

Port Modernization and Return on Investments

Based on the NC Maritime Strategy (AECOM) and Eastern Infrastructure Improvement Study (AECOM and PB)

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Transportation Planning

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Related AECOM Experience

- **NC Maritime Strategy - 2012**
- **Eastern Infrastructure Improvement Study – 2015**
- **NC Statewide Rail Plan – 2015**
- **Other Studies**
 - Radio Island EIS (as Earth Tech)
 - NCRRT Morehead City to Havelock Rail Relocation Feasibility Study (Earth Tech as a sub to CDM Smith)

Maritime Strategy Scope

- Evaluate North Carolina's position, opportunities and challenges as a portal for global maritime commerce;
- Examine the role of North Carolina ports in sustaining and strengthening the State's economy;
- Obtain input from freight transportation, economic development, and community interests, and
- Identify specific strategies to optimize benefits received from the State's investments in port and associated transportation infrastructure.
- [NCDOT: N.C. Maritime Study Document Library](#)

SB 402 Eastern Infrastructure Improvement Study

- Evaluate infrastructure improvements which promote job creation and economic development of the Global TransPark as an inland terminal, including, at a minimum, specialized transloading equipment, refrigerated and dry storage facilities.
- Assess highway and rail infrastructure improvements or service scenarios that improve access and throughput to the Global TransPark and North Carolina State Port Authority Morehead City Terminal.
- Perform a financial feasibility analysis of the Wallace to Castle Hayne and Wilmington track restoration project.

Maritime Advisory Council

- Public and private sector industry representatives from shippers, shipping lines, trucking, railroad, agricultural and manufacturing interests, along with government, policy, academic and community-at-large representatives
- Provide guidance to the project team, based on mission defined by the Maritime Study Executive Team
- As a hands-on, engaged advisory body, the Advisory Council met four times during the year to support strategy development at major project milestones

Industry and Stakeholder Meetings

■ Industry Workshops

- Agriculture
- Break-Bulk
- Shipping Lines
- Logistics & Special Zones
- Non-Ag Shippers
- Military
- Railroad & Trucking

Effort supported by hands-on Maritime Advisory Council

■ Focused discussions and interviews

- Metropolitan Transportation Organizations
- Economic Development Commissions
- NC Department of Commerce
- NC Department of Transportation
- NC State Ports Authority
- NC Railroad
- UNC Wilmington
- Southport/Oak Island Chamber of Commerce
- US Army Corps of Engineers
- Progress Energy
- No Port Southport
- Save the Cape
- Clean Carteret County Coalition
- Morehead City Port Committee
- YesPort NC

■ Public workshops

SB 402 Analysis & Market Outreach

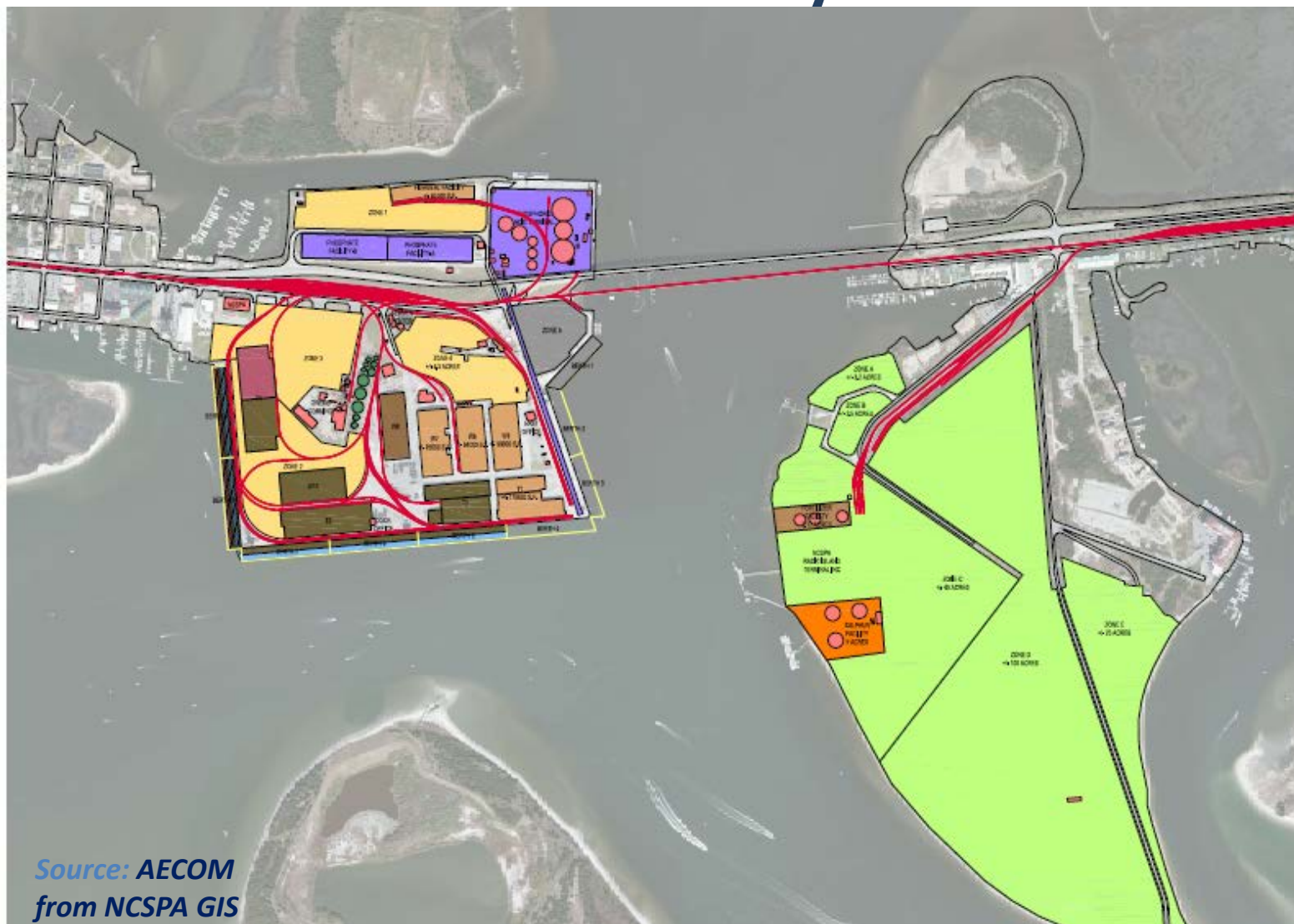
- Extensive data analysis was supplemented by expert market outreach
- Analysis:
 - In-depth analysis of cost/benefit was conducted on W2CH
 - Multiple scenarios were comprehensively investigated for GTP and MHC
- Outreach:
 - Major manufacturers and NC Chamber of Commerce
 - Military
 - Local communities
 - Economic development and rural planning/MPOs
 - Growers associations and agriculture processors
 - Port, Class I railroads and GTP representatives
 - Site selection specialists
 - Experts at other NC institutions (NCSU, First Flight Venture Center)



Summary of Stakeholder Input

- Jobs, economic growth, and the environment are top concerns
- Landside costs represent up to half of the total transportation cost of North Carolina exports – trucking cost is key
- Rail freight cannot be competitive within NC without sufficient volumes to support regular rail service
- Containerized trade requires regular service by ocean carriers
- Targeted investments needed to support the State's major industries: refrigerated storage; roll-on roll-off facilities; bulk handling for grain and wood pellets
- An integrated strategy for NC will include Commerce, Transportation, Environment, and the US Military

Port of Morehead City Land Use



Port of Wilmington Land Use Plan

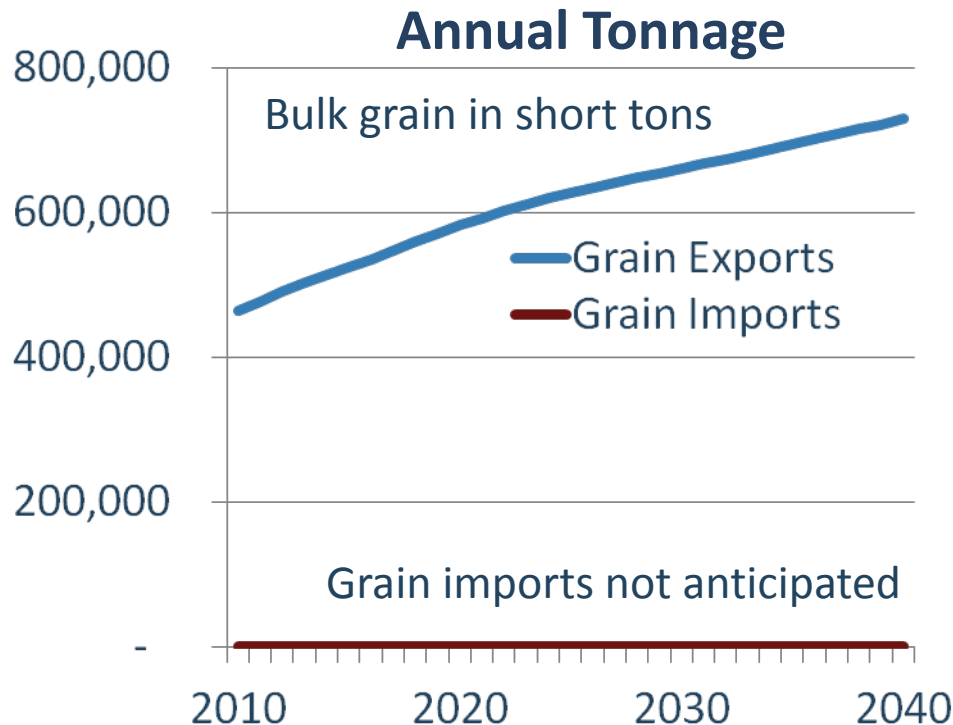
VACANT LAND			ANIMAL FEED / GRAIN FACILITY		
NAME	DESCRIPTION	AREA	NAME	DESCRIPTION	AREA
1000-1000000	VACANT AREA	1000 ACRES	100	BULK STORAGE FACILITY	100,000 SQ. FT.
AREA A	VACANT AREA	100 ACRES			
AREA B	VACANT AREA	100 ACRES			
AREA C	VACANT AREA	100 ACRES			
AREA D	PAVED/DIRT ROAD	100 ACRES			
AREA E	VACANT AREA	100 ACRES			
AREA F	VACANT AREA	100 ACRES			
AREA G	VACANT AREA	100 ACRES			
TOTAL		1000 ACRES			
WETLANDS			BULK FERTILIZER		
NAME	DESCRIPTION	AREA	NAME	DESCRIPTION	AREA
AREA 1	WETLAND	100 ACRES	101	PAVED DRIVE	100,000 SQ. FT.
AREA 2	WETLAND	100 ACRES	102	PAVED DRIVE	100,000 SQ. FT.
AREA 3	WETLAND	100 ACRES	103	PAVED DRIVE	100,000 SQ. FT.
TOTAL		100 ACRES			
BUILDING			ROAD / MACHINERY		
NAME	DESCRIPTION	AREA	NAME	DESCRIPTION	AREA
10	CONCRETE DRIVE	1000 SQ. FT.	1000	DIRT STORAGE	100,000 SQ. FT.
20	CONCRETE DRIVE	1000 SQ. FT.	2000	GRAVEL STORAGE	100,000 SQ. FT.
30	CONCRETE DRIVE	1000 SQ. FT.	3000	GRAVEL STORAGE	100,000 SQ. FT.
40	CONCRETE DRIVE	1000 SQ. FT.	4000	GRAVEL STORAGE	100,000 SQ. FT.
50	CONCRETE DRIVE	1000 SQ. FT.	5000	GRAVEL STORAGE	100,000 SQ. FT.
60	CONCRETE DRIVE	1000 SQ. FT.	6000	GRAVEL STORAGE	100,000 SQ. FT.
70	CONCRETE DRIVE	1000 SQ. FT.	7000	GRAVEL STORAGE	100,000 SQ. FT.
80	CONCRETE DRIVE	1000 SQ. FT.	8000	GRAVEL STORAGE	100,000 SQ. FT.
90	CONCRETE DRIVE	1000 SQ. FT.	9000	GRAVEL STORAGE	100,000 SQ. FT.
TOTAL		10000 SQ. FT.			
OPEN STORAGE AREA			FOREST PRODUCTS / FLUFF		
NAME	DESCRIPTION	AREA	NAME	DESCRIPTION	AREA
1000	DIRT STORAGE	100,000 SQ. FT.	100	DIRT STORAGE	100,000 SQ. FT.
2000	DIRT STORAGE	100,000 SQ. FT.	200	DIRT STORAGE	100,000 SQ. FT.
3000	DIRT STORAGE	100,000 SQ. FT.	300	DIRT STORAGE	100,000 SQ. FT.
4000	DIRT STORAGE	100,000 SQ. FT.	400	DIRT STORAGE	100,000 SQ. FT.
5000	DIRT STORAGE	100,000 SQ. FT.	500	DIRT STORAGE	100,000 SQ. FT.
6000	DIRT STORAGE	100,000 SQ. FT.	600	DIRT STORAGE	100,000 SQ. FT.
7000	DIRT STORAGE	100,000 SQ. FT.	700	DIRT STORAGE	100,000 SQ. FT.
8000	DIRT STORAGE	100,000 SQ. FT.	800	DIRT STORAGE	100,000 SQ. FT.
9000	DIRT STORAGE	100,000 SQ. FT.	900	DIRT STORAGE	100,000 SQ. FT.
TOTAL		1000000 SQ. FT.			
CEMENT FACILITIES			CONTAINER YARD		
NAME	DESCRIPTION	AREA	NAME	DESCRIPTION	AREA
100	PAVED DRIVE	100,000 SQ. FT.	100	CONCRETE DRIVE	100,000 SQ. FT.
			200	CONCRETE DRIVE	100,000 SQ. FT.
			300	CONCRETE DRIVE	100,000 SQ. FT.
			400	CONCRETE DRIVE	100,000 SQ. FT.
			500	CONCRETE DRIVE	100,000 SQ. FT.
			600	CONCRETE DRIVE	100,000 SQ. FT.
			700	CONCRETE DRIVE	100,000 SQ. FT.
			800	CONCRETE DRIVE	100,000 SQ. FT.
			900	CONCRETE DRIVE	100,000 SQ. FT.
			1000	CONCRETE DRIVE	100,000 SQ. FT.
			1100	CONCRETE DRIVE	100,000 SQ. FT.
			1200	CONCRETE DRIVE	100,000 SQ. FT.
			1300	CONCRETE DRIVE	100,000 SQ. FT.
			1400	CONCRETE DRIVE	100,000 SQ. FT.
			1500	CONCRETE DRIVE	100,000 SQ. FT.
			1600	CONCRETE DRIVE	100,000 SQ. FT.
			1700	CONCRETE DRIVE	100,000 SQ. FT.
			1800	CONCRETE DRIVE	100,000 SQ. FT.
			1900	CONCRETE DRIVE	100,000 SQ. FT.
			2000	CONCRETE DRIVE	100,000 SQ. FT.
			2100	CONCRETE DRIVE	100,000 SQ. FT.
			2200	CONCRETE DRIVE	100,000 SQ. FT.
			2300	CONCRETE DRIVE	100,000 SQ. FT.
			2400	CONCRETE DRIVE	100,000 SQ. FT.
			2500	CONCRETE DRIVE	100,000 SQ. FT.
			2600	CONCRETE DRIVE	100,000 SQ. FT.
			2700	CONCRETE DRIVE	100,000 SQ. FT.
			2800	CONCRETE DRIVE	100,000 SQ. FT.
			2900	CONCRETE DRIVE	100,000 SQ. FT.
			3000	CONCRETE DRIVE	1

