NORTH CAROLINA
STATEWIDE MULTIMODAL FREIGHT PLAN

Planning for the Future of Freight Movement

HAZARDOUS MATERIALS PROFILE - FINAL

North Carolina Statewide Multimodal Freight Plan

Hazardous Materials Profile

Prepared for:
North Carolina Department of Transportation

Prepared by:
HNTB Corporation
343 E Six Forks Rd #200
Raleigh, NC 27609

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ACRONYMS

CAS	Chemical Abstracts Service
EHS	Extremely Hazardous Substances
EIA	Energy Information Administration
EPCRA	Emergency Planning and Community Right-to-Know Act
FAF5	Freight Analysis Framework version 5
IRS	Internal Revenue Service
LEPC	Local Emergency Planning Committee
NGL	Natural Gas Liquids
NPMS	National Pipeline Mapping System
PHMSA	Pipeline and Hazardous Materials Safety Administration
SARA	Superfund Amendments & Reauthorization Act
SC	South Carolina
SCTG	Standard Classification of Transported Goods
SEC	Security and Exchange Commission
TCSA	Toxic Substances Control Act
TPQ	Threshold Planning Quantity
USDOT	United States Department of Transportation
TPQ	Threshold Planning Quantity

1.0 OVERVIEW

The movement of Hazardous Material (HazMat) freight has an enormous impact on North Carolina's transportation infrastructure today and will in the future. With communities growing, increasingly congested land-use, costly development , and demands on all parts of our aging infrastructure increasing, it is important that the state consider critical investments in the transportation infrastructure that will support the safe and timely delivery of HazMat freight to local markets and to destinations outside of North Carolina.

1.1 Overview, Data and Methodology

HazMat is a complex subject because of the nature of the particular chemistry of each individual chemical on one end and how completely dependent our economy is on HazMat on the other, not to mention the public health, safety, and environmental issues that are evident any time an accident occurs. Exploring this subject is further complicated by the many differing and largely incomplete data sets available on the topic collected by government agencies with different regulatory, public safety and emergency management, and economic purposes. This profile will work with a number of these different data sources to develop the context and scope of HazMat freight in North Carolina. It is important to state none of these data sources are complete enough to adequately or fully describe the nature, scope, volume, or even the value of HazMat freight anywhere in the United States. It is, however, possible to use the data that is available to take snaps shots of key parts of HazMat freight system and build models that increase our understanding of this important subject.

To begin, it is helpful to define HazMat. It includes any chemical, in any form, that has one or more hazardous properties and that is transported. The key properties are those that make up the nine U.S. Department of Transportation (USDOT) HazMat classes: explosives, gasses, flammable liquids, flammable solids, oxidizing substances and organic peroxides, toxic and infectious substances, radioactive materials, corrosive substances, and miscellaneous. Many chemicals meet these definitions that it is necessary to narrow the scope to a more comprehendible scale. We will start with a wide view and progressively narrow our focus.

The Chemical Abstracts Service (CAS) registry presently contains more than 127 million unique organic and inorganic chemical substances and more than 66 million sequences, with nearly 500,000 regulated chemicals and millions of commercially available products.[1] From among these, the U.S. Environmental Protection Agency maintains a list of over 86,000 chemicals in the Toxic Substances Control Act (TSCA) inventory that are registered for use in industry in the United States, with about 42,000 of these typically present in commerce.[2] If a chemical is present in commerce it has to be considered freight at some point in its lifecycle and may be present anywhere on the North Carolina transportation system.

This leads to the first key point: due to the free commerce clause in the U.S. Constitution there are very few restrictions to the transportation of HazMat. Other than some limitations for transporting some classes of HazMat on designated routes over steep terrain and through tunnels, many of these 42,000 chemicals will always be present within the transportation system.

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[1] Chemical Abstract Service Registry

[2] Toxic Substance Control Act Inventory, March 2022

The second key point is that HazMat, in some form, is in transportation everywhere in the state, as it is essential to our society and economy. Many chemicals are present in common products that are used to power, clean, make, or maintain virtually everything our society needs to survive. Almost everything we drink, grow, eat, wear, drive, fly or float, the roads we drive on and the fuel we use to get where we are going, what we use to build our homes and offices, to clean, preserve, maintain, and enable our lives is transported at some point as HazMat freight. HazMat is routinely transported in commerce in all modes of transportation. HazMat freight is transported by ship or barge, pipeline, rail, and truck. Air transport of Dangerous Goods (another name for HazMat) occurs routinely but only in limited quantities with strict packaging requirements and the shipping of many specific chemicals by air is forbidden due to inherent safety concerns.

Our dependency on HazMat is so complete that interruptions in the movement of HazMat freight will have immediate and profound consequences on the daily lives of everyone relying on the affected supply chains. Many chemicals that are commonly transported are essential for industry to make the products we all need. These base chemicals are essential because they are the building blocks for making whole families of related chemicals and products. One example in North Carolina is the Extremely Hazardous Substances (EHS) chemical ethylene oxide. The state imports large numbers of rail cars of this toxic, carcinogenic, flammable, reactive, and often unstable chemical. The reason for importing a chemical with so many hazards is that modern chemistry depends on it. In addition to its important use as a disinfectant for surgical tools, it allows industry in the state to make everything from antifreeze, to soap, makeup, and tooth paste at facilities in the Triad. There are a number of these base chemicals that are imported in the state and many of them are also EHSs.

To further narrow the focus, over 10,200 North Carolina facilities submitted Hazardous Chemical Inventory Reports as part of the Superfund Amendments & Reauthorization Act (SARA Tier II) in 20213. A Tier II report is required to be submitted when a business stores one or more hazardous chemicals in volumes exceeding 10,000 pounds, or for EHSs the Threshold Planning Quantity (TPQ) or 500 pounds, whichever is lower. These numbers of facilities and chemicals should not be considered as exhaustive because there are many exemptions to these reporting requirements: farmers are not required to report fertilizers they use, and explosives are not reported in this data, nor are chemicals present in laboratories under qualified supervision, nor those used in foods or drugs. But this information helps to define and narrow the scope for this profile. These reports showed nearly 40,000 unique hazardous chemicals in production, use, and/or storage in North Carolina.

The North Carolina SARA Tier II data supported the identification of primary transportation routes and corresponding annual transportation volumes by mode for a selection of these important base chemicals, EHSs, and other chemicals that local first responders and emergency management officials identified as important. These first-of-their-kind studies were conducted on behalf of the N.C. Division of Emergency Management for groups of Domestic Preparedness Regions covering the entire state over the course of five years from 2008 -2012. These studies were conducted using a demand-pull model where the presence of a study chemical at a facility meant that the demand was present. and the chemical was either locally produced or pulled into the state over the transportation system. Using authority given to Local Emergency Planning Committees (LEPCs) under Section 303(d)(3) of the 1986 Emergency Planning and Community Right-to-Know Act (EPCRA), owners or operators were asked to provide volume, container, destination, and origin data for all shipments of priority chemicals to or from their facilities by transportation mode.

[3] https://www.era-environmental.com/blog/tier-ii-reporting-an-overview-and-run-down-of-everything-tier-ii

The primary data collected by these studies is substantive and allowed for the identification of primary EHS transportation routes and related volumes for each transportation mode. The third key point is one of the important lessons learned while doing these studies. That is, other than in several notable exceptions, North Carolina does not produce base chemicals. Instead, the state imports base chemical commodities and either consumes them or makes them into other products.

One of the exceptions is Nutrien's integrated mine and plant facility in Aurora, North Carolina, which is the largest in the world[4]. Nutrien manufactures several base chemicals from the phosphate they mine, and their phosphate product sales totaled $1.6 billion in 2021[5]. About 70% of these are fertilizers used in agriculture. This business is highlighted later in the profile. This is just one example of how the state's economy is highly dependent on the movement of HazMat as freight, not just because it supports nearly everything we do, but also because HazMat is itself a class of products North Carolina exports. North Carolina is the 12th highest value producer and shipper of chemicals in the United States with a value of well over $3.2 billion shipped in 2020 by the chemical manufacturing industry[6].

This apparent conflict between these two points is not an error—it is important information. It means North Carolina is a net consumer of HazMat for the production of goods, including other HazMat products, and imports HazMat as fuel. Again, Nutrien is a good example. In order to produce the fertilizer that they sell, they need to import many unit train quantities of anhydrous ammonia.

