamston in Beaufort County [R-2510]
- Replace Bridge 060043 over Norfolk Southern Railroad in Beaufort County [B-5302]
- Widen and improve Newport River Bridge Morehead City to Beaufort [U-5740]
- Four lane divided Wilmington Bypass from US 17 to I 140 in Brunswick and New Hanover counties [R-2633]
- Upgrade US 74 Rockingham-Hamlet bypass to I-74 to interstate standards in Robeson and Richmond counties [FS-1508A, I-5899]
- Widen existing I-77 between I-485 to I-277/NC 17 to ten lanes in Mecklenburg county [I-5718]
- Widen and reconstruct I-77 from SR 5544 to I-40 in Iredell and Mecklenburg counties [I-4750]

- Widen NC 73 to multi-lanes in Lincoln and Mecklenburg counties [R-5721, R2632]
- Widen existing US 74 in Union County [U-5764]
- US 74 Shelby bypass four lane divided freeway [R-2707]

Implementation or acceleration of these projects would benefit the movement of North Carolina’s waterborne goods.

## 5.2 Operational

In concert with the infrastructure needs are operational ones to better serve waterborne freight as outlined in Table 5.2.

**Table 5.2 North Carolina Operational Needs**

<b>Port of Wilmington</b>	<b>Port of Morehead City</b>
<p>On-site:</p> <ul style="list-style-type: none"> <li>• Consider having separate main gate lanes and/or segregating non-port truck traffic to the new cold storage facility to minimize processing times of both port and non-port freight</li> <li>• Optimize on-site routing to:                             <ul style="list-style-type: none"> <li>– Minimize scale use</li> <li>– Decrease truck and train maneuvers with one-way loops through warehouses</li> </ul> </li> </ul>	<p>On-site:</p> <ul style="list-style-type: none"> <li>• Move military operations to Radio Island, add secure gate there</li> <li>• Optimize on-site routing to:                             <ul style="list-style-type: none"> <li>– Minimize scale use</li> <li>– Decrease truck and train maneuvers with one-way loops through warehouses</li> </ul> </li> </ul>
<p>Road (same concepts for both ports):</p> <ul style="list-style-type: none"> <li>• Regularly optimize traffic signals on freight connectors between the port and interstate system as well as in Rockingham and Monroe for Charlotte-bound freight</li> <li>• Use variable message signs to notify travelers/ customers/ businesses along the corridor of when the at-grade crossings will be closed – such as giving them 30 or 60 minutes lead time</li> <li>• Create a cellphone app that notifies mapping apps and drivers directly (such as for delivery trucks) when the crossings will be closed</li> </ul>	
<p>Rail:</p> <ul style="list-style-type: none"> <li>• Work with Wilmington Terminal Railroad to minimize and ultimately eliminate non-port freight from being handled on port property to both increase available space for port-specific freight and reduce potential security issues</li> </ul>	<p>Rail:</p> <ul style="list-style-type: none"> <li>• Since only 3 trains/week, prioritize movement through town to minimize closings of at-grade crossings and/or negotiate to have the trains arrive/depart at more optimal times of day</li> <li>• Also, if land could be found, could have the short line conduct the operations through the town at more convenient times, and instead have NS drop/pick up cars west of the town</li> </ul>

## 5.3 Institutional and Regulatory

Beyond investments in maritime-supporting infrastructure and operations, realization of maritime growth opportunities also depends upon the implementation of supportive institutional strategies and regulatory policies. This section outlines a number of recommendations for maintaining and growing port traffic through agency and public cooperation and directives.

### 5.3.1 Port Governance and Funding

US seaports operate under various structures for governance and funding. Most port authorities are financially self-supporting. In addition to owning land, setting fees, and sometimes issuing bonds and levying taxes, port districts can also operate shipping terminals, airports, railroads and even such things as irrigation facilities. As a general rule, port authorities operate as businesses, sustaining themselves on their revenue streams, and, as significant economic engines, in some cases contribute funds to state (or other governmental) coffers.

NCSPA owns and operates its terminals and facilities. The primary source of revenues to NCSPA is from these operating activities; however, NCSPA has received grants and aid from the State of North Carolina to support its capital program. The ports may be eligible for funds from the Golden LEAF Foundation and the Rural Infrastructure Authority which support infrastructure needs in rural, tobacco-dependent, and economically distressed areas.<sup>92</sup> NCSPA has also been the recipient of federal grants to support capital investments, primarily security-related. No state or local funds or tax revenues are used to support operations.

