




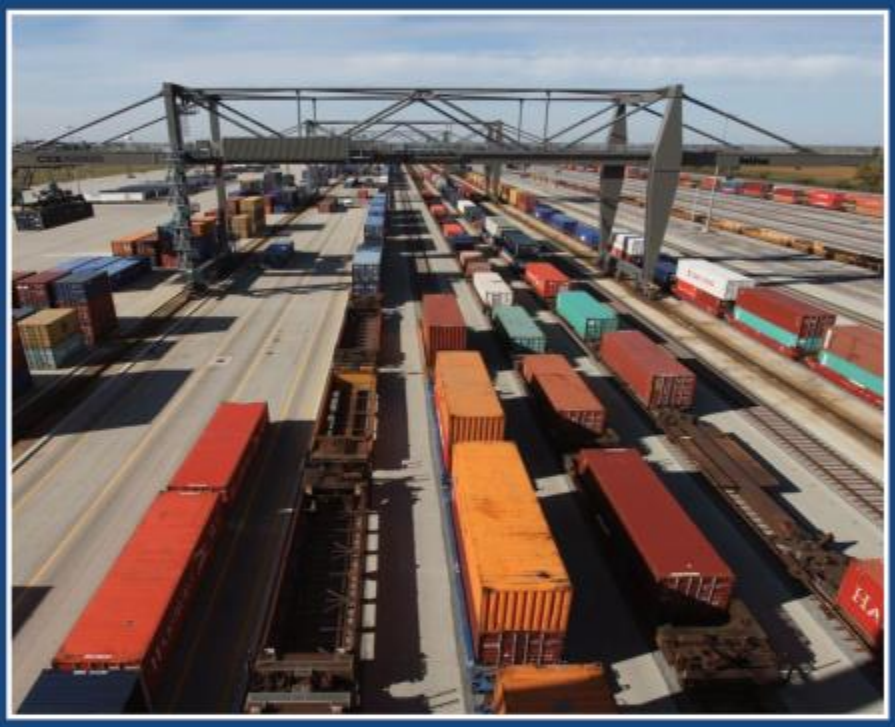

Evaluation of a Proposed Intermodal Terminal (CCX) in Rocky Mount

Prepared for

NC DOT RAIL

Prepared by

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Foreword

This study was conducted to identify the benefits specific to an intermodal facility located in Rocky Mount located on CSX's north-south mainline, the A-Line. The proposed facility would serve Raleigh and the Eastern North Carolina freight market as well as act as a hub for the railroad's southeast and mid-Atlantic intermodal operations. The project will deliver Governor McCrory's 25-Year Vision to provide intermodal service in eastern North Carolina and rail intermodal service to the Port of Wilmington opening up new markets for the state's industries and the Port.

The following summarizes the contribution that the terminal will make:

Three-Year Construction Impact

PB Estimated Impacts – Rocky Mount	Direct	Indirect	Induced	Total
Employment (job-years)	379	108	159	646
Earnings (millions of 2015$)	$ 19.2	$ 6.0	$ 6.6	$ 31.8
Output (millions of 2015 $)	$ 51.2	$ 18.6	$ 20.0	$ 90.0

Terminal Operation Employment

First Year of Operation	Direct	Indirect	Induced	Total
Employment (Annual Average)	109	93	104	306
Earnings (millions of 2015$)	$10.97	$5.48	$4.33	$20.78
Output (millions of 2015$)	$33.92	$14.96	$13.07	$61.95
Fifteenth Year of Operation	**Direct**	**Indirect**	**Induced**	**Total**
Employment (Annual Average)	236	187	208	632
Earnings (millions of 2015$)	$22. 1	$11. 0	$8. 7	$41. 8
Output (millions of 2015$)	$68. 4	$30. 1	$26. 3	$124. 7

Economic Development Impact

Fifth Year of Operation	Direct	Indirect	Induced	Total
Employment (Annual Average)	12,805	4,455	4,898	22,157
Earnings (millions of 2015$)	$594	$186	$204	$984
Output (millions of 2015$)	$1,277	$564	$618	$2,459
Fifteenth Year of Operation	**Direct**	**Indirect**	**Induced**	**Total**
Employment (Annual Average)	16,075	3,562	4,100	23,737
Earnings (millions of 2015$)	$504	$149	$171	$824
Output (millions of 2015$)	$1,021	$451	$517	$1,990

Public Benefits Over 30 Years (Millions of 2015$)

	Nationwide	North Carolina
Pavement Maintenance Savings	$194.2	$15.9
Shipper Savings	$809.9	$230.8
Congestion Savings	$237.4	$19.4
Emission Savings	$287.7	$23.5
Accident Savings	$247.1	$20.2
Total Benefits	**$1,776.2**	**$310.1**

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Chapter 1: Background

In response to the growth of intermodal transportation, CSX continues to examine opportunities to expand its network of intermodal terminals. North Carolina is one of several states in the Southeast being considered as a location for a terminal. A North Carolina facility (CCX) would be designed to serve two purposes. One purpose would be to provide accessible intermodal service for eastern and central North Carolina, driving economic growth in the region. An example of such a facility is the recently opened CSX Winter Haven intermodal facility, which was announced, in the following news release:

> *"State-of-the-Art Terminal Begins Operations in Winter Haven"*
>
> *WINTER HAVEN, Fla. – April 2, 2014 – Evansville Western Railway, an affiliate of CSX, today announced the start of operations at the state-of-the-art intermodal terminal located just off State Road 60. Known as the Central Florida Intermodal Logistics Center (ILC), this facility serves as a centralized hub for transportation, logistics, and distribution serving Orlando, Tampa and South Florida.*
>
> *The 318-acre intermodal terminal is surrounded by 930 acres that is planned for development of up to 7.9 million square feet of warehouse distribution centers, light industrial and office facilities. The terminal features five 3,000-foot loading tracks and two 10,000-foot arrival and departure tracks. It's estimated the terminal will process up to 300,000 containers a year.*
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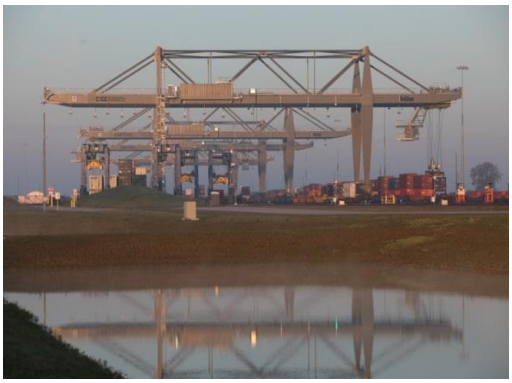
> 
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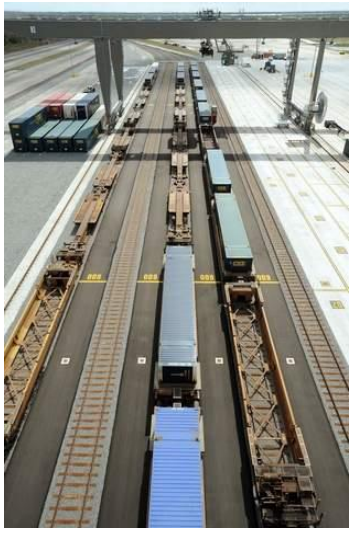
> *"The Central Florida ILC will add yet another transportation and logistics capability in a state that's already known for excellent ports, great highways, and extensive railroad connectivity," said Clarence Gooden, Executive Vice President and Chief Commercial Officer at CSX. "The terminal will provide an anchor for economic development in the region and position Florida for future growth while reducing congestion on the highways."*



While every market is different the NC facility is expected to process 240,000 to 505,000 containers per year over the 20 year planning horizon with 60% of those container attributed to the local market.

The second function of the North Carolina terminal would be to serve as a transfer facility for containers moving between other markets on the CSX network. In 2011, CSX initiated the hub and spoke business model for segments of its intermodal business centered on a new terminal in Northwest Ohio. Through the use of high productivity cranes, containers are quickly transferred between inbound and outbound trains making transshipments competitive with motor carriers. The advantage of the hub and spoke model is that, through consolidation, it enables intermodal service to markets with inadequate traffic volume to support direct services.

The transfer function would also directly benefit the intermodal traffic originated by North Carolina's shippers or from the state's ports. With access to the traffic lanes served by the hub, local shippers will benefit from a more expansive market reach.

An example of a terminal designed as a hub for container transfers is the CSX Northwest Ohio facility, which exceeded its capacity within the first year. Because its location is not in proximity to a local market, economic development was not expected but has occurred both near the terminal and in larger markets in Ohio.

To identify the benefits of a North Carolina facility, CSX contracted HDR to prepare a proprietary study titled *CSX's Intermodal Facility in Eastern North Carolina* (dated November 20, 2014). The proprietary CSX / HDR study (HDR Study) was originally based on prospective sites in Johnston County and consisted of the following components:

- Market assessment - The market assessment estimated the number and mileage of truck trips that would be diverted to rail as a result of the facility's construction. The primary data source used to estimate truck trips was the IHS Global Insight TRANSEARCH database a freight flow planning tool that helps identify freight origins, destinations, and transportation modes. The database is widely used and accepted an industry standard. The primary method used to identify diverted truck trips was to apply percentage diversion rates to truck flows between origin/destination pairs depending upon length of haul and the presence or absence of another intermodal solution. Presumably, freight was further defined by truck type, since usually dry van cargoes are more divertible to intermodal rail service than bulk shipments.

- A benefit/cost analysis (BCA) - This analysis compared the relative costs under a "build" and a "no build" scenario. Under the no build scenario, freight would be carried by truck, whereas under the build scenario, freight would be carried by truck/rail intermodal. The resulting reduction in costs between the build and no build scenarios are the benefits.

- An economic impact analysis - This analysis estimated changes to the North Carolina economy that would result from the project.

The HDR Study indicated the following:

Potential outcomes for North Carolina

- Efficient, state-of-the art facility creates density, connects midsize markets, drives growth
- 60 percent of projected volume will serve the eastern North Carolina market
- Increased opportunity for growth of logistics and distribution clusters in the region
- Direct intermodal rail access and new service offerings, including NY/NJ, the Midwest, West Coast and Southeast markets, including Florida
- Creates greater potential intermodal access for the Port of Wilmington
- Reduces through truck traffic on I-95 and I-85

Better connects people and economic centers

- Saves nearly $240 million in logistics costs
- Saves $32 million in congestion costs
- Greater potential access for state ports
- Cost-competitive supply chain networks underpin industry growth

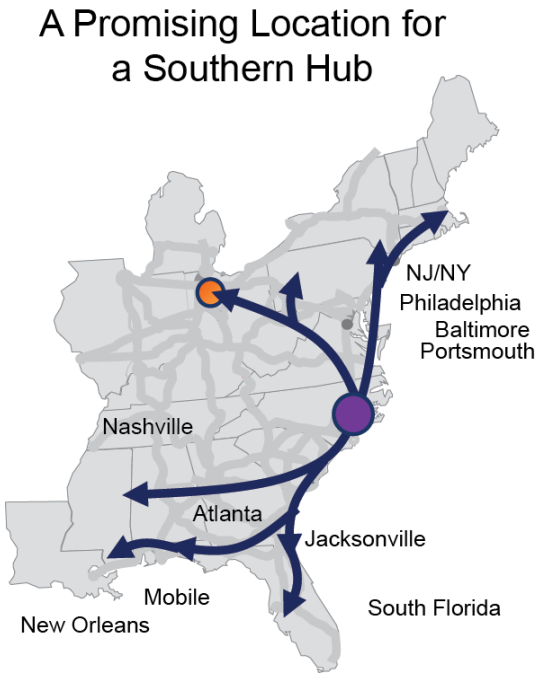
Expand industry and jobs

- Operation of the intermodal facility will generate over 860 permanent jobs in NC in 2018
- Over 40 percent of these jobs are anticipated in the transportation/warehousing industry as the facility will attract new warehousing and distribution tenants
- Over the long-term, the project will create over 1,500 direct and indirect jobs in NC by 2035

Improve quality of life

- Improves air quality with nearly 1.6 million tons of CO2 emissions saved
- Over $35 million in safety benefits

The original HDR study centered on Johnston County as a location. NCDOT determined that it would be prudent to commission an independent assessment of the facility, which was done for the initial Johnston County location as Project Scorpion. Subsequent to the completion of the initial study, CSX explored other potential sites with an interest in Rocky Mount, NC. Rocky Mount is located in Edgecombe and Nash Counties, approximately 58 miles (1 hour) east of Raleigh. The city straddles the county line, which follows the CSX transportation railroad tracks through the center of the city. According to the US Census Bureau, the city has a total area of 10.5 square miles and has a population of approximately 61,400. The potential site for the CCX facility site is located just east of the CSX corridor, just about centered vertically on the at-grade crossing at College Road. The Rocky Mount location, located on the CSX main line (A Line) will serve the greater Raleigh market and eastern North Carolina as well as act as a hub.



This document examines the benefits of a Rocky Mount terminal and how it can help deliver Governor McCrory's 25-Year Vision to develop intermodal train service at the Port of Wilmington and develop intermodal facilities along the I-95 corridor to support freight shipping[1]. The report includes the following:

- Description of the regional economy and need for the facility
- Analysis of the market for an Eastern North Carolina facility and development of projections of container volumes

[1] http://www.ncdot.gov/ncvision25/

- Analysis of benefits and costs, economic impact
- Terminal related land use alternatives and conceptual plan
- Identification of roadway access requirements
- Identification of funding alternatives

Minor changes in facility footprint, line of road improvements, design details, and implementation schedules may occur. However, these changes would not materially affect the findings of the evaluation presented in this document. Present values contained in this document are presented in 2015 dollars to be consistent with prior analyses conducted by HDR.

If a determination is made to pursue state funding for the facility, all applicable state and federal laws will be followed, including, but not limited to, the North Carolina Environmental Policy Act. [2]

[2] North Carolina General Statute (G.S.) 113A 1-13.

Chapter 2: The Eastern North Carolina Economy and Intermodal Transportation

Accessible intermodal transportation in eastern North Carolina can provide economic advantages to the state in four ways:

- Businesses and other segments of the economy will be able to improve the transportation and logistics of shipping and receiving goods, reducing costs, making industries more productive, and attracting and supporting growth.
- The development of a transportation hub will lead to an expansion of the state's distribution and logistics services, boosting jobs and economic development.
- Consumers will benefit from less expensive goods to the extent that transportation cost savings are passed on to them.
- The development of improved rail services means lower cost rail transportation replaces trucking, which reduces truck traffic and results in other environmental benefits.

The principal direct advantage of CCX to North Carolina industries will be greater market access due to improved and less expensive freight transportation for goods shipped, both outbound and inbound. Often this will involve replacing transportation of goods moved by truck with intermodal transportation by truck and rail.

Sections that follow examine these potential benefits further, from an industry and product perspective, using data from the US Commodity flow survey, US Census Bureau County Business Patterns statistics, and US Census Bureau international trade data. These sections cover:

- Wholesale distribution
- Manufacturing industries

Wholesale Distribution

The attraction of jobs and economic growth in distribution, manufacturing, and associated global trade is driven by well-established site selection criteria. [3] Chief among these criteria are access to markets and suppliers, availability of multimodal transportation, labor and workforce characteristics, and the total cost environment. Rail intermodal services are an essential component of the multimodal portfolio, not only because they expand transportation capacity and competitive alternatives, but also because they improve access to North American and global markets and reduce costs – thus meeting three of the top four selection criteria. A major manufacturer recently reported that the availability of reduced financing costs for its new facilities because of the value rail adds to operational locations. [4] Intermodal rail options moreover have become increasingly important as driver shortages and other factors are constraining trucking capacity. Because the same dynamics that attract industry also help to retain it and

[3] See for example NCFRP Report 13 "Freight Facility Site Selection"
[4] WSP | Parsons Brinckerhoff interview with confidential client, 2014

facilitate its growth, the introduction of new rail intermodal services can be an economic catalyst for a region.

Distribution in the Southeast has long been dominated by metropolitan Atlanta. Its large population at the crossroads of major highways, rail lines and air routes and its efficient links to the container port of Savannah has made it a natural location for regional distribution centers serving multiple states. Motor carriers, railroads and airlines have established hubs in Atlanta because of these network advantages and the business volume that has grown up around them, creating a positive feedback loop whereby hubs attract industry and industry supplies traffic to hubs. The distribution profile of the Southeast is summarized in Table 1, which displays wholesale and warehouse employment for the seven top metropolitan markets serving the region in 2007 and 2012. The figures are focused on containerized products – generally, consumer goods – and include market shares for each of the seven metro areas compared to the total of the group.

Table 1: Southeastern US Logistics Trends

Top Southeast Distribution Markets: Change in Distribution Employment 2007-2012 Containerizable Goods - Source: County Business Patterns, US Dept. of Census						
MSA Metro Market	Employment		Share of Top Metro's		2007-2012	
	2007	2012	2007	2012	Absolute	Percent
FL Miami-Fort Lauderdale-Port St. Lucie	112,569	109,087	25%	26%	-3,482	-3.1%
FL Orlando-Deltona-Daytona Beach	38,324	31,500	8%	7%	-6,824	-17.8%
GA Atlanta-Athens-Clarke County-Sandy Springs	146,910	137,503	32%	32%	-9,407	-6.4%
NC Charlotte-Concord (NC Part)	55,855	48,878	12%	11%	-6,977	-12.5%
NC Greensboro-Winston-Salem-High Point	31,981	29,646	7%	7%	-2,335	-7.3%
NC Raleigh-Durham-Chapel Hill	32,022	33,005	7%	8%	983	3.1%
TN Nashville-Davidson-Murfreesboro	39,416	36,322	9%	9%	-3,094	-7.8%
Sum of Top Metro Markets	457,077	425,941	100%	100%	-31,136	-6.8%
Subtotal: 3 NC Metro's	119,858	111,529	26%	26%	-8,329	-6.9%
Raleigh Share of 3 NC	27%	30%				
Charlotte Share of 3 NC	47%	44%				
Greensboro Share of 3 NC	27%	27%				
Comparision: 3 NC Metro's as % of Atlanta	82%	81%				

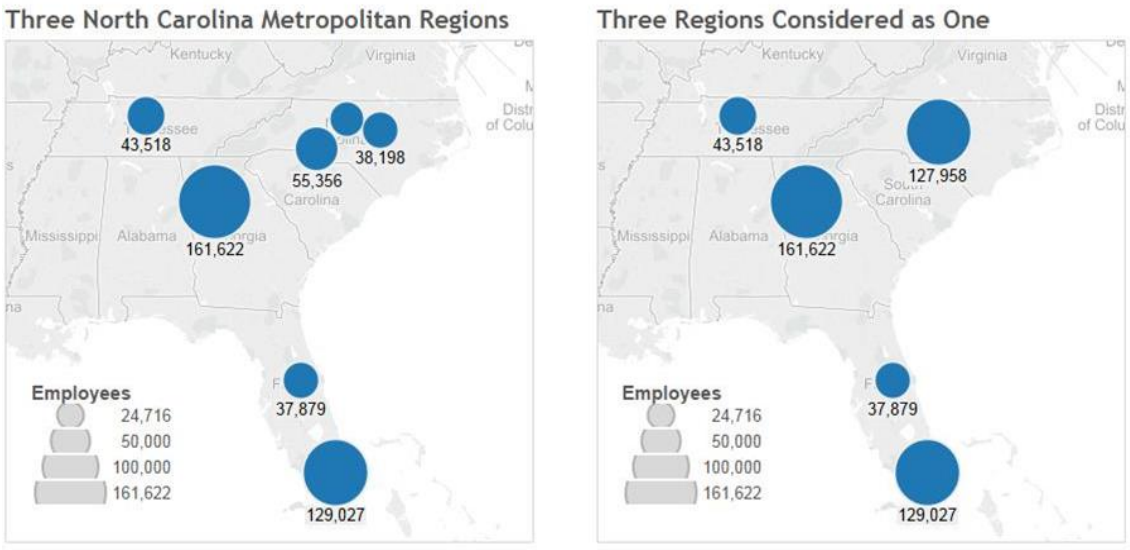
Several points are apparent from this table:

- Atlanta had the top position in both years, and retained market share despite a drop in employment.
- Miami had the second position, yet is a special case: with a very large population at the far end of a four-hundred-mile peninsula, its distribution services tend to be localized in South Florida.
- Almost all metro areas suffered a decline in employment from the pre-recession peak of 2007 with the exception of Raleigh, which produced a small increase. (Distribution traffic volumes did not necessarily suffer a commensurate decline because of possible productivity gains from

automation and other sources, but relative employment should be a reasonable indicator of relative market position.[5])

- The three metropolitan markets of the North Carolina Piedmont are individually smaller, yet all of them made the Southeast top seven, and in combination, they form a distribution corridor that is four-fifths the size of market leader Atlanta, as the maps below illustrate.
- Within the North Carolina Piedmont, Charlotte is the largest location, yet it has lost share to Raleigh. Raleigh's increase is aided by electronic products distribution, but it is also a fast growing part of the state in its own right, and more distant from the orbit of Atlanta.

High population growth in the North Carolina Piedmont should continue to stimulate distribution activity as the growth fosters a large local market. To step up to the status of a major regional logistics center, however, requires expanded intermodal services and associated global connections similar to those that Atlanta offers and North Carolina to date has lacked. Besides benefitting from the expanded market reach offered by the hub-and-spoke model, CCX will benefit the CSX Charlotte intermodal terminal, which is near capacity. From this perspective, CCX provides an opportunity to grow employment, compete more effectively for new business location, and graduate to a leading position in Southeast distribution. The Rocky Mount area, itself, is poised for employment growth. The Kingsboro Megasite, a CSX Select Site also being marketed by the Carolinas Gateway Partnership, is in close proximity to the potential Rocky Mount intermodal facility.



North Carolina Manufacturing

Manufacturing industries are major shippers of products, accounting for 94 million tons of goods shipped from North Carolina establishments, or 43 percent of the state total, according to US Commodity Flow Survey data. Since the Commodity Flow Survey samples goods from where they

[5] The federal 2012 Commodity Flow Survey suggests that traffic volumes in Southeast distribution have grown in the period, but the flow data are much less robust than the employment figures.

originate, these volume totals and shares do not portray the goods shipped to manufacturing locations, i.e. the inputs to the manufacturing process.

Table 2 includes 21 industries at the NAICS 3-digit code level. Of these, a few industries are heavily bulk product oriented, and products shipped by these industries are therefore unlikely to be transported in intermodal containers. These industries include petroleum products and non-metallic minerals.

Table 2: North Carolina 2012 Manufacturing Industry Shipments and Employment

				Industry Shares	
NAICS	Industry	Tons (000)	Employees	Tons	Employees
31----	**Manufacturing**	**93,885**	**408,716**	**100. 0%**	**100. 0%**
327	Nonmetallic mineral product manufacturing (1)	18,161	12,474	19. 3%	3. 1%
321	Wood product manufacturing (1)	17,444	17,319	18. 6%	4. 2%
311	Food manufacturing	15,143	48,499	16. 1%	11. 9%
325	Chemical manufacturing (1)	13,108	36,560	14. 0%	8. 9%
322	Paper manufacturing	5,741	16,209	6. 1%	4. 0%
312	Beverage and tobacco product manufacturing	5,066	9,719	5. 4%	2. 4%
324	Petroleum and coal products manufacturing (1)	3,258	912	3. 5%	0. 2%
326	Plastics and rubber products manufacturing	2,854	31,709	3. 0%	7. 8%
332	Fabricated metal product manufacturing	2,255	34,136	2. 4%	8. 4%
331	Primary metal manufacturing	2,161	6,926	2. 3%	1. 7%
313	Textile mills	1,978	25,152	2. 1%	6. 2%
333	Machinery manufacturing	1,605	30,883	1. 7%	7. 6%
336	Transportation equipment manufacturing	1,600	29,296	1. 7%	7. 2%
337	Furniture and related product manufacturing	1,035	31,909	1. 1%	7. 8%
335	Electrical equip. , appliance, and component manufacturing	862	14,869	0. 9%	3. 6%
314	Textile product mills	581	8,256	0. 6%	2. 0%
323	Printing and related support activities	489	12,138	0. 5%	3. 0%
339	Miscellaneous manufacturing	252	14,299	0. 3%	3. 5%
334	Computer and electronic product manufacturing	151	16,976	0. 2%	4. 2%
315	Apparel manufacturing	137	9,834	0. 1%	2. 4%
316	Leather and allied product manufacturing	2	641	0. 0%	0. 2%

Sources: US Census Bureau County Business Patterns and US Commodity Flow Survey
Note (1) Industries with products not typically shipped in containers

The following section examines the regional location of manufacturing industries within North Carolina that are able to benefit from the CCX development. Since US Commodity Flow Survey information is only available at the metropolitan area level (and an aggregate for the state remainder that is not included in metropolitan areas) this section uses employment data from US County Business Patterns to provide a view of industry location by region, developed from county components.