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Market Scenario Framework

Upper Bound	Conservative	Lower Bound (“Do Nothing”)
Advance Market Position	Maintain Market Position	Declining Market Position
Growth Outcome <ul style="list-style-type: none"> ▪ Market share capture or decline ▪ New markets 		
Necessary Conditions <ul style="list-style-type: none"> ▪ Vessel calls and sizes ▪ Port capacity and equipment ▪ Land and water access ▪ Industry growth 		
Risks and Opportunities <ul style="list-style-type: none"> ▪ Investments in other states encourage businesses to relocate near regional ports outside NC ▪ Business costs rise in NC, tempering manufacturing growth ▪ Spending profile of aging NC population shifts away from goods; migration weakens ▪ Key bulk and breakbulk markets falter ▪ Containerization of bulk/breakbulk accelerates 		
Strategies <ul style="list-style-type: none"> ▪ Cooperative agreements ▪ Niche markets ▪ Targeted infrastructure investments ▪ Leverage strength in bulk and breakbulk 		

Grain and Soybeans

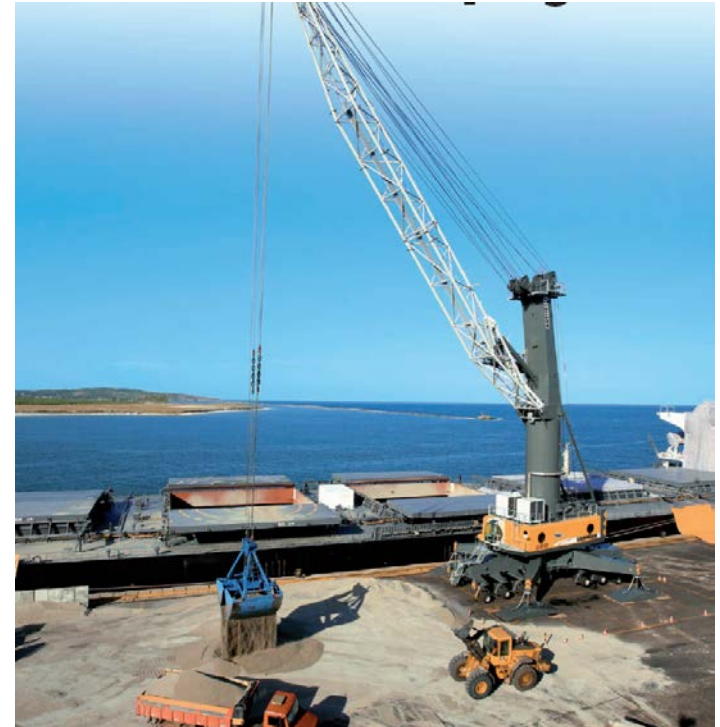


*Source: AECOM, from IHS Global Insight
projected growth and PIERS historical data*

- Greater capacity to export grain and soybean through North Carolina ports would support State's existing strength.
- World demand for grain and soybean is projected to grow strongly, so increased exports would attract more income to the State.
- Potential for grain and soybean producers to export more at lower cost if closer in-state ports became an option.
- A bulk grain terminal and rail connection are needed to serve this market.

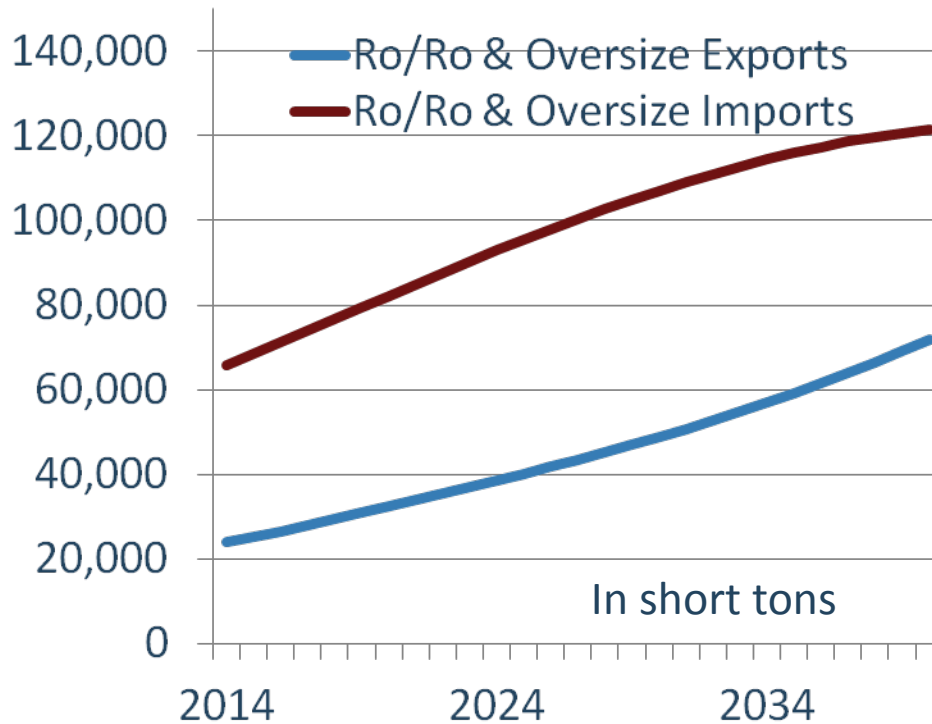
Bulk goods

- 40'+ water depth, considerably more for some cargos
- Specialized vessel loaders, or mobile harbor cranes with grabs
- Custom storage facilities
- Silos/buildings for dry goods
- Custom loaders for trains/trucks



Ro/Ro and Oversize Cargo

Annual Tonnage



Source: AECOM, from IHS Global Insight projected growth and PIERS historical data

- Producers of manufactured goods, especially those who make large bulky products such as Caterpillar and Spirit AeroSystems, rely on port access to receive parts and to deliver products to customers.
- Opportunity includes wind power.
- These are attractive employers because they not only hire workers directly, but they also make large purchases of goods and services from the economy, which also indirectly supports jobs.
- Requires port, road, and rail facilities that can handle large/heavy goods.

Roll-on, Roll-off (Ro-Ro) service

- 35'+ water depth
- No cranes required
- Open storage area near wharf
- Rail access is desirable for auto market



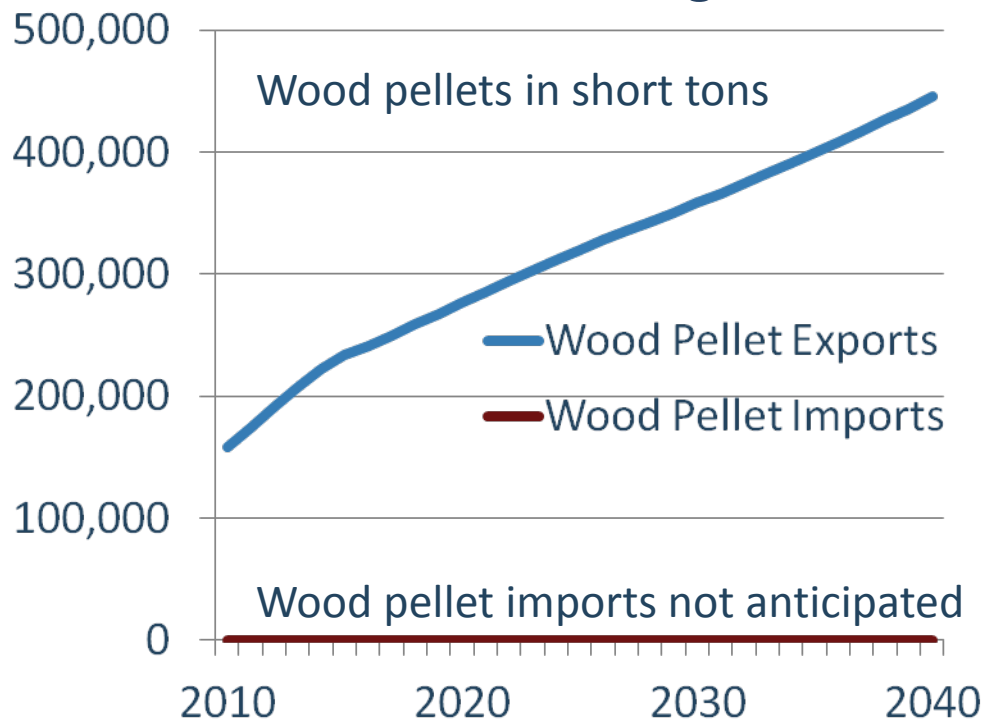
Military Cargo

- Both the Port of Wilmington and the Port of Morehead City are designated as Strategic Seaports, two of just 15 nationwide.
- Infrastructure needs to handle military cargo:
 - 35-ft+ water depth
 - Container cranes and mobile harbor cranes with various grabs
 - Ro-Ro facilities
 - Open area near the wharf that can meet military storage and security needs
 - Truck and rail access that can accommodate heavy loads
- The economic return on investment to preserving the Ports' attractiveness to the military is important. Military facilities support over 416,000 workers, about 8% of total State employment, through military or jobs supported by military installations in the State.