It is important to also identify what is not present in the state. Crude oil is a base chemical that has receives a lot of attention nationally over the last six years because of a number of major accidents resulting in environmental damage, primarily along rail corridors. The U.S. Energy Information Administration (EIA) data shows no pipelines, ship/barge, or truck shipments of crude oil through the state, nor is there any refining capacity that would require crude oil to be imported. North Carolina has no refineries that process crude oil.

As of November 2021, North Carolina has one biodiesel production facility, but very little information is available on it beyond the fact it produces about 2 million gallons of biofuels per year. The lack of any crude oil and only having one biodiesel plant in the state highlights the fourth key point; nearly all fuel used for any purpose in North Carolina is imported.

1.2 Organization of the Report

Consequently, a review of two HazMat sectors will provide significant insight into HazMat freight issues in North Carolina. These two sectors are: fuels, and selected EHS and non-EHS chemicals. Each is explored in separate sections of this profile. Section 2 discusses the distribution and transportation of fuels, and Section 3 focuses on priority chemicals studied over the course of the North Carolina HazMat Transportation study series. Within each of these sections of the profile, the primary HazMat activity, and the industries and markets served are identified, the

[4] Mining Technology, 2010. https://www.mining-technology.com/projects/aurora-phosphate-mine/

[5] Nutrien Annual Report 2021.

[6] 2020, Statista, https://www.statista.com/statistics/297819/chemical-exports-of-us-states/

bottlenecks and deficiencies in the transportation system are evaluated, and safety concerns are identified. Current and future demand estimates are provided. Finally, existing and expected future needs are evaluated.

2.0 FUELS

North Carolina imports all of its petroleum-based fuel and natural gas, as well as significant quantities of biofuels, such as ethanol. The transportation network used for transportation of fuel consists of:

- 5,451 miles of pipeline for the movement of petroleum fuel, non-fuel products, propane, and natural gas
- 38 inland motor fuel terminals – 36 supported by pipeline, 4 also served by rail, and 2 receive ethanol exclusively by rail – all support truck loading operations (5 market areas served: Charlotte, Greensboro, Apex, Selma, and Fayetteville)
- 11 aviation fuel terminals – 7 military bases, 5 supported by pipeline, 3 by rail, and 4 by truck (4 market areas served: Charlotte, Winston-Salem, Greensboro, and Morrisville). Some of the fuel terminals are served by multiple modes.
- 4 propane terminals – one supported by pipeline and one supported by rail, both support truck loading operations (2 market areas served: Sylva in eastern NC and Apex in west central NC)
- 2 Transload Facilities, one in Star, NC (Figure 2.1) and the second in Midland, NC (Figure 2.2) – these facilities transfer unit train quantities of butane from rail tank cars to tank truck trailers for delivery to fuel terminals and elsewhere for fuel blending to raise the octane during winter months, serving all markets
- Private marine terminals receive petroleum ships and barges, also served by rail and trucks (1 market area served: Wilmington)
- Rail transport of petroleum fuels and biofuels for large volume delivery to terminals and large volume consumers not served by a pipeline or port
- Tank truck trailer fleets and support services to enable the transport and local delivery of all fuels except natural gas
- 1 ethanol facility

FIGURE 2.1 STAR, NC BUTANE RAIL TO TRUCK TRANSLOADING FACILITY

FIGURE 2.2 MIDLAND TRANSLOAD FACILITY

Data on the terminals in this network obtained from the U.S. Energy Information Administration was inaccurate, incomplete and very basic. Information from the Internal Revenue Service (IRS) identified many missing terminals, as did searches of Google Earth satellite images and general web searches. Terminals pay tariffs on fuel to the IRS; as such, the IRS keeps a more accurate list. Data on the shell capacity, the gross storage capacity of a tank, and products they support at these terminals was obtained whenever possible from on-line documents produced by the terminal operators. To fill in gaps, additional data was obtained from shareholder annual reports, Security and Exchange Commission (SEC) 10,000 filings, construction contracts, local news articles, and by generating close

estimates of shell capacities for about one third of the terminals. These estimates were based on dimensions of the tanks determined using satellite images and estimation tools. The disaggregated county level Freight Analysis Framework version 5 (FAF5) used for other parts of this study was missing any information on the shipments of refined petroleum fuels.

2.1 Pipelines

Pipelines move more than two thirds of all the crude oil and refined products in the United States. Based on the estimates described in the previous section, the pipeline system in North Carolina moves over 60% of petroleum-based fuels to five local market areas. Pipelines are generally the most economical and safest way to transport large quantities of refined petroleum products or natural gas over land. Exceptions to the otherwise exceptional safety record highlight North Carolina's dependence on pipeline deliveries. These have mainly been service disruptions due to facilities' malfunctions outside of the state. A rupture and spill on a section of the Colonial Pipeline in Alabama occurred in September of 2016, and an explosion and fire about a mile away from the first event about a month later in October of 2016. Both events caused widespread shortages in North Carolina, and within two weeks, most gas stations were out of fuel. A similar situation occurred in 2021 when the Colonial Pipeline was closed for nearly a week due to a ransomware attack. Despite these events, the pipeline system remains the most reliable means of delivering the needed fuel to the state.

North Carolina has a significant pipeline network. The state sits mid-route on several major pipelines that transport refined petroleum products from the United States. Gulf Coast to destinations along the northeast, is the terminus of a major Natural Gas Liquids (NGL) or propane pipeline also from the Gulf Coast and has numerous refined product and natural gas distribution terminals across the state. The next section describes the physical and operational characteristics of the pipeline network in North Carolina. The data analyzed for this pipeline profile was taken from the National Pipeline Mapping System (NPMS) GIS Layer, and FAF5.

2.1.1 Pipeline System Description

There are approximately 5,490 miles of product pipelines in North Carolina, see Figure 2.3. About 0.7% of these pipelines are abandoned (39 pipeline miles). The remaining 99.3% (5,451 pipeline miles) are active/in-service carrying liquids and gases, such as refined product and natural gas. Table 2.1 shows the range of pipeline sizes and the corresponding lengths in miles. The pipeline sizes range from relatively small lines with less than five inches in diameter to very large lines with up to 28 inches in diameter. Among the 5,451 miles of active pipelines, about 4,316 pipeline miles (79.2%) are small pipelines less than five inches of diameter. About 2% of the network (107 pipeline miles) consists of very large pipelines with over 25 inches in diameter. The remaining pipelines range between 5 and 25 inches in diameter.

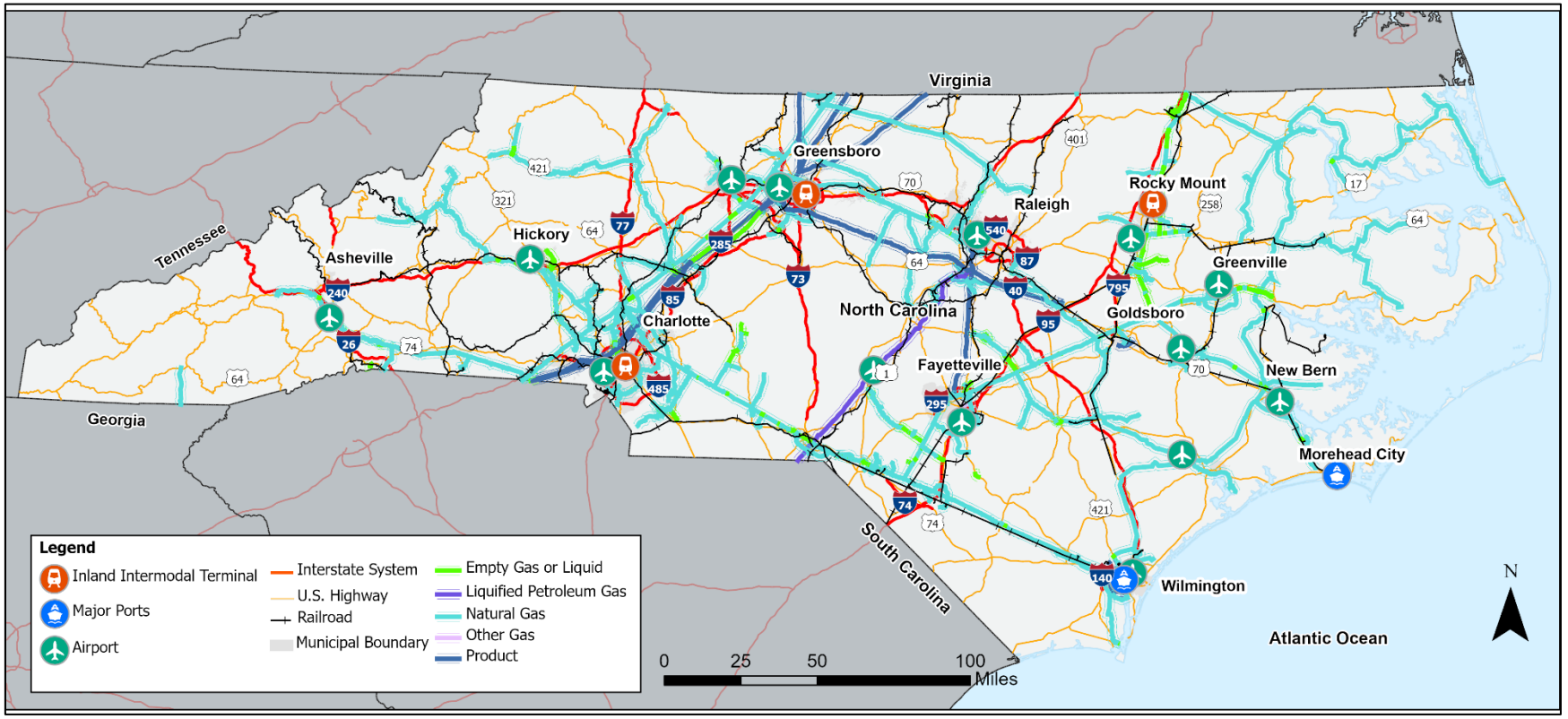
Figure 2.4 displays a map of the North Carolina pipeline network with the lines that are in service by pipeline diameter. Figures 2.5 and 2.6 are maps of the active natural gas and liquefied petroleum gas (propane) pipeline systems respectively. Figure 2.7 displays other active gas pipelines near Greenville and Durham that carry specialized chemicals over short distances.