Maritime infrastructure is capital-intensive, increasingly requiring project sponsors to assemble funding from multiple sources to meet maintenance and expansion needs. Given the multi-modal nature of goods movement infrastructure, and its many beneficiaries, numerous funding options need to be explored for federal, state and local participation. Several federal grant and loan programs that should be evaluated to support maritime infrastructure investment include the following:

- Grants from the US Departments of Homeland Security, Agriculture, and Transportation.
- Federal cost-sharing for navigational improvements is available through the USACE.
- US Department of Defense funding to support investments that benefit US military institutions and strategic seaports.
- US Economic Development Administration support for public works and developments to help distressed communities attract new industry and diversify local economies.

Private investment opportunities and benefit capture strategies should also be leveraged. Direct investments by railroads, user fees, sale/leaseback of rail assets, and public-private partnerships are all potential means for funding maritime investments that have demonstrated private benefit.

### 5.3.2 Comprehensive Maritime Vision and Marketing Plan

An organization's marketing strategy is, first, defined by its mission—a statement of what the organization is and does. A clear and unified mission and vision is paramount to advancing North Carolina's maritime industry. Other regional ports are perceived to have realized a closer alignment between overall state vision and the goals of host communities, yielding successful partnerships that benefited both the host communities and the ports. A joint economic development and marketing plan, such as has been developed by the South

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<sup>92</sup> NC Department of Commerce, *Golden LEAF Board Budgets \$25 Million for Major Site Development*, April 12, 2016.

Carolina Ports Authority in collaboration with the City of Charleston, would demonstrate broad-based support for a single mission.

Through a collaborative marketing and economic effort, the state, the ports, and the port community can advance a single mission—leveraging resources and providing a unified message to potential relocating firms that need reliable port access, to ocean carriers whose competitive service must be supported by complementary port and landside infrastructure, and to landside transportation providers who seek cargo volumes that can justify their own capital and operating investments. Such collaboration could not only support growth for existing port users and facilities, but may also encourage growth at Radio Island, where there is ample space for port development but contention with the local community. A comprehensive vision for the ports should include Radio Island if the NCSPA hopes to take advantage of the island's proximity to port and developable space.

Greater collaboration among the state's various marketing and operating functions could also raise the port's profile in the market. A few examples include: the NCSPA could consider having a satellite office near shippers and customers; coordinating shipments for smaller customers who lack the logistical expertise; and updating the NCSPA operating hours to accommodate more truck turns and thereby be more appealing to customers.

### 5.3.3 Continued Stakeholder Input

Involvement of the maritime industry and community stakeholders was an important element of the *North Carolina Maritime Strategy* (AECOM, 2012). Maritime stakeholders provided valuable input. Stakeholder expressed a willingness and desire to provide continued input to the strategic direction of North Carolina's ports and maritime-supporting transportation and facilities. In addition, port staff and local residents agreed that greater interaction and understanding of port operations would establish a stronger, more supportive relationship between North Carolina ports and the surrounding port communities.

A repeated theme in several of the stakeholder workshops was that the local communities around the ports were not supportive of the port authority's operation. The perception<sup>93</sup> was that other ports in the region were much more closely aligned with overall state vision and goals of host communities, yielding successful partnerships that benefited both the host communities and the ports. There were two main consequences from this perception.

First, if given an option, retailers would choose to operate in locations where the customer base welcomed their logistics operations because market perception is so important for a retailer. Stakeholders described public campaigns in other communities that demonstrated support for the ports—an example cited were bumper stickers with the slogan Ports = Jobs. Similarly, when the City of Charleston developed an economic development and marketing plan, it was a combined effort with the port and demonstrated state-level support. The port, the city, and state all market together, leveraging resources and providing a unified message to potential relocating firms or port customers.

Second, the perceived conflict between the North Carolina communities and the resident ports combined with the perceived harmony between local communities and competitor ports in the region adds uncertainty to the future outlook for the North Carolina ports. Shippers and carriers value stability and predictability.