Manufacturing Industries' Regional Location

One of the most basic measures of industry activity is the number of employees. Through an annual survey, the US Census Bureau's US County Business Patterns data includes estimates of employment for almost all industries. In aggregate, the portion of the state closest to the CCX development (defined here as within a 120-mile radius or about a two-hour truck trip) covers 62 percent of North Carolina's 2012 manufacturing base as measured by employment. The Charlotte region includes another 21 percent. As Table 3 depicts, most of the important industries of the state are concentrated within these two regions with the majority of the manufacturing employment located in the Eastern region. Industries with especially high shares of employees in the Eastern region include food manufacturing, chemicals, and electronics.

Table 3: Regional Shares of Manufacturing Industries' Employment

				Regional Shares	
NAICS	Industry	Employees		Eastern	Charlotte
31----	**Manufacturing**	**408,716**		**62%**	**21%**
311	Food manufacturing	48,499		70%	17%
325	Chemical manufacturing (1)	36,560		72%	20%
332	Fabricated metal product manufacturing	34,136		59%	27%
337	Furniture and related product manufacturing	31,909		48%	9%
326	Plastics and rubber products manufacturing	31,709		56%	25%
333	Machinery manufacturing	30,883		63%	23%
336	Transportation equipment manufacturing	29,296		49%	38%
313	Textile mills	25,152		57%	23%
321	Wood product manufacturing (1)	17,319		63%	18%
334	Computer and electronic product manufacturing	16,976		73%	12%
322	Paper manufacturing	16,209		60%	16%
335	Electrical equip. , appliance, and component manufacturing	14,869		48%	14%
339	Miscellaneous manufacturing	14,299		66%	21%
327	Nonmetallic mineral product manufacturing (1)	12,474		62%	24%
323	Printing and related support activities	12,138		61%	29%
315	Apparel manufacturing	9,834		79%	9%
312	Beverage and tobacco product manufacturing	9,719		84%	11%
314	Textile product mills	8,256		54%	24%
331	Primary metal manufacturing	6,926		44%	43%
324	Petroleum and coal products manufacturing (1)	912		70%	24%
316	Leather and allied product manufacturing	641		54%	12%

Source: US Census Bureau County Business Patterns and WSP | Parsons Brinckerhoff Analysis

Note (1) Industries with products not typically shipped in containers

The ability of the North Carolina manufacturing base to benefit from the proposed expanded intermodal service is especially significant because of the economic importance of so-called traded industries. Traded industries sell products and services outside their region to domestic and foreign markets. In other words, they generate goods that are "made here, shipped there" - and the manufacturing base is the source of such goods. According to research, traded industries have higher wage growth and much higher productivity; they create demand for local industries and influence their wage rates; and they "appear to heavily influence the relative prosperity of regions."[6] Because new intermodal services will reduce costs for these industries, improve their access to domestic and foreign markets, and effectively facilitate their ability to trade, CCX development contributes to the economic wellbeing of the state and its citizens.

The proposed intermodal terminal also benefits agriculture and related meat processing and food manufacturing. The intermodal terminal will allow for the transport of goods needing refrigeration in refrigerated containers. Food manufacturing is the largest manufacturing industry in the region and relies heavily on van transportation, thus a strong candidate for intermodal container transportation. A discussion of the food industry follows.

Food Manufacturing (NAICS 311)

Food manufacturing is North Carolina's largest manufacturing industry, with 48,500 employees representing 12 percent of total state manufacturing employment in 2012. About half of the tonnage and over two-thirds of the value of the state's food production is shipped to other parts of the country and to international markets. The industry is principally concentrated in eastern North Carolina, with a smaller concentration in the Charlotte region.

Figure 1 shows the larger USDA inspected processing plants and the smaller state inspected plants. The larger USDA-inspected plants involved in meat slaughter, meat and poultry processing are concentrated in the Central, and Eastern regions of the state while smaller state inspected plants are spread more widely across the state with a larger share in the Eastern region of the state. Note that many of these plants are involved in meat as well as poultry processing.

[6] *The Economic Performance of Regions*, Michael Porter, Institute for Strategy and Competitiveness, Harvard Business School, April 2003.

Figure 1: Distribution of North Carolina Meat and Poultry Processing Plants

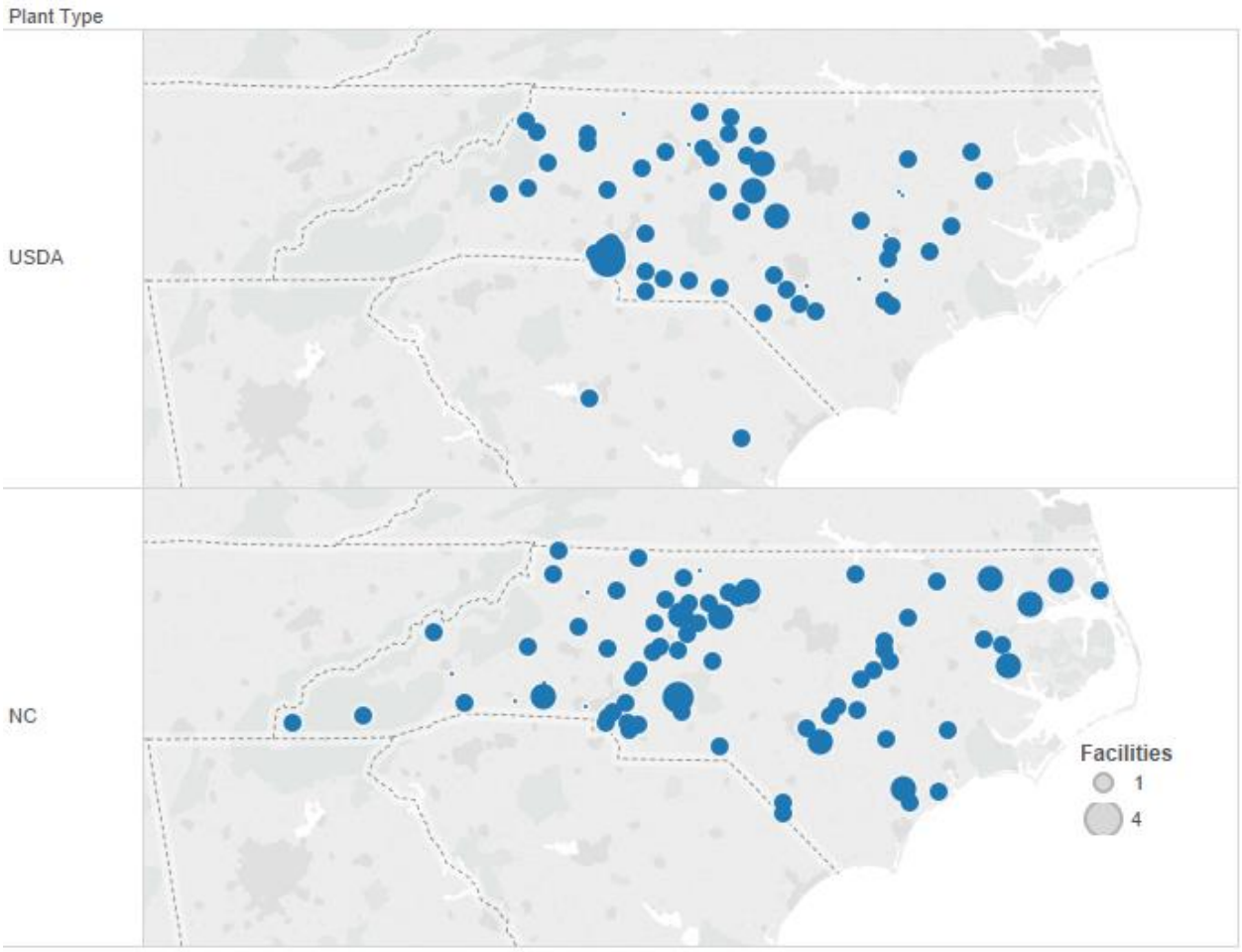
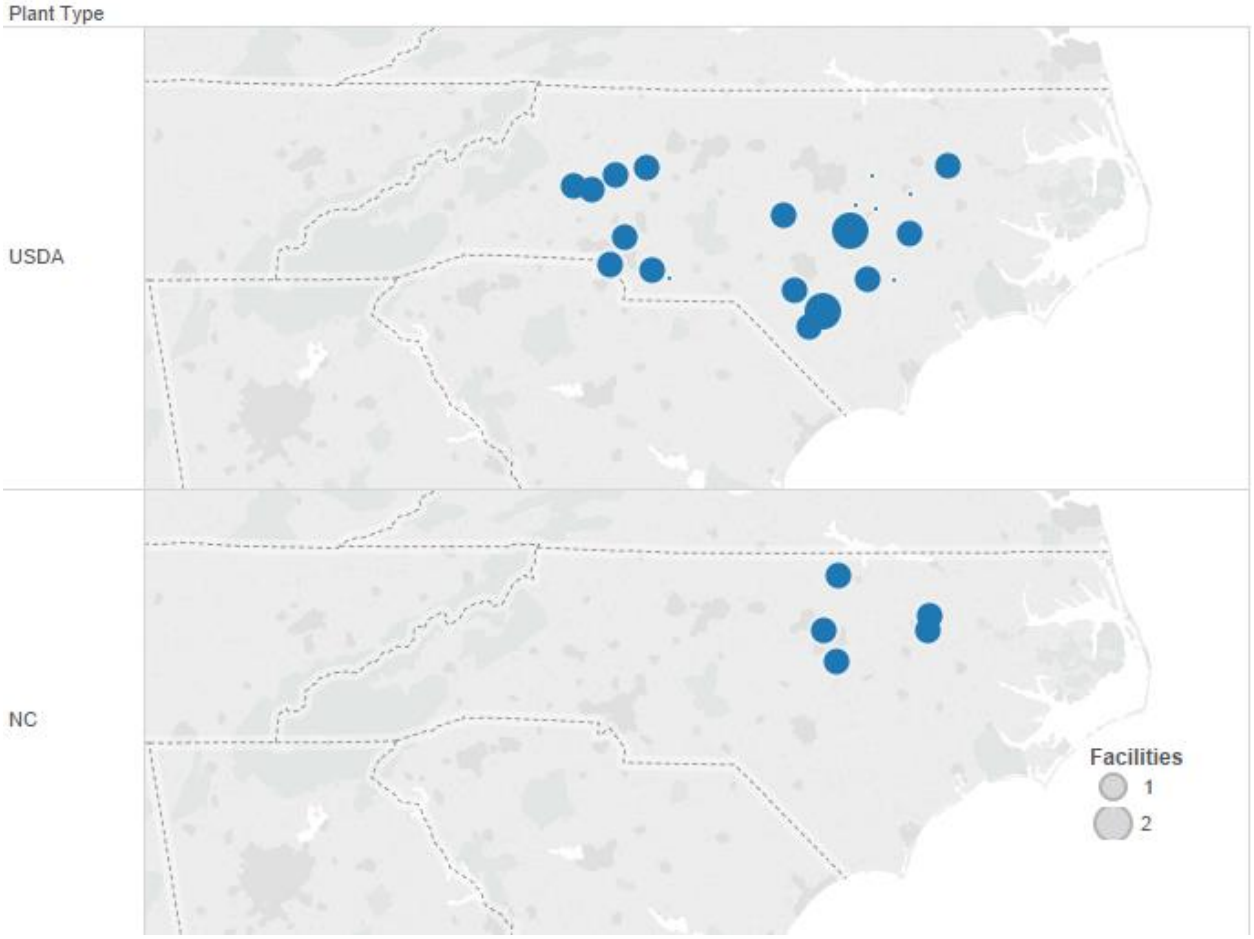


Figure 2 displays facilities involved in the final processing stage, such as those involved in inspection, certification (e.g. for export) and off-premises freezing. The larger USDA-inspected plants and all North Carolina inspected plants are clustered in eastern North Carolina.

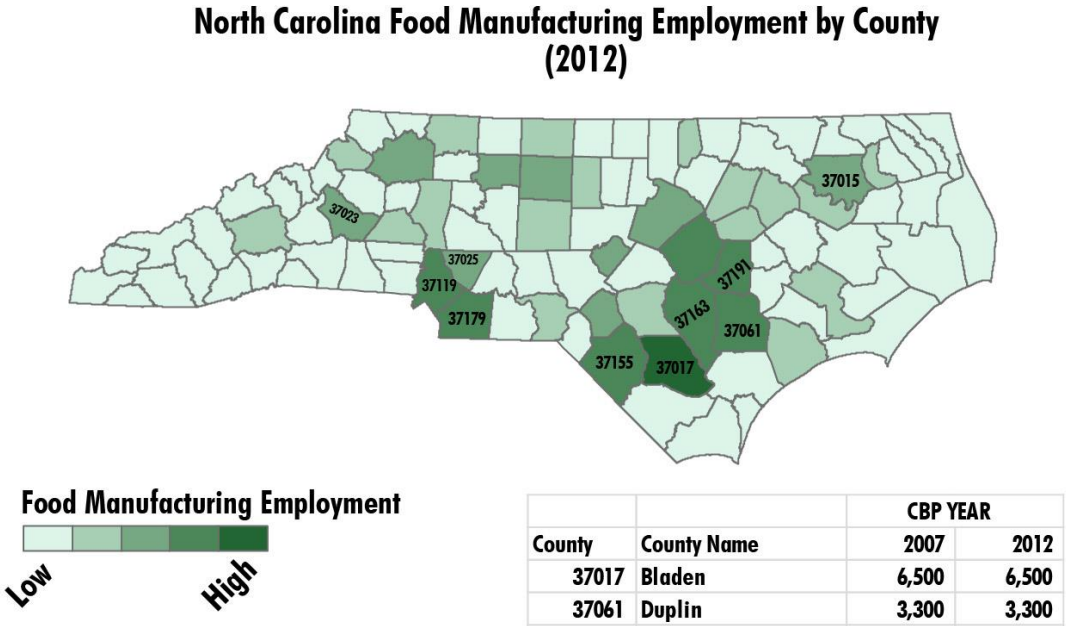
Figure 2: Distribution of North Carolina Meat and Poultry End-of-Process Facilities: Identification, Inspection, Certification, and Freezing



Data Sources: USDA and North Carolina Department of Agriculture and Consumer Services

About 70 percent of 2012-industry employment was in the Eastern region and about 17 percent in the Charlotte region shown in Figure 3.

Figure 3: North Carolina Food Manufacturing Employment by County in 2012



		CBP YEAR	
County	County Name	2007	2012
37017	Bladen	6,500	6,500
37061	Duplin	3,300	3,300
37155	Robeson	3,300	3,300
37119	Mecklenburg	2,705	2,869
37191	Wayne	2,581	2,666
37179	Union	1,500	2,431
37163	Sampson	2,609	2,170
37025	Cabarrus	1,513	1,603
37015	Bertie	1,500	1,500
37023	Burke	1,500	1,500

North Carolina's food manufacturing is dominated by animal processing which represented 62 percent of statewide food manufacturing employment in 2012. Of this total about 65 percent was poultry processing for which Duplin and Robeson Counties had the largest numbers of employees in 2012. The second largest 4-digit food manufacturing industry was bakeries at 17 percent of the statewide total.

Table 4: North Carolina Food Manufacturing Employment by 4-Digit NAICS Industry

NAICS	Industry	Employees	Share
311	**Food Manufacturing**	**48,499**	**100. 0%**
3116	Animal Slaughtering and Processing	29,885	61. 6%
3118	Bakeries and Tortilla Manufacturing	8,128	16. 8%
3119	Other Food Manufacturing	3,194	6. 6%
3114	Fruit and Vegetable Preserving and Specialty Food Manufacturing	3,167	6. 5%
3115	Dairy Product Manufacturing	1,615	3. 3%
3112	Grain and Oilseed Milling	1,098	2. 3%
3111	Animal Food Manufacturing	862	1. 8%
3113	Sugar and Confectionery Product Manufacturing	413	0. 9%
3117	Seafood Product Preparation and Packaging	137	0. 3%

Source: US Census Bureau County Business Patterns

The Raleigh area is expanding its participation in global and domestic supply chains for all products produced in the state. Although still behind Atlanta in volume of logistics activity, logistics employment is growing in Raleigh while decreasing elsewhere in the Southeast. Within North Carolina itself, the Raleigh area is the dominant region of the state. While existing intermodal terminals in the state are reachable by Raleigh industries, the proposed CCX location is significantly more accessible to the Raleigh region. Locally, the Rocky Mount area is home to domestic and international food manufacturing companies, including, but not limited to, the Italian group Nutkao, Tyson's Brands, The Cheesecake Factory Bakery, Poppies International, Atlantic Natural Foods, and George's Barbeque Sauce.[7]

The following chapters will provide projections of the level of intermodal activity at CCX and estimates of the social and economic benefits.

[7] www.econdev.org/clusters/food-processing (Carolinas Gateway Partnership)

Chapter 3: CCX Market Analysis

The terminal market analysis focuses on the ability of CSX to convert truck traffic to rail. Intermodal freight projected to be handled by CCX would be drawn solely from existing truck traffic diverting to intermodal service, thus would be entirely new intermodal business for CSX.

Existing Truck Flows

Potential truck traffic that could divert to truck-rail intermodal was identified through the TRANSEARCH freight flow database, a proprietary data product purchased from IHS Economics. A particular copy of the TRANSEARCH database was purchased with the following characteristics:

- The database only includes truck trips that are routed through North Carolina or portions of southern Virginia. Truck trips that do not "touch" these states are not included.
- Geographic origins and destinations are defined by Business Economic Areas (BEAs) outside of North Carolina and southern Virginia and by county within North Carolina and southern Virginia. BEAs are defined by the U. S. Department of Commerce and represent collections of counties that share a common economic center, typically an urban area.
- Flows are shown as truckload units (units) and weight (short tons) for 2013.
- Truck body types are identified as dry van, reefer (refrigerated van), or other.

Existing Intermodal Market

Information about existing demand for intermodal rail service to, from, or across North Carolina was obtained from the U. S. Surface Transportation Board (STB) Carload Waybill Sample for the state. This database represents a survey of terminating waybills for rail carriers terminating over 5,000 carloads of freight per year. The database includes information of railcar type, which can be used to identify intermodal units.

CCX Origins/Destination Pairs identified by CSX

CSX previously analyzed potential freight markets for truck/rail diversion to be handled by CCX. CSX provided the resulting service matrix to WSP | Parsons Brinckerhoff for purpose of its traffic analysis. To complete its diversion analysis, WSP | Parsons Brinckerhoff used the same dataset as CSX, the TRANSEARCH database.

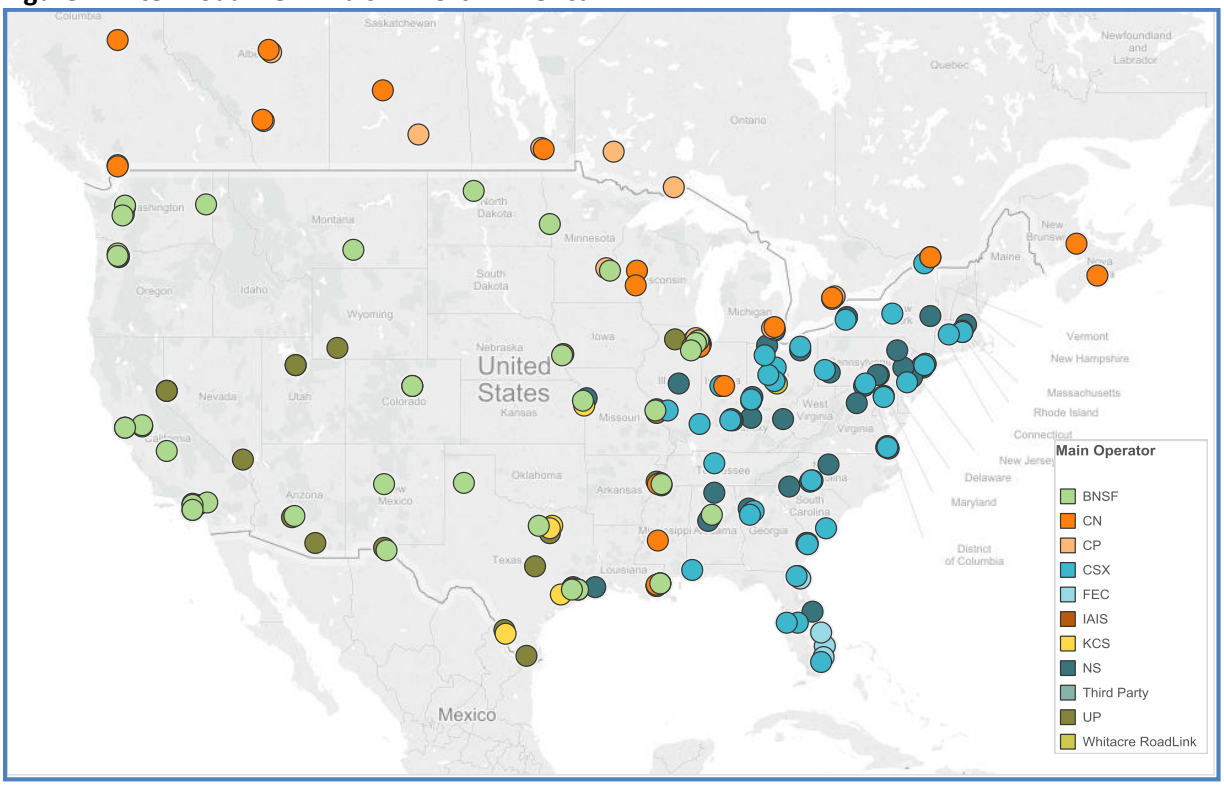
Diversion Analyses

WSP | Parsons Brinckerhoff performed two sets of analyses to determine potential truck/rail diversions handled by CCX.

1. **Evaluated routes that CSX had previously identified.** The origin/destination pairs from the CSX matrix represent those that the company has expressed a willingness or intention to serve. CSX has investigated these lanes and considers serving them to be feasible. Therefore, these routes were considered the most realistic alternatives, and developing an independent assessment of these lanes was the focus of WSP | Parsons Brinckerhoff's efforts. The CSX-identified lanes represent the WSP | Parsons Brinckerhoff "base case".

2. **Evaluated all potential routes**. Routes were considered "feasible" if they fit the following criteria: 1) over 250 miles of length, 2) are served by a CSX terminal at origin and/or destination, 3) if not served by a CSX terminal at both origin and destinations, served by a non-Norfolk Southern (NS) terminal in addition to a CSX terminal. Figure 4 below displays intermodal terminals throughout the U. S. and Canada that were considered in this analysis. The analysis was later refined to exclude markets that already had an existing intermodal service. The primary purpose of this analysis was to determine whether there might be other feasible routes in addition to those identified by CSX.

Figure 4: Intermodal Terminals in North America



Truck-to-Rail Diversion

For all analyses, potentially divertible traffic was limited to existing truck traffic carried in either dry vans or reefer trucks. Dry van moves as short as 250 miles were considered, however, for reefer traffic, only corridors longer than 500 miles were considered. This reflects the reality that reefer traffic is less prone to divert in shorter corridors. Other types of equipment, such as flat beds, tank trucks, etc. were not considered divertible to intermodal rail.

The BEAs served by each intermodal terminal were defined as those located within 100 miles of the terminal. Clusters of terminals that serve common BEAs were grouped together. In cases where there was preexisting intermodal traffic between origins and destinations, this preexisting traffic was eliminated from the estimated diversion. The data source for the estimated preexisting intermodal freight was the STB Waybill Sample.

The percentage of truck traffic diverted to intermodal rail was estimated as a function of distance and route density (defined as the total container traffic along a corridor). Below certain distances, intermodal rail transportation is much more expensive than trucking because of the high fixed costs associated with intermodal moves. These costs remain the same whether a shipment is sent 100 or 1,000 miles. As shipment distances increase, rail becomes more competitive as line-haul economies take hold.

Lane density also affects mode share. At a minimum, enough demand is needed to operate train services at an acceptable frequency. With a greater concentration of freight on a corridor, railroads can operate longer trains or more trains decreasing the cost per unit. The cost of terminals is spread across a larger volume of freight. For this reason, lane density can signal the level of intermodal costs. The higher the concentration of freight the lower the costs of providing intermodal service, and the lower the rate paid by the shipper, all things being equal.

Research using the STB Waybill Sample and TRANSEARCH database found a strong correlation between route density, distance, and intermodal market share. The relationships are shown in Table 5 below.