Table 2.1 ACTIVE PIPELINE DIAMETERS

Diameter (Inches)	Miles
< 5	4,316
(5 to 10)	459
(10 to 15)	463
(15 to 20)	76
(20 to 25)	30
> 25	107
Total	**5,451**

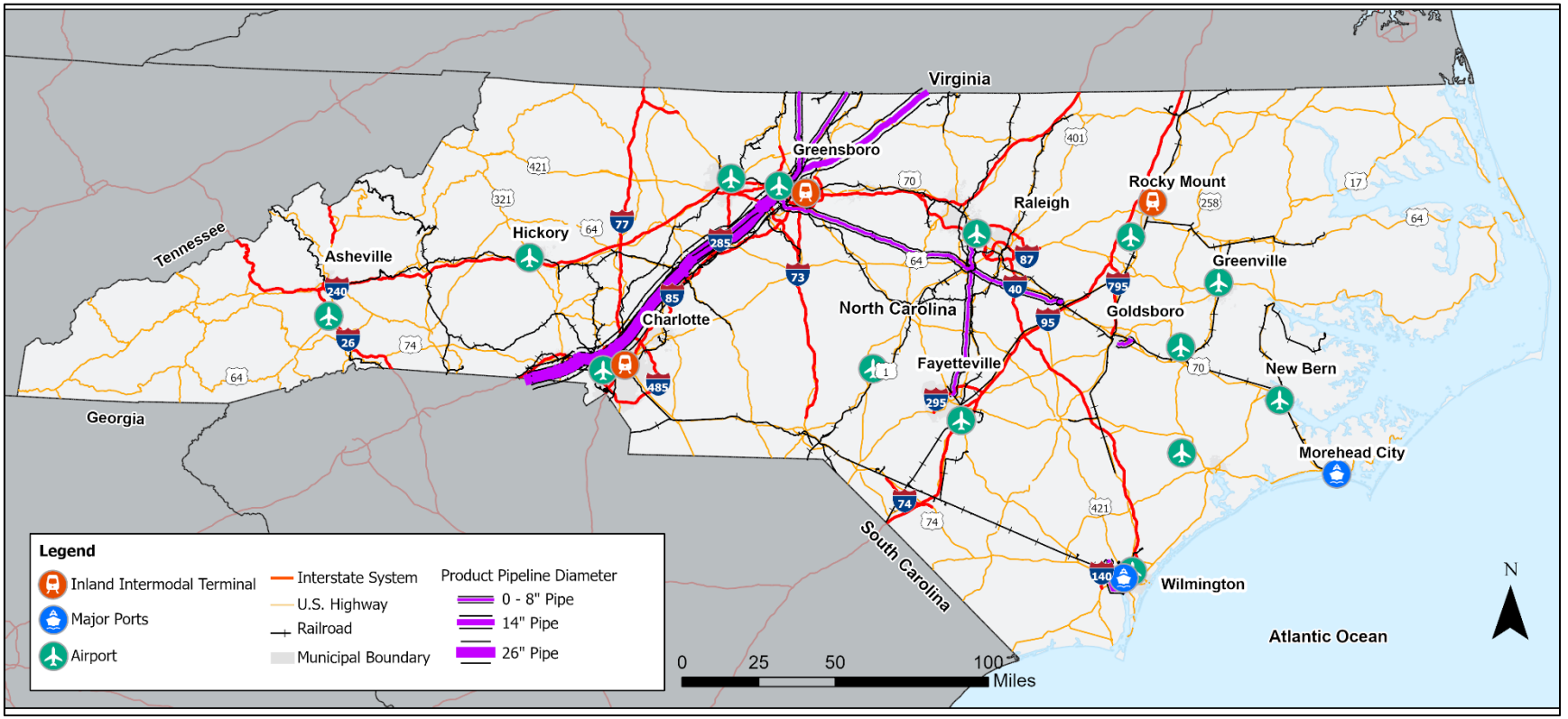
Source: National Pipeline Mapping System (NPMS).

FIGURE 2.3 NORTH CAROLINA ACTIVE PIPELINE NETWORK BY COMMODITY



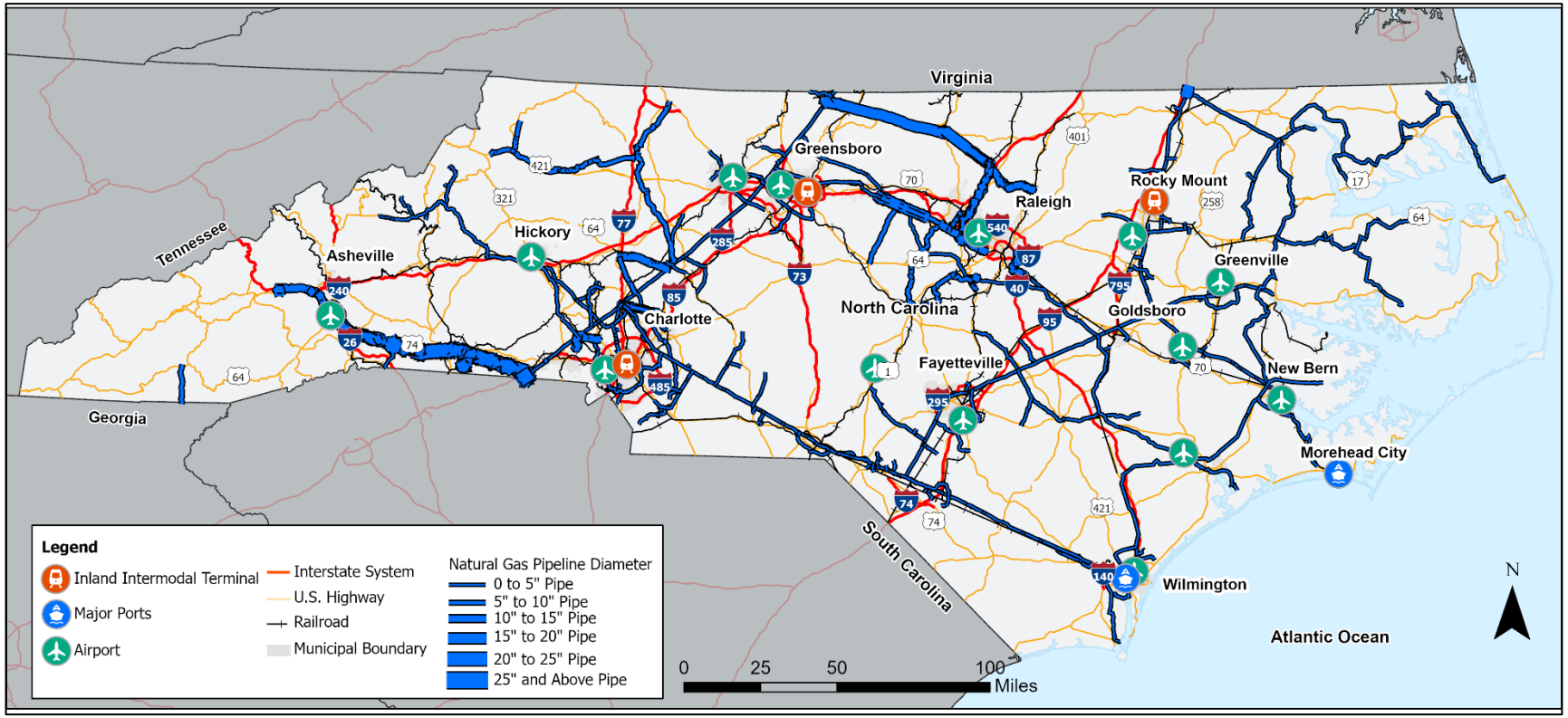
Source: North Carolina DOT, Bureau of Transportation Statistics Open Data Catalog