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<sup>93</sup> *NC Maritime Strategy* industry workshop with shippers – held August 10, 2011 and reiterated as part of the *Eastern Infrastructure Study* in 2014.

While the perceived conflict does not affect day-to-day operations (shippers and carriers both reported that port operations were high quality and staff were flexible and easy to work with), it does affect the market's assessment of potential realization of future plans. Because of the greater uncertainty concerning developments at NCSPA, the market is likely to discount these more than at other ports in the region.

The outside perception of NCSPA activities is that there is fragmentation and that the port, the local communities, and the state do not share the same vision. Continued efforts to engage both the maritime industry and the port community are important components of the state's future success.

### *5.3.4 Integration of Maritime Freight Needs into Statewide Transportation Planning*

The project prioritization for the STIP is based on a combination of quantitative data, qualitative input, and multimodal characteristics under the Strategic Prioritization Process. Quantitative data includes volume-to-capacity ratios, crash rates, and freight volumes (to name a few). Qualitative input is based on the top priorities of each respective metropolitan planning organization, rural planning organization, and NCDOT Division. The prioritization approach has been effective in achieving the strategic goals of the Strategic Transportation Investments law, which aims to use funding to improve infrastructure, create jobs, support economic growth, and a high quality of life; however, the current prioritization approach does not include maritime as one of the measurable modes and therefore does not capture the potential economic benefits of maritime investments beyond the traditional measures of congestion and safety. While clearly very important, these measures tend to favor improvements that enhance passenger mobility over those that provide freight mobility within the state. The state should emphasize the marine ports' importance and better focus funds to them by separating and scoring maritime projects.

### *5.3.5 Shared Rail Service*

North Carolina's freight market is, today, dominated by truck. Long term strategies would benefit from improved rail service. Sufficient rail tonnages, however, are required for rail carriers to be competitive with trucking. In order to offer North Carolina shippers the benefits of service from both Class I railroads operating in the state, the implementation of shared rail service across CSX and NS should be promoted.

North Carolina ports and in-state shippers contend that the lack of dual rail service contributes to high quotes for rail transport to the state's port facilities. Dual rail service would introduce rail freight competition by offering service of two railroads to each port location. In theory, competition would cause the railroads to reduce their rates and make rail service more competitive with truck transport. With low rail density on port-connecting rail lines, however, the operation of additional trains (without an accompanying increase in volume) could actually increase variable rail costs and quoted rail freight prices.

An alternative to dual rail service is shared rail service, whereby two or more railroads enter into an agreement to transport the other's cars on their trains. CSX and NS hold shared service agreements in other locations, but do not have such an arrangement in North Carolina. Shared rail service would allow shippers to contract with one railroad while obtaining access to the other railroad's operating lines (as set forth in the shared service agreement); an interchange of cars would be required between the two railroads. Implementation of shared service could therefore benefit the ports by attracting ocean carriers, who may enter into exclusive agreements with a single rail carrier to provide point-to-point transportation service to shippers. Under the provisions of the existing trackage rights agreement that grants NS exclusive freight operating rights over designated NCRR rights of way, explicit agreement of NS and NCRR may be required to allow for CSX or any other operator's freight to be transported over these lines.

### 5.3.6 Regulation of Shipping Alliances

As shipping alliances between cargo carriers have developed and evolved, ports should coordinate closely with the Federal Maritime Commission and inland facility operators, such as the Class I railroads, to monitor, report, and ensure fair trade practices and pricing. There have been meetings of maritime regulators from the US, China, and Europe, called the Global Regulatory Summit, where attendees discuss markets, global carrier cooperation, and policies relating to the ports. The group approves the latest proposed alliances, generally when the combined market shares of the partners is under 35 percent,<sup>94</sup> and hears complaints from port users who claim to be unfairly charged fees. In addition, the group investigates rate-fixing allegations that result from the formation of alliances. In the future, NCSPA should monitor these meetings and the ongoing changes in alliance structures to understand the impact of the alliances' services and pricing for customers, and if necessary, report unfair practices to the appropriate regulators.