Wood Pellets

Annual Tonnage

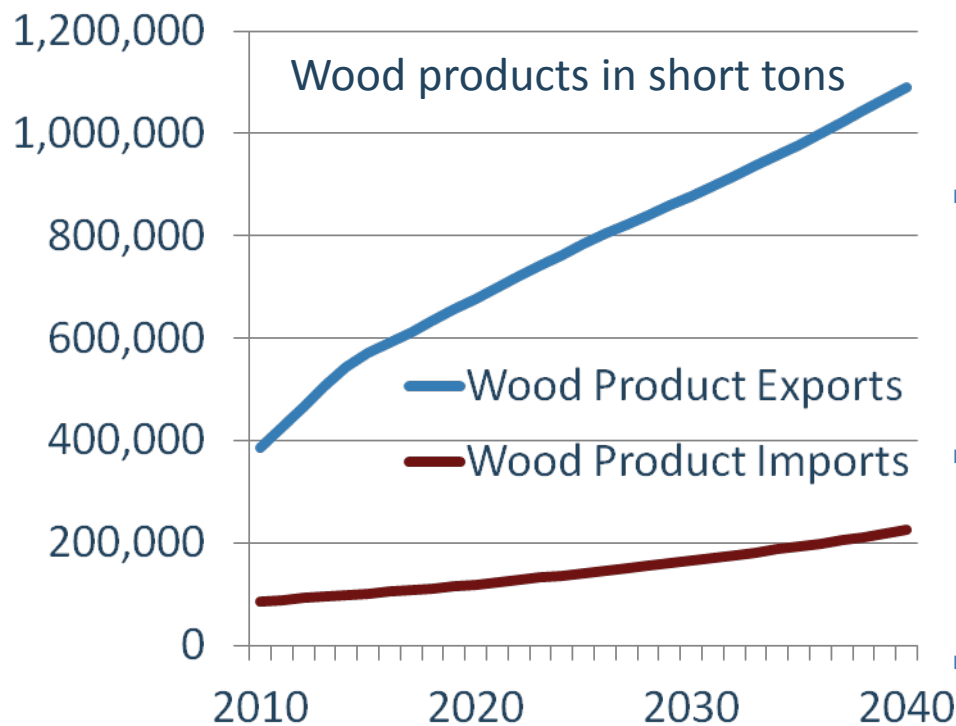


- Assumes two small pellet facilities locate in the state and use in-state ports
- Upside opportunity for greater volumes as some plants have higher volumes, but would need to be supported by inland distribution network

Source: AECOM, from IHS Global Insight projected growth and PIERS historical data

Other Wood Products

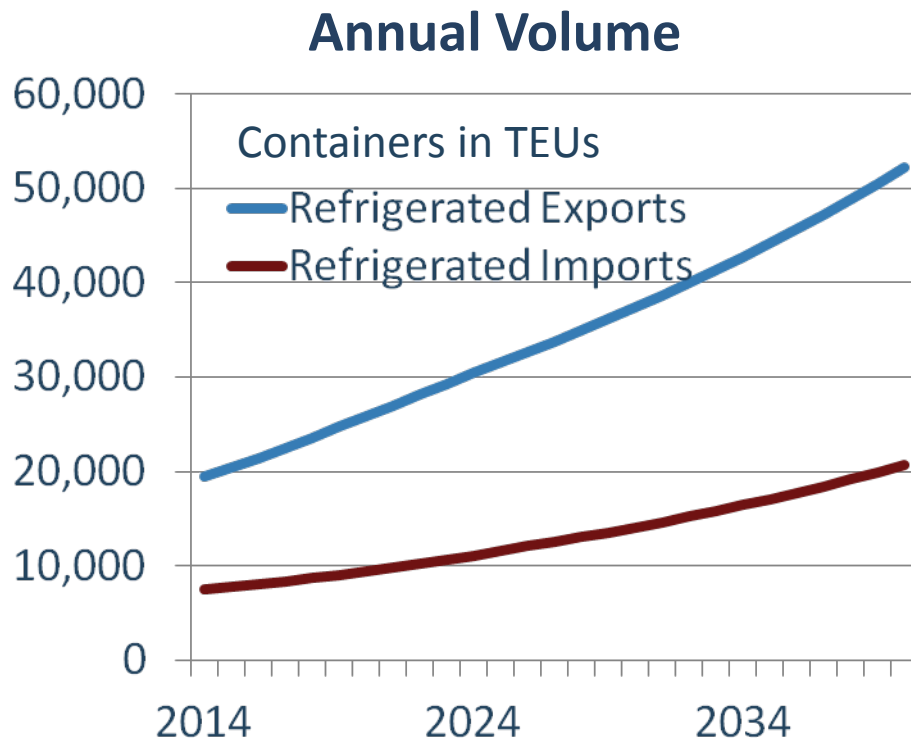
Annual Tonnage



Source: AECOM, from IHS Global Insight projected growth and PIERS historical data

- Increased export of wood products through North Carolina ports would support an important existing industry in the State.
- World demand for wood products, such as pellets as a source of replenishable energy, is expected to grow strongly in next 10 years.
- Heavy commodities such as wood and wood products are particularly affected by transportation costs.
- Improved land access and handling facilities at NC ports would support greater capture of world market by NC producers.

Refrigerated Cargo

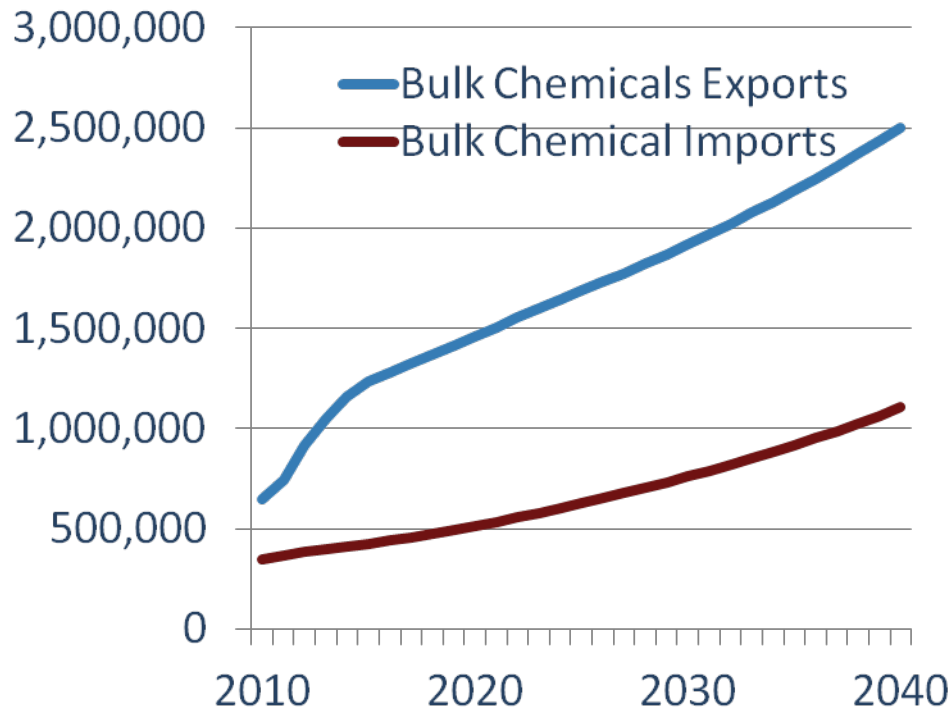


- Serves a variety of markets—both agricultural and manufactured goods
- Potential for greater capture of North Carolina production at North Carolina ports
- Supports sweet potatoes, specialized textiles, fresh and frozen meats and fish
- **Requires cold storage facilities and plug-ins for refrigerated containers at or near the port**

Source: AECOM, from IHS Global Insight projected growth and PIERS historical data

Chemicals and Phosphates

Annual Tonnage

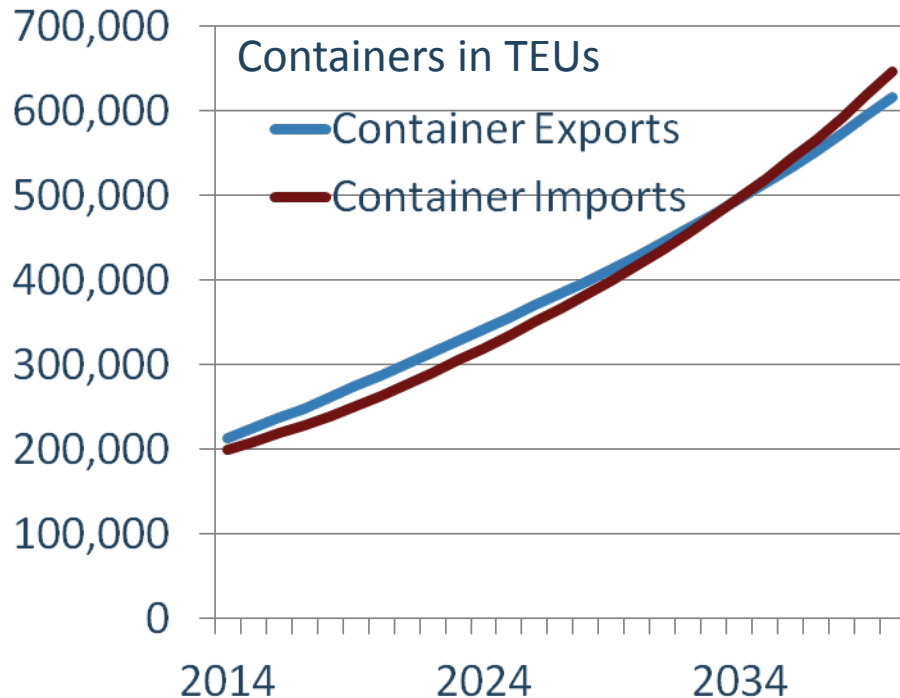


Source: AECOM, from IHS Global Insight projected growth and PIERS historical data

- Supports large existing industry with solid baseline growth
- This is already a source of strength for NC Ports; no cost or other impediment to remove to foster stronger growth

Containers


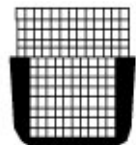

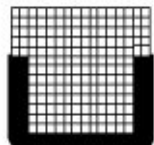

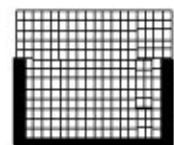

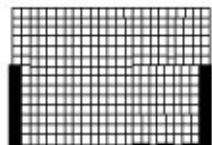
Annual Volume



Source: AECOM, from IHS Global Insight projected growth and PIERs historical data

- Supports export and import activity across a large variety of industries--from sweet potatoes and frozen chickens to consumer goods destined for local retailers
- Growth in NC port container activity makes containers and vessels available for export needs of NC producers.
- Infrastructure needs include:
 - 50-ft+ water depth for Neo Panamax vessels, 40-ft+ for Panamax vessels
 - 2 or 3 contiguous berths each 1200' long
 - Container storage area of 150-200 acres+
 - Truck and rail access

Larger vessels

Designation	TEU Capacity	Year	Length	Beam	Draft
 Panamax	3,000-5,000	1980	965 ft	106 ft	 39.5 ft
 Post-Panamax	5,000-6,000	1992	1,043 ft	128 -138 ft	 49 ft
 5 th & 6 th generation	5,000-8,700	1997	1,148 ft	128 -138 ft	 49 ft
 Neo Panamax	10,000-13,000	2009	1,200 ft	160 ft	 49.9 ft

Source: graphic adapted from www.GlobalSecurity.org

Mega container terminal

- 50+' water depth to accommodate Neo Panamax vessels
- Dock cranes of minimum 20 container reach
- 3 or more contiguous berths
- High density (stacked) container storage area (backland)
- Automated or automatable
- On-terminal rail in North America