Table 5: Average Intermodal Market Share by Shipment Distance and Market Size

Shipment Distance (Miles)	Average Lane Density from 2002 - 2008 (Thousands of Metric Tons)						
	10 - 31. 6	31. 6 - 100	100 – 316	316 - 1000	1,000 – 3,162	3,162 – 10,000	10,000+
250	0. 10%	0. 20%	0. 20%	0. 30%	0. 30%	0. 10%	0. 50%
500	0. 20%	0. 40%	0. 90%	1. 10%	2. 40%	2. 60%	1. 00%
750	0. 20%	0. 90%	2. 60%	6. 20%	8. 40%	8. 40%	8. 40%
1,000	0. 40%	1. 10%	3. 30%	7. 70%	17. 40%	31. 70%	31. 70%
1,500	0. 70%	1. 90%	5. 30%	10. 00%	14. 10%	55. 20%	55. 20%
2,000	1. 30%	2. 60%	7. 70%	15. 20%	39. 50%	71. 40%	71. 40%
2,500	1. 90%	4. 70%	15. 40%	25. 90%	37. 90%	65. 20%	80. 20%
3,000	9. 40%	20. 50%	30. 50%	37. 20%	37. 20%	37. 20%	37. 20%
3,500	13. 30%	21. 40%	28. 60%	30%	38. 50%	38. 50%	38. 50%

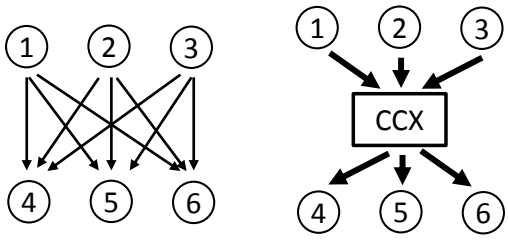
*Lane Density is defined as the total demand for truck and rail for a specific corridor

This analysis was designed specifically to fit the unique circumstances of CCX. The key economic advantage of CCX facility (depicted in Figure 5) is that it will act as an intermodal hub, increasing the lane density on corridors that were previously not served by traditional intermodal service.

Figure 5: CCX Hub

As Figure 6 demonstrates, the use of a hub decreases the number of lanes that are needed to service demand from the hypothetical terminals 1, 2, and 3 to terminals 4, 5, and 6. This concept has been widely adopted in air transportation over the last several decades, but it has not been equally embraced by railroads.

Figure 6: Effect of Hubs on Lane Density



The only intermodal terminal in the US that is currently designed for efficient train-to-train container transfers is the Northwest Ohio terminal operated by CSX. This facility, opened in February 2011, contains five wide-span cranes that reposition containers from one train to another as shown in Figure 7. There are plans to add two more cranes in 2015 to meet rapidly rising demand for intermodal service. The Northwest Ohio facility also allows trains to bypass congested yards in Chicago, reducing travel times on many corridors.

Figure 7: CSX Northwest Ohio Intermodal Terminal

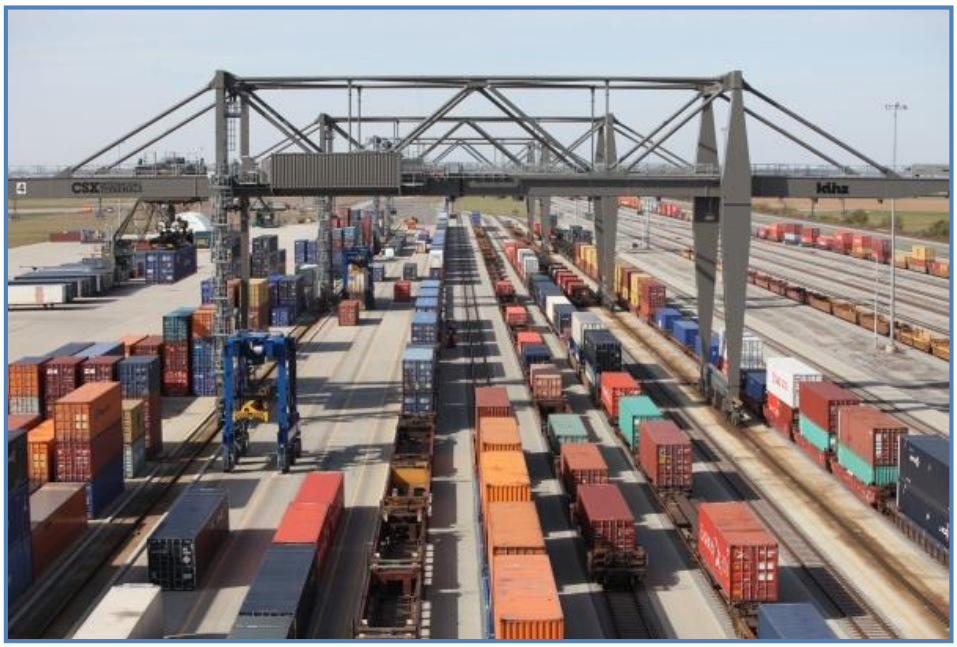


Photo credit: Joc.com

Because of the hub, densities on traffic lanes served by CCX will be higher than they otherwise would have been. Containers on corridors that share the same origin, for example, will be able to be placed on same train to CCX facility irrespective of ultimate destination, where they will be sorted into trains that share the same destination. This was taken into consideration in applying the factors from Table 5 with lane densities between two locations adjusted to reflect this consolidation.

Intermodal Growth and Ramp-up Period

Once the facility opens in 2020, it is assumed that it would require four years for volume to ramp-up to its full potential. After operations have ramp-up, it is assumed that intermodal traffic grows at a rate of 2.2 percent per year, CBO's long-term projection for real GDP growth.

Estimated Diversions

Table 6 shows the expected diversions following the four-year ramp-up period. A total of 271,547 truckloads are expected to divert to intermodal service after the ramp-up, with around 44 percent terminating or originating in the greater Raleigh area and 56 percent passing through. This represents a 4.8 percent diversion rate.

Table 6: CCX Terminal Volume after Four Year Ramp-up Period

			All Truck Miles			North Carolina Truck Miles			
	Units Diverted	% of Truck Units Diverted	Line-haul Truck Miles Diverted (millions)	Truck Drayage Miles Added (million)	Net Truck Miles Reduced (million)	Line-haul Truck Miles Diverted in NC (millions)	Drayage Truck Miles Added in NC (million)	Net Truck Miles Reduced in NC (millions)	% of Truck Miles Diverted in NC
Raleigh Greensboro	119,443	4.8%	110.25	15.53	94.72	12.29	9.56	2.73	2.9%
Pass-through	152,103	4.7%	114.43	15.21	99.22	15.12	1.94	13.18	13.3%
Total	271,547	4.8%	224.68	30.74	193.94	27.41	11.50	15.91	8.2%

Shifting truckloads to rail will have the effect of reducing line-haul truck miles, but local truck miles will increase due to drayage to intermodal terminals. It is estimated that the regional market centered on Raleigh-Greensboro and the pass-through diversions will reduce truck activity by 193.9 million miles after increases in drayage are considered. It is also estimated that 8.2 percent of the miles saved would occur in North Carolina.

The intermodal mileage added to the rail network will be significantly larger than the reductions in trucking mileage because of circuity attributable to rail network and the use of a hub. A factor of 1.4 rail miles to truck miles was used to account for these differences.

Figure 8 and Figure 9 graphically display estimated diversions over time, both in truckloads and in truck miles.

Figure 8: Projected Diverted Truckloads

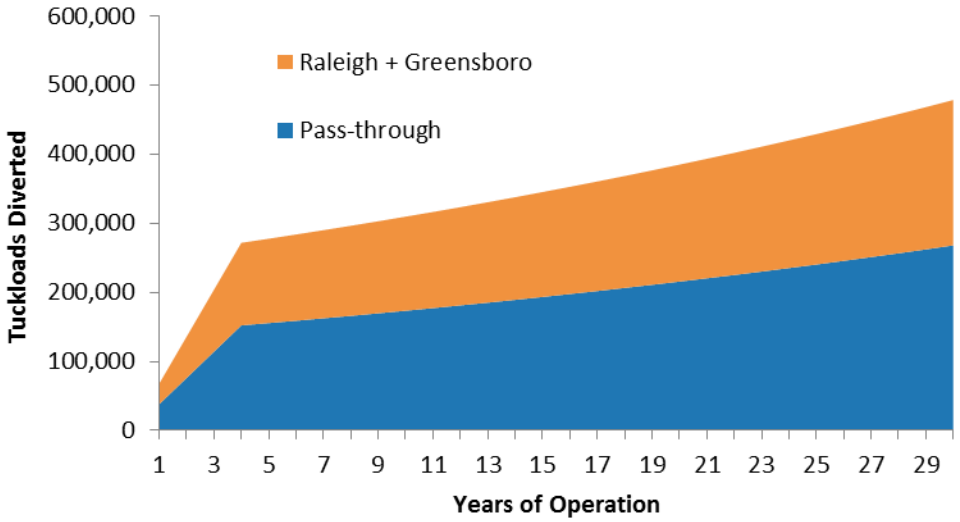


Figure 9: Projected Truck Miles Eliminated

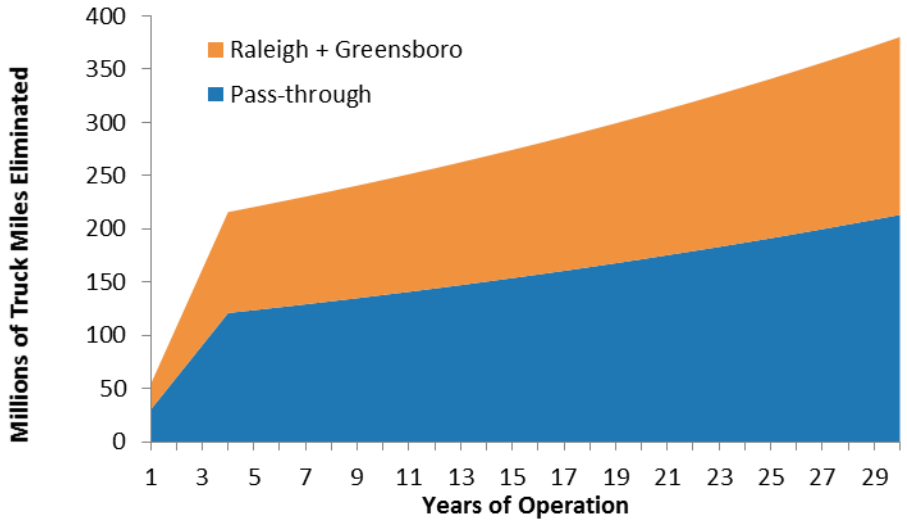
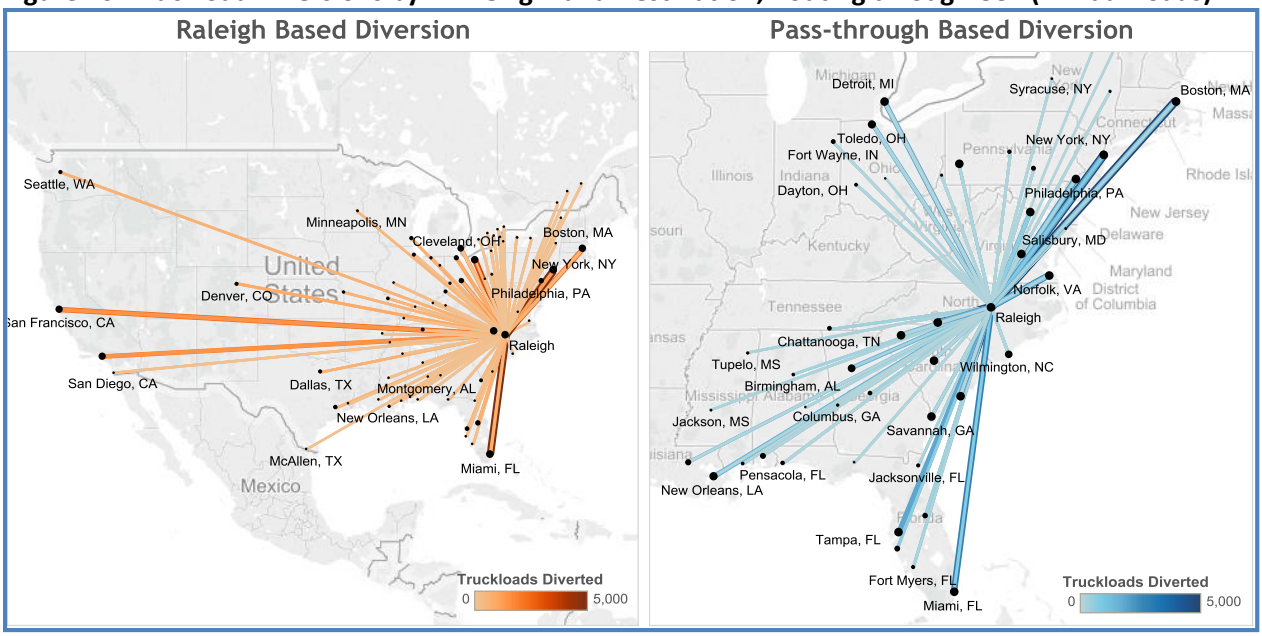


Figure 10 presents the diversion results on a corridor level. Truckloads that divert to or from the Raleigh area due to the Rocky Mount terminal terminate or originate all over the U. S., including the West Coast. On the other hand, diverted pass-through traffic is concentrated mostly on corridors in the Southeast, Northeast, and Midwest. A large portion of these diversions originates or terminates at population centers along the East Coast: Miami, Tampa, Philadelphia, Atlanta, New York, and Boston. Additionally, locations associated with logistics infrastructure such as ports also are prominent in this figure. This includes Savannah, Norfolk, New Orleans, Wilmington, etc. The average length of Raleigh-based diverted truck trips is 896 miles and the average length of a pass-through diverted truck trips is 793 miles.

Figure 10: Truckload Diversions by BEA Origin and Destination, Routing through CCX (Annual Loads)



**Pass-through traffic was routed through Raleigh on map*

Figure 11 displays diversions estimates by trip distance. The size of the bubble represents the number of truckloads diverted in that corridor, and the color indicates the type of diversion. From this map, it can be seen that most diversions occur in the 400 – 1,000 mile range, and no pass-through diversion is predicted on corridors longer than 1600 miles.

Figure 11: Truckload Diversions by OD Distance and Market Share (Labeled by Origin/Destination State)

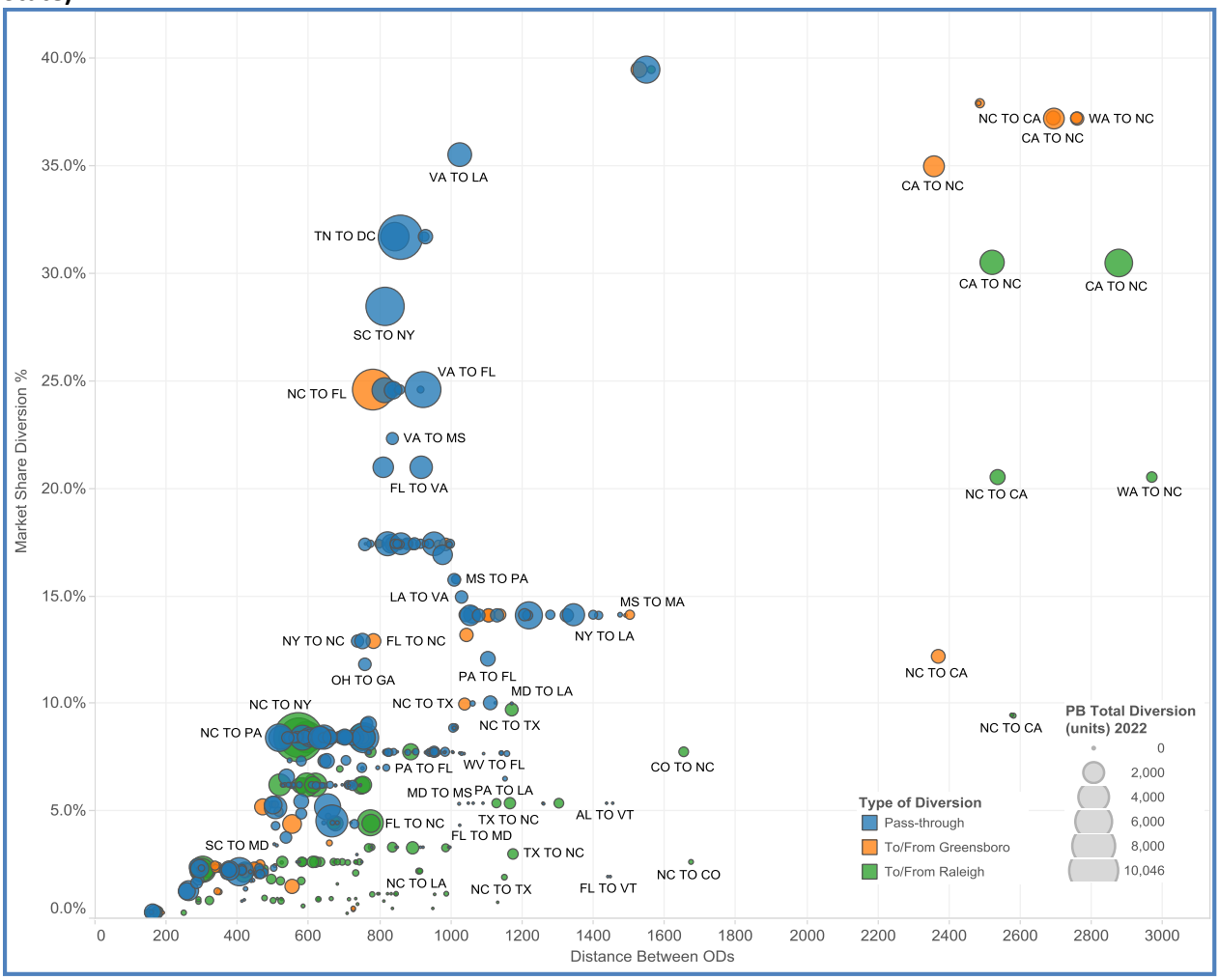
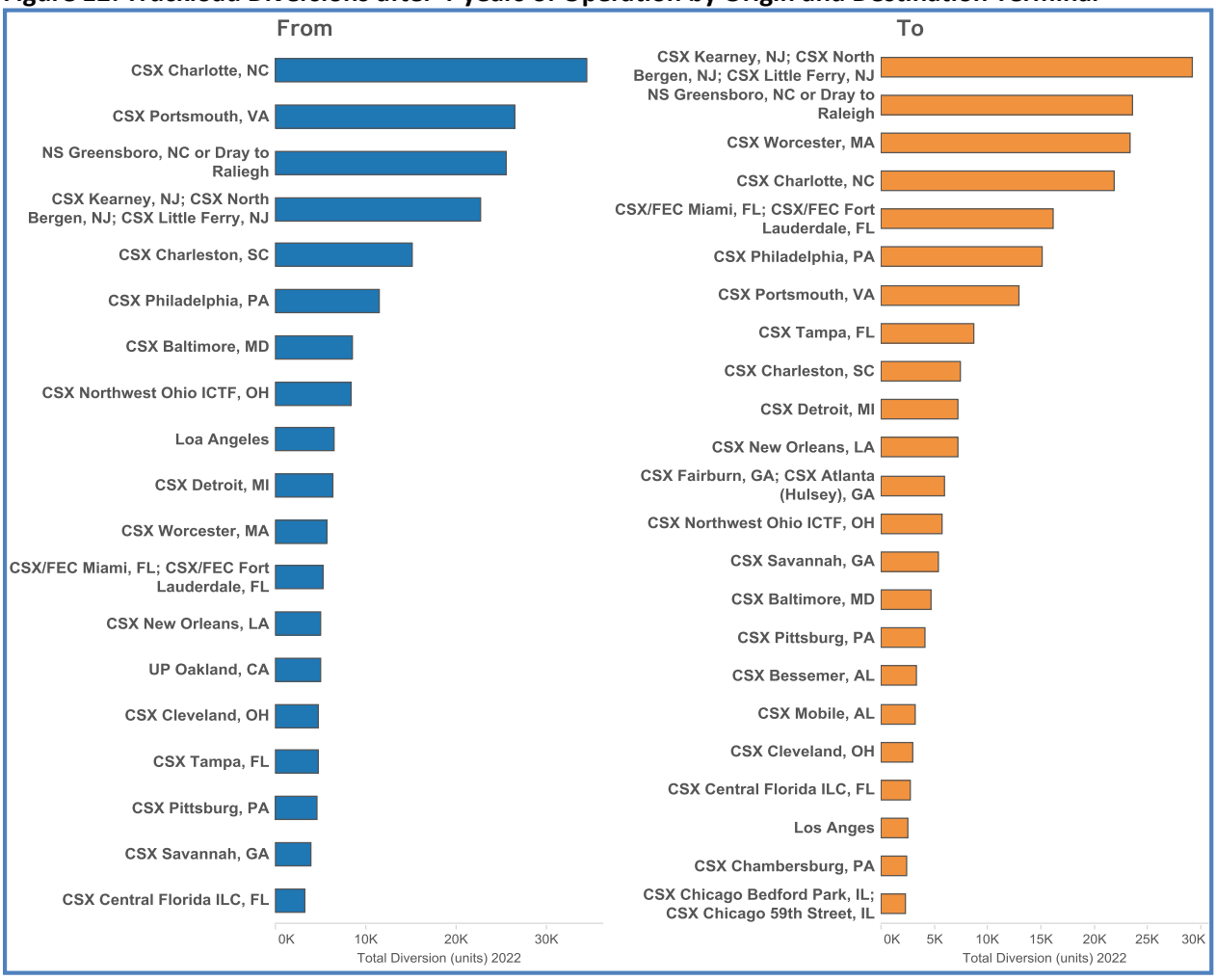


Figure 12 presents diversions by intermodal terminal. The top CSX terminals for originating intermodal units are Charlotte, Portsmouth, Kearney/North Bergen/Little Ferry, Charleston, and Philadelphia. Significant flows are also expected from Greensboro.

The principal CSX intermodal terminals exchanging traffic with CCX are Kearny/North Bergen/Little Ferry, Worcester, Charlotte, Philadelphia, and Portsmouth. Greensboro also receives substantial intermodal traffic. Note that the specific terminal results should be interpreted as approximations, since the markets of intermodal terminals in the same region overlap.

Figure 12: Truckload Diversions after 4-years of Operation by Origin and Destination Terminal



Diversion Sensitivity Analysis

Diversion estimates were also prepared under two alternative assumptions to explore the sensitivity of the results and benefits.

A **conservative scenario** was constructed with rail service levels playing a more significant role in determining lanes that would be competitive with trucking. CSX provided expected transit times between different origins and destinations for CCX service. The transit times were compared with estimated truck transit times. Truck transit times were estimated by dividing trip distance by an assumed truck speed of 550 miles per day, rounded up to the nearest day. Corridors were eliminated as susceptible to diversion where the difference between truck and rail was more than five days. An exception was made for corridors involving a large seaport at either end, defined as handling more than 900,000 TEUs in 2013. International shipments are considered less sensitive to differences of a couple of days in the transit time over land. Applying both of these filters reduced diverted units by around 10 percent.

An **optimistic scenario** was developed in which additional lanes not identified by CSX as CCX-served were included in the analysis. These routes have no current intermodal service, but could be candidates for service in the future. The additional lanes include Memphis and several destinations in the Northeast, including New York, Boston, and Baltimore as well as Raleigh-Baltimore. This lane may have been excluded by CSX due to its short distance. However, the truck volume between Raleigh/Durham and the Washington, DC/Baltimore metropolitan area is substantial. Given the high volume, even at the short distance, an intermodal service may be viable. In addition, while CSX identified New York to Mobile as a potential route for traffic to divert to CCX, CSX did not identify Mobile to New York as a possibility. However, an assessment by WSP | Parsons Brinckerhoff found substantial potential diversion for this route.

The criterion used to select the lanes was the level of truck volume. In doing so, it is understood that other factors such as container balance, truck-intermodal rate differentials, network fit, among others, contribute to establishment of service.

Table 7: CCX Terminal Volume after Four Year Ramp-up Period

Assumptions		Type	Units Diverted per year	Net Truck Miles Reduced (millions)	Net Truck Miles Reduced in NC (millions)	% of Truck Miles Diverted in NC
Conservative	CSX Identified Lanes w/ Service Filter	**Raleigh + Greensboro**	105,571	85.32	2.49	2.9%
		Pass-through	141,578	90.50	11.57	12.8%
		Total	***247,148***	***175.82***	***14.06***	***8.0%***
Base	CSX Identified Lanes	**Raleigh + Greensboro**	119,443	94.73	2.73	2.9%
		Pass-through	152,103	99.22	13.18	13.3%
		Total	***271,547***	***193.95***	***15.91***	***8.2%***
Optimistic	CSX Identified Lanes w/ Potential Lanes (Memphis-Northeast, Mobile-New York, Raleigh-Washington DC)	**Raleigh + Greensboro**	125,233	95.93	2.76	2.9%
		Pass-through	174,724	121.14	14.37	11.9%
		Total	***299,957***	***217.07***	***17.13***	***7.9%***

Chapter 4: Benefit Cost Analysis

The preceding chapter described the diversion analysis and the traffic that could be expected to convert from truck to rail due to the services offered by the CCX facility. This chapter presents the public benefits attributable to that traffic being removed from the highway network.