## 5.4 Community and Environmental

### 5.4.1 Community

The relationship between the ports and communities that surround them is complex. The ports support vital economic interests with local as well as geographically far reaching effects. On the local level, a fine balance has been developed overtime between the economic benefits of the port and burdens which are borne by the local community including competing land uses, traffic congestion, noise, and visual effects. The NCSPA endeavors to maintain a positive relationship with the local community and often sponsors local events such as the North Carolina Seafood Festival. Through the NCSPA Foundation, the port authority awards employees' children with scholarships. The NCSPA also has a Communications Department that is responsible for maintaining communications with the community through press releases and social media, as well as providing tours of port facilities. In Morehead City the port provides regular updates to the community via monthly breakfasts where interested parties can visit with Port Authority representatives. As both the Port of Wilmington and the Port of Morehead City grow, it will be increasingly important for the ports to maintain good community relations by expanding partnerships with local businesses, organizations, and the general public.

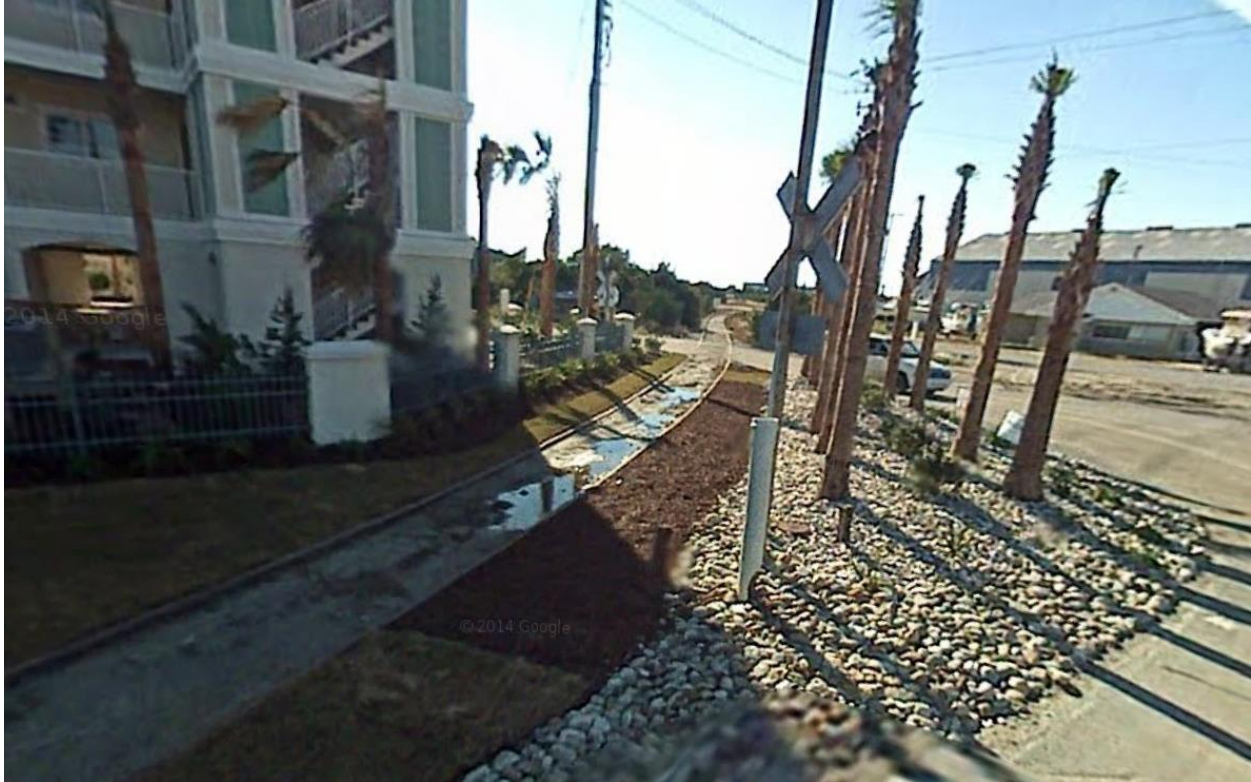
According to the NCSPA, relations between the Port of Morehead City and the community are good and the locals are generally supportive of the port. The port also works very closely with the community to minimize disruption from port-related activity. For example, the port and the city worked out an agreement that oversized cargo, such as wind turbines, being transported by truck through the city must be accompanied by a police escort and that only one piece of oversized truck cargo can be transported at a time through the city limits. This effort helps to minimize traffic impacts. As competing land uses such as residential developments, tourism-related businesses, and recreational marine uses, such as marinas, encroach upon port property, the port is concerned that it will become increasingly more difficult to develop port property, particularly Radio Island, without complaints from adjacent land owners about issues such as visual impacts, noise, rail and truck movement, and property access. As is evident in the photo (Figure 5.3), housing is quite close to the port's rail line on Radio Island.

