Port Modernization and Return on Investments
Based on the NC Maritime Strategy (AECOM) and Eastern Infrastructure Improvement Study (AECOM and PB)

Eddie McFalls, PE – AECOM – Transportation Planning
March 28, 2016
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)
  – NCRR 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

Source: AECOM from NCSPA GIS
# Port of Wilmington Land Use Plan

## Table

<table>
<thead>
<tr>
<th></th>
<th>Chemicals</th>
<th>Grains (Animal Feed)</th>
<th>Cement Products (Coils)</th>
<th>Machinery</th>
<th>Gen Merch / Misc</th>
<th>Lumber &amp; Forest Products</th>
<th>Fertilizer</th>
<th>Woodpulp</th>
<th>Woodchips</th>
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<tr>
<td>Berth 6</td>
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<td></td>
<td>X</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Berth 7</td>
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<td>X</td>
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</tbody>
</table>

Source: AECOM from NCSPA GIS
## Market Scenario Framework

<table>
<thead>
<tr>
<th>Upper Bound</th>
<th>Conservative</th>
<th>Lower Bound (“Do Nothing”)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance Market Position</td>
<td>Maintain Market Position</td>
<td>Declining Market Position</td>
</tr>
</tbody>
</table>

### Growth Outcome
- Market share capture or decline
- New markets

### Necessary Conditions
- Vessel calls and sizes
- Port capacity and equipment
- Land and water access
- Industry growth

### Risks and Opportunities
- 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
- Cooperative agreements
- Niche markets
- Targeted infrastructure investments
- Leverage strength in bulk and breakbulk
Grain and Soybeans

- 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
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.

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

- 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

- 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.

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

- 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

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

- 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

**Annual Volume**

Containers in TEUs

- Container Exports
- Container Imports

**Source:** AECOM, from IHS Global Insight projected growth and PIERS historical data
<table>
<thead>
<tr>
<th>Designation</th>
<th>TEU Capacity</th>
<th>Year</th>
<th>Length</th>
<th>Beam</th>
<th>Draft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panamax</td>
<td>3,000-5,000</td>
<td>1980</td>
<td>965 ft</td>
<td>106 ft</td>
<td>39.5 ft</td>
</tr>
<tr>
<td>Post-Panamax</td>
<td>5,000-6,000</td>
<td>1992</td>
<td>1,043 ft</td>
<td>128-138 ft</td>
<td>49 ft</td>
</tr>
<tr>
<td>5th &amp; 6th generation</td>
<td>5,000-8,700</td>
<td>1997</td>
<td>1,148 ft</td>
<td>128-138 ft</td>
<td>49 ft</td>
</tr>
<tr>
<td>Neo Panamax</td>
<td>10,000-13,000</td>
<td>2009</td>
<td>1,200 ft</td>
<td>160 ft</td>
<td>49.9 ft</td>
</tr>
</tbody>
</table>

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
- Offers ocean access
- Provides adequate protection from wind and wave action

### Land Suitability
- 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
- 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
- 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

Site 1
Pamlico Sound - Parch Corn Bay

Site 2
Pamlico Sound - Bonner Bay

Site 3
Beaufort Inlet - Radio Island

Site 4
Cape Fear River - River Road Southeast

Site 5
Cape Fear River - POW

Site 6
Cape Fear River - Southport

Atlantic Ocean
Annualized Dredging Costs for Alternative Container Port Sites

Pamlico County sites (Sites 1 and 2) would require significantly greater capital investment for channel dredging

Source: AECOM
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

Source: AECOM
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

Source: AECOM
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.

Source: AECOM
## Mode of Travel by Weight, 2010

<table>
<thead>
<tr>
<th>Port</th>
<th>NC Exports Leaving from Port</th>
<th>Goods Imported to NC Arriving at Port</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Truck Only</td>
<td>Rail Only</td>
</tr>
<tr>
<td>North Carolina¹</td>
<td>97.3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Norfolk</td>
<td>83.8%</td>
<td>3.2%</td>
</tr>
<tr>
<td>Charleston</td>
<td>83.2%</td>
<td>3.3%</td>
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<tr>
<td>Savannah</td>
<td>55.9%</td>
<td>2.8%</td>
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</table>

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

<table>
<thead>
<tr>
<th>Port</th>
<th>Rail Service</th>
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<tbody>
<tr>
<td>Norfolk</td>
<td>NS &amp; CSX</td>
</tr>
<tr>
<td>Morehead City</td>
<td>NS</td>
</tr>
<tr>
<td>Wilmington</td>
<td>CSX</td>
</tr>
<tr>
<td>Charleston</td>
<td>NS &amp; CSX</td>
</tr>
<tr>
<td>Savannah</td>
<td>NS &amp; CSX</td>
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</table>

Map: I-95 Coalition
Large variation in criteria used by states and others to evaluate freight project outcomes

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

**Source:** EDRG Report prepared for Port of Portland and Portland Business Alliance
Truck Turns

- Line Haul: one-way trip, zero turns
- 1 roundtrip = 1 truck turn/day
- 2 roundtrips = 2 truck turn/day
- 3 roundtrips = 3 truck turn/day

Distance from Port

Site D

Unload

Site C

Unload Load

Site B

Unload Load

Site A

Unload Load

Port

Load

Time

11-hr Daily Driver Limit
Regional Ports—Truck Turn Distance (2040)
Truck-Served NC Market Areas Benefitting from Highway Investment

Legend:
- Truck markets anticipated to be captured by NC Ports, based on highway travel times
- Truck markets that may be captured by NC Ports depending on infrastructure investments, based on highway travel times
- Truck markets not anticipated to be captured by NC Ports, based on highway travel times
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

* Benefit-Cost Ratio based on 30-year benefits discounted to 2011 at 3%
Grain Infrastructure

- **POW North Property**  
  (grain terminal shown at right)

- **Radio Island**  
  (grain terminal shown at left)

Source: AECOM
Ro/Ro and Oversize Cargo

- 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

- 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

- $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—2,700 permanent jobs statewide

2.1 BCR
Refrigerated Cargo

- 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

6.7 BCR
http://www.ncdot.gov/business/committees/statewidelogistics/MaritimeLibrary.html

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

Eddie McFalls, AECOM