Mid-range container terminal

- 40+' water depth to accommodate Panamax vessels
- Dock cranes with minimum reach of 13 containers
- 2 or more contiguous berths
- Medium to high density (stacked) container storage area (backland)
- Rail on- or near terminal is desirable in North America

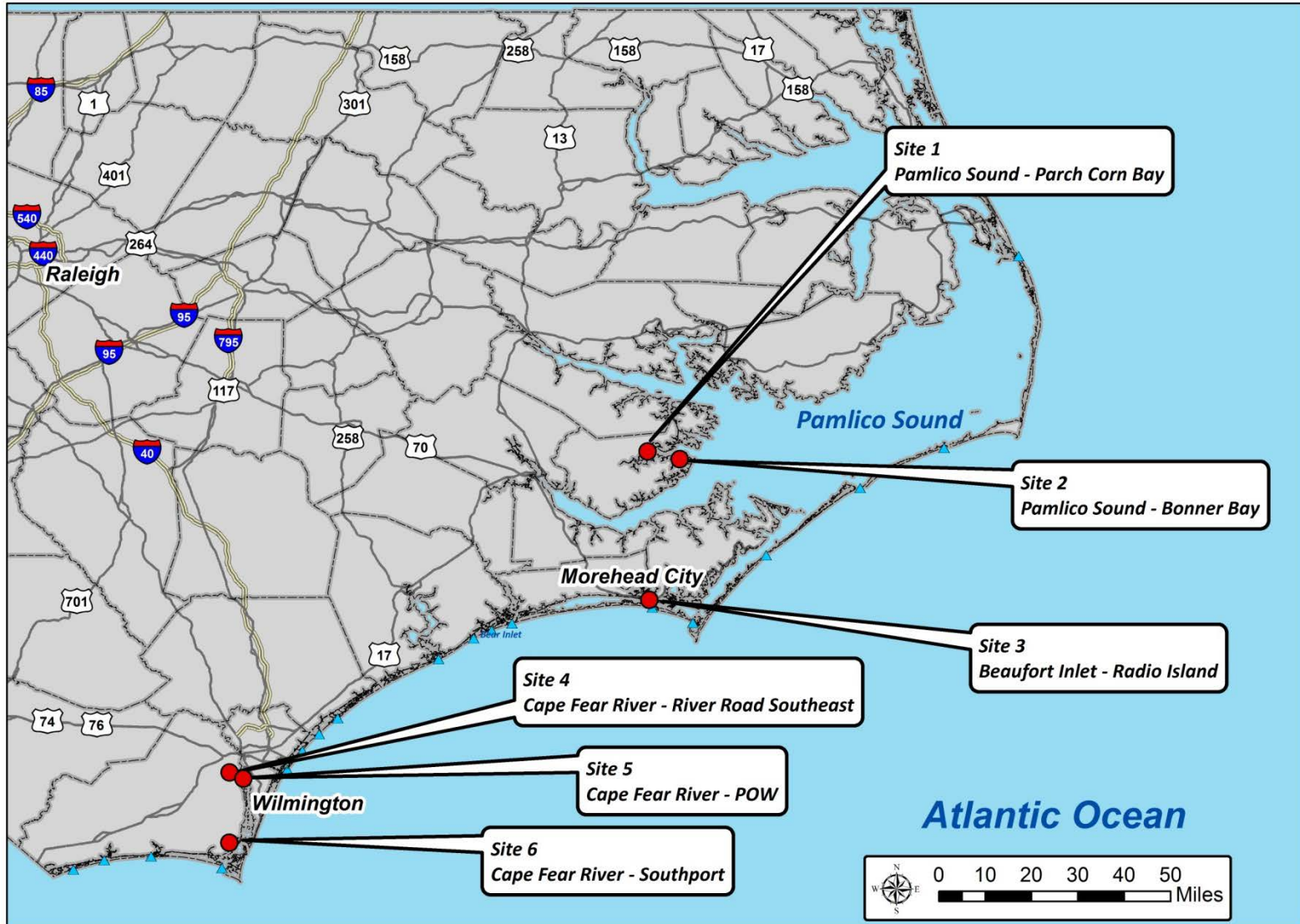


Evaluation of Container Port Sites

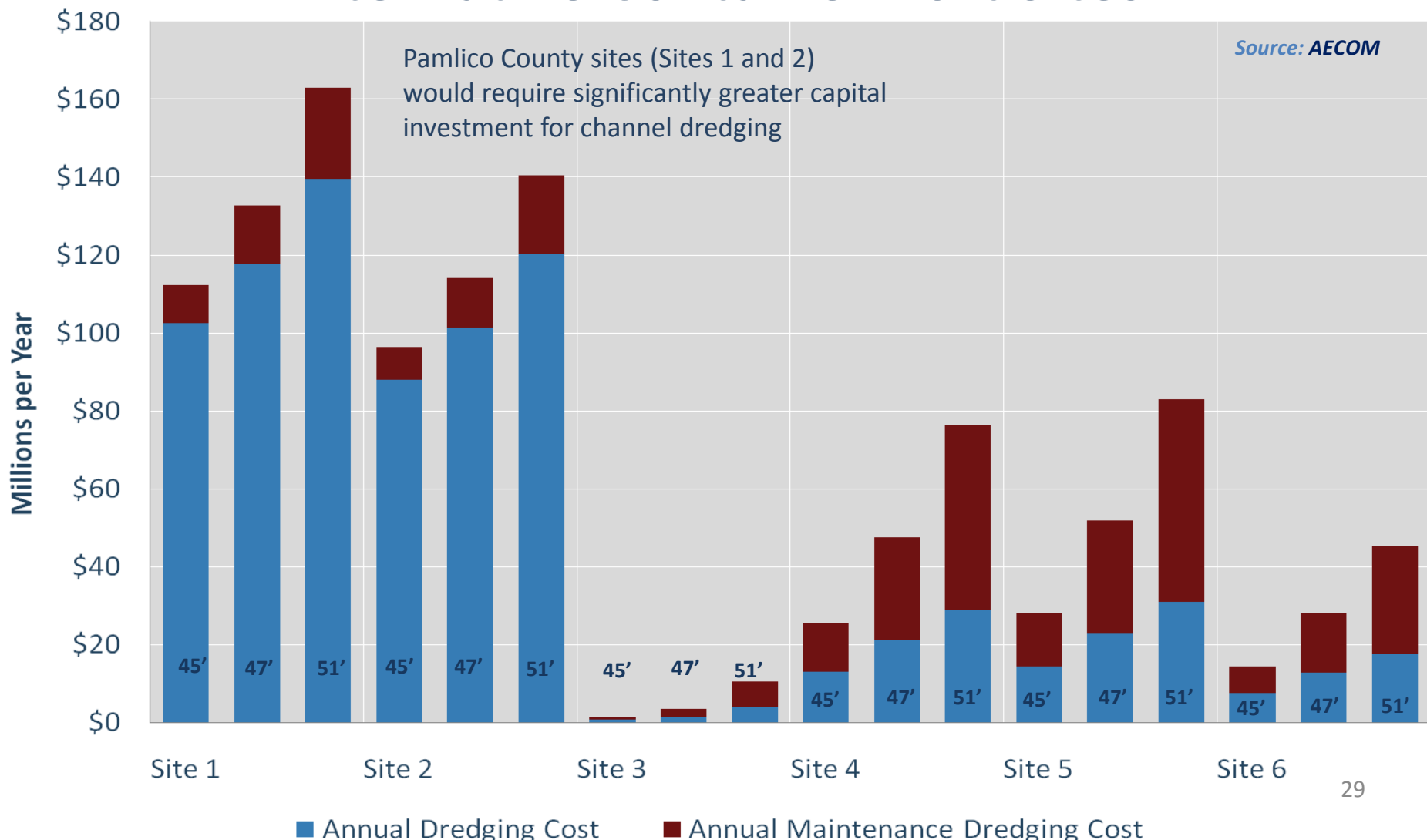
Initial Screening	Water Suitability	<ul style="list-style-type: none">• Offers ocean access• Provides adequate protection from wind and wave action
	Land Suitability	<ul style="list-style-type: none">• Avoids National Parks, Wilderness, and Refuge Areas• Avoids Military Lands• Complies with Coastal Barrier Resources Act (COBRA)• Limits displacement of other uses: vacant lands or existing port use• Meets minimum port terminal requirements: 200 acres, 3000' berth
Site Analysis	Comparative Cost and Impact	<ul style="list-style-type: none">• Limits extent and cost of dredging as compared to alternatives• Offers opportunity for cost-efficient container terminal operation• Offers opportunity for cost-effective land access• Limits environmental impacts as compared to alternatives*
	Comparative Benefit	<ul style="list-style-type: none">• Proposed terminal size and expansion capability are well-matched to projected market demand

* Environmental screening does not include full environmental impact analysis

Candidate Container Port Sites



Annualized Dredging Costs for Alternative Container Port Sites



Container Terminal at Radio Island

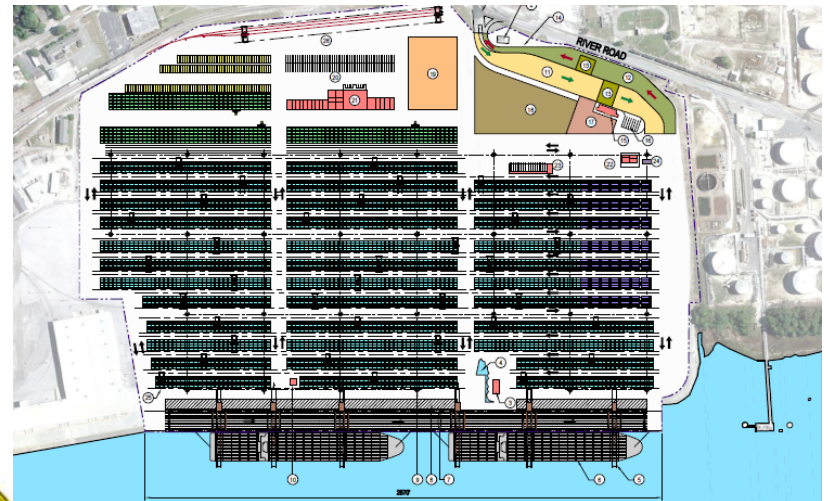
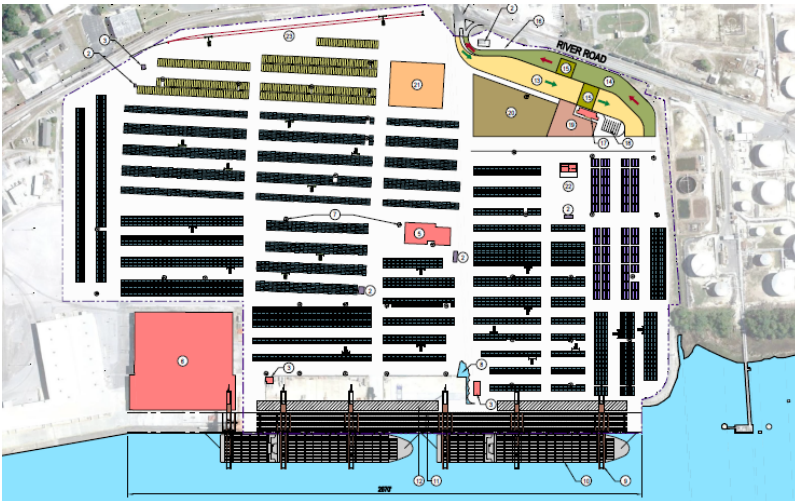
- New terminal with rubber tire gantry (RTG) operations
- 2 premium berths
- Evaluated at 45' and 51' water depths
- 1.2 million TEU max. capacity