<sup>94</sup> Paris, Costas, The Wall Street Journal, "Shipping Mergers to Remake Global Alliances," April 12, 2016, <http://www.wsj.com/articles/shipping-mergers-to-remake-global-alliances-1460479203>, accessed 9/6/16.



Land use compatibility is not as much of a critical issue in Wilmington where development pressures and competition for developable land are not as demonstrable. Long-established urban residential areas border the port to the east and compatible industrial and commercial uses are north and south of the port.

**Figure 5.3 Radio Island Port Property Rail Access**



Source: Google Maps Image (Street View Dec 2007)

### 5.4.2 Environmental

NCSPA is dedicated to being a good steward of the environment and the community surrounding its ports. In 2007 NCSPA implemented Project Energy, a sustainability program aiming to reduce emissions, use alternative energy sources, conserve fuel, and increase recycling and use of hybrid technologies. After just four years, the program was selected as one of four ports to receive Inbound Logistics Magazine's designation as a G75 Green Supply Chain Partner (<http://www.ncports.com/for-our-community/>). Continuing to remain a leader amongst ports in the sustainability effort means securing grants and other funding to continue efforts to conserve energy consumption, reduce air emissions, and protect water quality.

## 5.5 Safety & Security

### 5.5.1 Safety

Given the nature of work and the number of moving parts and people at North Carolina ports, NCSPA prioritizes safety and security. Figure 5.4 shows a conceptual framework for successful implementation of a



safety management system policy.<sup>95</sup> Each part of the safety process goes through a feedback loop to include a review and assessment of the policy process. The intent is to achieve the desired safety goals and continually review maritime port safety effectiveness. Both ports at Wilmington and at Morehead City have taken necessary safety and security measures to comply with threat management and have a process to address their respective effectiveness.

#### Figure 5.4 Example Safety Management Policy

The key elements of successful safety management are as follows:

- Effective safety policies setting a clear direction for the organization to follow
- An effective management structure and arrangements in place for delivering the policy
- A planned and systematic approach to implementing the policy through an effective safety management system
- Performance is measured against agreed standards to reveal when and where improvement is needed
- The organization learns from *all* relevant experience and applies the lessons

Together these elements constitute a continuous cycle over time, aimed at ensuring continued achievement of safety goals, and relevance of policies, plans and procedures; and continuous improvement in safety performance.

Port authorities should make the following commitments (to safety policy):

- To manage the relevant assets of the authority safely and efficiently
- To discharge existing statutory duties and powers
- To maintain relevant port equipment to agreed industry standards
- To recruit and train operational staff to nationally agreed competence levels
- To ensure that staff are properly trained for emergencies and contingencies

Source: Department for Transport, 2015

Figure 5.4 explains the key elements needed in the management of an effective safety program. Safety measures are to be planned to mitigate risks before they occur and provide a systematic approach of how to assess and respond when an incident occurs. Hazards and safety risks should be viewed from the perspectives of the port authority, the terminal operators, and the vessel operators. Each of these parties must know what is expected of it to help mitigate and assess safety situations.

To provide a safe working environment on-site for all operators on the ports, The NCSPA and the Port Police work closely with anyone who will be using the port and advise all port users to become familiar with and adhere to the following safety policy and rules posted on their website:<sup>96</sup>

- Obey all traffic signs and lane markings.
- Obey posted speed limits.
- Do not travel between containers in the container yard.

<sup>95</sup> Department for Transport. (2015). *A Guide to Good Practice on Port Marine Operations*. London: United Kingdom.

<sup>96</sup> North Carolina State Ports Authority — NC Ports. (2016). *North Carolina State Ports Authority*. Accessed September 14, 2016, from <http://www.ncports.com/>

- Maintain 50 feet from heavy equipment while operational.
- Travel in approved lanes. Do not take shortcuts.
- Class 2 reflective vests are required when walking in the operational areas.
- NCSPA employees are prohibited from using a cell phone while their vehicle is in motion. Please exercise the same courtesy when you are visiting a port facility.