FIGURE 2.4 ACTIVE PRODUCT PIPELINES BY DIAMETER



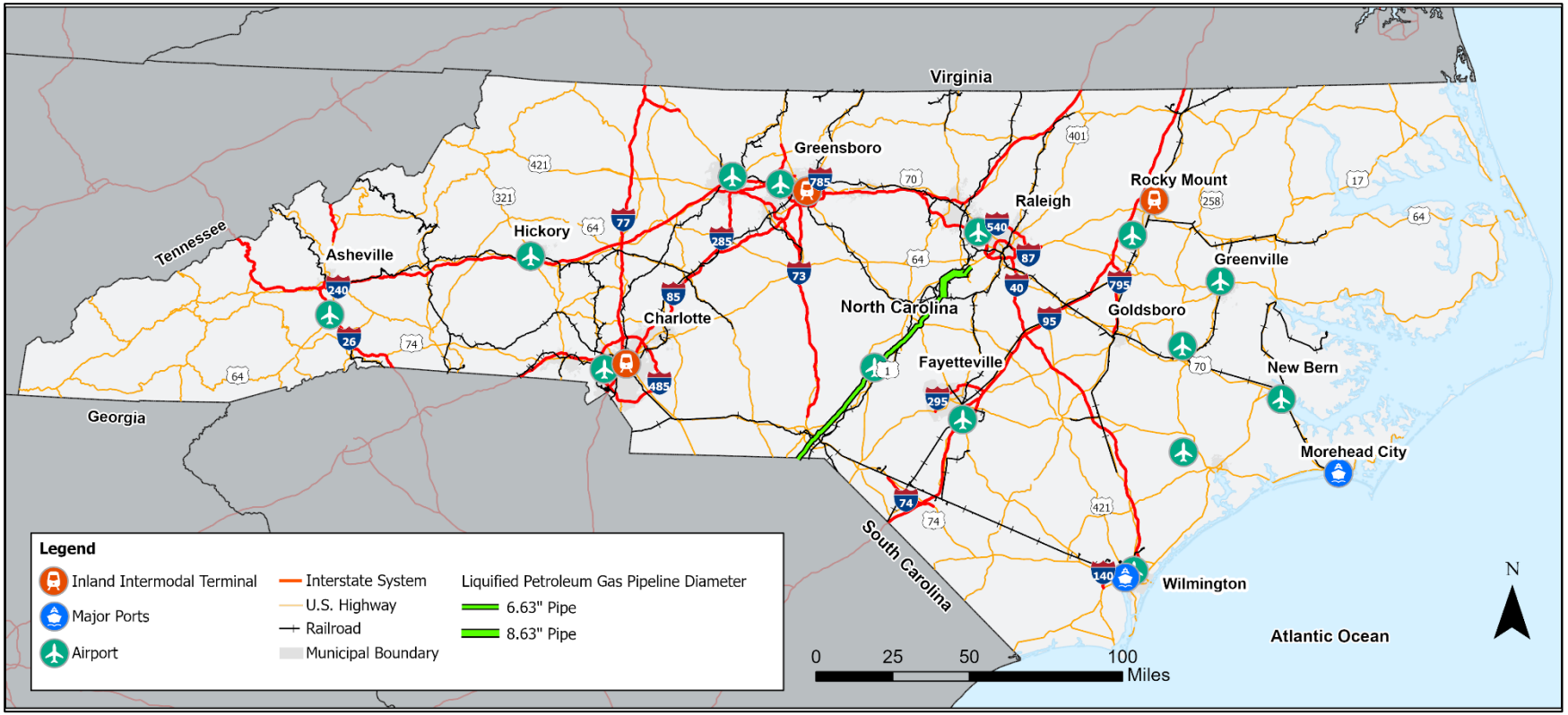
Source: North Carolina DOT, Bureau of Transportation Statistics Open Data Catalog

FIGURE 2.5 ACTIVE NATURAL GAS PIPELINES BY DIAMETER



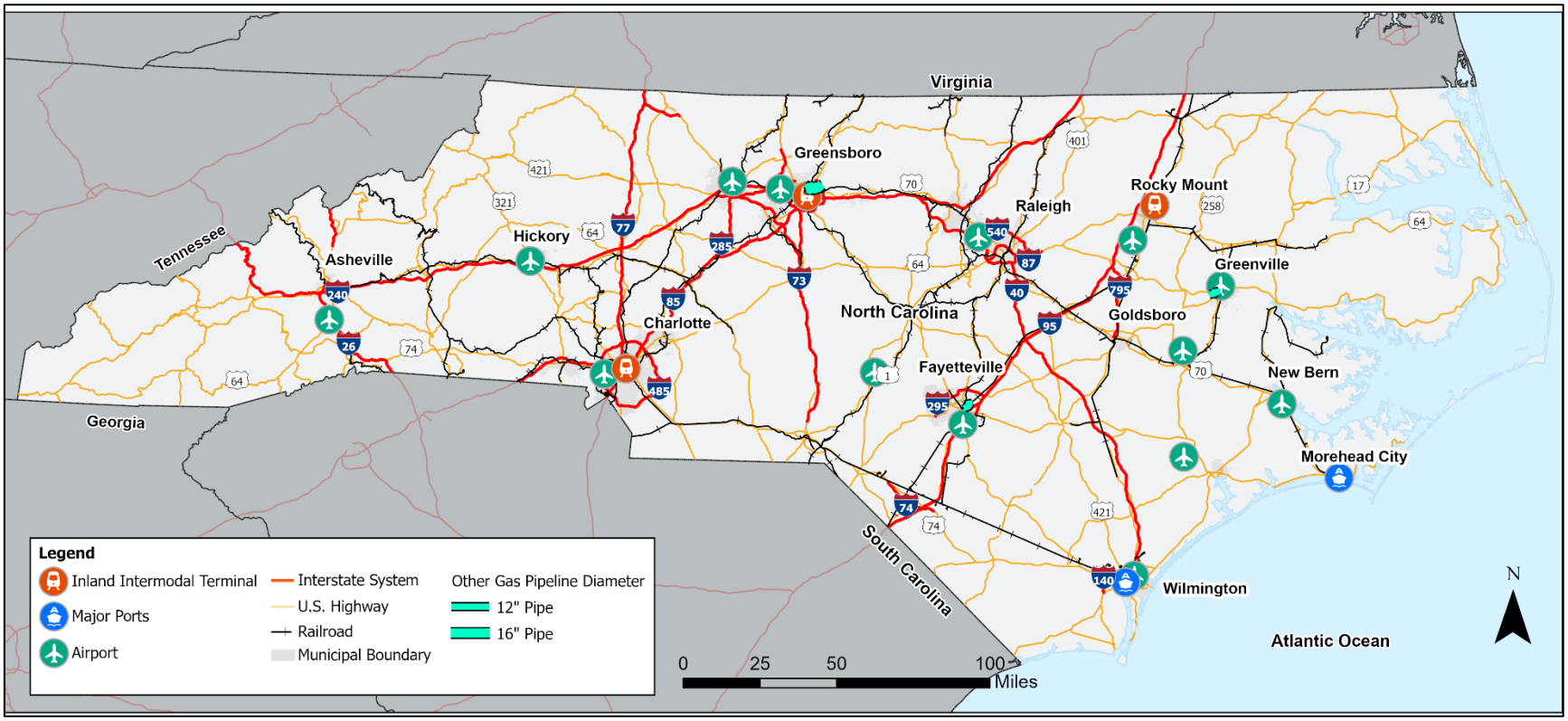
Source: North Carolina DOT, Bureau of Transportation Statistics Open Data Catalog