Container Terminal at Port of Wilmington

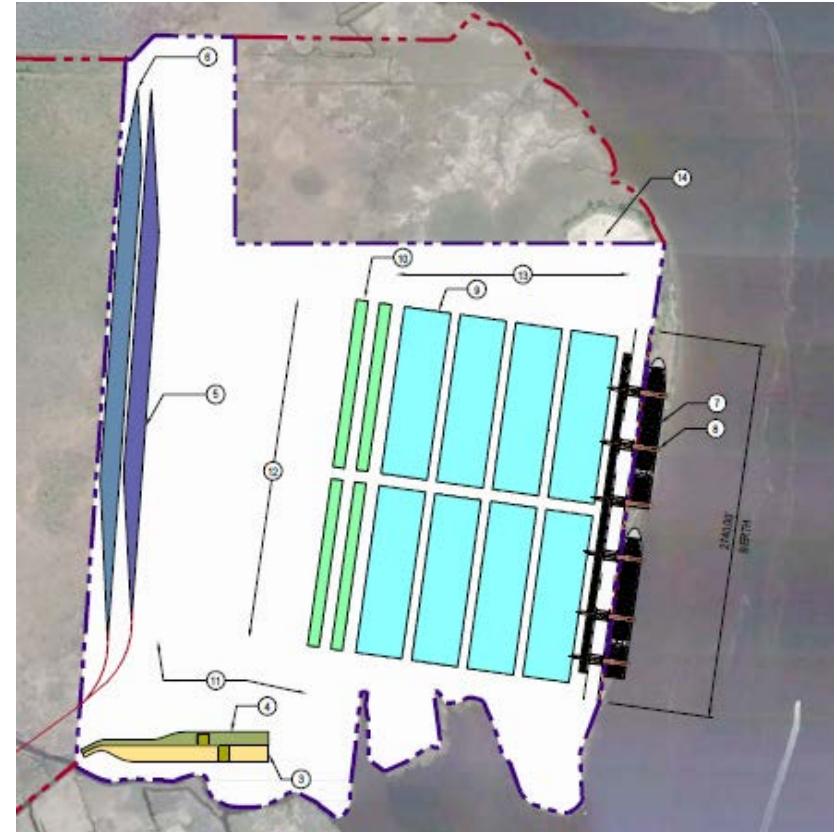
- Expanded terminal area
- Relocated gate
- Reach stacker operations
- 2 premium berths
- 42' water depth
- 750,000 max. TEU capacity

- Expanded terminal area
- Relocated gate
- Rubber tire gantry (RTG) operations
- 2 premium berths
- 42', 45', 47' or 51' water depth
- 1.1 million to 1.6 million TEU capacity



Container Terminal at River Road

- Rubber tired gantry (RTG) or automated stacking crane (ASC) operation
- 2 premium berths
- 51' water depth
- 1.5 million TEU capacity

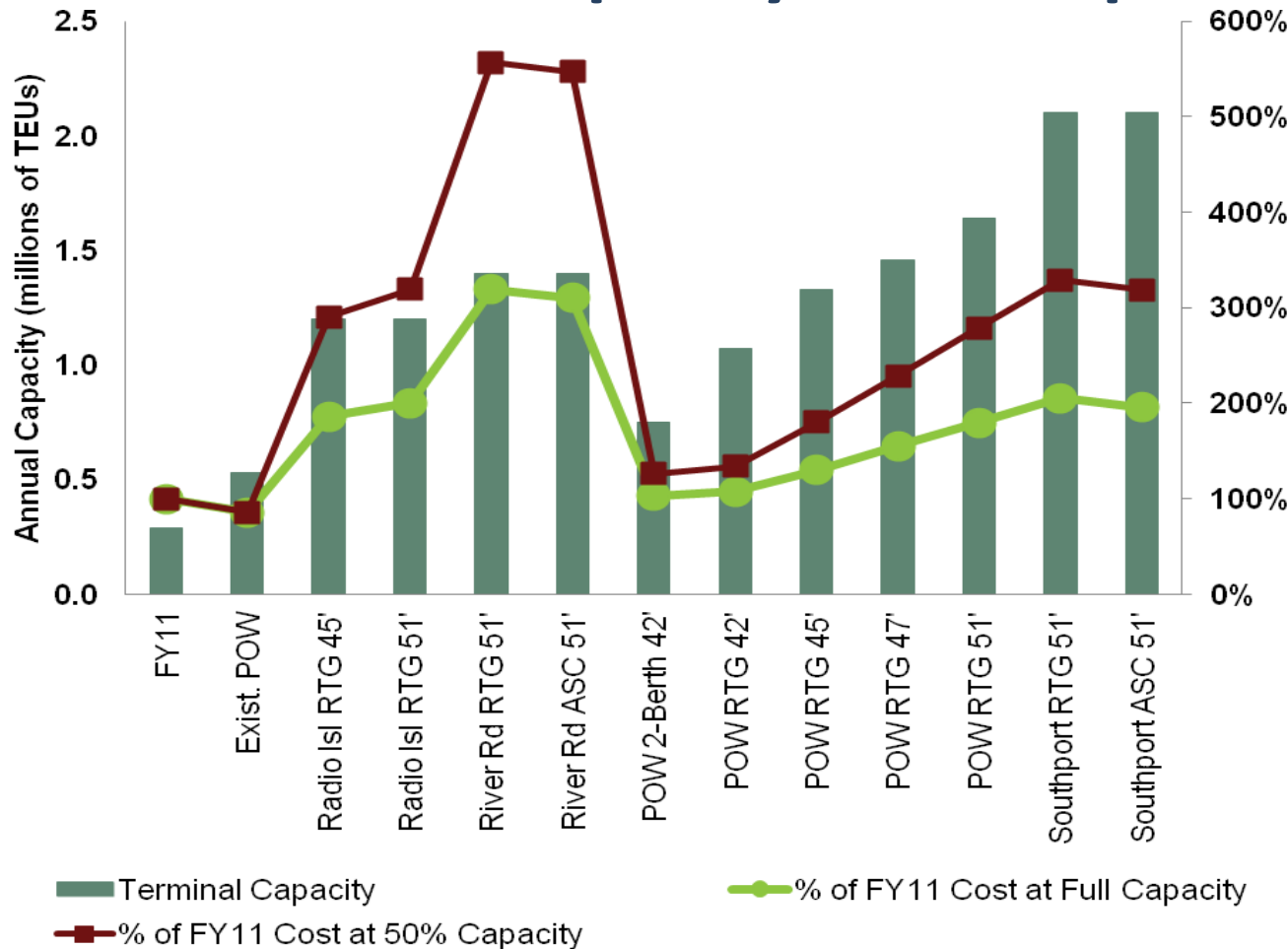


Container Terminal at Southport

- Rubber tired gantry (RTG) or automated stacking crane (ASC) operation
- 3 premium berths
- 51' water depth
- CY development normalized to 2.1 million TEU capacity for comparison purposes



Terminal Capacity vs. Cost per Move



Includes incremental capital costs for terminal development, dredging, and landside access annualized over 30 years plus annual stevedoring and terminal costs without regard to cost responsibility

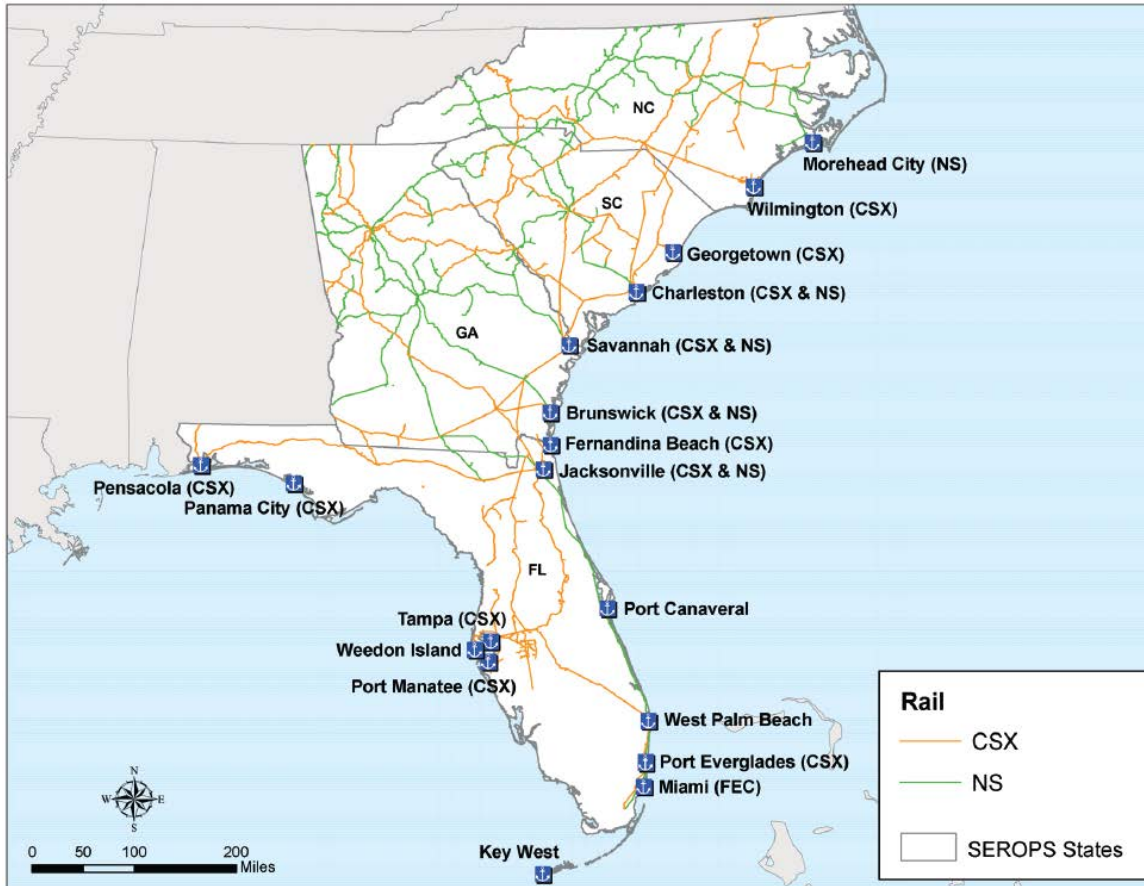
Mode of Travel by Weight, 2010

Port	NC Exports Leaving from Port			Goods Imported to NC Arriving at Port		
	Truck Only	Rail Only	Multiple Modes	Truck Only	Rail Only	Multiple Modes
North Carolina ¹	97.3%	0.3%	2.5%	94.8%	4.6%	0.7%
Norfolk	83.8%	3.2%	13.0%	90.8%	0.0%	9.2%
Charleston	83.2%	3.3%	13.5%	70.8%	14.2%	15.0%
Savannah	55.9%	2.8%	41.3%	91.9%	1.7%	6.4%

1. Note: FAF data does not distinguish between Port of Wilmington and Port of Morehead City

Source: FHWA Freight Analysis Framework (FAF) 3.1

Competitive position: rail access



Port	Rail Service
Norfolk	NS & CSX
Morehead City	NS
Wilmington	CSX
Charleston	NS & CSX
Savannah	NS & CSX