Safety concerns at the ports seem to stem from the need for improved infrastructure rather than security threats, based on the interviews conducted. The Port of Wilmington recently received a Freight Rail and Rail Crossing Safety Improvement (FRRCSI) grant for rail switching and track work. The port is designing 5,000 feet of interchange track (active line). Total cost is approximately \$1.4 million with about 50 percent of the funding coming from NCDOT. This improvement is partly driven by the Enviva wood pellets business beginning at Wilmington. The FRRCSI grant will help improve the safety infrastructure to support the rail switching and track work.

The Port of Wilmington staff would also like to review the possibility of relocating pedestrian and cyclist activity from the Front Street and Memorial Bridge projects as that corridor has three “at-grade” rail crossings for port traffic. The intent would be that the added traffic could create an unsafe environment for the pedestrians and cyclists.

The Port of Morehead City staff has recognized a need for a crane replacement plan. The two cranes were built in the 1960s and will need to be replaced over the next few years. Each crane will cost \$1.5 million to refurbish. Portable cranes would be a desirable addition, but they are heavy and the port surface may not be able to sustain their weight. Also, having overhead powerlines creates a safety hazard and limits use of a portable crane. New equipment means an additional aspect of operational safety.

### 5.5.2 Security

There is a need to continually review maritime security at the Port of Wilmington and at the Port of Morehead City. Following our nation’s recent 15<sup>th</sup> year anniversary of the terror attacks on September 11, 2001, port security has been a priority of the NCSPA. Understanding the potential threats has had an impact on NCSPA’s security planning development; for example, the port authority now works in concert with regional, state, and national organizations to reduce threats.

Each of the North Carolina ports has policing operations that actively conduct training exercises and both continually update their compliance with security protocols based on anticipated security threats. The North Carolina State Port Police work closely with the local, state, and federal law-enforcement as well as emergency management agencies. The department includes sworn police officers (with arresting authority) and security officers on duty 24 hours a day, seven days a week. These officers work at both the Port of Morehead City and the Port of Wilmington. The police work closely with port customers and visitors to be sure they are aware of the safety and security measures they should adhere to while using the port. The mission is to provide a safe and secure environment for personnel and cargo.

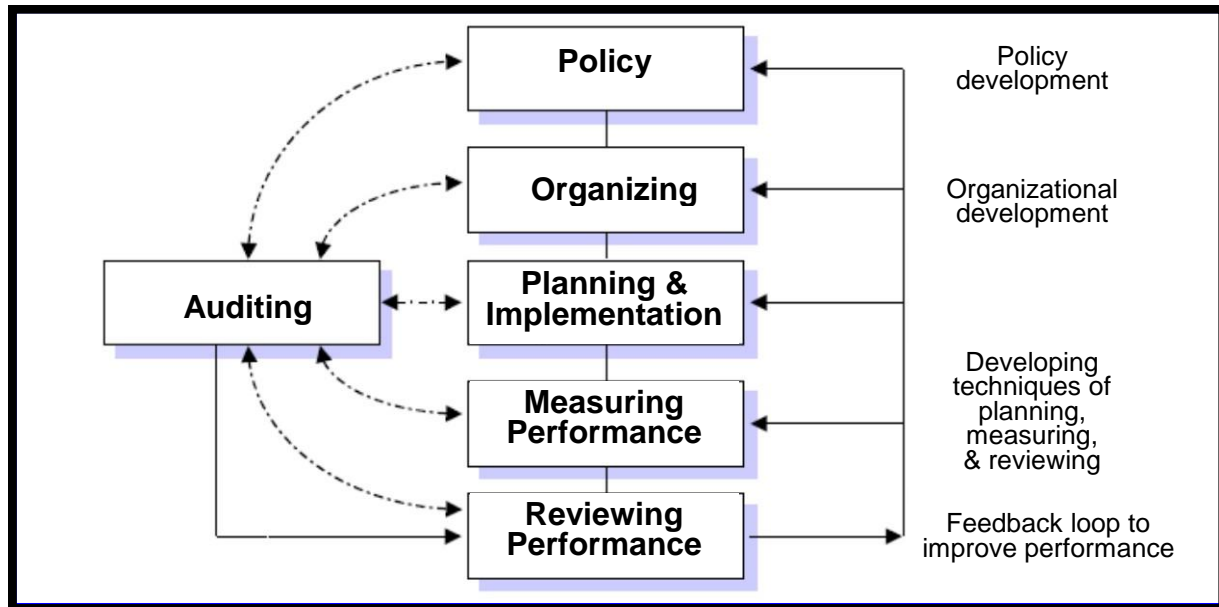
“The US Coast Guard and Transportation Security Administration have required that anyone needing access to restricted areas of NCSPA facilities, be required to present a valid Transportation Worker Identification