BCA Methodology

The methodology used to calculate public benefits attributable to CCX is recommended by USDOT. It suggests estimating several categories of benefits: state of good repair, economic competitiveness, quality of life, environmental sustainability, and safety.

Diversion Estimates

As shown in Table 6**,** 271,500 units (base scenario) are expected to shift from truck to rail during 2022, the first full year of operation. Removing these units from the highway network will eliminate nearly 194 million truck miles on the nation's roadways. North Carolina will benefit from a reduction of 16 million vehicle miles, eight percent of the total reduction. While long haul trucking will decrease, local trucking and the local demand for drivers serving the terminals will increase.

Forecasts

Annual growth in containers is projected to be 2.2 percent, based on information provided by CSX. This represents a conservative approach as recent intermodal growth trends have exceeded that rate. Growth in U.S. intermodal traffic over the past 13 years has averaged 3.2 percent (including the economic recession of 2008), while the five-year average has been 6.4 percent. Recent forecasts for the American Trucking Associations (ATA) by IHS Global Insight estimate annual growth of 5.1 percent between 2013 and 2025.

Discount Rate

The standard discount rate of 7 percent per USDOT guidance is used.

Residual Value

Residual value represents the value of the project asset at the end of the project's useful life. For the purposes of this analysis, the terminal itself is assumed to be fully depreciated at the end of the project analysis period. However, the land retains value, and CSX has estimated that land acquisition would cost $15.2 million. This amount is assumed to be the residual value.

State of Good Repair

US DOT recognizes pavement damage as an important measure of the state of good repair. Trucks deteriorate pavement and increase pavement damage repair costs reducing the state of good repair.

By decreasing truck miles, CCX will reduce highway maintenance costs. The CSX analysis relies on a commonly accepted study although 15 years old, the *Addendum to the 1997 Federal Highway Cost Allocation Study Final* Report, May 2000. This is still a source for estimating pavement deterioration in BCA analyses, since few comparable studies have been completed since that time. WSP | Parsons Brinckerhoff has recently relied on the same study in preparing grant applications for the USDOT TIGER

Discretionary Grant program. The *Highway Cost Allocation* study provides a range of estimates of pavement damage per VMT depending upon the weight of the truck, number of axles, type of truck, type of roadway and whether the highway is in urban or rural areas. Because the pavement damage ranges from $0.01 per VMT for a 40,000 pound gross vehicle weight (GVW) 4 axle single unit truck on a rural interstate to $0.409 per VMT for an 80,000 pound 5 axle combination truck on an urban interstate, results from using the *Cost Allocation* Study vary widely.

Based on CSX information in support of CCX, it is assumed that 95 percent of the diverted trucks would be 60,000 pounds gross vehicle weight (GVW) and 5 percent would be 80,000 pounds GVW. The split in pavement miles would be 35 percent urban and 65 percent rural. Calculating average pavement cost and updating the result to 2014 using the Consumer Price Index – All Urban Consumers (CPI-U) yields $0.09/VMT. This value is on the lower end of parameters often used for trucking, but intermodal containers are generally lighter than general truck cargo, and therefore should cause less pavement deterioration.

Table 8 presents the estimated reduction in highway maintenance costs by eliminating truck competitive traffic from the roadways.

Table 8: State of Good Repair Savings in 2015 Dollars, 30 Years of Operations

CCX Rocky Mount	
Reduced Truck Miles - 30 Years	7,339,657,351
Repair Cost per Truck Mile	$.0918
Undiscounted Value of Reduced Pavement Repair Cost	$673,780,545
Discounted Value of Reduced Pavement Repair Cost	$194,214,707

Economic Competiveness

USDOT considers customer costs as a measure of economic competiveness - the lower the cost the more competitive a good is in the global market place. With market-based pricing, it is difficult to precisely determine the impact of a facility on a shipper's costs; consequently, an accepted surrogate is transportation operating expenses. While the cost of intermodal transportation is generally lower than that of trucking for shipments over 500 miles, transit times are often worse. In most cases, intermodal rail is less expensive, but slower and less convenient than trucking. Where freight has diverted to rail, it is assumed that this tradeoff was favorable for rail for these particular shippers.

Therefore, the impact of intermodal on logistics costs is usually evaluated in two components. The first compares the transportation cost savings that arise from switching to rail. The second attempts to quantify the cost penalty that arises from the slower transit times of intermodal. Typically, this is provided as an inventory carrying cost, essentially a value of time that is applied to freight.

Rather than try to anticipate market conditions and estimate rates, we adopted the rates used by CSX in its evaluation of CCX, as the railroad better understands the discount to truck rates required to convert

truckloads to intermodal. The annual inventory cost was assumed to be 30 percent of the value of the inventory, an industry rule of thumb.

Table 9 shows the estimated decease in customer costs based on the estimated traffic diverted. The truck and rail costs are weighted average rates of local traffic and transshipment traffic.

Table 9: Economic Competiveness Impact - Transportation Cost in 2015 Dollars, 30 Years of Operations

CCX Rocky Mount	
Reduced Truck Miles	7,339,657,351
Customer Truck Cost per Truck Mile	$1.63
Customer Rail Cost per Equivalent Truck Mile	$1.23
Undiscounted Customer Cost Savings	$2,919,715,694
Discounted Customer Cost Savings	$841,597,065

Offsetting the reduction in transportation costs is the increase in inventory carrying costs due to additional transit time of shipping by rail in the undiscounted value of $110,082,000 and discounted value of $31,731,000. Inventory costs were calculated following a methodology from the Highway Economic Requirements System State Version (HERS-ST) of the Federal Highway Administration.

Livability

Reduced congestion is a livability benefit. This is calculated on a per VMT basis. The CSX study relies on the same *Highway Cost Allocation Study* to estimate congestion benefits as used for the pavement damage estimates. For now, this value is adopted in the current BCA analysis. Table 10 describes the benefits associated with reducing congestion.

Table 10: Value of Reduced Congestion in 2015 Dollars, 30 Years of Operations

CCX Rocky Mount	
Reduced Truck Miles	7,339,657,351
Average Congestion Cost per Truck Mile	$.011
Undiscounted Truck Congestion Savings	$823,509,555
Discounted Truck Congestion Savings	$237,373,531

Sustainability

The Project will create environmental and sustainability benefits from the reduction of air pollution associated with trucks. Four forms of emissions were identified, measured, and monetized: nitrous oxide (NOx), particulate matter (PM), volatile organic compounds (VOC), and carbon dioxide (CO2). The emission rates for trucks can be found in Table 11 and the emission rates for rail can be found in Table 12**Error! Reference source not found.** These emission rates decrease substantially over time in response to improvements in vehicle technology and the expected introduction of stricter emissions standards. While these year over year improvements are speculative in nature because of the inherent challenges in forecasting technological advancements, the rates of improvements are in-line with historical trends and are likely to provide a better assessment of impacts than assuming constant emission rates.

Table 11: Truck Emissions Rates (grams per mile)

Emissions Type	2015	2020	2030	2040
NO_X	6.22	3.40	1.70	1.31
PM	0.43	0.21	0.07	0.04
VOC	0.24	0.13	0.06	0.04

Source: EPA MOVES[8]

Table 12: Rail Emissions Rates (grams per mile)

Emissions Type	2015	2020	2030	2040
NO_X	129	99	53	28
PM	3.4	2.3	1.0	0.4
VOC	6.0	3.8	2.0	1.1

Source: EPA 2009[9]

Because emission rates for railroads are specified per gallon of fuel used, it was necessary to obtain information about how the fuel efficiency of the trains will improve over time. Records were obtained from CSX (see Table 13) that show their fuel efficiency has been improving at a rate of 1.5 percent per year (in ton-miles) over the last 15 years.

Table 13: Rail Fuel Consumption

Emissions Type	2015	2020	2030	2040
Tons-miles / gallon	483.0	520.3	603.9	700.8

Source: Based on information provided by CSX

Emission rates of CO2 are simpler to calculate because they are a direct function of fuel consumption. Each gallon emits 22.4 lbs. of CO2.

Value of Emissions

The costs of air pollution emissions were obtained from USDOT guidance on TIGER applications. This guidance in turn references a National Highway Traffic Safety Administration study that calculated valuations for metric tons emitted of NOx, PM and VOC. These values, shown in Table 14, were inflated to 2015 dollars.

Table 14: Non-CO_2 Emissions Costs per Metric Ton, in 2015 Dollars

Emissions Type	Cost Per Ton
NO_X	$7,937
PM_{10}	$363,113
VOCs	$2,046

[8] EPA MOVES Model, assumed long-haul Long-Combination Vehicles driving at 55 mph

[9] EPA 2009, Emission Factors for Locomotives, Office of Transportation and Air Quality, EPA-420-F-09-025 April 2009. http://www.epa.gov/nonroad/locomotv/420f09025.pdf

The per-ton costs of carbon were also derived from USDOT guidance for TIGER applications. These values were in turn obtained from a Technical Support Document published by the Interagency Working Group on Social Cost of Carbon.[10]

Table 15: CO_2 Emissions Costs per Metric Ton, in 2015 Dollars

	2015	2020	2030	2040
Social Cost of Carbon	$45.34	$52.39	$63.48	$74.56

Source: U.S. EPA, 2013; WSP | Parsons Brinckerhoff, 2015

As summarized in Table 16, total discounted sustainability savings were estimated to be $296 million over the analysis horizon, which is a substantially higher estimate than found by CSX. These benefits are driven primarily by the large reductions in CO2 emissions that would result from shifting freight from trucks to rail, through the CCX hub. Additionally, these savings are weighed more heavily in the analysis because they are discounted at 3 percent per year instead of 7 percent per year, as are the other emission categories (following the USDOT guidance mentioned above).

For the other types of emissions, we observed that VOC emissions are anticipated to increase while PM and NOx emissions are anticipated to decrease. However, when these impacts are monetized, the reductions in PM and NOx emissions more than offset the increase in VOC emissions. This, combined with the substantial reductions of CO2 emissions that are expected, leads us to conclude that the CCX project will have a highly favorable impact on the environment. The increase in VOC emissions is insignificant in the analysis.

Table 16: Nationwide Sustainability Savings in 2015 Dollars, 30 Years of Operations

CCX Rocky Mount	
Reduced NO_X metric tons	676
Reduced PM metric tons	277
Reduced VOC metric tons	(30)
Reduced CO_2 metric tons	6,840,251
Undiscounted Savings of NO_X	$5,364,721
Undiscounted Savings of PM	$100,601,750
Undiscounted Savings of VOC	$(60,771)
Undiscounted Savings of CO_2	$460,719,441
Total Discounted Sustainability Savings	$287,719,181

Safety

Rail is a safe mode of transportation with a lower rate of injuries and fatalities than trucking. The cost savings that arise from a reduction in the number of accidents include direct savings (e.g., reduced personal medical expenses, lost wages, and lower individual insurance premiums), as well as significant avoided costs to society (e.g., second party medical and litigation fees, emergency response costs,

[10] https://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf

incident congestion costs, and litigation costs). The value of all such benefits – both direct and societal – could also be approximated by the cost of service disruptions to other travelers, emergency response costs to the region, medical costs, litigation costs, vehicle damages, and economic productivity loss due to workers' inactivity.

Table 17: Values Used to Calculate Accident Savings

	Incident Rates and Costs	Source
Rail Fatal Crashes per 100 M ton-miles	140	FRA
Rail Injury Crashes per 100 M ton-miles	580	FRA
Rail Damage Crashes per 100 M ton-miles	1,770	FRA
Fatal Crashes per mil. Truck VMT	0.012500	FMCSA
Injury Crashes per mil. Truck VMT	0.224550	FMCSA
Damage Crashes per mil. Truck VMT	0.785910	FMCSA
Value per Fatal Crash (2015 dollars)	$9,572,000	US DOT
Value per Injury Crash (2015 dollars)	$114,455	US/NC DOT
Value per Damage Crash (2015 dollars)	$4,087	US DOT

Sources: US DOT[11]; NC DOT[12]; FMCSA[13]; FRA[14]

The costs of each injury and each fatality was taken from 2014 TIGER Benefit-Cost Analysis (BCA) resource guide published by USDOT. These have been adjusted by 2 percent to account for inflation since 2013. Values used to calculate accident savings are presented in Table 17. The terminal is expected to reduce fatalities by 76 and injuries by 1,558 over the 30-year period.

[11] http://www.dot.gov/sites/dot.gov/files/docs/TIGER_BCARG_2014.pdf

12 https://connect.ncdot.gov/business/DMV/.../2012%20Crash%20Facts.pdf *– weighted average product of total non-fatal, non-PDO accidents and accident monetized values.*

13 Large Truck and Bus Crash Facts 2012. FMCSA-RRA-14-004. Analysis Division, Federal Motor Carrier Safety Administration, U.S. Department of Transportation. June 2014.

[14] One Year Accident/Incident Overview – Combined (2012). Office of Safety Analysis, Federal Railroad Administration, U.S. Department of Transportation. 2014.

Table 18: Safety Savings, 30 Years of Operations

	Rocky Mount
Fatal Crashes from Rail	23
Injury Crashes from Rail	96
Property Damage Crashes Rail	292
Fatal Crashes Avoided from Truck	92
Injury Crashes Avoided from Truck	1,648
Property Damage Crashes Truck	5,768
Fatal Crashes Avoided	69
Injury Crashes Avoided	1,552
Property Damage Crashes Avoided	5,476
Value per Fatal Crash (2015 dollars)	$9,572,000
Value per Injury Crash (2015 dollars)	$114,455
Value Per Property Damage Crash (2015 dollars)	$4,087
Value of Fatal Crashes Avoided (2015 dollars)	$657,045,323
Value of Injury Crashes Avoided (2015 dollars)	$177,682,456
Value of Property Damage Crashes Avoided (2015 dollars)	$22,374,035
Undiscounted Value of All Crashes Avoided (2015 dollars)	$ 857,101,814
Discounted Value of All Crashes Avoided (2015 dollars)	$ 247,056,373

Investment Costs of Facility

Project development costs are anticipated to total $269.5 million over 3 years. This includes $241.3 million to build the CCX facility and $28.2 million for complementary investments.

Table 19: Timing of Development Costs ($Millions)

	Terminal Costs	Line of Road Improvements	Total
Year 1	41.1	4.9	46.6
Year 2	98.2	11.7	111.4
Year 3	98.2	11.7	111.4
Total Costs ($)	237. 5	28.2	269.5
Discounted Total Costs		24.3	231.9

Summary

Table 20 summarizes the benefit-cost analysis.

Table 20: Summary of Discounted Public Benefits of CCX Discounted at 7% (Millions of 2015$)

CCX Rocky Mount	
Pavement Maintenance Savings	$194.2
Shipper Savings	$809.9
Congestion Savings	$237.4
Emission Savings	$287.7
Accident Savings	$247.1
Total Discounted Benefits	$1,776.2
Total Discounted Development Costs	$229.7
Net Present Value	$1,546.5
Benefit Cost Ratio	7.7
Total Discounted O&M Costs	$183.2
Net Present Value (w O&M)	$1,363.3
Benefit Cost Ratio (w O&M)	4.3

Net present value and benefit cost ratios are presented in two forms: excluding operating costs (USDOT methodology) and including maintenance cost.

Table 21: Summary of Discounted Public Benefits of CCX Discounted at 3% (Millions of 2015$)

CCX Rocky Mount	
Pavement Maintenance Savings	$376.6
Shipper Savings	$1,570.6
Congestion Savings	$460.3
Noise Pollution Savings	--
Emission Savings	$314.8
Accident Savings	$479.1
Total Discounted Benefits	$3,201.4
Total Discounted Development Costs	$244.7
Net Present Value	$2,956.7
Benefit Cost Ratio	13.1

Benefits to North Carolina

The TRANSEARCH database used to estimate truck diversion also included information about truck routing. This supported calculating the mileages within North Carolina if pass-through and Raleigh-based truck trips had not been diverted.

In all, it was found that for Raleigh-based truck diversion 2.9 percent of miles would have been incurred in North Carolina. This value was higher for pass-through traffic at 13.3 percent of total miles, principally because nearly each trip traverses the state. For all diversions, it was estimated that 8.2 percent of truck miles reduced would have occurred in North Carolina. Therefore, for savings that vary linearly with truck mileage, such as in emissions, congestion, pavement maintenance, and accidents, it was assumed that 8.2 percent of the benefits would accrue to the state.

For shipper savings, it was assumed that only North Carolina-based trips would benefit shippers in the state. Approximately 57 percent of the diversions have an origin or destination in North Carolina, either in Raleigh, Greensboro, Charlotte, or eastern North Carolina. For trips to/from these locations, it was assumed that half of the benefits would accrue within the state. This led to estimate that 28.5 percent of shipper savings associated with CCX would accrue within North Carolina. Table 22 describes the benefits to North Carolina.

Table 22: Summary of Discounted Public Benefits of CCX for North Carolina Discounted at 7% (Millions of 2015$)

	Nationwide	North Carolina
Pavement Maintenance Savings	$194.2	$15.93
Shipper Savings	$809.9	$230.81
Congestion Savings	$237.4	$19.46
Reduction in Noise Pollution		
Emission Savings	$287.7	$23.59
Accident Savings	$247.1	$20.26
Total Benefits	$1,776.2	$310.1

Sensitivity of Results

The diversion analysis was conducted with two alternative sets of assumptions. Table 23 summarizes the BCA results for the three analyses. Despite the differences among the assumptions, the final benefit-cost results were very similar suggesting a marginal impact of changes in traffic. Moreover, it is likely that in reality several of the service constraints in the conservative scenario will materialize, but be offset by demand in some of the corridors in the optimistic scenario.

Table 23: Sensitivity of Results

	Units Diverted in 2022	Net Truck Miles Reduced in 2022 (millions)	Net Truck Miles Reduced in NC in 2022 (millions)	% of Truck Miles Diverted in NC	Total Benefits (millions of $ in 2015)	Benefits in NC (millions of $ in 2015)	Net Present Value (millions of $ in 2015)	Benefit Cost Ratio
Conservative	247,148	175.7	14.1	8.0%	1,609	282	1,380	7.0
Base	271,547	193.9	15.9	8.2%	1,776	310	1,546	7.7
Optimistic	299,957	216.8	17.1	8.0%	1,987	348	1,757	8.7

Chapter 5: Economic Impacts

The CCX facility will expand economic activity in North Carolina creating jobs, income, and additional economic output within the state. The economic activity will be a result of a number of different factors.

- Local labor will be employed in the building of CCX and materials for construction will be purchased in North Carolina.
- CCX will directly employ individuals to operate lift equipment, gates, etc.
- The locating of complementary industries in the vicinity of CCX. Intermodal terminals often generate synergistic economic development projects with employers attracted to the vicinity of the terminal.
- CCX will provide new transportation options for shippers in the Raleigh-Durham area, eastern North Carolina, and within North Carolina in general. Those industries for which intermodal is an economical option will save shipping costs. This in turn will enable companies to spend money on other goods, services, or employment.
- The presence of better transportation options will position the region and the state to attract new employers, not just within the immediate vicinity of CCX, but also within the overall market area for which containers are shipped through CCX.

Impacts from Construction

The construction of CCX is expected to create short-term economic impacts on the State of North Carolina, driven by the increase in construction spending in the region. These project expenditures would generate a short-term increase in demand for engineering and technical services, as well as construction-related labor and materials.

To quantify the near-term economic impacts of this project, this analysis used an input-output modeling framework based on multipliers from MIG Inc. the developers of IMPLAN. [15] U. S. National data were selected for the economic profile and multiplier set.

Two types of economic impacts are included in this analysis.

- **Direct/Indirect Impacts**: Direct impacts represent new spending, hiring, and production by civil engineering and construction companies in providing resources to complete the project. Indirect impacts result from inter-industry purchases necessary to support the increase in construction industry activity. The other industries providing goods and services required by the construction industry will also increase their production and, if necessary, hire new workers to meet the additional demand.
- **Induced Impacts:** Induced impacts stem from the spending of wages earned by workers benefitting from the direct and indirect activity within the area. It has been proven that construction activity leads to new employment and additional earnings in other industries, both the construction workers and workers in the other industries will spend some proportion of

[15] http://implan.com/V4/Index.php

their increased income at local retail shops, restaurants, and other places of commerce, which would further stimulate economic activity.

Three types of economic impacts are estimated.

- **Employee person years**: Total full-time employee equivalents
- **Earnings –** Wages and associated employee benefits
- **Output:** The value of industry production. For manufacturers this would be sales plus/minus change in inventory. For service sectors, production equals sales. For Retail and wholesale trade, output equals gross margin (as opposed to gross sales).

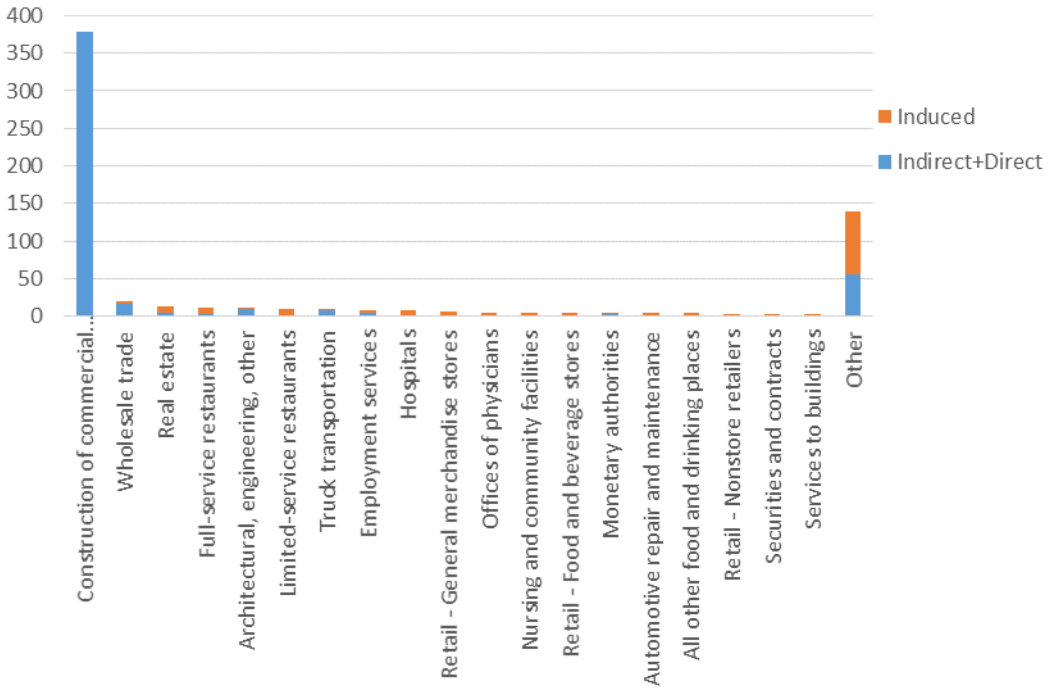
CSX has estimated that the facility and line of road improvements will cost approximately $269.5 million to construct. However, of this total, some expenditures, such as land acquisition, would not generate economic impacts to North Carolina. Furthermore, much of the $269.5 million would flow to suppliers outside of the state. CSX has estimated that only about 20.4 percent of the $269.5 million would flow to North Carolina.

Table 24: Summary of Near-Term North Carolina Economic Impacts

PB Estimated Impacts – Rocky Mount	Direct	Indirect	Induced	Total
Employment (job-years)	379	108	159	646
Earnings (millions of 2015$)	$ 19.2	$ 6.0	$ 6.6	$ 31.8
Output (millions of 2015 $)	$ 51.2	$ 18.6	$ 20.0	$ 90.0

Figure 13 shows the distribution of jobs by industry and type of impact.

Figure 13: Breakdown of Job Creation by Industry and Type of Impact (job-years)



Ongoing Employment at CCX Facility

Most of the statewide economic impact associated with CCX, will be related to the facility's users, cost savings and benefits that will accrue to North Carolina's shippers. Additionally, as discussed in the next section, it is expected that the number of jobs that are expected to develop in areas surrounding the intermodal facility in Rocky Mount are anticipated to reach 13,000 jobs based on the number of local lifts. However, ongoing operations of the facility itself will employ 109 people its opening year, 149 people by 2023, and 236 people by 2035. Similar to the case of the short-term construction employment, the operating labor will generate induced and indirect economic impacts. The terminal operator will need to purchase supplies, equipment, and services, a significant portion of which will be obtained from sources in North Carolina, thus producing the indirect economic impacts. Employees at CCX will spend money in the local economy, generating the induced economic impacts. Table 25 shows the economic impacts.