Map: I-95 Coalition

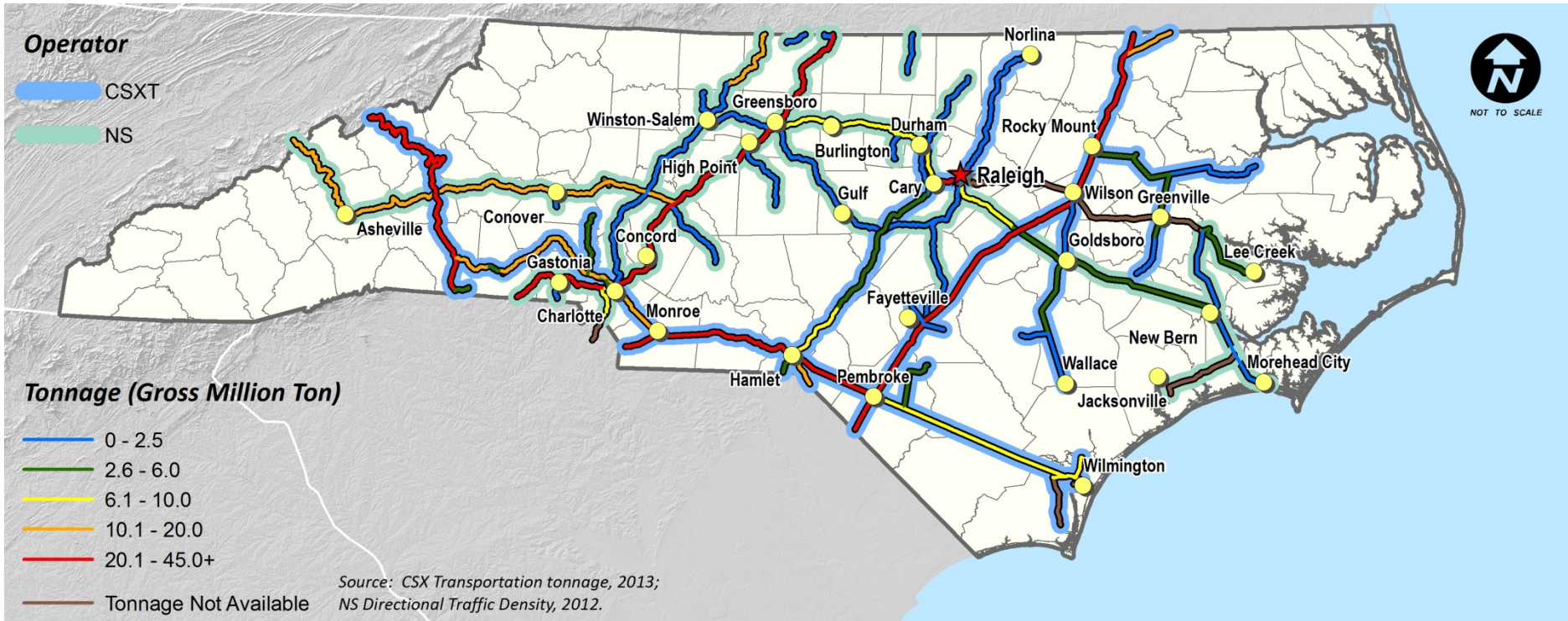
Large variation in criteria used by states and others to evaluate freight project outcomes

Criteria	OH	WI	MN	MO	VA	Scot
<i>Transportation Drivers of Economic Impact</i>						
Multi-modal & Intermodal facilities	X		X	X	X	X
Connectivity to key statewide corridors		X		X		X
Supports desired land development clusters		X		X		X
Predictability of travel times			X			X
Connectivity of access to global markets			X			
Concentration of trucks for goods movement					X	
Enhances competitiveness of shipping rates			X			
Reduces bottlenecks and size/wt impediments			X	X		
Supports economic development initiatives				X		
Supports redevelopment of old industrial areas	X					
Location in economically distressed area	X			X	X	
<i>Economic Growth Outcomes</i>						
Job creation – supports industry attraction	X	X				X
Job retention – supports existing industry	X	X				X
Public-private participation in funding	X					

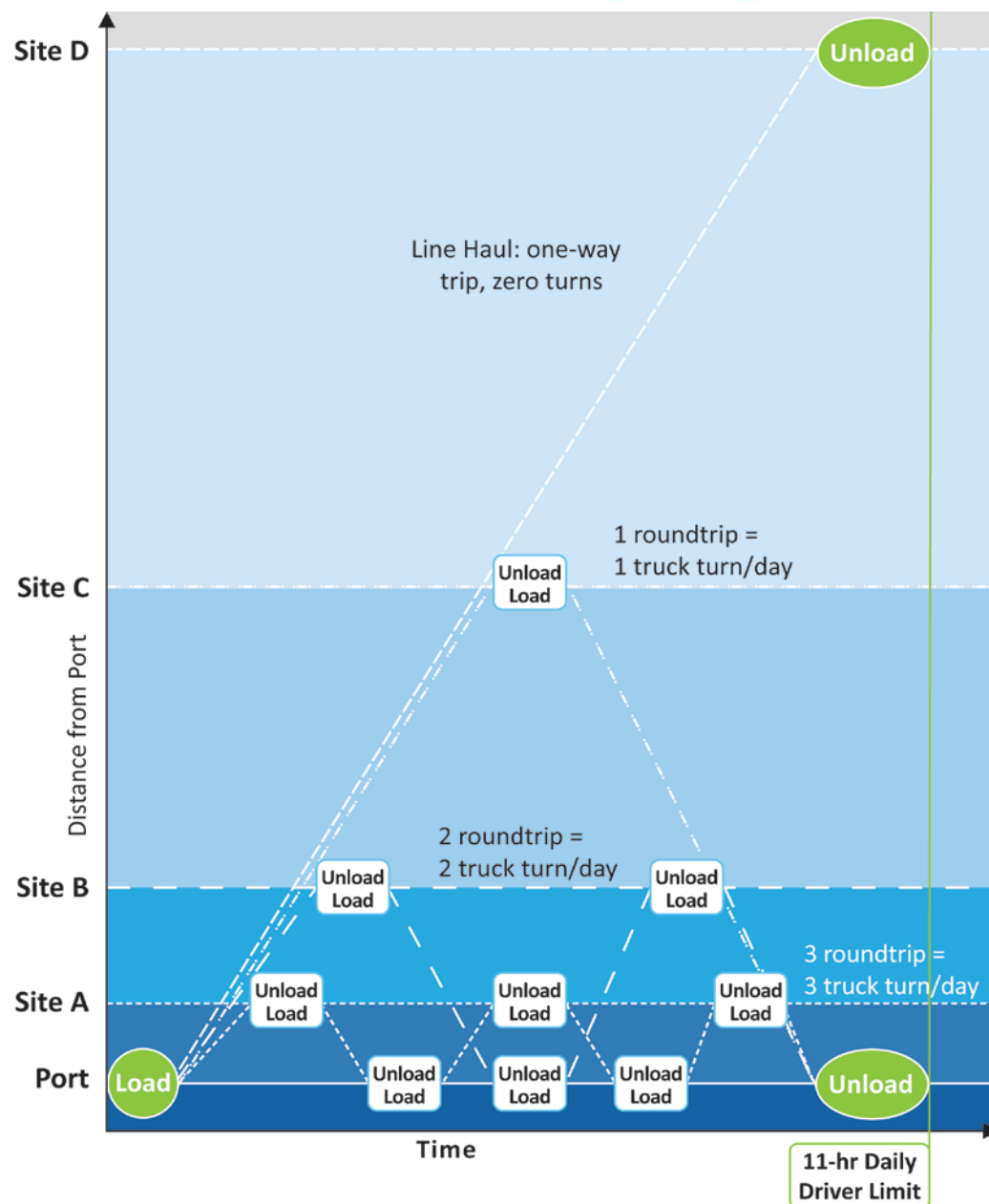
Legend:

- OH: Ohio DOT rating system
- WI: Wisconsin DOT rating system
- MN: Minnesota DOT rating system
- MO: Missouri DOT rating system
- VA: Virginia DOT rating system
- Scot: The Scottish appraisal system