Credential (TWIC), or be escorted by a TWIC holder.”<sup>97</sup> This protocol includes access management to the restricted areas which are composed of all areas within the gates at both ports.

For the past 14 years, the North Carolina ports have received federal grants and invested millions more to assess security and upgrade capabilities. Some of the physical security measures include improving the lighting, upgrading perimeter fencing, installing cameras to include underwater surveillance capabilities, and addressing extensive communications upgrades to mitigate security threats.

In 2007, the NCSPA’s ports in Morehead City and Wilmington and the Charlotte Inland Terminal received C-TPAT certification from the US Department of Homeland Security. This certification is revalidated each year. “The C-TPAT is a voluntary supply chain security program led by US Customs and Border Protection (CBP) and focused on improving the security of private companies’ supply chains with respect to terrorism.”<sup>98</sup> The intent of this program is to have the CBP work with the trade community to strengthen international supply chains and improve US border security. Figure 5.5 below identifies a security implementation model to address the effectiveness of planning and process implementation.

**Figure 5.5 Example Security Implementation Model**



Source: Department for Transport, 2015

Today, more than 11,400 certified partners spanning the gamut of the trade community have been accepted into the C-TPAT program. “The partners include US importers/exporters; US/Canada highway carriers; US/Mexico highway carriers; rail and sea carriers; licensed US Customs brokers; US marine port authority/terminal operators; US freight consolidators; ocean transportation intermediaries and non-operating

<sup>97</sup> North Carolina State Ports Authority — NC Ports. (2016). *North Carolina State Ports Authority*. Accessed September 14, 2016, from <http://www.ncports.com/>

<sup>98</sup> U.S. Customs and Border Protection. (2016). *C-TPAT: Customs-Trade Partnership Against Terrorism | U.S. Customs and Border Protection*. Accessed September 14, 2016, from <https://www.cbp.gov/border-security/ports-entry/cargo-security/c-tpat-customs-trade-partnership-against-terrorism>

common carriers; Mexican and Canadian manufacturers; and Mexican long-haul carriers, all of whom account for over 52 percent (by value) of cargo imported into the US<sup>99</sup>

Traditionally, attacks on marine vessels have included piracy, boarding, theft, and/or destruction. In addition, there is great need to upgrade security measures to counter the cyber-attacks that can be waged. The implication of these attacks includes the disruption of business transactions, navigation, cargo-related functions, and financial losses. Maritime vessels are under significant threat of cyber-attack because many are carrying outdated software and were not designed with cyber security in mind. This has an impact on the North Carolina ports and those providing cargo operations throughout the country. Through the updating of security systems, training, and on-going technology improvements, the maritime security infrastructure at the ports at Morehead City and Wilmington can be successful in meeting future security threats.

NCSPA takes port safety and security very seriously, and in the past ten years has had few incidents according to the US Coast Guard Incident Investigation Reports.<sup>100</sup> In addition, security cameras are in operation throughout the ports of Wilmington and Morehead City as an extra level of surveillance. Available funding for improved security measures as well as infrastructure improvements could help NCSPA continue to be a leader in port safety and security.

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<sup>99</sup> North Carolina State Ports Authority — NC Ports. (2016). *North Carolina State Ports Authority*. Accessed September 14, 2016, from <http://www.ncports.com/>

<sup>100</sup> USCG Maritime Information Exchange. (2016). *USCG CGMIX Incident Investigation Reports (IIR) home page*. Accessed September 14, 2016, from <https://cgmix.uscg.mil/IIR/Default.aspx>