FIGURE 2.6 ACTIVE LIQUEFIED PETROLEUM GAS PIPELINES



Source: North Carolina DOT, Bureau of Transportation Statistics Open Data Catalog

FIGURE 2.7 OTHER ACTIVE GAS PIPELINES



Source: North Carolina DOT, Bureau of Transportation Statistics Open Data Catalog

According to Pipeline and Hazardous Materials Safety Administration (PHMSA) data, FAF5 data, pipeline/terminal operators, and EIA gasoline sales data, refined petroleum fuel is transported in North Carolina through pipeline as shown in Table 2.2. The demand is expected to decrease by 26.5% from 2017 -2050. A total of 12.1 million tons of fuel is expected to be transported into North Carolina in 2050. Within this group of fuels is a large amount of aviation fuel that is consumed at the major airports in Charlotte, Morrisville and Fayetteville, all of which connect to the Colonial Pipeline. Gasoline is mainly transported to facilities in Greensboro, Charlotte, Selma, and Fayetteville for blending with ethanol and butane and distribution by truck. Additionally, about 60% of the fuel demand in the mid-Atlantic and lower northeastern states is met by the Colonial and Plantation pipelines with fuel transported from southern Gulf states through Greensboro, North Carolina, serving as the primary hub.

TABLE 2.2 FUEL TO AND FROM NORTH CAROLINA BY PIPELINE

From	To	2017 Thousand Tons	2050 Thousand Tons
South Carolina	Charlotte, NC	6,623	9,571
Charlotte, NC	Greensboro, NC	288	445
Greensboro, NC	Raleigh, NC	2,687	2,131

Source: Freight Analysis Framework Version 5 (FAF5)

2.2 Non-Fuel Petroleum Products

The “non-fuel petroleum products” are commodities with a Standard Classification of Transported Goods (SCTG) code of 19 in FAF5 dataset and are officially named as “other coal and petroleum products not else classified”. This commodity type does not include crude petroleum, gasoline, aviation turbine fuel, ethanol (including kerosene and fuel alcohols), or fuel oils (including diesel, bunker C and biodiesel). It does include lubricating oils and greases, gaseous hydrocarbons (including liquefied natural gas, liquefied propane, liquefied butane), and other coal products and products of petroleum refining, and natural asphaltic minerals, not elsewhere classified. Table 2.3 provides a summary of non-fuel petroleum products flowing in North Carolina by pipeline.

TABLE 2.3 NON-FUEL PETROLEUM PRODUCT TO AND FROM NORTH CAROLINA BY PIPELINE

From	To	2017 Thousand Tons	2050 Thousand Tons
Greensboro, NC	Charlotte, NC	329	402
Greensboro, NC	Greensboro, NC	759	1,023
Rest of SC	Charlotte, NC	1,231	2,197
Rest of SC	Greensboro, NC	582	1,147
Rest of VA	Charlotte, NC	1,066	1,914

Source: Freight Analysis Framework Version 5 (FAF5)

2.2.1 Chemical Pipelines

As shown in Table 2.4, there are basic chemicals transported within North Carolina through pipeline. These types of commodities only appear in short pipelines at the ports of Wilmington and Morehead City between the terminals

and tank farms. These chemicals are shipped to and from foreign countries to the ports by ships. Because information on these short pipelines is not available via the NPMS data, shipments of these chemicals are not mapped. The total amount imported in 2017 is slightly greater when compared to 2012, but the main import locations have shifted from the Rest of the Americas and Europe to Southwest and Central Asia. The same pattern is found in the 2050 projections.

TABLE 2.4 BASIC CHEMICAL PRODUCT TO AND FROM NORTH CAROLINA BY PIPELINE

From	To	2017 Thousand Tons	2050 Thousand Tons
Rest of NC	Europe	3.1	8.8
Rest of NC	Africa	0	0
Rest of NC	SW & Central Asia	1.4	2.5
Rest of NC	Eastern Asia	2.7	4.2
Rest of NC	SE Asia & Oceania	0	0
Rest of Americas	Rest of NC	25.8	240.1
Europe	Rest of NC	22	35.7
Africa	Rest of NC	1.2	1.9
SW & Central Asia	Rest of NC	76.9	131.1

Source: Freight Analysis Framework Version 5 (FAF5)

2.2.2 Pipeline Operators

The pipeline data from NPMS listed 20 pipeline operators in North Carolina. Table 2.5 shows these pipeline operators, their pipeline miles and primary commodity carried. These are some of the key highlights:

- Piedmont Natural Gas Co Inc. operates the longest miles (about 2,724 miles or 50.0%) of the pipelines in North Carolina. It operates the longest natural gas pipeline in the state, followed by Public Service Co of North Carolina, Transcontinental Gas Pipeline Company, Frontier Energy, and Cardinal Operating Company, LLC.

- Colonial Pipeline Co. operates the second longest miles (about 673 miles or 12.3%) of the pipelines in North Carolina. It operates the longest product pipeline in the state, followed by Plantation Pipeline Co and Dixie Pipeline Company LLC.

All other operators operate no more than 50 miles of pipeline each.

TABLE 2.5 MAJOR PIPELINE OPERATORS IN NORTH CAROLINA

Pipeline Operator	Primary Commodity Carried	Miles of Pipeline	Percent of Pipeline
Piedmont Natural Gas Co Inc.	Natural Gas	2,724	50.0
Colonial Pipeline Co	Product	673	12.3
Public Service Co of North Carolina	Natural Gas	599	11.0

Pipeline Operator	Primary Commodity Carried	Miles of Pipeline	Percent of Pipeline
Transcontinental Gas Pipeline Company	Natural Gas	587	10.8
Plantation Pipeline Co	Product	424	7.8
Frontier Energy	Natural Gas	137	2.5
Cardinal Operating Company, LLC	Natural Gas	104	1.9
Dixie Pipeline Company LLC	Liquefied Petroleum Gas	90	1.7
City of Monroe Natural Gas Dept.	Natural Gas	44	0.8
Kinder Morgan Liquid Terminals, LLC	Natural Gas	15	0.3
South Wilmington Pipeline	Product	14	0.3
City of Toccoa Natural Gas System	Natural Gas	13	0.2
East Tennessee Natural Gas, LLC	Natural Gas	8	0.1
Buckeye Development & Logistics, LLC	Liquefied Petroleum Gas	6	0.1
Douglas Pipeline Co	Other Gas	3	0.1
Duke Energy Asheville Combustion Turbine	Natural Gas	3	0.1
Fayetteville Gas Producers, LLC	Natural Gas	2	0.0
Pine Needle Operating Company, LLC	Natural Gas	2	0.0
Pitt Landfill Gas, LLC	Other Gas	2	0.0
Columbia Gas Transmission, LLC	Natural Gas	1	0.0
Total Miles		**5,451**	**100.0**

Source: National Pipeline Mapping System (NPMS).