Table 25: Short-Term and Long-Term Economic Impacts - Terminal Facility

2019	Direct	Indirect	Induced	Total
Employment (Annual Average)	109	93	104	306
Earnings (millions of 2015 $)	$10.97	$5.48	$4.33	$20.78
Output (millions of 2015 $)	$33.92	$14.96	$13.07	$61.95
2035	**Direct**	**Indirect**	**Induced**	**Total**
Employment (Annual Average)	236	187	208	632
Earnings (millions of 2015 $)	$22. 1	$11. 0	$8. 7	$41. 8
Output (millions of 2015 $)	$68. 4	$30. 1	$26. 3	$124. 7

Economic Impacts from Development in Areas Surrounding CCX

The impact of an intermodal terminal on the local and regional economies is far greater than that attributable to the operations of the facility itself. Intermodal transportation provides shippers with economies that are not found in the competing truck transportation alternative. The consolidation of individual shipments into trainloads at intermodal terminals significantly reduces cost. The closer shippers can locate to the terminal, the greater the benefit as trucking costs to the terminal are reduced. Thus, terminals spawn new manufacturing activity in close proximity to the facility. This includes transportation dependent industries as well as their suppliers.

Warehouses and distribution centers also locate near intermodal terminals. One recent example of a facility that has helped to generate significant nearby development is the CSX Northwest Ohio ICTF near North Baltimore, Ohio. This facility is similar to CCX, since it also performs a hub function. The Northwest Ohio ICTF was originally solely intended to be a transfer hub, but since its opening regional freight has materialized as has economic development. Based on discussions with members of the community about the benefits, some believed that all growth opportunities were not initially fully captured due to limited preparation and planning of infrastructure by local governments. Regardless, since opening, Wood County, where the Northwest Ohio ICTF is located, and the surrounding area are hosts to several new or expanded distribution centers, including facilities owned by Home Depot and Calphalon constructed in 2013. FedEx, Walgreen's, Kohl's, Best Buy, UPS, Menards, BX Solutions, and Lowe's have developed new facilities or expanded existing ones since the opening of the terminal.

Figure 14 displays the CSX facility and nearby major distribution centers or manufacturers.

Figure 14: NW Ohio Logistics Development

While it is difficult to predict the type of economic activity and precise employment attributable to a new terminal without a comprehensive modeling effort that includes numerous variables, benchmarks relating employment to terminal container volume can be used to provide a valid approximation. This approach is based on the premise that economic development is proportional to terminal volume. CSX used this methodology in its National Gateway application for a TIGER grant estimating job creation based on information on several intermodal facilities.

Based on this approach, **Table 26** shows the number of additional jobs expected from the economic activity related to a new intermodal terminal in the region. The economic impacts of intermodal terminals vary considerably. On the one extreme is the Virginia Inland Port (VIP) with 116.8 jobs per 1,000 TEU, while at the other extreme is the projected impact of the Choctaw Point Intermodal Facility with only 5.3 jobs per 1,000 TEU.

Table 26: Estimation of Jobs Generated by CCX Based on Forecast Lifts – Either Terminal Location

Comparable Facility	Jobs Per 1,000 TEUs	Annual TEUs	Terminal Status
Virginia Inland Port - Front Royal, VA (NS)	116. 8	56,000	Operational
Logistics Park - Alliance, TX (BNSF/UP)	33. 3	600,000	Operational
Logistics Park-Chicago (CSX)	27. 4	365,000	Operational
Rickenbacker Intermodal Facility - Columbus (NS)	68. 0	300,000	Planned
Prince George Intermodal Terminal - Prince George, BC (CN)	6. 0	124,000	Planned
Choctaw Point Intermodal Facility – Mobile, AL (CN, CSX, NS, KCS, BNSF)	5. 3	320,000	Planned
Average All	42. 9		
Average Completed	59. 2		
	2025	**2035**	
Estimated CCX Local TEUs	298,488	374,699	
Estimated Jobs Average	12,805	16,075	
Estimated Jobs High	20,297	25,480	
Estimated Jobs Low	8,179	10,267	

Note: Terminal Status is at the time the estimates were developed; Source: National Gateway TIGER Grant Application, PB Analysis

If CCX were to generate the same number of jobs per TEU as the average of the terminals, the annual economic impact would be around 13,000 jobs based on the number of local lifts the first year of full operations. If the terminal were to generate employment analogous to the Rickenbacker Intermodal Facility, in this high scenario, the annual employment would be around 20,000 based on the local container volume the first year of full operations. However, if the facility were to generate economic impacts similar to Logistics Park-Chicago, the number jobs generated would be around 8,000 based on the local container volume the first full year of operations. The economic development surrounding CCX would be long-term, perhaps reaching full potential after 10 or 15 years.

The approach used in forecasting can explain part of the differences. However, there are three other drivers of note as well as well:

- Relationship between the intermodal terminal and regional economic development initiatives
- Overall desirability of the location for logistics development
- The nature of the intermodal service that the terminal supports

Generally, those intermodal terminals that are credited with generating the most jobs and greatest economic impacts are coupled with major economic development initiatives. From Table 26 above, the Rickenbacker Intermodal Facility was forecast to generate a significant number of jobs. The terminal, however, is one component of a broader economic development initiative, the Rickenbacker Inland Port. The Columbus Regional Airport Authority has been marketing development sites in the area as the Rickenbacker Global Logistics Park. This includes up to 29 million square feet of additional development floor space to complement the 40 million square feet of existing space. One of the most prominent

logistics facilities is the BNSF terminal at Alliance, Texas. This is part of a 17,000-acre master-planned, mixed-use development. Alliance credits itself with having created over 139,348 jobs and over $55 billion in economic impact since 1990. While one could dispute whether all of these economic impacts are a direct result of constructing an intermodal terminal, it seems that logistics facilities have the highest economic impact if they are coupled with economic development initiatives. Intermodal facilities and other components of logistics parks mutually support each other. The Carolinas Gateway Partnership is currently working to market several industrial sites in the Nash and Edgecombe County area. These sites include the Kingsboro Megasite, a CSX Select site in close proximity to the facility.

Table 27 shows the economic impacts that would be expected from nearby development, in the years 2025 and 2035. These were developed with the IMPLAN model, assuming that the job creation figures shown above in Table 26 materialize in the warehousing and storage industry.

Table 27: Summary of Economic Impacts from nearby Development

Estimated Impacts 2025	Direct	Indirect	Induced	Total
Employment (Annual Average)	12,805	4,455	4,898	22,157
Earnings (millions of 2015 $)	$594	$186	$204	$984
Output (millions of 2015 $)	$1,277	$564	$618	$2,459
Estimated Impacts 2035	**Direct**	**Indirect**	**Induced**	**Total**
Employment (Annual Average)	16,075	3,562	4,100	23,737
Earnings (millions of 2015 $)	$504	$149	$171	$824
Output (millions of 2015 $)	$1,021	$451	$517	$1,990

The Virginia Inland Port, estimated to have generated the greatest number of jobs per TEU, was not linked to a specific development project. This terminal was originally constructed to help the Port of Virginia compete with the Port of Baltimore by intercepting containers destined for Baltimore. The Virginia Inland Port was constructed at a highly strategic location - the intersection of Interstates 66 and 81. I-81 is one of the most heavily used truck routes in the United States and I-66 is the primary highway that links I-81 to the Washington, DC metropolitan area, consistently one of the fastest growing metropolitan areas over the past several decades. Good highway connections are attractive both for intermodal terminals and for distribution centers and other logistics facilities. One could argue that shippers may have constructed warehouses and distribution facilities in the area around Front Royal regardless of the Virginia Inland Port due to the strategic intersection of highways, but the presence of the Virginia Inland Port could have tipped shippers' decisions. Figure 15 displays the density of truck traffic on the U. S. National Highway Network.

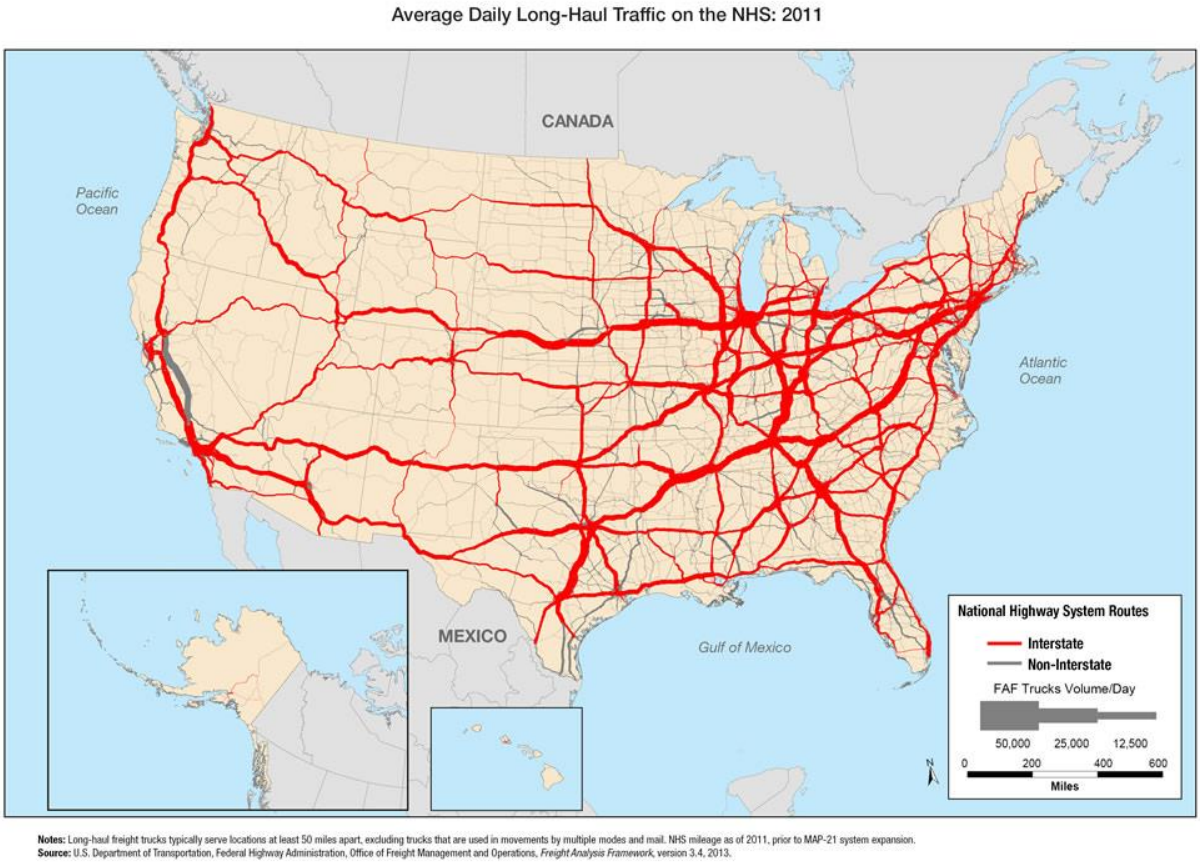
In addition to stimulating economic growth in the region, CCX could have a significant impact on the Port of Wilmington. The role of the terminal as a hub with connections to many markets could facilitate the establishment of dedicated intermodal rail service to the Port of Wilmington. Competitive intermodal service will support the Port in meeting its objective of doubling its container volume to 530,000 TEUs in 2020 as outlined in the North Carolina State Port Authority 2015 Strategic Plan. Reliable intermodal service is required to expand the geographic reach of the Port beyond its current truck

market. Dedicated rail intermodal service would assist the Port of Wilmington in attracting targeted new container services:

- Far East super post-Panamax service
- Far East Panamax service
- Trans-Atlantic service
- South Atlantic service

These potential port services are expected have a $7.1 billion impact on the North Carolina economy. [16]

Figure 15: Average Daily Long-Haul Traffic on the National Highway System in 2011



Source: FHWA

CCX would also enjoy an advantage in this respect. I-95, I-40, and US 64 (future I-87) in North Carolina are busy freight corridors. At either location, CCX would be strategically located offering accessibility to these major east-west/north-south corridors.

[16] North Carolina State Ports Authority, "Economic Contribution of the North Carolina Ports", 2014

Finally, intermodal terminals represent a gateway to an intermodal network. The desirability of an intermodal terminal from a shippers' perspective relates to the types and extent of intermodal services available. Many small intermodal terminals provide limited service options, enabling shipments between markets on a single train's route. This is analogous to a small airport's limited service offerings compared to those of a major hub airport. With CCX as hub, shippers will have access to nearly any point in the CSX network. Therefore, from a shipper's perspective and from the perspective of a tenant in a nearby logistics park, CCX would be an attractive terminal near which to locate.

One would expect CCX's economic development prospects to be relatively bright, based upon the following considerations:

- Availability of nearby land to create an integrated logistics center;
- Strategic location near I-95, I-40, and US 64 (future I-87) three busy freight corridors;
- The breadth of the intermodal service offerings that will be available at CCX.

Another consideration will be the desirability of economic development for the region. If employment in nearby areas of eastern North Carolina were at capacity, the benefits of bringing additional jobs to the area would be minor. Employment associated with CCX would just be pulling jobs away from other industries. However, the economic conditions of the region are in some ways below U. S. average. The U. S. Economic Development Administration (USEDA) considers regions to be distressed if the average income per capita of that area is at or below 80 percent of the national average or the unemployment rate is one percentage point higher than the national average. In the case of the two counties bordering CCX-Rocky Mount, unemployment is higher than the national average and per capita income is lower by all measures. Thus, the immediate surrounding region would qualify as economically distressed.

Table 28: Measures of Economic Distress: Edgecombe and Nash Counties

Indicator of Economic Distress	Region	U. S.	Threshold Calculations
24-month Average Unemployment Rate (BLS) period ending May 2016	8.12	5.39	2.73
2014 Per Capita Personal Income (BEA)	$21,060	$28,555	73.75%
2000 Per Capita Money Income (Decennial Census)	$35,544	$46,049	77.19%
24-month Average Unemployment Rate (BLS) period ending May 2016	$17,142	$21,587	79.41%

Source: Statsamerica.org

CCX would also provide employment opportunities for other counties in the region, which would be considered economically distressed by all USEDA approved indicators. Table 29 provides a summary of the economic distress metrics for Franklin, Halifax, Johnston, Martin, Pitt, and Wilson counties. Collectively, they have unemployment rates over a percent higher than the U. S. average and income per capita that is lower than 80 percent of the U. S. average, regardless of how measured.

Table 29: Measures of Economic Distress: Franklin, Halifax, Johnston, Martin, Pitt, Wilson Counties

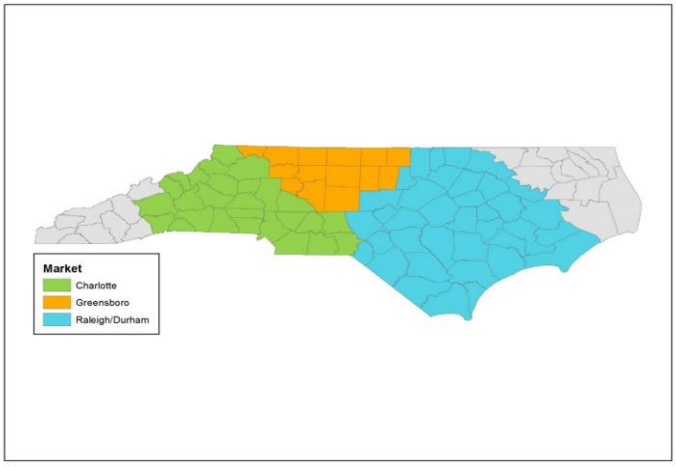
Indicator of Economic Distress	Region	U. S.	Threshold Calculations
24-month Average Unemployment Rate (BLS) period ending May 2016	6.47	5.39	1. 22
2014 Per Capita Money Income (5-year ACS)	$22,095	$28,555	72. 72%
2014 Per Capita Personal Income (BEA)	$34,646	$46,049	73. 56%
2000 Per Capita Money Income (Decennial Census)	$17,407	$21,587	74. 28%

Source: Statsamerica.org

Economic Impacts to Shippers in Raleigh-Durham Area

CCX would generate jobs, not only associated with development in the immediate vicinity of the facility, but also the overall Raleigh-Durham area, as well as other parts of North Carolina. Any business that could truck a container to or from CCX could potentially benefit. The presence of the facility would also make the region a more attractive location for new firms to locate. As described earlier, the market capture area includes all counties that are either within a 120-mile radius of Rocky Mount or closer to CCX than competing intermodal terminals in Hampton Roads, Virginia, Greensboro, or Charlotte. CCX, however, could serve the Greensboro and Charlotte terminal markets as well, given that the service offering of CCX will be much more extensive than those of these other terminals.

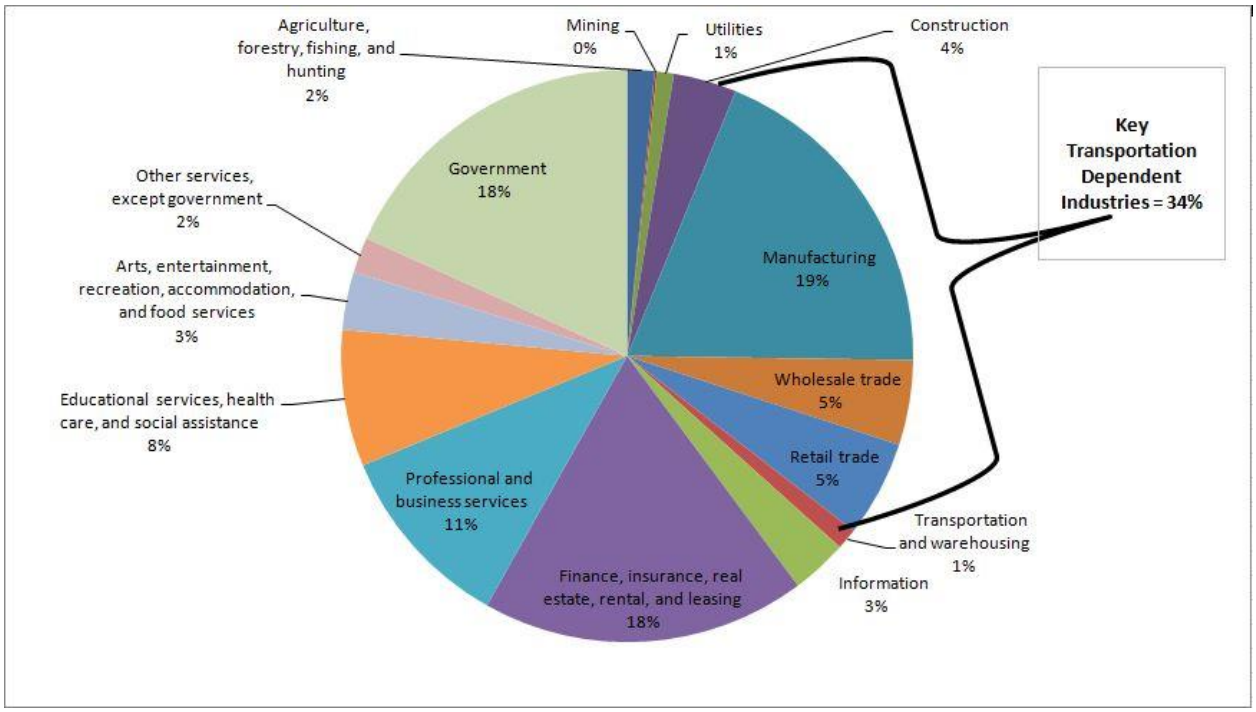
Figure 16: Raleigh-Durham, Greensboro, and Charlotte Intermodal Market Areas



Raleigh-Durham Freight Transportation Dependent Industries

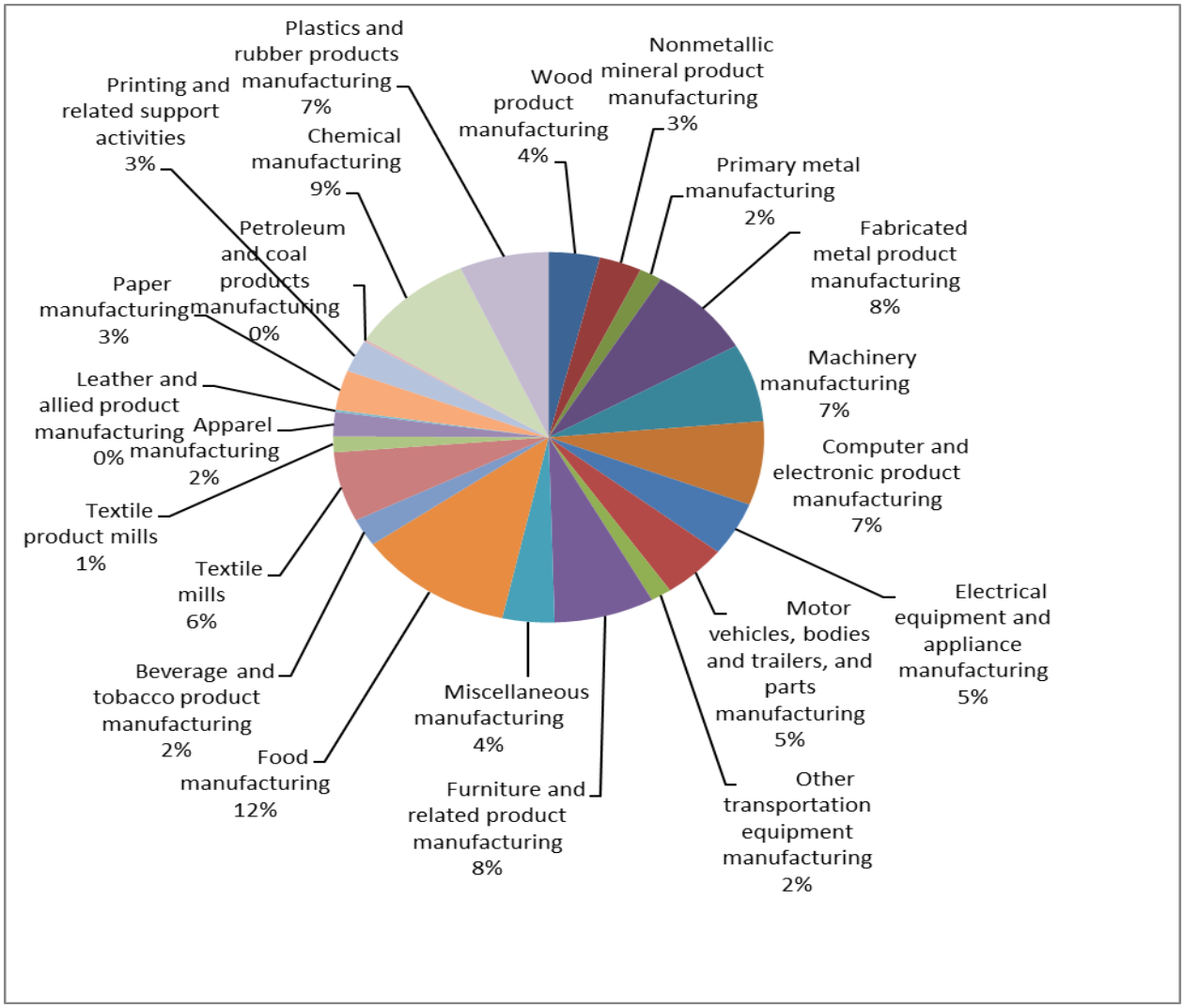
Within the Raleigh-Durham area, about 34 percent of the economy can be considered *freight transportation dependent*, i.e. requiring the movement of goods to or from the area. These firms account for approximately $66 billion in gross domestic product.

Figure 17: Key Intermodal Dependent Industries in the Raleigh-Durham Area



Manufacturing is 19 percent of the economy of the Raleigh-Durham market measured by GDP. Overall employment in manufacturing statewide is about 9 percent of total employment. With the exception of continuous manufacturing subsectors (manufacture bulk products such as chemicals), most of these manufacturing subsectors are of industries that could potentially benefit from improved intermodal service.

Figure 18: Subsector Share of Total Manufacturing Employment in North Carolina



Preliminary Employment and Fiscal Impacts

The potential delivery of as much as 5 million square feet of new space would yield a significant amount of new employment in the area. Using basic industry rule-of-thumb factors for employment per square foot, this amount of space could result in as many as 3,200 new employees. This calculation assumes the following:

- Two thirds of the new inventory spurred by the intermodal facility is comprised of warehouse uses and the remaining third is made up of manufacturing based uses. This is based on the existing mix of industrial inventory by subcategory. It also assumes that the intermodal facility will not directly result in any new space for the R&D or "other" sub-categories.