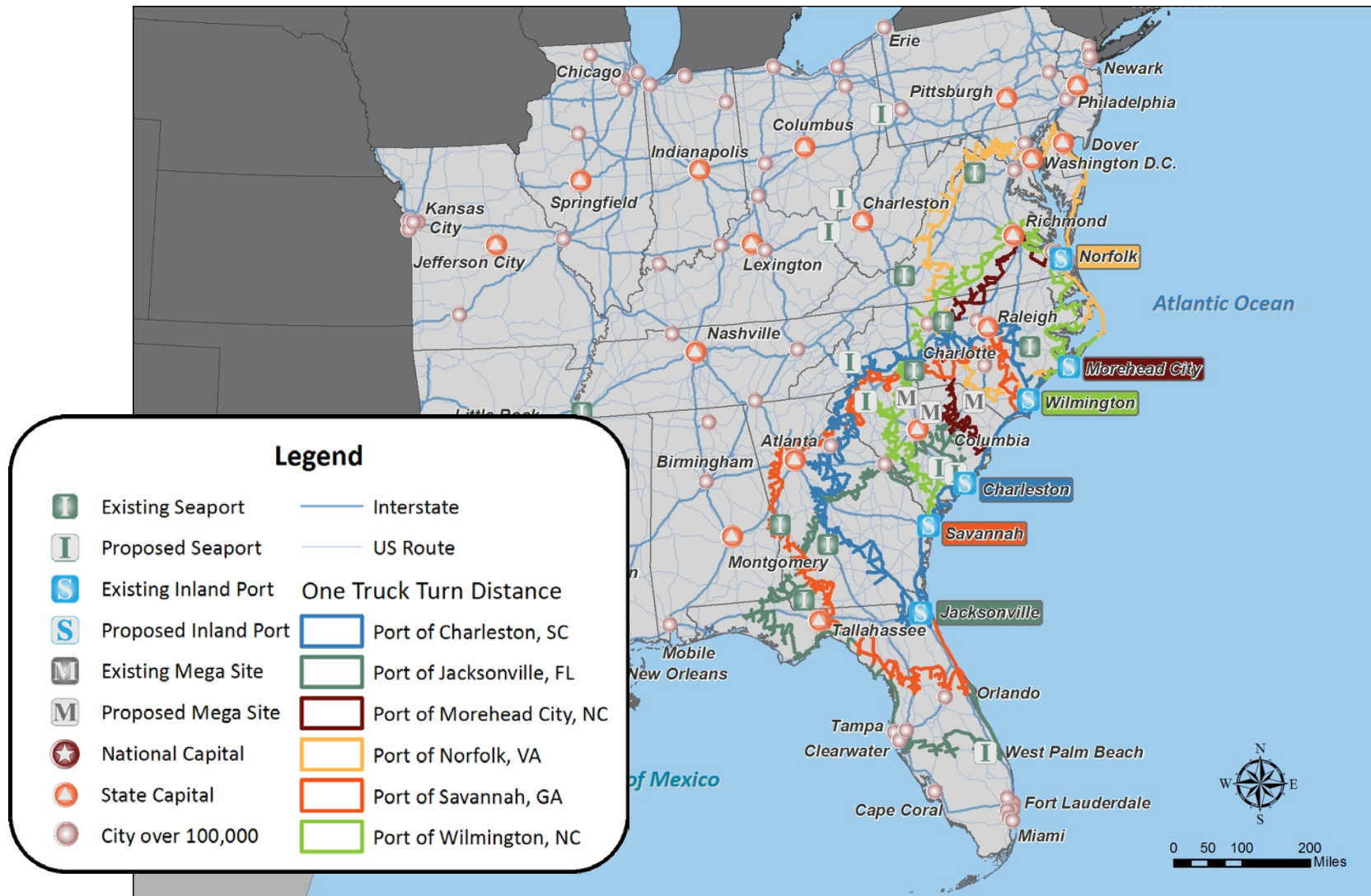
Evaluation of Freight Rail Network



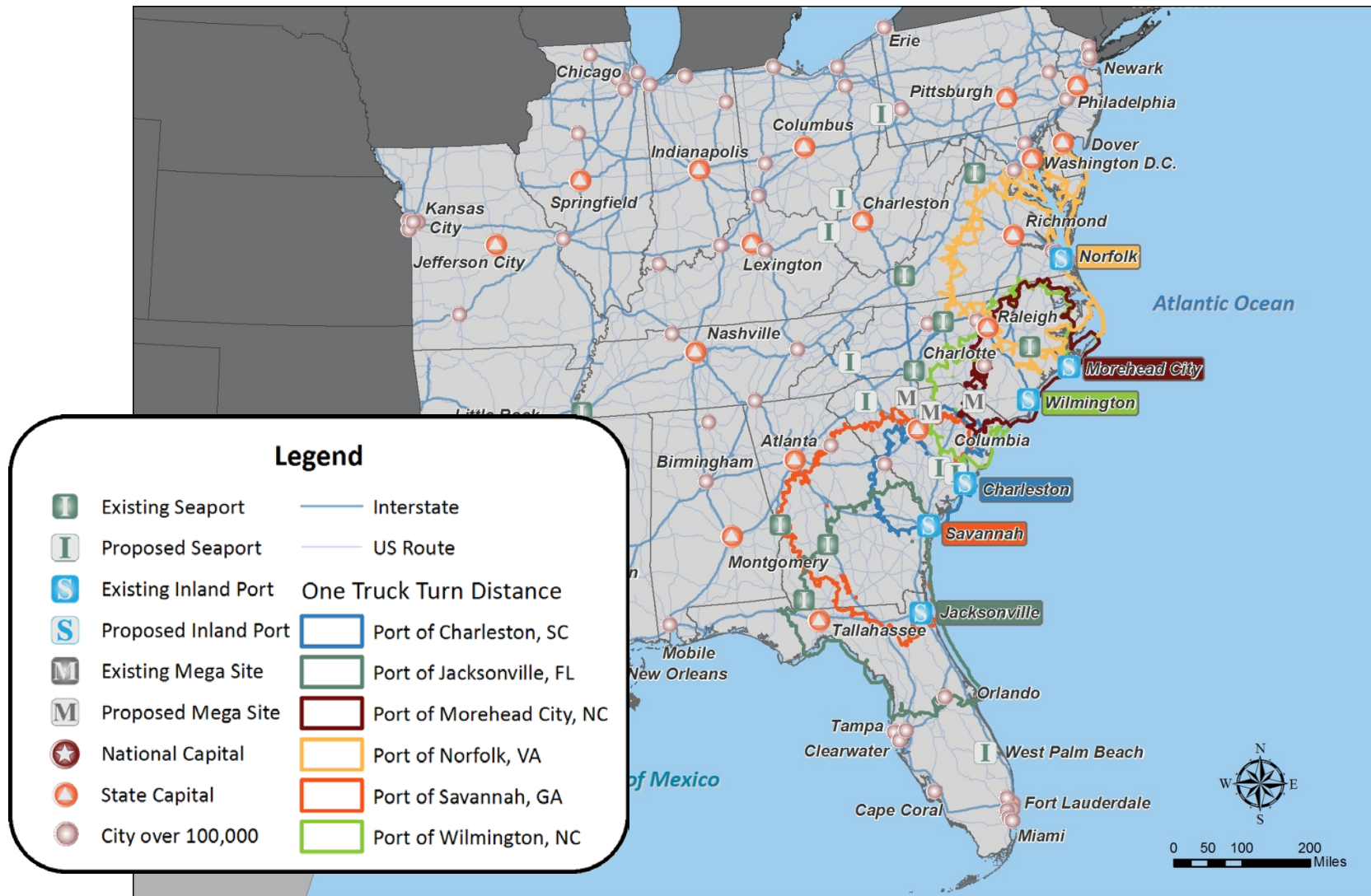
Truck Turns



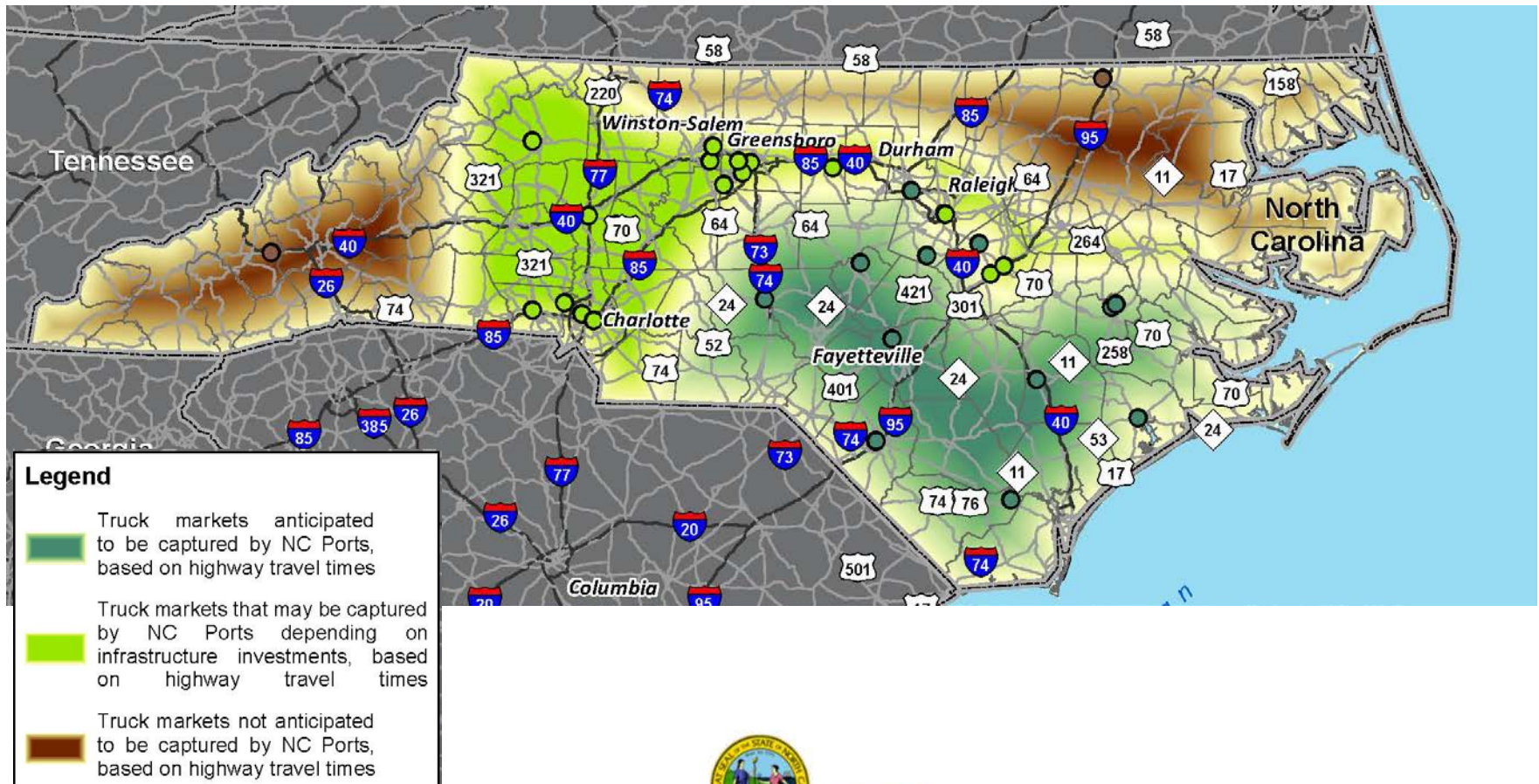
Regional Ports—Truck Turn Distance (2007)



Regional Ports—Truck Turn Distance (2040)

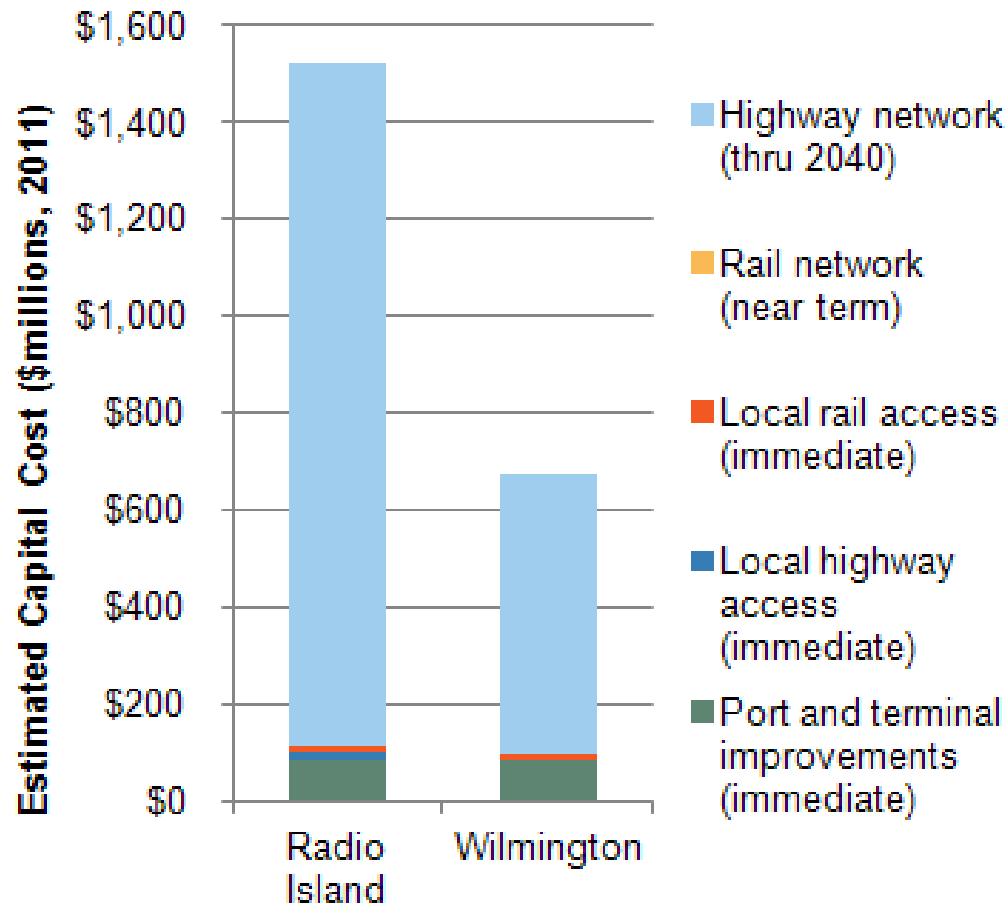


Truck-Served NC Market Areas Benefitting from Highway Investment



Grain and Soybeans

2.6 BCR*



- Requires a new bulk grain terminal , port rail connection and improved highway access
- \$ 97 million shipper benefits
- \$ 2.1 billion travel time savings
- \$ 105 million public benefits
- 21,000 construction jobs
- Supports retention and growth of food processing in NC – with 135 permanent jobs per typical plant

Grain Infrastructure

- **POW North Property**

(grain terminal shown at right)



- **Radio Island**

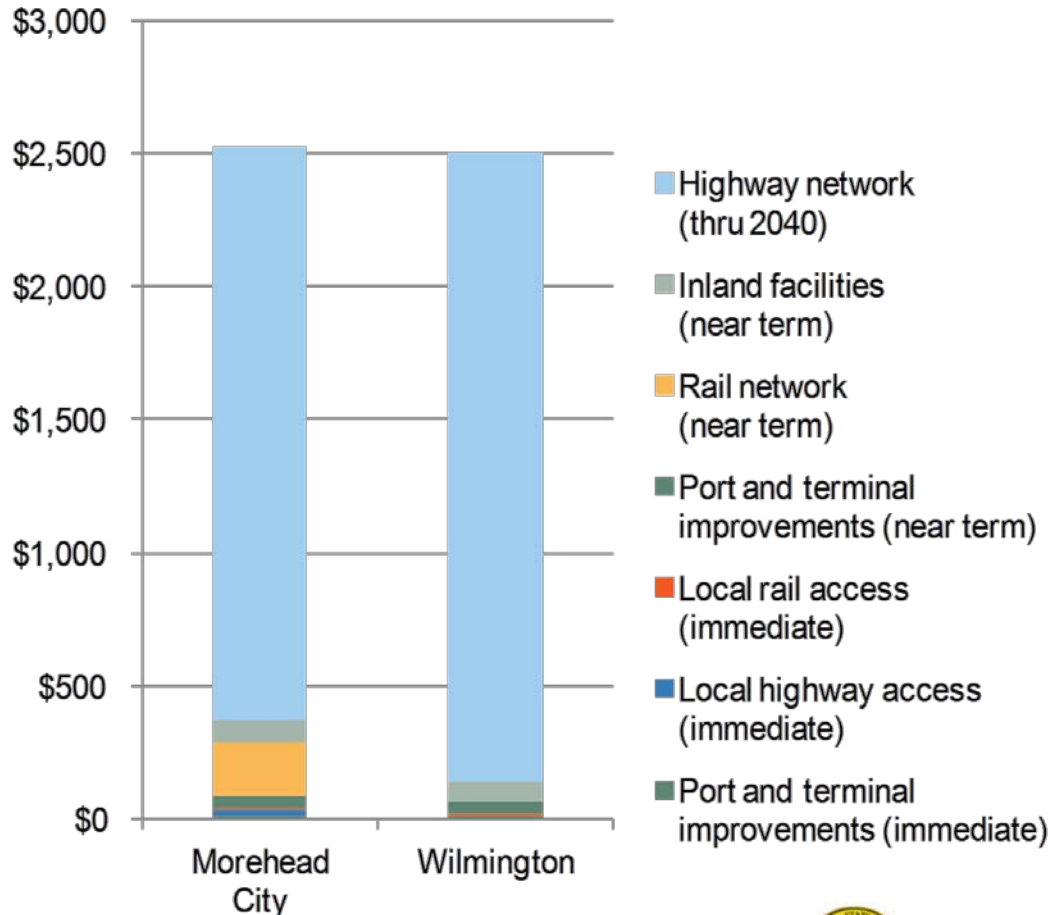
(grain terminal shown at left)