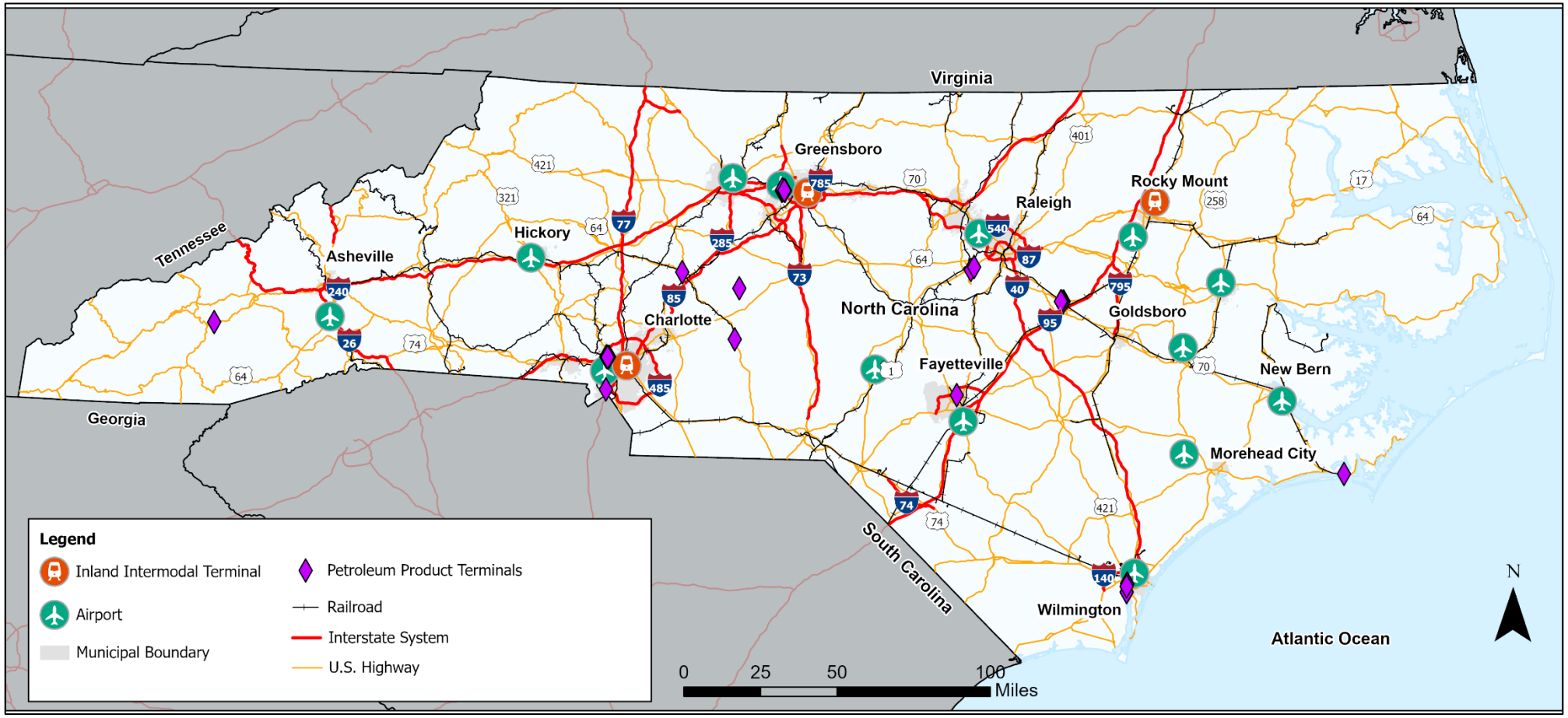
2.2.3 Intermodal Connections

Figure 2.8 shows the location of major intermodal petroleum product terminals for pipelines in North Carolina. Tables 2.6 -2.8 show their names, addresses, commodities and capacities. There are 53 fuel, propane and aviation terminals, and the pipelines supporting these terminals are operating at or near capacity mainly transporting fuels (gasoline, diesel, aviation fuel). Below is the breakdown for the terminal clusters by city:

- There are ten fuel terminals in Selma, NC. They all are connected to the pipeline system operated by Colonial. Gasolines are blended there with biofuel, which are transported into the terminal by rail cars. The processed products are shipped out from these terminals by trucks.
- There are 12 fuel terminals in Charlotte. They are connected to the pipelines operated by Colonial and/or Plantation. Gasolines are blended there with biofuel, which are transported in by rail cars. The processed products are shipped out from these terminals by trucks.
- There are seven fuel terminals in Greensboro, NC. They are connected to the pipelines operated by Colonial and/or Plantation. Gasolines are blended there with biofuel, which are transported in by rail cars. The processed products are shipped out from these terminals by trucks.
- There are six marine fuel terminals in Wilmington, NC. Gasolines are blended there with biofuel, which are transported in by ship. The processed products are shipped out from these terminals by trucks.

- There is one terminal is Apex, NC. It is supported by a connection to the Colonial Pipeline System. Gasolines are blended there with biofuel which are transported in and shipped out by truck shipments.
- Another Apex terminal supports only propane. It is served by the Dixie Pipeline. Propane is shipped out from this terminal by trucks.
- There is one terminal in Fayetteville, NC. It is supported by a connection to the Colonial Pipeline System. Gasolines are blended there with biofuel which are transported in and shipped out by truck shipments.
- There is an ethanol terminal in Denton, NC. It receives ethanol deliveries by rail. Ethanol is then shipped out by trucks.

FIGURE 2.8. MAJOR INTERMODAL TERMINALS FOR PIPELINE IN NORTH CAROLINA



Source: North Carolina DOT, U.S. Energy Information Administration Layer Information for Interactive State Maps

TABLE 2.6 FUEL TERMINALS

Name	Address	Commodity	Shell Capacity (BBL's)	Notes
Kinder Morgan Southeast Terminal Selma 4	4086 Buffalo Road, Selma, NC 27576	Gasoline, Diesel, Ethanol	160,000	Ethanol Blending, Dye Injection
Marathon Petroleum Company Selma	3707 Buffalo Road, Selma, NC 27576	Gasoline, Ethanol	151,300	Listed as BP, ethanol
Kinder Morgan Southeast Terminal Selma 2	2100 West Oak Street, Selma, NC 27576	Diesel, Ethanol	70,000	Ethanol Blending
Kinder Morgan Southeast Terminal Selma 1	2200 W Oak Street, Selma, NC 27576	Gasoline, Diesel, Ethanol	332,000	Ethanol Blending, Truck Refueling, Additive Injection, Dye Injection
ARC Terminals Holding Co Selma	2999 West Oak Street, Selma, NC 27567	Gasoline, Distillates, Ethanol, Biodiesel	171,000	
TransMontaigne Product Services Selma - N	2427 West Oak Street, Selma, NC 27576	Diesel, Gasoline	529,000	
Marathon Petroleum Company Selma MOC 1	2555 West Oak Street, Selma, NC 27576	Gasoline	312,000	
Citgo Petroleum Corp Selma	4095 Buffalo Road, Selma, NC 27576	Gasoline, Diesel	250,000	
Kinder Morgan Southeast Terminal Selma 3	4383 Buffalo Road, Selma, NC 27576	Gasoline, Diesel, Ethanol	190,000	Ethanol Blending, Additive Injection, Dye Injection
Magellan Pipeline Co LP Selma	4414 Buffalo Road, Selma, NC 27576	Diesel Fuel, Gasoline, Ethanol	186,300	
Motiva Enterprises LLC Raleigh Blending Terminal	2232 Ten-Ten Road, Apex, NC 27539-8115	Gasoline	186,300	Ethanol Blending Facility
Motiva Enterprises LLC Fayetteville	992 Shaw Mill Road, Fayetteville, NC 28311	Gasoline, Diesel, Ethanol	185,000	
Magellan Pipeline Co Charlotte 1	7145 Old Mount Holly Road, Charlotte, NC 28214	Gasoline, Diesel, Ethanol	155,000	
Kinder Morgan Southeast Terminal Charlotte 3	7325 Old Mount Holly Road, Charlotte, NC 28214	Diesel and Ethanol	145,000	Ethanol Blending, Additive and Dye Injection

Name	Address	Commodity	Shell Capacity (BBL's)	Notes
Marathon Petroleum Co Charlotte	8035 Mount Holly Road, Charlotte, NC 28214	Gasoline	145,000	
TransMontaigne Product Services Charlotte Paw Creek	7615 Old Mount Holly Road, Charlotte, NC 28214	Gasoline, Diesel	327,667	
Citgo Petroleum Corp Charlotte	7600 Mount Holly Road, Charlotte, NC 28214	Gasoline, Diesel	240,000	
Eco-Energy Distribution Services LLC Charlotte	7720 Mount Holly Road, Charlotte, NC 28214	Gasoline, Ethanol, biodiesel	130,000	
Kinder Morgan Southeast Terminal Charlotte 2	6801 Freedom Drive, Charlotte, NC 28214	Gasoline, Diesel, Jet A, Ethanol	376,000	Ethanol Blending, Additive and Dye Injection
Motiva Enterprises LLC Charlotte NC Motiva South	6851 Freedom Drive, Charlotte, NC 28214	Gasoline	180,000	
Magellan Pipeline Co LP Charlotte 2	7924 Mount Holly Road, Charlotte, NC 28214	Gasoline, Diesel, Ethanol	325,000	
Motiva Enterprises LLC Charlotte	410 Tom Sadler Road, Charlotte, NC 28214	Gasoline, Distillate, Jet and Bio-fuels	200,000	
Marathon Petroleum Co LLC Charlotte - East	7401 Old Mount Holly Road, Charlotte, NC 28214	Gasoline, Diesel, Ethanol	350,000	
Kinder Morgan Southeast Terminal Charlotte 1	502 Tom Sadler Road, Charlotte, NC 28214	Gasoline, Diesel	658,000	Dye Injection
JT Russell & Sons Inc. - Denton	18846 N.C. 8, Denton, NC 27239	Ethanol and Asphalt	36,000	Eco-Energy Distribution Services LLC High Rock is partner
Kinder Morgan Southeast Terminal Greensboro 2	6376 Burnt Popular Road, Greensboro, NC 27409	Gasoline, Diesel, Ethanol	631,000	Ethanol Blending, Additive and Dye Injection
Motiva Enterprises LLC Greensboro Blending Terminal	101 South Chimney Rock Road, Greensboro, NC 27409	Gasoline	215,000	
Magellan Terminals Holdings LP Greensboro 1	115 South Chimney Rock Road, Greensboro, NC 27409	Diesel, Gasoline, Ethanol	215,000	