- 2,114 square feet per employee for warehouse space based on an estimate from the U. S. Department of Energy.
- 535 square feet per employee for manufacturing space based on an estimate from the Institute of Transportation Engineers.

This estimated number of jobs does not take into consideration any indirect or induced increases in employment resulting from the new economic activity in the area.

The extent of spin-off development will also have a significant positive impact on county- and state-level fiscal revenue. Property taxes represent the majority of revenue generated. Although time constraints limit the ability to conduct detailed research and analysis of industrial property values in the county and region, a sampling of sales transactions from a recent CBRE quarterly report suggest that $70 to $80/square foot is a conservative estimate of industrial property value in the region. Without adjusting for existing land value, this suggests that an additional 5.1 million square feet of development in the surrounding area would increase the county's property valuation by approximately $400 million. Applying the county's tax rate of $0.78 per $100 would yield an additional $3. 1 million per year in property tax revenue.

This analysis represents a preliminary, cursory calculation. A comprehensive fiscal impact analysis is recommended to more accurately estimate the full fiscal impact of new industrial development in the area, as well as any potential indirect impacts from increased housing demand, retail sales, and other revenue sources. Although this new construction may require public sector investments in infrastructure upgrades, once these industrial uses are delivered, they will not require significant increases in county / city services relative to the development of other land uses such as residential units, which serve to increase school capacity requirements and greater need for public safety services.

At the state government level, the majority of general revenue is comprised of individual income taxes, sales, and use taxes. While the forecasted new development will contribute to increases in these revenue sources, a detailed analysis is recommended to estimate the extent of these increases, and to determine how much new employment generated will pull from beyond the state.

Land Inventory

In the Raleigh region, the average coverage ratio (building-to-land ratio) for modern (built in the last 10 years) manufacturing and warehouse properties is 0.16. This indicates that for 5.1 million square feet of new space to be delivered, over 700 acres of non-contiguous developable land would be required in the surrounding area.

Chapter 6: Local Land Use Alternatives

An intermodal facility has the potential to be a strong catalyst for investment in new industrial real estate development in the surrounding area, especially in light of the ample developable land inventory highlighted above. This is especially true for the industrial land uses such as warehousing and manufacturing as proximity to intermodal facilities reduces supply chain costs. Developable land parcels in the immediately surrounding area will be far more attractive to industrial developers and end users with an intermodal facility in place.

Potential Industrial Real Estate Impacts

Based on preliminary research, there appears to be little available data or analysis quantifying the impacts of an intermodal facility on the local industrial real estate market. There is, however, plenty of anecdotal evidence from other new facilities around the country that suggests that it can serve as a strong catalyst for new manufacturing and warehouse development in the immediately surrounding areas. A recent analysis by Jones Lang LaSalle suggests that 31 new intermodal facilities built or planned since 2000 have the potential to generate over 170 million square feet of new industrial development in the immediately surrounding area (5. 6 million square feet per facility). [17] CSX's own experience from previous intermodal developments supports these assertions. Development surrounding the Chambersburg, PA facility included large-scale expansions by major businesses, including Target, Wal-Mart, Kmart, and Rubbermaid, and many new, large-scale buildings were constructed near its Fairburn intermodal facility 20 miles southwest of Atlanta.

Although it is unknown how much new development the intermodal facility will generate, a preliminary, market-based analysis suggests that it could be in the millions of square feet over the long term.

The remainder of this chapter identifies an inventory of parcels that leverage business and job creation to support the proposed intermodal facility location. With that in mind, this chapter is divided into two sections consisting of the 1) general methodology and 2) a site analysis. The methodology evaluates access to qualified labor, identifies types of facilities and the impacts these factors can have on a community, facility requirements, and freight facility location criteria. The second part of the chapter provides a detailed discussion of the assessment of the land use alternatives associated with Rocky Mount CCX. Parcels within a 10-mile radius of the proposed site identified underutilized parcels that could potentially be used for an intermodal logistics center (ILC). Based on these parcels, the analysis took into account large parcels that were adjacent to the proposed CCX for the expansion of an ILC. A brief description of the location of the proposed site is provided below.

[17] *The Re-emergence of the Iron Horse; the Growth of Inland Ports and their Impact on Industrial Real Estate,* Jones Lang LaSalle, 2014

METHODOLOGY

Demographics and Workforce

Demographics, socioeconomic environment, and workforce are important factors in intermodal terminal-related development. Freight facilities bring jobs but as logistics services are becoming more sophisticated and supply chains more complex, there is an increasing need for highly skilled labor.

Average worker age, earnings, and education serve as an indicator of labor skills. The demographics of the areas surrounding both sites demonstrate a relatively young population that is still in their prime working years. Looking at Edgecombe and Nash Counties, approximately 78 percent of the population is 54 years old or younger. This suggests a relatively large labor pool that is young and trainable for employment.

The local population for the two counties is reasonably well educated. Edgecombe and Nash counties have a population with 31.2 percent having some college or associates degree and 18.6 percent having a bachelor's degree or higher. Only 14 percent of the population in Edgecombe and Nash counties has less than a high school degree. In general, the data show that the age and education level of the population in the surrounding areas of the potential site is a good indicator of a healthy labor market.

To provide further perspective on the labor force, Edgecombe and Nash were compared to two other counties with major intermodal logistics centers, Polk County (Central Florida Intermodal Logistics Center) and Franklin County (Chambersburg, PA).

Table 30 shows that Edgecombe and Nash compare favorably with the two other counties having similar distributions of worker age, earnings, and worker education attainment. These demographics are reasonably conducive to attracting intermodal logistics facilities and supportive freight facilities to the area.

Table 30: Labor Force Benchmarking

	Polk County (Winter Haven, FL)		Franklin County (Chambersburg, PA)		Edgecombe & Nash Counties (Rocky Mount)	
Population Estimate 2013	623,009		152,085		61,433	
Labor Force						
Total All Jobs -2011						
	Count	Share	Count	Share	Count	Share
Total	201,702	100%	50,249	100%	50,249	100%
Worker Age						
	Count	Share	Count	Share	Count	Share
Age 29 or younger	42,780	21.2%	11,861	23.6%	13,117	21.2%
Age 30 to 54	113,318	56.2%	27,484	54.7%	34,917	56.5%
Age 55 or older	45,604	22.6%	10,904	21.7%	13,751	22.3%
Earnings						
$1,250 per month or less	51,013	25.3%	13,930	27.7%	18,290	29.8%
$1,251 to $3,333 per month	87,539	43.4%	19,635	39.1%	24,948	40.6%
More than $3,333 per month	63,150	31.3%	16,684	33.2%	18,195	29.6%
Worker Education Attainment						
Less than high school	22,143	11.0%	4,004	8.0%	7,023	14.0%
High school or equivalent, no college	47,381	23.5%	13,873	27.6%	16,244	32.3%
Some college or Associates degree	51,663	25.6%	12,306	24.5%	15,684	31.2%
Bachelor's degree or advanced degree	37,735	18.7%	8,205	16.3%	9,365	18.6%

Source: U. S. Census Bureau, OnTheMap Application

In general, Edgecombe and Nash Counties have relatively similar worker age profile as the two benchmark counties. Edgecombe and Nash fall slightly behind Polk and Franklin Counties in earnings, but fare somewhat better in education.

Freight and Logistics Facilities

Logistics services are provided by several types of facilities with each having a different purpose and different location requirements. Each, however, will have an impact on corollary land uses and traffic. For example, a distribution center will increase truck traffic in the immediate area contributing to congestion and reduced air quality. On the other hand, these facilities can also be a catalyst for economic growth by spurring new development or redevelopment of existing underutilized land, increasing property value. They also generate income for the community and state directly in the form of property tax and indirectly through employees or vendors making local purchases. The following table shows representative examples of freight and logistics facilities.

Table 31: Freight Facility Alternatives

Facility Type	Name of Facility	Size	Direct and Indirect jobs	Transportation Access	Freight handled	Freight Volume
Inland Port	Virginia Inland Port	161 acres	17 direct jobs, over 8,000 indirect jobs	One Class 1 Railroad (NS), within 5 miles of I-66 and I-81	Intermodal containers	33,600 Containers
Intermodal Terminal	Rickenbacker Intermodal Terminal (Columbus, OH)	175 acres	Approximately 150 direct jobs at Intermodal facility , projections of 20,000 jobs at freight industrial park	Two Class 1 Railroads (NS& CSX), within 5 miles of I-270 and Highways 23 and 33 Airport 1 mile	Primary intermodal containers	250,000 annual container movements
Bulk or Transload Terminal	Savage Safe Handling (Auburn, ME)	210 Acres	100 direct jobs	One Shortline Railroad (SLA), within 3 miles of I-95	Chemicals, plastic pellets, liquid fuels	500,000 tons per year – 5,000 railcars per year
Distribution Center	Family Dollar	75 acres, 1.2 million sq.ft. for buildings	515 direct jobs , catalyst to another 155 DC jobs	Direct ramp to I-10 Highway	Consumer retail goods	90 trucks / day – 32,000 trucks per year
Intermodal Logistics Center	Central Florida ILC (Winter Haven)	900 acres	55 direct jobs-terminal 8000 jobs-ILC	Class 1 Railroad CSX State Road 60	Primarily Intermodal containers	300,000 intermodal rail lift per year
Hub Terminal	Old Dominion (Morristown , TN)	65 acres		Adjacent to I-81	Consumer retail goods	75-90 trucks per day

Source: NCFRP Report 13

While CCX will serve the role of an intermodal terminal, it will attract other of the logistics services to Rocky Mount and the region. Distribution centers will locate in the area with the potential for collocation with other facilities in an integrated intermodal logistics center. Although, logistics development would be expected to be focused on containerized shipments, facilities handling bulk or other non-containerized products could also locate in the region.

Table 32 presents the requirements for representative industrial uses including logistics and manufacturing. It shows that intermodal rail access is typically required within 100 miles of many industrial uses.

Table 32: Industrial Facility Requirements

Industry	Industrial Distribution	Modal Facility	Heavy Industrial/ Manufacturing	General Manufacturing	Hi-Tech Mfg. & Processing
Example	***Auto parts***	***Truck terminal***	***Machinery***	***Plastics***	***Electronics***
Size (Contiguous, Developable Acres)	Minimum **25** acres	Minimum **15** acres ; Medium **25** acres for hub or large LTL.	Min. **25** acres	Minimum **10**	Minimum **25**
Security	Manageable at site	Manageable at site	Manageable at site	Manageable at site	Manageable at site
Population w/in 1 hr. drive	>20,000	>200,000	>30,000	>30,000	>50,000
Public Transit	Accessible	Accessible	Accessible	Accessible	Accessible
Skills	As defined by the specific industry	Basic logistics, Driver, material handling, technician	As defined by the specific industry	As defined by the specific industry	Strong engineering and IT skills across broad range
Other Economic Network	Proximity to end markets	Ability to serve immediate region	Proximity to supplier/vendor base	Proximity to supplier/vendor base	Proximity to strong, specialized supplier/vendor base
Highway Access	Interstate, state highway or major arterial within 5 miles	Interstate, state highway or major arterial within 1 mile or less	Interstate, state highway or major arterial within 20 miles	Interstate, state highway or major arterial within 30 miles	Interstate, state highway or major arterial within 15 miles
Intermodal Rail Access	Within 100 miles	As defined by mode	Within 100 miles	Within 100 miles	Not typically required
Port Access	N/AP	Variable	Bulk B/B & Project	Bulk B/B	N/AP

CSX Chambersburg and Fairburn (Georgia) intermodal terminals provide examples of the type of development that is likely to occur. The Chambersburg facility has attracted Target, Rubbermaid, Wal-Mart, Kmart, Schneider Logistics, and Franklin Logistics. Locating near Fairburn have been production facilities: Clorox, SC Johnson, Smuckers, Navistar, Exel, Purin, Unilever, and Georgia Pacific.

Freight Facility Location Criteria

Beyond demographics, other criteria are important in logistics facility location. Key criteria include:

Accessibility to key markets- Proximity to population and economic centers is an important consideration in the location of logistics facilities.

Congestion-free connectivity with markets and production locations - A congestion free local and regional roadway as well as rail network is extremely important. A fluid surface transportation network increases reliability and speed as well as reduces cost. The facilities are usually located on property along major highways or where multiple highways converge, near railroad terminals or major sea and airports.

Availability of suitable facilities or land - Another consideration in logistics facility site selection is land or facility availability. Each type of logistics activity has specific land or facility size requirements driven by the processing and product storage conducted at the facility as well as commercial vehicle parking need. Land or facility cost is equally important as acreage or floor space. Zoning is a factor that contributes to space availability and cost.

Ease of permitting and no burdensome regulation - Permitting and regulatory procedures can influence the logistics facility location decision. Where a community is already experienced with freight facilities and their operations/process, that understanding can positively influence a company locating a facility in that area.

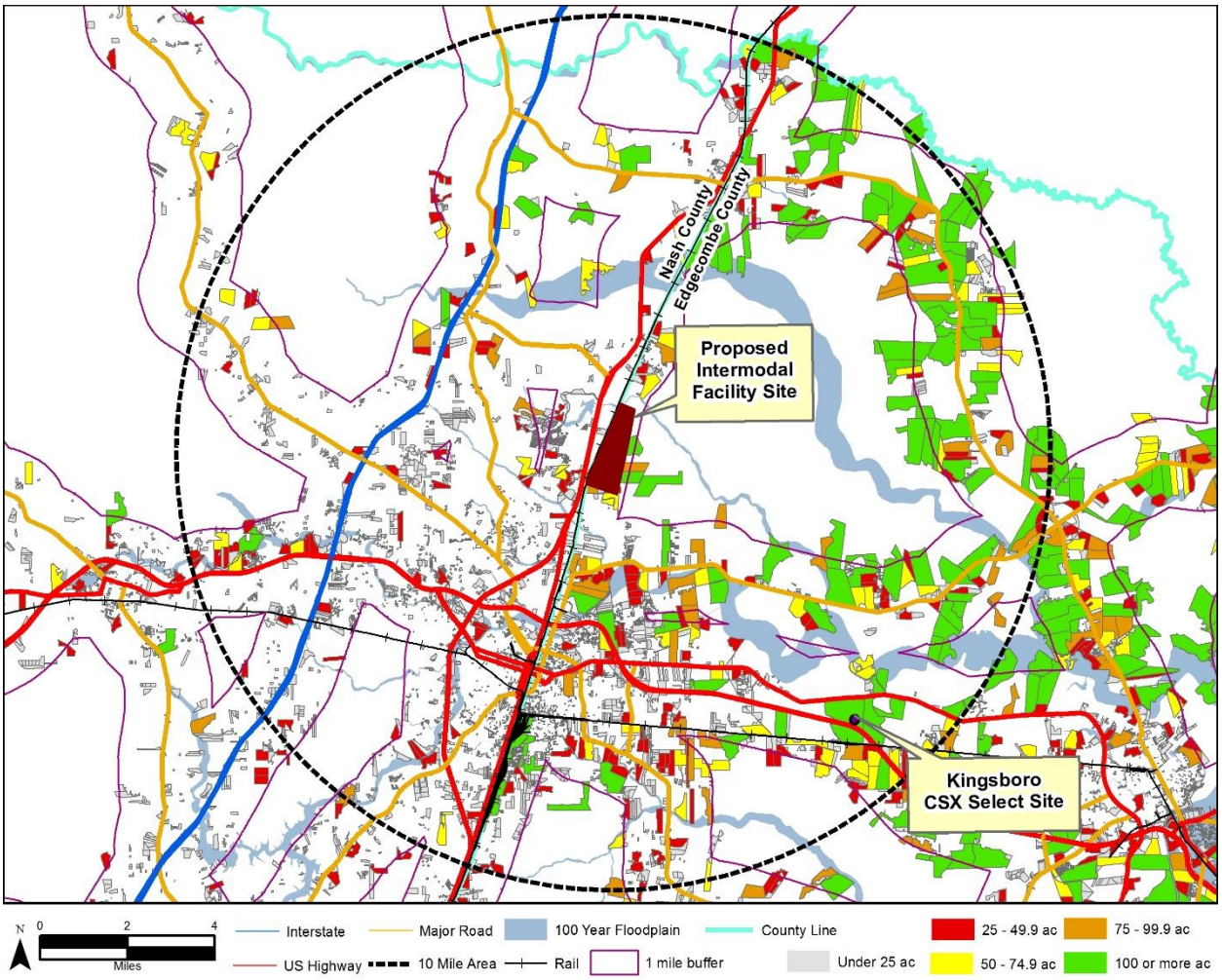
Favorable tax environment- Income, sales, real estate, and other property taxes can affect the logistics facility location decision as any of these can materially affect cost.

Favorable climate and minimal natural hazards - Unfavorable climatic conditions and natural hazard can affect both operating costs and employee safety.

Freight Dependent Industry and Logistics Services Site Inventory

Several sites suitable for industrial facilities within a 10-mile radius of the potential intermodal facility were identified and are shown in Figure 18. Potential sites were examined in terms of physical constraints and opportunities. Properties were selected based on size and configuration; ease of access to and distance from key transportation routes (highways, intermodal facilities), rail access, and environmental considerations (floodplain, wetlands), and a vacant land use classification. The figure shows candidate parcels and corresponding acreage. In addition, parcels are identified that are within one-mile buffer of major highways. These are considered to be located in preferred development zones (PDZ).

Figure 19: Rocky Mount Site Inventory: 10 Mile Radius of CCX



The figure above shows a concentration of underutilized parcels east and northeast of the proposed intermodal facility site.

Focus Area for Related Facilities

While the 10-mile analysis area identified a large number of vacant parcels of different sizes, it is also important to look at potential sites that could be developed closer to the CCX terminal. Larger groupings of parcels closer to the terminal will be more attractive for development in the near term than sites further away from the terminal, due to proximity to the terminal and the lack of increased competitive land prices. Additionally, sites closer to the terminal could attract higher land values in the future and could create demand to assemble contiguous vacant and underutilized parcels.

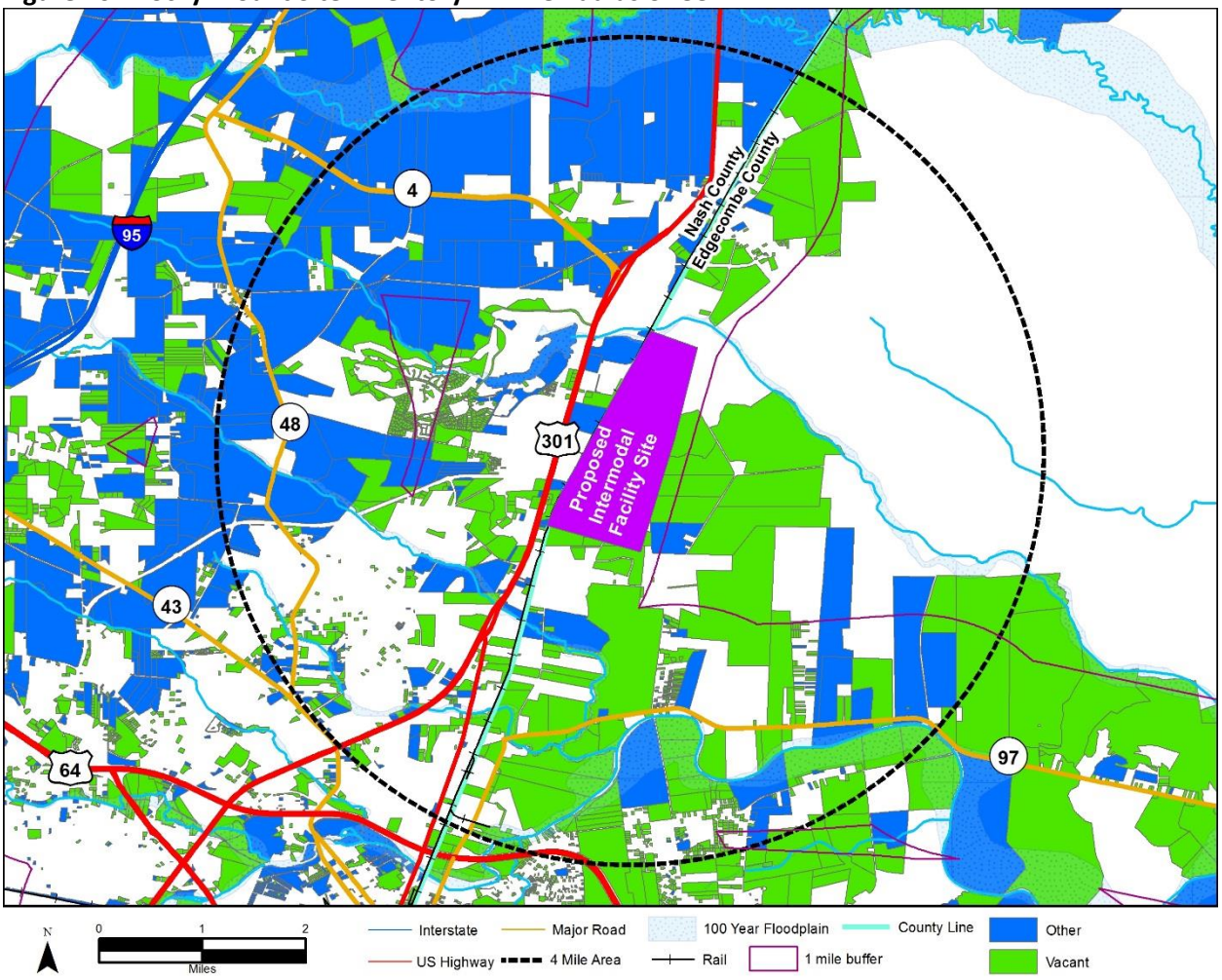
Four-mile catchment primary employment area. Based on the specific geographic context of the CCX terminal, including the locations of major roadways proximate to the terminal, a 4-mile catchment area has been defined for the Rocky Mount site in Figure 19 and illustrates the vacant and underutilized parcels that are within one mile of a major roadway. The four-mile area constitutes the potential

"employment area" based on industrial investments. These parcels could qualify as suitable sites for industrial facilities.

Value of underutilized parcels - Since the 4-mile area represents a more competitive area than farther away from the terminal, parcels identified in this area were classified as vacant and as underutilized. In this context, underutilized parcels were identified where the land improvements are less than ten percent (10 percent) of the land value. For instance, this occurs when the land value of a parcel may be valued at $100,000, and the improvement (or structure) on the land is valued at less than $10,000. This is significant because the cost to acquire these parcels is relatively the same as the cost of vacant land, and identification of highly underutilized parcels can show patterns of lands that have the potential to be assembled into productive job centers. However, there are many parcels in both counties that have deferred property taxes due to agricultural or similar production, so some parcels may be more expensive than what the analysis shows.

Figure 19 illustrates the mix of vacant and underutilized parcels near Rocky Mounty site. Vacant properties are shown in green. Properties that are underutilized are shown in other colors (i.e. residential, non-residential, and other). The figure shows a good distribution of underutilized parcels with a concentration north and south of the proposed site.

Figure 20: Rocky Mount Site Inventory: 4-Mile Radius of CCX



rail line and of the proposed terminal site. The map above shows several attractive parcels within the 4-mile radius area that could be consolidated for freight generating facilities. Two large parcels within the proposed intermodal facility site abut the rail. These sites are ideal for easy access to the CSX line from US Highway 301. Other considerations for the candidate parcels included easy access to the transportation network. The proposed CCX site and the parcels considered for the intermodal logistics center (ILC) would have access to NC 4, which is the recommended route to I-95. These candidate parcels are also considered suitable based on their underutilization and vacant status.