Source: AECOM

Ro/Ro and Oversize Cargo

3.4 BCR



- Requires port, road, and rail facilities that can handle large/heavy goods
- \$ 68 million shipper benefits
- \$ 4.9 billion travel time savings
- \$ 91 million other public benefits
- 35,000 construction jobs
- Typical relocation of a new equipment manufacturing plant creates 400 direct jobs

Ro/Ro and Oversize Infrastructure

- **POW North Property**

(Ro/Ro and Lo/Lo terminal shown at left)



- **Radio Island**

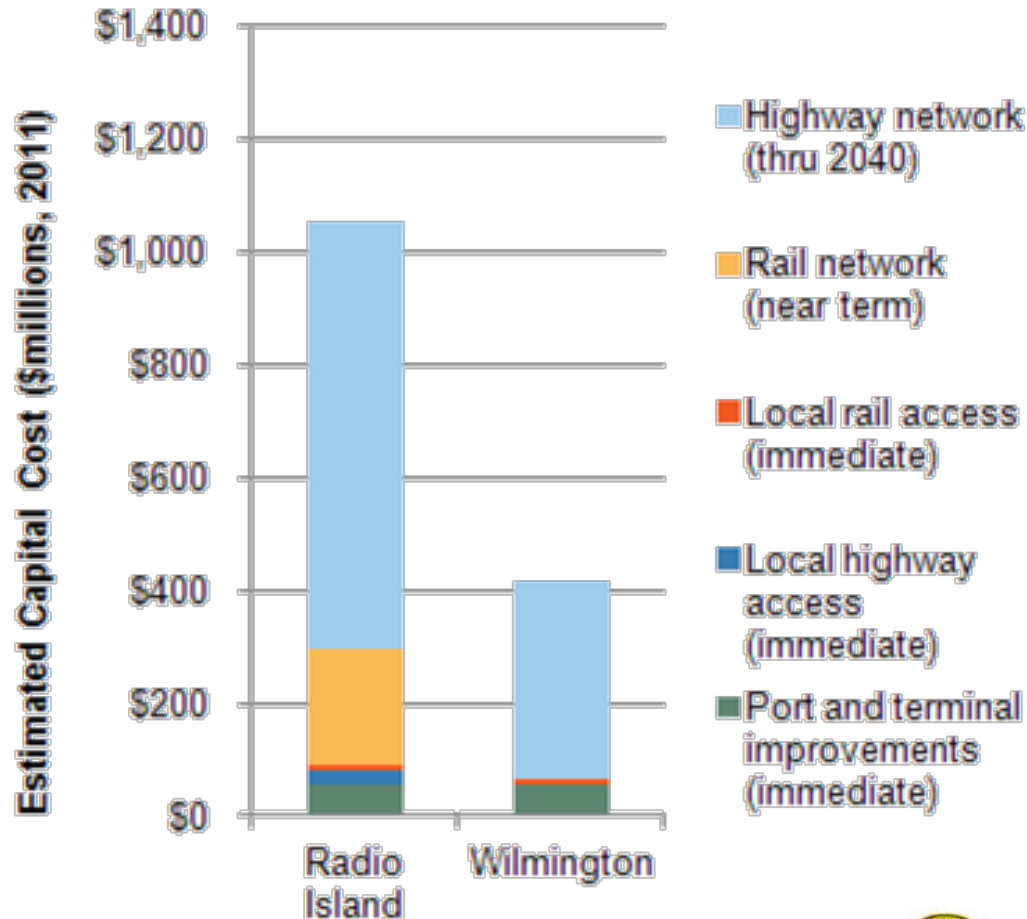
(Ro/Ro and Lo/Lo terminal shown at right)



Source: AECOM

Wood Pellets

3.1 BCR



- Requires a new bulk wood pellet terminal, port rail connection, and highway improvements
- \$ 133 million shipper benefits
- \$ 628 million travel time savings
- \$ 31 million public benefits
- 5800 construction jobs
- 132 permanent jobs for a typical wood pellet plant

Wood Pellet Infrastructure

- **POW North Property**

(wood pellet terminal shown at right)



- **Radio Island**

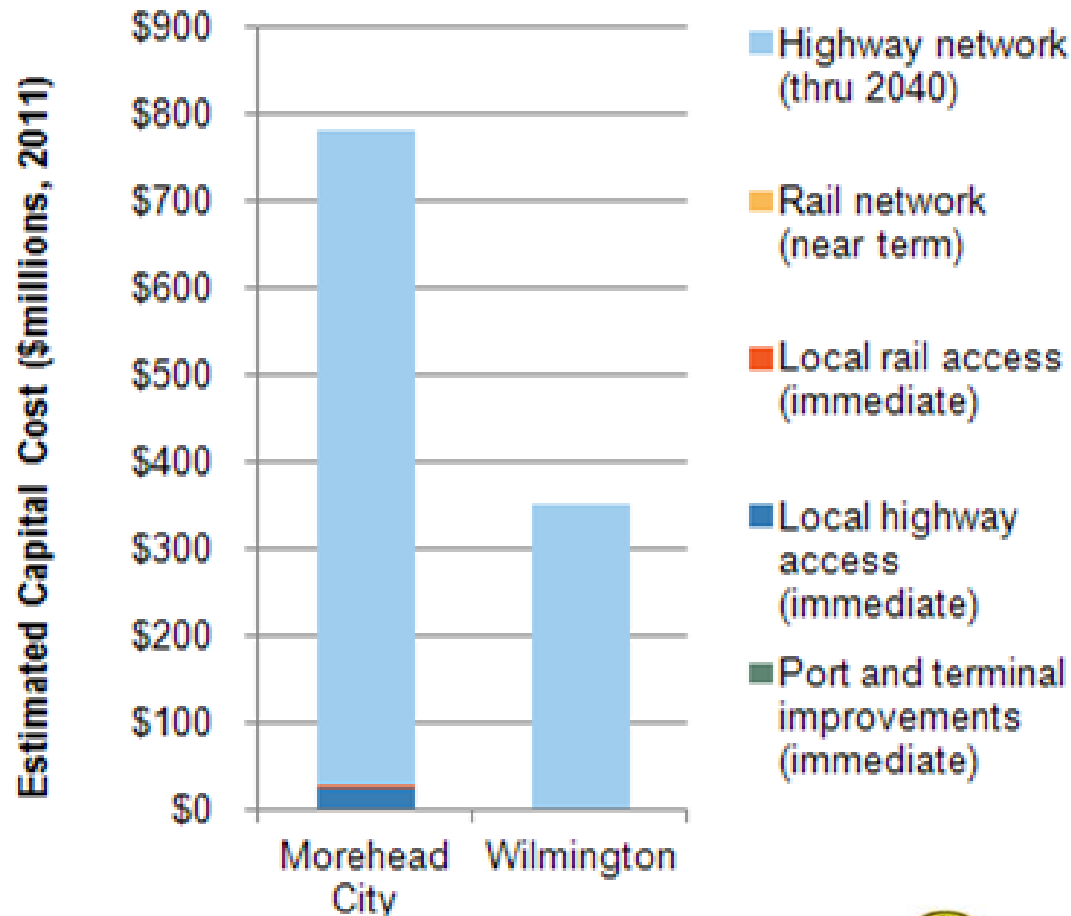
(wood pellet terminal shown at left)



Source: AECOM

Other Wood Products

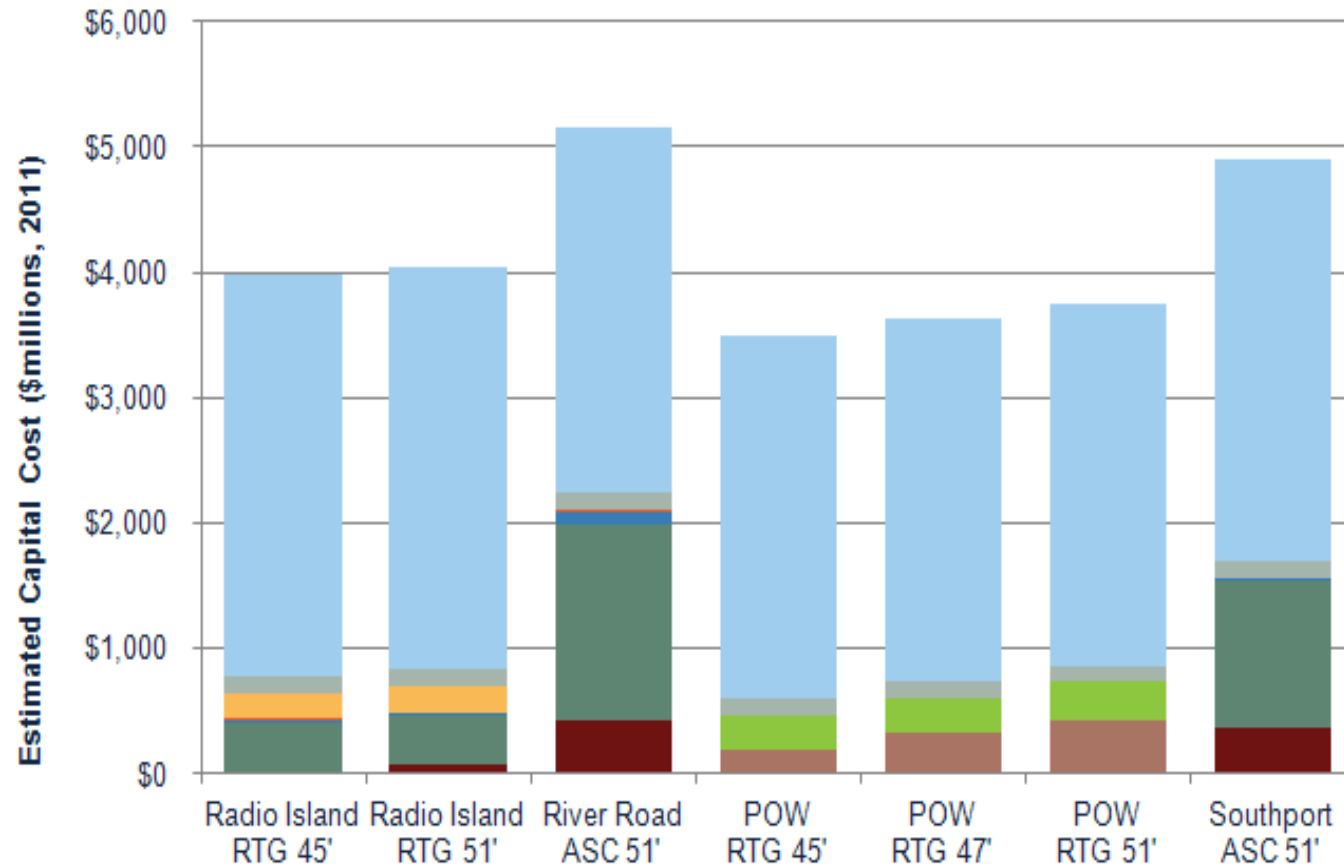
4.0 BCR



- Requires improved land access and handling facilities at NC ports
- \$ 64 million shipper benefits
- \$ 693 million travel time savings
- \$ 31 million other public benefits
- 4885 construction jobs
- Support for jobs within existing NC wood industry

Containerized Cargo

2.1 BCR



- \$ 1.4 billion shipper benefits
- \$ 3.0 billion travel time savings
- \$ 352 million other public benefits
- 52,000 construction jobs
- 175 permanent jobs at a typical distribution center—2700 permanent jobs statewide

Refrigerated Cargo

6.7 BCR



- Requires \$24 million investment in cold storage facilities and plug-ins for refrigerated containers at or near the port
- \$ 136 million in shipper benefits
- 1,000 permanent jobs statewide

<http://www.ncdot.gov/business/committees/statewidelogistics/MaritimeLibrary.html>

<https://connect.ncdot.gov/resources/Pages/Rail-Division-Resources.aspx>

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