Name	Address	Commodity	Shell Capacity (BBL's)	Notes
TransMontaigne Products Services Inc Greensboro	6907 B West Market Street, Greensboro, NC 27409	Diesel, Gasoline	479,000	
Center Point Terminal LLC Greensboro	6900 West Market Street, Greensboro, NC 27409	Diesel, Gasoline, Biodiesel, Distillate, Jet Fuel	684,000	
Kinder Morgan Southeast Terminal Greensboro 1	6907 West Market Street, Greensboro, NC 27409	Gasoline, Diesel, Ethanol, Jet A	735,000	Ethanol Blending, Additive and Dye Injection
Magellan Pipeline Co LP Greensboro 2	7109 West Market Street, Greensboro, NC 27409	Diesel, Gasoline, Ethanol	631,000	
Buckeye Terminal LLC Wilmington	1312 Front Street, Wilmington, NC 28401	Diesel, Gasoline	572,000	
Kinder Morgan Terminal Wilmington LLC Woodbine Street	1710 Woodbine Street, Wilmington, NC, 28402	Chemicals, Petroleum, Asphalt	821,529	Additive Injection, Blending, Heating
Kinder Morgan Terminal Wilmington LLC River Road	3340 River Road, Wilmington, NC 28412	Chemicals, Veg Oils, Petroleum	313,000	
Kinder Morgan Terminal Wilmington LLC N 6th Street	2005 North Sixth Street, Wilmington, NC 28401	Petroleum and Specialty Chemicals	1,100,000	
Apex Oil Company Inc. Wilmington	3314 River Road, Wilmington, NC 28412	Asphalt, Liquid Asphalt, Distillate, Biodiesel, Aviation Gasoline	1,485,000	
Colonial Terminals Wilmington	1002 South Front Street, Wilmington, NC 28401	Caustics, Acids, Petroleum, Specialty Chemicals, Solvents, Alcohols	730,239	Blending, Heating, Truck Scales

Source: Pipeline Operators, U.S. Energy Information Administration (EIA), U.S. Internal Revenue Service, and other sources

Note: BBL is a measurement term which refers to a barrel of crude oil. In the oil industry, an oil barrel is 42 US gallons.

TABLE 2.7 PROPANE TERMINALS

Name	Address	Commodity	Shell Capacity (BBL's)	Notes
Enterprise Products Aberdeen - Operating LLC Sylva NGL	2805 Skyland Drive, Sylva, NC 28779	Propane, NGL	6,667	Rail Terminal
Enterprise Products Aberdeen NGL	1674 Roseland Road, Aberdeen, NC 28315	Natural Gas Liquids (Propane, Butane, Isobutane, Pentane, Ethane, etc.)	-	No tanks, just monitoring
Dixie Pipeline Enterprise Products HGL	1497 Central Drive, Southern Pines, NC 28387	Propane	-	No apparent storage
Dixie Pipeline Apex Tank (Enterprise Products)	1521 East Williams Street, Apex, NC 27539	Propane	426,190	NGL 36 MBPD Pipeline Capacity

Source: Pipeline Operators, U.S. Energy Information Administration (EIA), U.S. Internal Revenue Service, and other sources

Note: BBL is a measurement term used in the industry that equals 42 gallons.

TABLE 2.8 AVIATION TERMINALS

Name	Address	Commodity	Shell Capacity (BBL's)
Pope Air Force Base	Gena Street, Pope Field, NC, 28308	Jet Fuel	630,000
Seymore Johnson AFB	1510 Wright Brothers Avenue, Goldsboro, NC 27531	Jet Fuel	94,500
North Carolina Air National Guard	4930 Minuteman Way, Charlotte, NC 28208	Jet Fuel	5,700
Camp McKall Army Base	Hoffman NC, 28347	Jet Fuel	3,500
US Coast Guard - Elizabeth City	1664 Weeksville Road, Elizabeth City, NC 27909	Jet Fuel	5,500
US Marine Corps - Camp Lejeune (New River)	White Street AS-201, Jacksonville, NY 28540	Jet Fuel	28,000
US Marine Corps - Cherry Point	N.C.101, Cherry Point, NC 28533	Jet fuel	76,000
Raleigh-Durham Airport Authority (Worldwide Flight Services)	2800 West Terminal Boulevard, Morrisville, NC 27560	Aviation Fuel	153,000
Aircraft Service International, Inc.	6502 Old Dowd Road, Charlotte, NC 28219	Jet Fuel	350,000
Signature Flight Support	1060 PTI Drive, Greensboro, NC 27409	Jet Fuel	1,800
Landmark Aviation	3821 North Liberty Street, Winston-Salem, NC 27105	Jet Fuel	1,500

Source: Pipeline Operators, U.S. Energy Information Administration (EIA), and other sources

Note: BBL is a measurement term used in the industry that equals 42 gallons.

2.2.4 Bottlenecks and Deficiencies

There are two clear bottlenecks and one major deficiency in the transportation infrastructure for fuels in North Carolina.

FUEL PIPELINE SYSTEM CAPACITY

The first and most obvious bottleneck is more of a vulnerability; the pipelines are operating at or near maximum capacity. While there appears to be some additional capacity to import fuel via the private marine terminals in Wilmington, this would only be sufficient for emergency needs and surge capacity as there would be a higher cost to transport fuel to markets around the state. Over the mid- to long-term this additional cost would be passed on to consumers as increased fuel prices. Consequently, the state is highly dependent on the pipelines. When there is a supply disruption, like during the recent Colonial Pipeline ransomware event, the state has few options except to suffer the economic and social impacts that a prolonged fuel shortage will cause.

FUEL TERMINAL ACCESS AND MULTIMODAL CONNECTIVITY

The second bottleneck concerns the linkages between the fuel terminals and all other modes of transport. They are weak at best. All the inland and marine terminals are only supported with two lane roads as connections to main arterial roads, highways, and the interstate system. Additionally, not all the fuel terminals have full access to rail lines to obtain ethanol by rail. This may not seem to be important except when you consider:

- Every railcar that can deliver ethanol to a terminal replaces three or more deliveries by tank truck trailer
- The nearly 2 million tank truck trailer loads leaving these terminals per year is nearly 2 million opportunities for a serious accident and HazMat event as these trucks turn or merge into traffic

Recent and new terminals are being built in isolated areas with access to rail and local roads. The JR Russel & Sons ethanol terminal in Denton, NC, for example, is located 14 miles from Interstate 85. To get to the interstate, trucks must travel over sections of three state highways and two local roads. Local officials are concerned for the safety of the residents.

Another example is the Dixie propane facility in Apex, NC. This facility receives propane from the dedicated propane pipeline and in turn has 5 -10 trucks leaving the facility every hour. During some periods of the day this may not seem like a big problem, but during peak-hour-traffic it is a major safety concern for the facility and local officials. Trucks leaving the facility have to stop at a gate and from that point to where they need to begin to turn into traffic is about 18 feet. This is not enough space to accelerate and safely merge a large fully loaded semi-truck into traffic on N.C. 55, especially when carrying HazMat. (See Figure 2.9)

FIGURE 2.9 DIXIE TERMINAL IN APEX, NC

FIELD FUEL BLENDING

Another deficiency concerns fuel blending. Gasoline is not one chemical; it is more of an engineered fuel. A mixture of chemicals with different properties are blended together in precise combinations and ratios during the fall and winter, and spring and summer to obtain the different grades of fuel matched to the seasonal temperature variations. Additives are included in the mixture to help keep engine components from fouling, to lubricate, to inhibit corrosion, to increase octane, and to meet environmental standards. Ethanol and butane are two of the most important chemicals that are included in these blends. Ethanol ranges from 0 up to 85% of the blend. Butane ranges from 2% up to 10% of the blend.