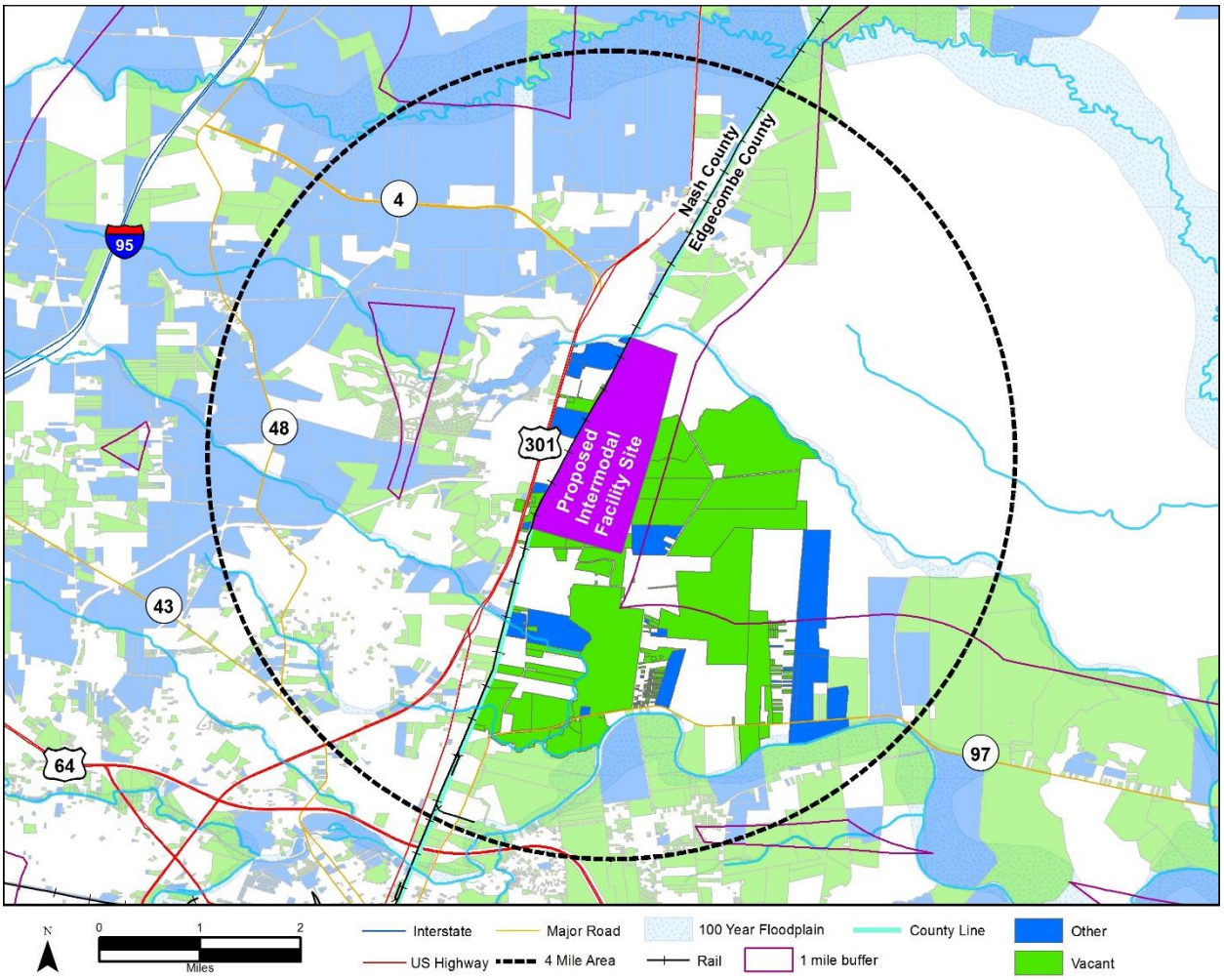
Intermodal Logistics Center

Figure 20 suggests opportunities for the development of an intermodal logistics center (ILC) near the proposed Rocky Mount site. An ILC is a site or area hosting a cluster of industrial, distribution, and logistics infrastructure and supporting uses. The ILC can incorporate an intermodal terminal or it can be adjacent to the terminal permitting the movement of cargo without the need to use public thoroughfares. The central feature of the ILC is high-quality connections to intermodal and other transportation infrastructure (road, rail, air, and barge) that enable the fast and flexible transportation of freight. Because of the development costs, many ILCs are funded by large private developers who also serve as integrators or through public-private partnerships.

A distinguishing characteristic of an ILC is shared access to facilities, equipment, and services among firms located on site. This access can include common intermodal infrastructure, customs, and quarantine services, cleaning and repair areas, information technology and telecommunications, and security areas.

ILCs add significant value to the supply chain through their diversity of collocated facilities, services, and infrastructure. The combination of freight generators with multiple modes of transportation, logistics activities, and commercial support services at a location near markets can increase regional competitiveness. An ILC can have a large impact on a number of freight-related processes and provide additional value, to the extent that services can be coordinated.

Figure 21: High- Potential Parcels for Freight Facilities at the Rocky Mount Site



Rocky Mount ILC Example

Shown in Figure 21 are parcels east of the proposed intermodal facility site that were found to be potential candidates for inclusion in an ILC due to the ability to assemble large, vacant, and contiguous sites (over 500 acres), adjacency to the CCX terminal, and accessibility of highway transportation (less than one mile from a major roadway). The ILC could support warehousing and distribution centers, office, light industry, and manufacturing and assembly. The closest NCDOT certified site or CSX Select Site is the Kingsboro industrial site, located about 10 miles southeast of the proposed intermodal facility site, adjacent to US 64.

Figure 22: Rocky Mount Candidates Sites for an ILC

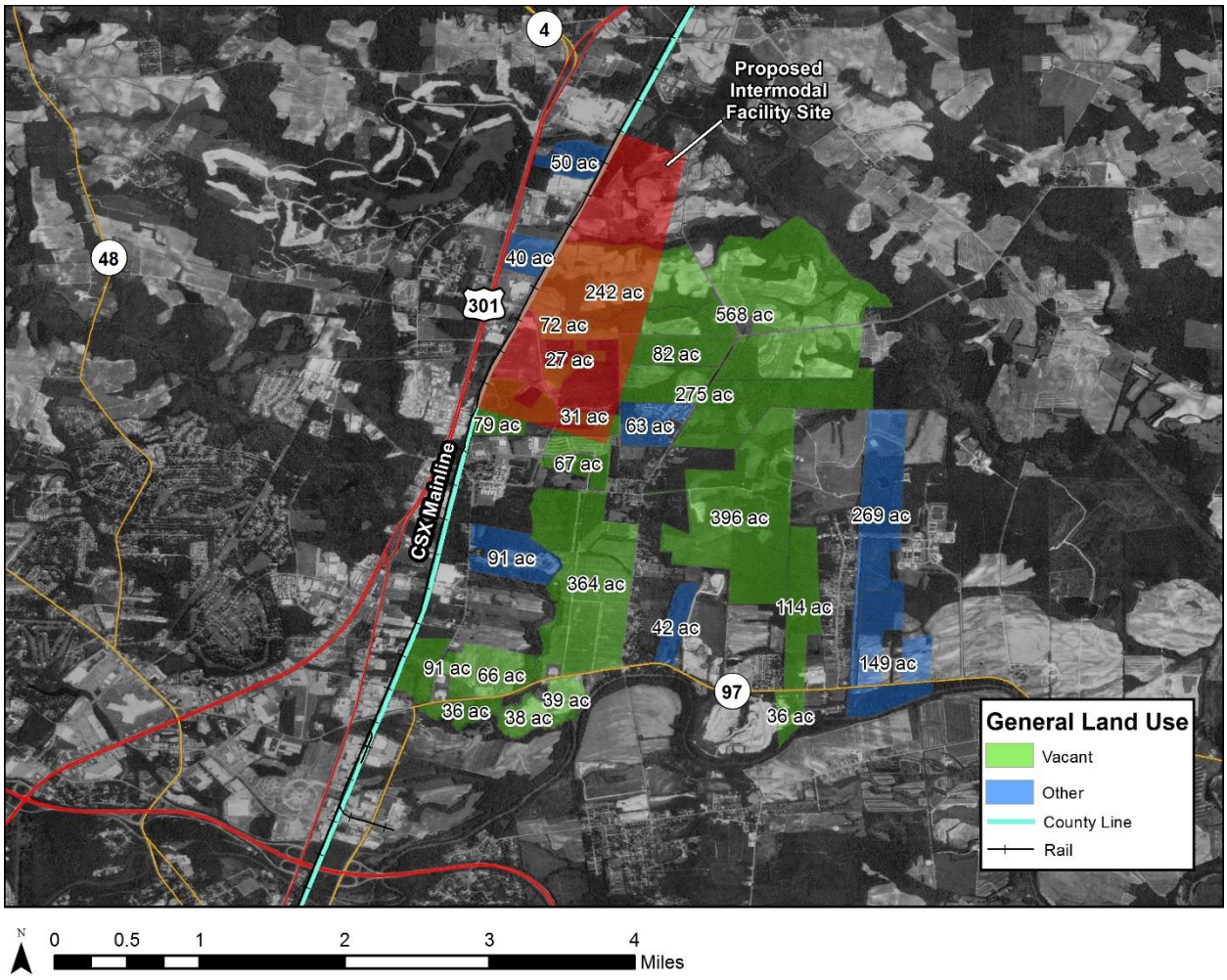
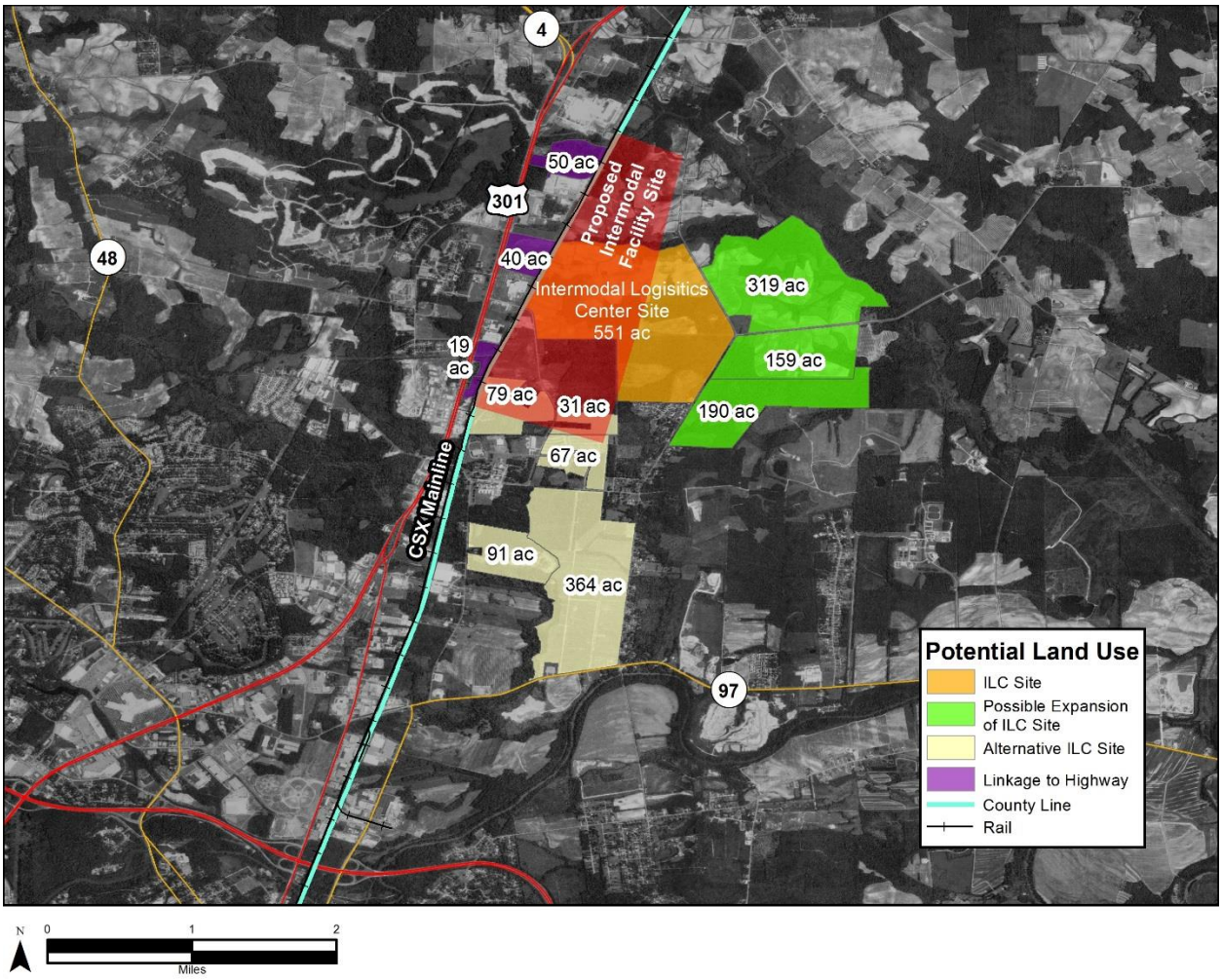


Figure 23: Rocky Mount Candidates Sites for an ILC



The orange area shown in Figure 22 illustrates one example of an ILC footprint on a 551-acre site assembled from large parcels of vacant land. There is an additional large vacant parcel (364 acres) available south of the site that could serve as potential candidates based on its adjacency to state highway 97. Additional parcels would have to be acquired and assembled to meet the 500-acre requirement.

West of the CSX mainline are three parcels adjacent to the rail that have a direct linkage to U.S. Route 301, which are relatively smaller than the other parcels west of the rail line. Through the analysis, suitable parcels were not identified on west side of the rail.

Typically, warehouse buildings are estimated to occupy somewhere between a quarter and a fifth of the land on sites where they are located. The remaining land is devoted to parking lots, roadways, and landscaping. A reasonable estimate is for a warehouse to occupy roughly 12,000 square feet per acre.

The U. S. Energy Information Administration (EIA) estimates that the employment density of warehousing is about 1,700 square feet per worker. [18] Based on those assumptions, the estimated employment generated by a 550 acre ILC is 3,880 jobs.

[18] http://www.eia.gov/consumption/commercial/data/2003/pdf/b2.pdf

Chapter 7: Capacity Assessment

CCX Terminal Capacity

Limited information on the CCX facility and its operations precluded conducting a detailed capacity analysis. The CSX Northwest Ohio ICTF in North Baltimore, however, provides a benchmark to assess broadly the capacity of CCX as its operating model is similar to that being proposed for CCX. The North Baltimore facility is used to process containers moving between western rail carriers and the CSX system. The terminal is also used for local container shipments to or from Northwest Ohio.

The CSX $175 million Northwest Ohio ICTF began operations in early 2011. In two years, CSX saw the need to expand the terminal as lift activity began to increase significantly. The expansion, which extended eight 3,000 foot processing tracks to 5,300 feet, added two additional cranes, and increased the number of receiving and departure tracks, cost $42 million increasing investment in the facility to $217 million.

CSX provided a potential footprint for the proposed CCX facility, a schematic of a typical cross section of the terminal, and basic information about assumed track length, container dwell time, container sizes, and train lengths. While this information, by itself, is inadequate to develop a quantitative assessment of the capacity or scalability of the terminal, it does permit a high order benchmarking evaluation of capacity to be made.

The capacity of the Northwest Ohio ICTF is two million lifts per year. The WSP|PB CCX traffic analysis projects that the terminal will handle between 478,000 and 528,000 loaded containers in 2048. Using the very conservative assumption that both the full local containers and transfer containers would generate a complementary empty container move, the total required capacity would be 1,056,000 units in 2048, twice the projected number of loaded containers at the high end.

Benchmarking the proposed CCX layout under full build out to the Northwest Oho ICTF is shown in Table 33.

Table 33: Comparison of CCX to Northwest Ohio ICTF

Metric	Northwest Ohio ICTF	CCX
Total Acreage	500	Approx. 450
Total Length Along Mainline (feet)	10,560	Over 10,000
Total width, i.e. perpendicular distance from mainline to far end of truck parking area (feet)	726	646 or 803 (2,000 width of footprint)
Number of Support Tracks	9	12
Avg. Length of Support Tracks (feet)	8,631	8,500
Number of Process Tracks	8	8
Avg. Length of Process Tracks (feet)	3,953	4,300
No. of Rail Mounted Gantry Cranes	5	6
Lanes for Straddle Carriers	3	0
Width of Container Stacking Area (container widths)	5	5
Number of Wheeled Spaces	Approx. 450	1,200

As shown, most of the proposed dimensions of CCX are at least as sizeable as the Northwest Ohio ICTF. This would suggest that CCX should have more than enough capacity to handle the approximately one million lifts that would be required at full build out. However, the mix of local and transfer containers handled would differ. The differing proportions of local and through freight could cause the capacities of the two terminals to differ.

Rail Network Capacity

This section assesses the ability of CSX's rail network to support the incremental train traffic that is expected from the proposed CCX terminal. The terminal will route cargo with origins and destinations throughout the US through North Carolina, which will increase train volumes in and around the state. The rail network needs to have enough spare capacity to accommodate this increase without seeing a significant degradation of service quality. Moreover, because these additional trains will be providing high-priority intermodal service, speeds and reliability need to remain high in order to be competitive in targeted markets. Many of these rail lines also have high volumes of passenger trains, requiring service to remain fast and reliable in order to meet schedules.

This capacity assessment was performed using the information provided by CSX. CSX maintains detailed data on train operations throughout its network, and constantly looks for ways to improve fluidity by removing bottlenecks. NCDOT received historical performance data on line segments that CSX had identified as representing bottlenecks in the region. Our assessment is built on the performance information.

CSX's Approach for Identifying Rail Bottlenecks and Choosing Solutions

1) Demand Forecast: CSX used models of economic activity and freight demand to project current traffic into the future, with and without the CCX facility.

2) Critical Segment Identification: CSX identified critical segments in their rail network by estimating practical capacity from historical data, and making a comparison to their traffic forecasts.

3) Simulation of Capacity Issues and Solutions: Each critical segment identified is then modeled using simulation software to single-out the specific issues or conflicts causing performance degradations and evaluate potential solutions.

4) Engagement of Local Resources: CSX presents their findings to the local resources that manage and operate the critical segments to validate simulation results and provide a ground-level perspective on issues causing capacity constraints.

5) Project Selection: CSX then considers all of the evidence obtained and selects the projects that have

Capacity Constrained Segments

Rail capacity and capacity utilization are difficult concepts to measure because they are performance-related. Similar to vehicles operating on highways, there is an optimal point at which the throughput of trains cannot be maximized without seeing a major degradation of speeds and performance. After this point, if more trains are added to the segment, performance will decline and conditions on the corridor could resemble gridlock on highways. However, unlike in highways, trains are scheduled by railroads and operations are rarely allowed to reach a point of congestion. The flow of trains through the corridor is restricted in order to achieve required performance levels that allow rail to be competitive against other modes. In other words, capacity is defined more by the ability to provide a competitive service that is desired by end users and less about the physical limitations of the infrastructure on throughput. This is particularly important for passenger and intermodal trains, which require significantly higher travel speeds and greater reliability.

Two CSX lines that would serve CCX traffic are operating near capacity: the SE-Line and A-Line. Figure 23 and Figure 24 provide a visual perspective on the relationship between train performance and numbers of trains. These flow-density diagrams show the relationship between train flows, speeds, and reliability. Flows are shown on the y-axis and train density on the x-axis, while speeds can be read as the slope of the line connecting each point to the origin. Reliability or variability is demonstrated by the range of speeds (distance along the x-axis) for a given level of trains. As expected, in both of these figures, speeds and reliability decrease with higher train flows

For the A-Line between Rocky Mount and Selma, performance degradation is clearly observed when volumes approach 28 trains per day. With 2015 YTD 85th percentile volume[19] currently at 29 trains per day, additional volume growth across this segment will force CSX into a situation where, based on current infrastructure limitations, congestion and reliability will increase nonlinearly (as seen in Figure 23). In other words, without capacity investments, the risk profile of operations across this segment will increase markedly with additional growth—a situation that CSX cannot accept particularly with the substantial passenger train volume on the corridor.

The performance of trains was found to be worse on the SE-Line between Pembroke and Hamlet, as can be interpreted from Figure 24. Even though the SE-Line carries lower priority merchandise trains, degradations in performance occur at much lower volumes due to inadequate infrastructure capacity, and lower speeds extend throughout a greater range of operations. Adding an intermodal train on this segment would be practically impossible given these operations—the speeds are too low and unreliability too great.

[19] 85th percentile volume is the volume metric CSX uses to address infrastructure capacity to avoid the risk of working with averages, which do not account for day of week variability. Using the 85th percentile volume helps CSX ensure that its infrastructure capacity is sized to reliably handle normal day-to-day variability that is experienced across the railroad.

Figure 24: Performance of CSX A-Line (Rocky Mount – Selma) as a Function of Intermodal Train Volumes, 2008 to 2015

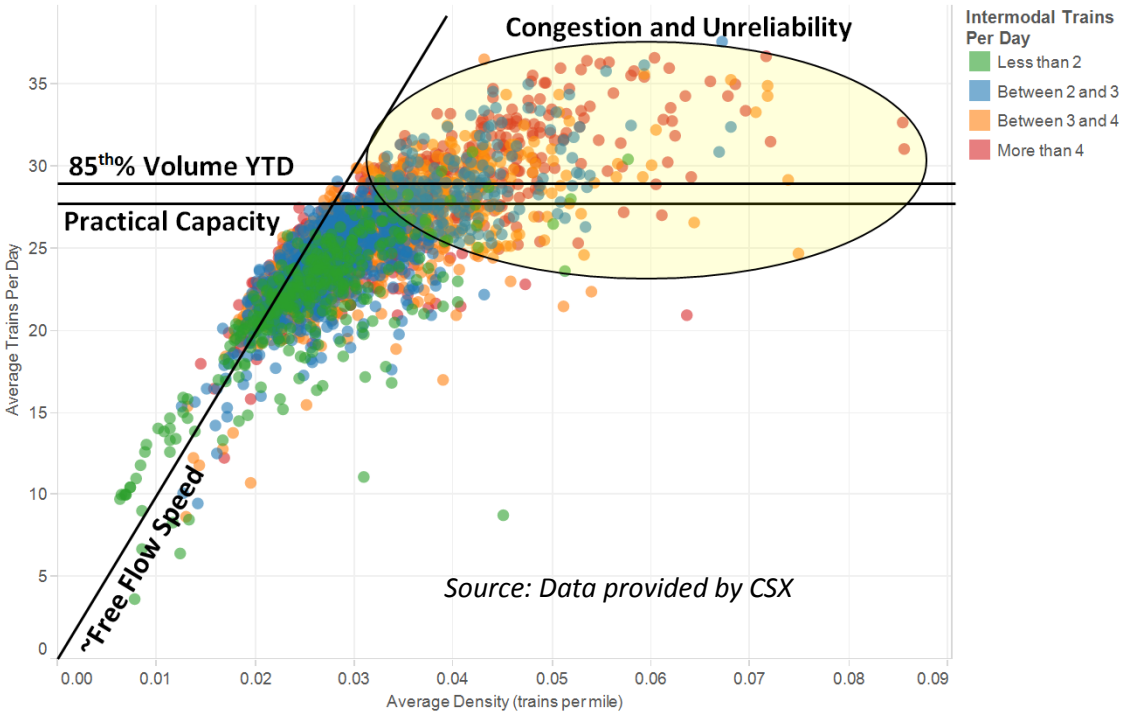
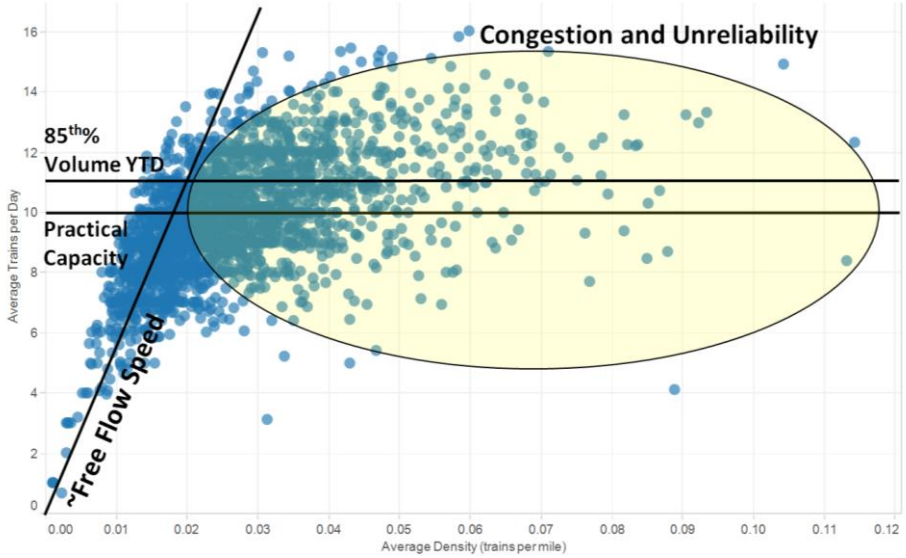


Figure 25: Performance of CSX SE-Line (Pembroke – Hamlet), 2008 to 2015



Source: Data provided by CSX

Rail Capacity Benchmarks

It is difficult to benchmark the capacity estimates presented in the previous section because of the wide variety of factors that come into play. Tracks that appear similar on the surface can have very different capacities depending on the train mix, schedules of passenger and intermodal trains, frequency of sidings, conflicts with local trains, etc. However, the estimates in Table 34 provide a reasonable starting point for benchmarking the volumes on the A- and SE- Lines. This table was generated by a study that

obtained capacity information from Railroads all over the US, including a wide range of infrastructure characteristics and operating conditions.

The A-Line can be best represented in Table 34 as a single track using centralized traffic control to move multiple types of trains. Given these conditions, one would anticipate the A-Line having a capacity of 30 trains per day based on the information in the table. This value is only slightly higher than the capacity estimated in the previous section, of 28 trains per day. This implies that the historical analysis of performance data for this line provides a reasonable estimation of capacity that is comparable to what is observed elsewhere in the US shown in Table 34.