Some of the terminals in the state have automatic blending systems built into their truck loading racks, but others do not. Both butane and ethanol are primarily shipped into the state in rail tank cars. These tank cars can be delivered directly to only four of the inland terminals that are equipped to receive them. The ones that do not have rail facilities have to pay for delivery of ethanol and butane by truck tank trailers to the terminal or meet them in the middle somewhere and blend directly into the tanker trucks before they deliver fuel to the gas stations. This situation gives rise to the transload facilities in Star and Midland, NC. These transload facilities transfer ethanol and butane from rail tank cars into truck tank trailers. Often this splash blending is done in back lots, without adequate safety processes and systems, and no community awareness.

Rail connections need to be established with all fuel terminals in the state that distribute gasoline. Splash blending of gasoline needs to be discouraged.

2.3 Safety

In addition to the significant safety issues discussed in the previous section concerning splash blending of gasoline, these activities are usually opportunistic and ad-hoc, providing community first responders, and emergency management officials little opportunity to plan for or prepare an adequate response. Beyond that, the siting of these activities is often poor, exposing the population in many communities and especially sensitive populations, such as schools, day cares, hospitals, and similar facilities, to unnecessary risk.

Use of side rails to store rail cars of butane, propane, and ethanol in close proximity to Star and Midland, NC, and elsewhere in the state, while lawful and advantageous to the terminals, again exposes the population to unnecessary risk. The terminals need to develop rail car storage facilities adequate to support their needs.

North Carolina needs to promote and enhance the safe operation of all the pipeline systems in the state. Local utility identification and marking (811) and safety programs that seek to prevent violations of pipeline easements are important, especially as development demands begin to encroach due to rapid development. Local government land-use planners need to be aware of all pipeline easements and demonstrate respect for the serious public safety risk presented by a breach or fire anywhere on a pipeline system. They need to recognize that during an event it will be necessary to isolate the event area within a 150-foot radius and may be necessary to evacuate within a half-mile radius. It is prudent to not allow some sensitive populations like hospitals and prisons to be built within a half-mile of a pipeline[7]. Because there is no way a major hospital, large school, prison or major event location can be evacuated quickly enough to save everyone from harm during a rapidly evolving HazMat event, it is best not to build these types of facilities within a half-mile of any HazMat facility.

2.4 Existing and Expected Future Needs

There are three existing priority needs, they are:

- Enhancing the connections between all modes of transportation at all terminals;
- Planning for public protective actions at the community level out to a half-mile for all terminals; and

[7] U.S. DOT Emergency Response Guidebook, 2020 Guide 128, Evacuation Distance for Fire. https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2021-01/ERG2020-WEB.pdf

- Engaging local land-use planners and public officials in an effort to prevent encroachment on the terminals and pipeline easements.

Developing additional pipeline capacity may be a future need if fuel demand exceeds expectations or if the pipelines become less reliable and a need is identified to develop some redundancy and resiliency within the pipeline infrastructure.

3.0 SELECTED EXTREMELY HAZARDOUS SUBSTANCES AND NON-EXTREMELY HAZARDOUS SUBSTANCES

Previous studies conducted by the North Carolina Division of Emergency Management identified priority Extremely Hazardous Substance (EHS) corridors covering the entire state. Each study year a process was followed to work with key stakeholders to identify and rank study chemicals that represented the most significant hazard to the community, reducing the focus down from hundreds or thousands of candidate chemicals to the 10 -14 priority study chemicals that had the greatest potential for a community scale risk.

3.1 Overflow

EHS and Non-EHS HazMat chemicals are present on nearly every major highway, interstate, the entire length of both Class I railroads, and many of the short line railroads in significant volumes. Volumes of over a billion pounds per year or more are represented on some parts of the transportation system. Charlotte, Winston-Salem, Raleigh, and Wilmington are major HazMat hubs. The following 13 EHS chemicals are commonly transported in NC: Anhydrous Ammonia, Chlorine, Formaldehyde, Hydrogen Fluoride, Hydrogen Chloride, Sulfuric Acid, Sulfur Dioxide, Bromomethane, Hydrogen Peroxide, Cyclohexylamine, Vinyl Acetate Monomer, Phenol, and Ethylene Oxide. Four Non-EHS chemicals are also commonly transported in the state including: Phosphoric Acid, Toluene Diisocyanate, Butane, and Toluene. These 17 chemicals are representative of both the significant hazard and volume of the many thousands of chemicals that are on the North Carolina transportation system. It is important to also recognize that HazMat can also be moved by barge and ship. Other significant concentrations of HazMat in transportation are found at truck parking areas, and rail yards and side rails that are present in many communities across the state.

HIGHLIGHT - NUTRIEN

Nutrien operates an open pit mine in Aurora that mined 3.77 million tons of phosphate rock in 2021. The on-site plant produced 1.05 million tons of phosphoric acid and an additional 2.12 million tons of other liquid products, including merchant grade acid and super phosphoric acid, which have wide uses in agriculture and various industries. Other 2021 production includes 0.31 million tons of phosphate feed and 0.3 million tons of purified acid[8]. They import and ship large volumes of gaseous, liquid, and dry HazMat products using the state's rail, highway, and port transportation systems; operate a 31-mile railroad spur that connects the facility to the Norfolk Southern and CSX railways[9]; export large volumes of HazMat and import many unit train quantities of anhydrous ammonia and other chemicals; and chemically react the phosphoric acid with ammonia to produce differing grades of fertilizer.

[8] Nutrien Annual Report 2021.

[9] Mining Technology. https://www.mining-technology.com/projects/aurora-phosphate-mine/

Nutrien operates a terminal located near the mouth of the Newport River at Morehead City, North Carolina. The company receives raw materials and finished products from Aurora by barge, tugboat, rail, and truck.[10]

3.2 Bottlenecks and Deficiencies

Two key areas of needs and deficiencies were identified:

- The concurrent use of the two Class I railroad mainlines for passenger, freight, and HazMat service in North Carolina, as elsewhere in the United States, is a deficiency. Not only do these trains have different maximum allowable speeds over the same track, but they also have different infrastructure needs that are not compatible with each other. It is not advisable to collocate passenger, freight, and HazMat support infrastructure.

- Areas within the transportation system where there is especially high HazMat transportation risk include: communities with heavy land-use development involving large numbers of sensitive populations and environmental receptors or large recreation or public event facilities alongside major transportation corridors; unsecured rail yards; side rails within major communities; at-grade railroad crossings; and freeway ramps.

3.3 Existing and Expected Future Needs

It is important for local and state government to prevent incompatible land-uses, especially those involving HazMat, to be able to protect the public. In some cases, there is a failure to maintain a separation between incompatible land uses because the authorities are not engaged with the HazMat community, and there is not an understanding of the significant hazards that HazMat can bring into a community nor that a community can create hazard by bringing people into proximity to HazMat facilities and corridors. The siting of especially sensitive populations, such as schools, day cares, hospitals, and similar facilities, adjacent to HazMat facilities and transportation corridors is almost commonplace within North Carolina and the U.S. overall.

Use of side rails to store rail cars of HazMat within cities exposes the population to unnecessary risk. Local government land-use planners need to be aware of all HazMat sources in their community, including the locations of these side rails and rail yards and demonstrate respect for the serious public safety risk they represent. They need to recognize that during an event that it will be necessary to isolate the area within a 3,000-foot radius[11] and that it may be necessary to evacuate out a number of miles. It is not a question of if a HazMat event will occur but when and how bad will it be. It is prudent to not allow some sensitive populations like hospitals and prisons to be built within a 3,000-foot radius of identified EHS transportation corridors.

Three current and future needs have been identified in this profile. They are:

[10] Nutrien Ltd. Annual Information Form for SEC, 2019.

[11] 2020 U.S. Department of Transportation, Emergency Response Guidebook, Table 3 for a large Chlorine release. https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2021-01/ERG2020-WEB.pdf

- All parties should work through the Local Emergency Planning Committee (LEPC) in their county to develop land-use planning policies that prevent incompatible land uses relative to HazMat storage, use, or transportation.
- Communities should eliminate as many at-grade railroad crossing as possible.
- Railroads should consider not using side rails within city limits to store HazMat rail cars.