On the other hand, the historical analysis of performance data for the SE-Line show a capacity estimate that is much lower than the values in Table 34. Even an uncontrolled single track should have a higher capacity than what was estimated from this analysis. The reason for this discrepancy, which CSX discovered from talking with their local operators, is that the storage track on this Line is not long enough to accommodate local trains, causing conflicts on the main line. This was preventing the SE-Line from reaching expected performance levels.

Table 34: Average Capacities of Typical Rail-Freight Corridors

		Trains per Day	
Number of Tracks	Type of Control	Practical Maximum If Multiple Train Types Use Corridor*	Practical Maximum If Single Train Type Uses Corridor**
1	N/S or TWC	16	20
1	ABS	18	25
2	N/S or TWC	28	35
1	CTC or TCS	30	48
2	ABS	53	80
2	CTC or TCS	75	100
3	CTC or TCS	133	163
4	CTC or TCS	173	230
5	CTC or TCS	248	340
6	CTC or TCS	360	415

Key: N/S-TWC – No Signal/Track Warrant Control.
ABS – Automatic Block Signaling.
CTC-TCS – Centralized Traffic Control/Traffic Control System.

Source: AAR: National Rail Freight Infrastructure Capacity and Investment Study, September 2007.

Capacity Enhancements Needed

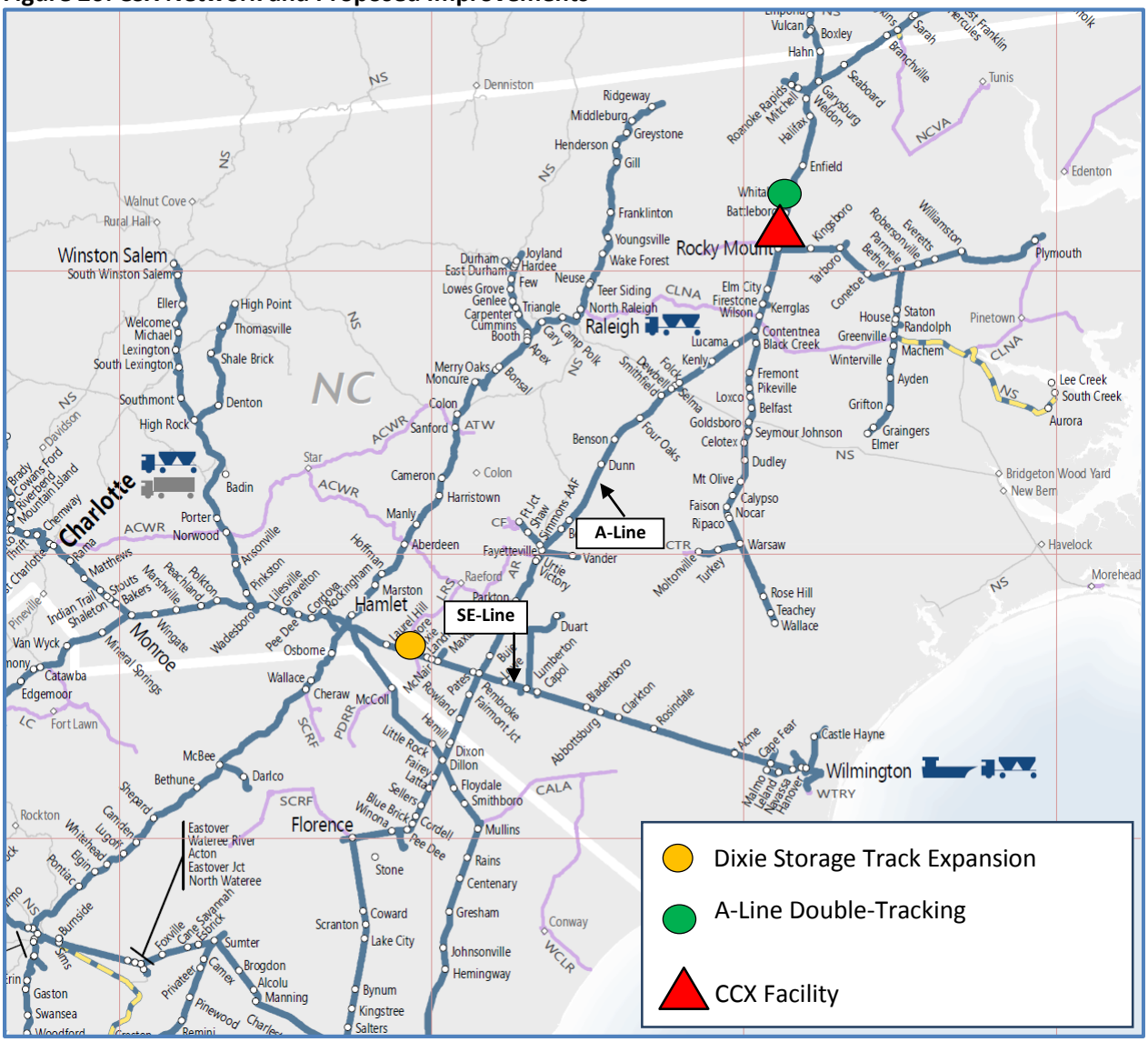
After analysis, it was determined that two improvements are required in North Carolina to accommodate incremental train traffic from CCX (see Figure 25). These include:

1. **Three Miles of Double Track:** The A-Line is the CSXT main line and its sole connection east of the Appalachians between the northern and southern halves of its network. This lynchpin not only joins CSXT lines in the northern and southern portions of North Carolina, it connects the southeastern and northeastern regions and markets of the United States. The analysis of performance data indicated that this line is unlikely to be able to support the additional traffic of CCX facility without seeing significant degradations of performance, which is unacceptable given

the importance of this line to the whole network and its high volume of passenger trains. It is necessary to double-track three miles of this rail line immediately north of the proposed CCX to facilitate the entry and exit of trains, and improve the ability of the line to support the wide range of train types it carries. This will allow non-intermodal trains to travel through this segment without major interruptions, eliminating the capacity issues identified in previous sections.

2. **Extending the Dixie Storage track on the SE-Line (Wilmington Subdivision) in Laurinburg, NC:** As shown in the previous section, a line with the characteristics of the SE-Line should be able to support higher volumes before having capacity conflicts and seeing a degradation of service. The reason for the poor performance of this line is the insufficient length of the Dixie Storage Track, which causes local trains to back up into the mainline. Fixing this issue would allow the SE-Line to support significantly higher volumes at higher speeds, enabling intermodal trains to traverse this segment. Currently no intermodal trains travel along this route for this reason.

Figure 26: CSX Network and Proposed Improvements



Source: CSX

Roadway Capacity

A significant share of the intermodal containers handled by the CCX facility will come from or be delivered to local sources. Businesses around the CCX facility, including Raleigh and as distant as Greensboro, would now have the option to ship their products throughout the US by intermodal train. This will generate additional truck drayage activity on the roads leading up to the CCX location. This section provides a high-level assessment of the traffic impacts that this drayage activity would have on the access roads leading to either facility. Traffic generated by employees of the facility is also considered.

Horizon Network with CCX

The truck volumes that are expected to be generated by the facility in 2035 and 2048 were based on the expected percentage of drayage trips made by bobtailing truck tractors (trucks either arriving or

departing without a container). Thirty-five percent of the trucks delivering containers to the terminal were assumed to depart without return container; conversely, 30 percent of the outbound containers moved on trucks that arrived at the terminal without a container. Table 35 shows the anticipated additional truck volumes on the roadway network serving the terminal.

Table 35: Projected Truck Traffic

	2035		2048	
	Inbound	Outbound	Inbound	Outbound
Yearly	120,333	124,103	173,260	167,996
Daily	330	340	475	460

The Ninth Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual was used to estimate the number of proposed trips generated by employees during the peak hour. Table 36 identifies the volumes generated by a typical distribution center with 236 employees, which is the anticipated employment of the facility in 2035[20]. Typically, there are two peak periods each day: AM peak (7am-9am) and PM peak (4pm-6pm).

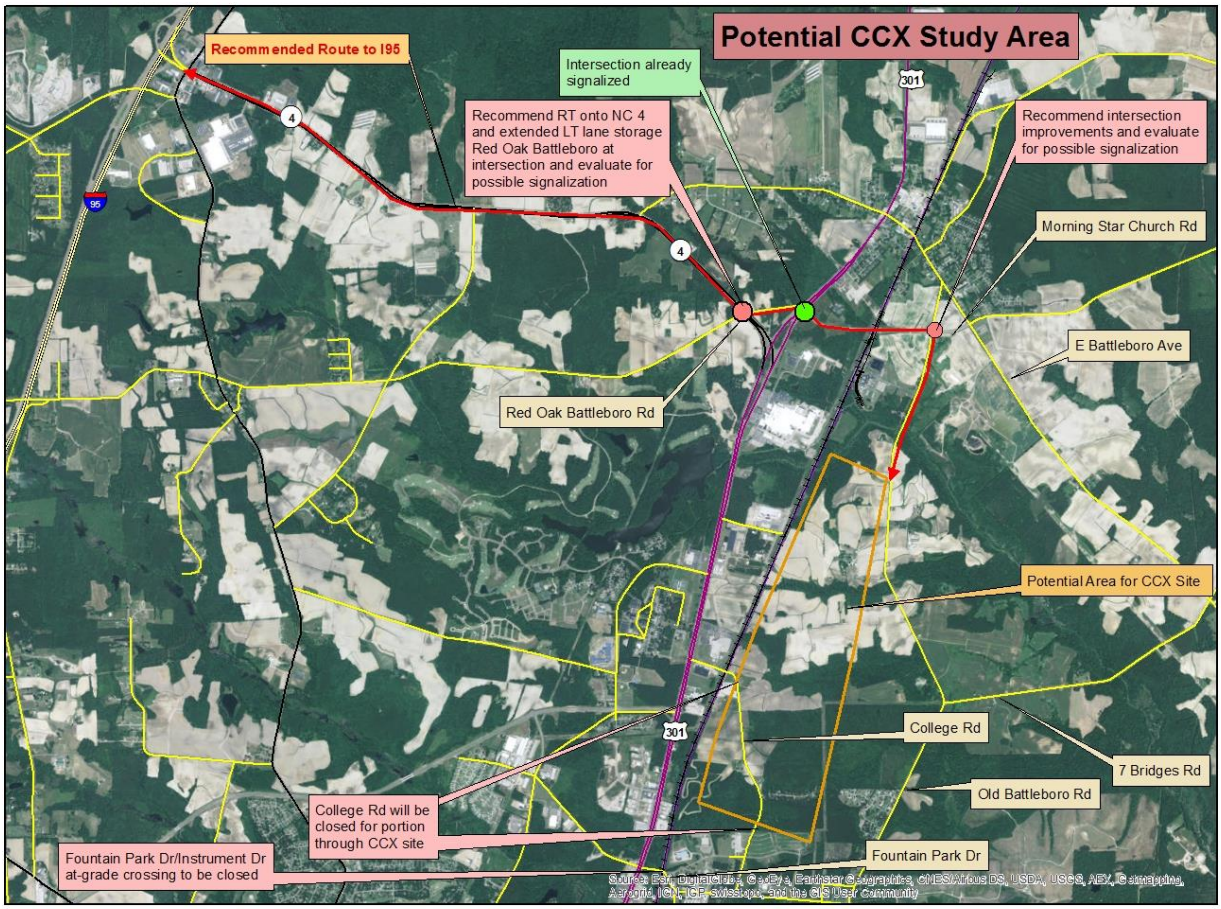
Table 36: Projected Employee Traffic

	Average Daily Trips			Peak Hour Trips		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Distribution Center (236 employees)	459	459	918	49	90	139

The study area focused on the local roadway networks surrounding the I-95 interchange with NC4, Red Oak Battleboro Road, and Morning Star Church Road. Majority of the incremental vehicular activity will use the NC4/I-95 interchange, as well as Red Oak Battleboro Road and Morning Star Church Road to access the CCX facility. Figure 26 below identifies the study area and intersections included in the traffic examination.

[20] Information provided by CSXT

Figure 27: Rocky Mount Study Area



Once the truck traffic reaches the NC 4 interchange, it is assumed a majority of the trucks will take the south I-95 route as it connects most directly to Raleigh and Greensboro. Assumptions were that ten percent of the daily truck volume would assume to occur in the peak hour. Further analysis and a Traffic Impact Analysis (TIA) will need to occur in the future.

Since the main route from the proposed CCX facility to I-95 would utilize Old Battleboro Road, Morning Star Church Road, Red Oak Battleboro Road, and NC 4, the preliminary examination identified potential intersection improvements at the Old Battleboro Road/Morning Star Church Road intersection. In addition, a traffic impact assessment (TIA) to be conducted during the preliminary engineering phase of project development will evaluate possible signalization at that intersection. Intersection improvements at the NC4/Red Oak Battleboro Road intersection could require additional improvements, such as additional turn lanes and increasing turn lane storage lane lengths. Fountain Park Drive/Instrument Drive at-grade crossing will be closed and the College Road at-grade crossing will be changed to only traffic going to/from the cemetery (through traffic will be removed).

As this project moves forward, further analysis relating to the various intersections along the route will be required. The next phase of the project will need to collect new traffic volume data and complete a

TIA to identify specific impacts and mitigation measures relating to possible roadway revisions and reconfigurations.

Chapter 8: Intermodal Funding Options

Rarely is a single funding source used to cover the costs for a major freight rail project, partially due to the high cost of facilities and partially due to the availability of public funds. With the advent of public interest in freight rail projects, railroads no longer rely solely on internal resources to fund infrastructure development projects choosing to use a combination of public and private funding. Combinations of federal, state, and local funding programs are employed dictated by both availability and expected benefits.

Federal Programs

Transportation Investment Generating Economic Recovery Program

In February 2009, Congress passed the American Recovery and Reinvestment Act (ARRA). The act provided $1. 5 billion in multi-modal funding to be distributed through a discretionary grant program, established by USDOT as the Transportation Investment Generating Economic Recovery, or TIGER Discretionary Grant program. These grants have been awarded on a competitive basis for surface transportation projects that the USDOT believes will have a significant economic impact on the nation, a metropolitan area, or a region. Since the first round of TIGER grants, six additional rounds have been awarded with an eighth round in April 2016. The recently passed Fixing America's Surface Transportation Act (FAST Act) authorized $500 million for the recent round of TIGER grants. Because of the overwhelming demand, the success rate has been low with six percent of the applications successfully receiving funding.

One of the initial TIGER grant awards was made to the *National Gateway Project.* This project eliminated clearance constraints on a CSX line that connects eastern seaboard ports and markets with the Midwest. The grant funded $98,000,000 of the project's expected cost of $842 million. The CCX terminal will benefit from that project, as it will improve access to many markets served by the proposed terminal.

Listed below are other examples of intermodal projects that were successful in receiving funding in prior rounds of the TIGER Discretionary Grant program.

2010

Crescent Corridor Improvement – the project improves Norfolk Southern's rail lines and facilities between the Gulf Coast and the Northeast including new intermodal terminals in Birmingham Memphis, and Franklin County, PA. The award was in the amount $105,000,000 of a total expected cost of $2. 5 billion.

Port of Providence – the project includes the replacement of port cranes to handle container traffic. The program funded $10,500,000 of a total project cost of $39,463,976.

Port of Miami Rail Access – the project establishes intermodal container rail service, transfer facility, and crane at the port. The program funded $22,767,000 of a total project cost of $46,907,800.

2011

Rutherford Intermodal Facility Expansion – the project expands the facility to accommodate an additional 125,000 lifts by improving track, parking, and cranes. The program funded $15,000,000 of a total project cost of $60,500,000.

Prichard Intermodal Facility – the project constructs a new intermodal terminal along a rail corridor. The program funded $12,000,000 of a total project cost of $35,000,000.

Dames Point Intermodal Container Facility – the project includes a rail yard, cranes, and operational area improvements. The program funded $10,000,000 of a total project cost of $45,000,000.

2012

Port of Oakland Intermodal Rail Improvements – the project enhances rail access and capacity at the port. The program funded $15,000,000 of a total project cost of $43,000,000.

Garrows Bend Intermodal Container Transfer Facility – the project connects a container facility with the national rail system. The program funded $12,000,000 of a total project cost of $28,800,000.

South Hudson Intermodal Facility – the project builds a new intermodal facility to expand the capacity of an East Coast port. The program funded $11,400,000 of a total project cost of $125,000,000.

2013

Port of Pascagoula Intermodal Improvement – the project upgrades the rail connection to the port. The program funded $14,000,000 of a total project cost of $44,000,000.

Port of Tucson: Container Export Rail Facility – the project extends a siding to improve operational efficiency at an inland port. The program funded $5,000,000 of a total project cost of $13,054,575.

2014

Port Newark Container Terminal Access Improvement and Expansion Project – the project updates the operational layout and capacity of the port to handle containerized goods. The program funded $14,800,000 of a total project cost of $53,869,000.

Norfolk International Terminals – the project includes highway improvements, a service gate, and container storage for the port. The program funded $15,000,000 of a total project cost of $31,000,000.

In 2015, NCDOT applied for a TIGER grant for an expansion of the Dixie Storage track, and the highway grade separation to cross the new double track. NCDOT was unsuccessful in obtaining the funding.

FAST Act

In addition to the TIGER funding, the FAST Act provides that $0.63 billion in National Highway Freight Program (NHFP) funds be dedicated to rail and port projects. Also, $0. 5 billion of the Nationally Significant Freight and Highway Projects (NSFHP) competitive grant funds are to be used for rail and port related projects. In March of 2016, the U. S. DOT issued its initial Notice of Funding Opportunity for the Department of Transportation's Nationally Significant Freight and Highway Projects (FASTLANE Grants) under the FAST Act with applications due in April.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

Through this program, funding is available for areas that do not meet the National Ambient Air Quality Standards (nonattainment areas) as well as former nonattainment areas that are now in compliance (maintenance areas). The program funds transportation projects and programs that reduce transportation-related emissions of pollutants specified by the Clean Air Act's National Ambient Air Quality Standards. These include ozone, carbon monoxide, and particulate matter. Examples of CMAQ-funded rail projects include diesel engine retrofits, idle-reduction projects in rail yards, and projects that encourage substitution of rail for truck transportation such as intermodal terminals or rail capacity improvements. Recent language from MAP-21 places considerable emphasis on selected project types including electric and natural gas vehicle infrastructure and diesel retrofits. State departments of transportation and metropolitan planning organizations (MPO) select and approve projects for funding. The federal share is 80 percent with a non-federal match of 20 percent. The high-end of CMAQ awards is typically in $1,000,000 -$10,000,000 range.

Surface Transportation Program

The Surface Transportation Program is a general grant program available for improving federal-aid highway, bridge, or transit capital projects. Eligible rail improvements include lengthening or increasing the vertical clearance of bridges, eliminating crossings, and improving intermodal connectors. The federal share is 80 percent with a non-federal match of 20 percent.

Federal Transportation Funding in North Carolina

Although the state was not successful in obtaining TIGER grant funding for CCX related projects, North Carolina has received federal funding for various elements of NS Charlotte Regional Intermodal Facility at Charlotte Douglas International Airport through the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users Act **(**SAFETEA-LU):

- $5.0 million for the Charlotte Douglas International Airport Freight Intermodal Facility
- $4.0 million for NS Intermodal System improvements in Charlotte
- $7.5 million for Construction of Charlotte Douglas International Distribution Center
- $5.0 million for paved storage for trailers and containers at the CSX Charlotte Intermodal Facility

State Funding and Tax Credits

Several sources of North Carolina state funds are available for components of the project. Each is under evaluation as to applicability to the CCX project, amount, and timing.

Intermodal Tax Credit

The intermodal tax credit is available to any entity that constructs or leases an eligible railroad intermodal facility in the state and places it in service during the taxable year. The tax credit is equal to 50 percent of the cost of construction or lease. The credit can be applied to the state franchise tax or state income tax, but not both. Unused portions may be carried forward.

State Sales Tax Refund

Refund of sales tax paid on construction expenditures made in the state for economic development projects by interstate carriers.

Strategic Transportation Investments Fund (STI)

STI provides Highway Trust Fund monies for non-highway projects through a project scoring formula. STI categorizes projects as statewide mobility, regional impact, or division needs, each with different funding levels and scoring. Intermodal terminal development on a Class I railroad falls into the statewide category, and as such, project selection decisions are based entirely on a date-driven scoring system. The rail project scoring system considers:

- Cost-effectiveness which is a combination of a return on investment index and regional job creation index
- System health which is a combination of a capacity index and accessibility / connectivity index
- Safety and suitability which is based on a safety index
- Project support which is based on a funding leverage index

In recent scoring association with the prioritization process (Prioritization 4.0), CCX received one of the highest scores of any infrastructure project across all modes (91.83 out of 100), and is eligible for funding at the statewide tier. Therefore, the draft Statewide Transportation Improvement Program (STIP) will include $100 million of capital funding for CCX. Several other rail improvement projects that benefit intermodal systems have been funded through the STI and are programmed in the draft State Transportation Improvement Program (STIP):

- Development of container parking/storage adjacent to the NS Greensboro Intermodal Facility – total cost $1. 7 million
- 10,000-foot siding extension on the CSX line in Stouts – total cost of $10.6 million

In each case, the state contributed half of the development cost.

Chapter 9: Conclusion

The proposed CCX terminal in Rocky Mount will deliver Governor McCrory's 25-Year Vision to provide intermodal service in eastern North Carolina and rail intermodal service to the Port of Wilmington opening up new markets for the state's industries and the Port. It will stimulate economic growth and reduce the adverse impacts of truck transportation producing significant benefits to the state. Increased employment and associated economic benefits would be a result of terminal construction, terminal operations, and local logistics and manufacturing development. The favorable economic impact would be complemented by benefits associated with the reduction in truck traffic including reduced pavement damage, congestion, emissions, and motor vehicle accidents. Key benefits are:

- CCX-Rocky Mount will produce 646 person years of employment during construction
- By the 15th year of operation, it will employ 236 people at the terminal and contributing 396 additional jobs in the rest of the economy
- Also by the 15th year of operation, the terminal will result in 23,700 jobs in warehousing, local manufacturing, truck operators and in other logistics areas
- Eliminating more than 200,000 trucks each year from the nation's roadways and a like amount from North Carolina's highways
- Produce more than $310 million of public benefits in North Carolina and nearly $1.8 billion nationwide principally by eliminating those trucks from the road

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Joe Bryan - Principal-In-Charge

Joe Bryan directs the firm's practice in freight transportation and logistics policy, planning and management. He possesses broad practical experience in freight carrier management in multiple modes. Joe has been a leading contributor to the development of public and public-private freight planning in the U.S., working at the urban, corridor and national levels, and he assists private- and public-sector clientele in strategy development, policy and operations analysis, and market assessment. He is currently leading the FAST Act update of the Illinois state freight plan, managing urban freight plans in Phoenix and Raleigh, and will serve as principal in charge for new NCFRP research on supply chain resiliency. Joe is a member of the US Department of Commerce's Committee on Supply Chain Competitiveness, which pioneered freight fluidity measures in the United States, he successfully piloted its new approaches in a feasibility study for FHWA and the I-95 Corridor Coalition, and he will co-lead the follow-on project implementing these measures. Joe is past chair of the Transportation Research Board (TRB) Urban Freight Committee, an author of the original AASHTO Freight Rail Bottom Line Report and principal-in-charge for the 2015/2016 update of this report, which is AASHTO's key position paper on freight rail issues. He also held management positions with several railroads and trucking companies. Joe has a BA from Princeton University and an MBA from the Tuck School, Dartmouth University.

Joe Gurskis – Project Manager

Joe Gurskis leads WSP | Parsons Brinckerhoff's state rail planning practice area and is an experienced transportation and logistics professional with extensive knowledge of the railroad industry operations, markets and economics. He has supported several states in the development of PRIIA and FRA compliant state rail plans, serving as the project manager for the Kansas, North Dakota, Oklahoma, Ohio, New Jersey, Virginia, and District of Columbia state rail plans as well as senior advisor on the Arkansas, Colorado, Delaware, and Vermont state rail plans. In addition to his state rail plan experience, Joe has conducted intermodal terminal feasibility studies for several states including Minnesota, North Dakota, and West Virginia. He is currently managing the firm's activities with the Great Northern Corridor Coalition, a coalition of states, ports, and a class I railroad focused on improving freight mobility in the Northern Tier of the US. Prior to becoming a consultant, he held management positions with several railroads, the last as Vice President Fleet Management at the former Southern Pacific Railroad. Joe holds a BS in Economics from the Wharton School, University of Pennsylvania and a Master of City Planning degree from Harvard University.

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