Draft Connecticut Statewide Freight Plan Update

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ACRONYMS

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway Transportation Officials
ACT	Advanced Clean Trucks
ADA	Americans with Disabilities Act
AIP	Airport Improvement Program
ATRI	American Transportation Research Institute
BDL	Bradley International Airport

BEA	Bureau of Economic Analysis
BIL	Bipartisan Infrastructure Law
BUILD	Better Utilizing Investments to Leverage Development
CAA	Connecticut Airport Authority
CAD	Contained Aquatic Disposal
CAV	Connected and autonomous vehicles
CBIA	Connecticut Business & Industry Association
CDL	Commercial driver's license
CFR	Code of Federal Regulations
CGS	Connecticut General Statutes
CMAQ	Congestion and Mitigation Air Quality
CNG	Compressed natural gas
COG	Council of Governments
CPA	Connecticut Port Authority
CRA	Connecticut Rail Association
CRCOG	Capitol Region Council of Governments
CRISI	Consolidated Rail Infrastructure and Safety Improvement
CTDOT	Connecticut Department of Transportation
CURFN	Critical Urban and Rural Freight Network
CV	Connected vehicles
CVO	Commercial Vehicle Operations
CWR	Continuous welded rail
DEEP	Department of Energy and Environmental Protection
DMMP	Dredged Material Management Plan
DrayFLEX	Drayage Freight and Logistics Exchange
DSRC	Dedicated Short-Range Communications
EIA	Energy Information Administration

EJ	Environmental justice
EPA	Environmental Protection Agency
EV	Electric vehicles
FAA	Federal Aviation Administration
FAF	Freight Analysis Framework
FAST	Fixing America's Surface Transportation
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FNP	Federal Navigation Project
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GHG	Greenhouse gas emissions
GRP	Gross regional product
GVW	Gross vehicle weight
HMT	Harbor maintenance tax
HMTF	Harbor Maintenance Tax Fund
HOS	Hours-of-Service
HOV	High-occupancy vehicles
HPMS	Highway Performance Monitoring System
HSIP	Highway Safety Improvement Program
IGT	Iroquois Gas Transmission
IIJA	Infrastructure Investment and Jobs Act
IRI	International Roughness Index
ITD	Innovative Technology Deployment
ITS	Intelligent transportation systems
JFK	John F. Kennedy International Airport
LNG	Liquefied natural gas

LPMS	Lock Performance Monitoring System
LRTP	Long-range transportation plan
LTE	Long-Term Evolution
MAP	Metropolitan Area Planning
MetroCOG	Connecticut Metropolitan Council of Governments
MMUCC	Model Minimum Uniform Crash Criteria
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organizations
MPOFPA	MPO Freight Program Assessment
MTP	Metropolitan Transportation Plan
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NECR	New England Central Railway
NEPA	National Environmental Policy Act
NEVI	National Electric Vehicle Infrastructure
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
NHPP	National Highway Performance Program
NHS	National Highway System
NMFN	National Multimodal Freight Network
NVCOG	Naugatuck Valley Council of Governments
NYC	New York City
OPM	Office of Policy and Management
PAS	Planning Assistance to States
PDO	Property Damage Only

PED	Pre-Construction, Engineering, and Design
PEL	Planning and Environmental Linkages
PHED	Peak hour excessive delay
PHFS	Primary Highway Freight System
PIERS	Port Import/Export Reporting Service
PROTECT	Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
SB	Senate Bill
SCCOG	Southeastern Council of Governments
SCRCOG	South Central Region Council of Governments
SCTG	Standard Classification of Transported Goods
SHIPP	Small Harbor Improvement Projects Program
SHSP	Strategic Highway Safety Plan
SMART	Strengthening Mobility and Revolutionizing Transportation
SOGR	State of Good Repair
STAA	Surface Transportation Assistance Act
STB	Surface Transportation Board
STCC	Standard Transportation Commodity Code
STF	Special Transportation Fund
TDM	Travel Demand Model
TIGER	Transportation Investment Generating Economic Recovery Discretionary Grants
TPAS	Truck Parking Availability Services
TRWTS	Truck Road Weather Travel Services
TSR	Truck Smart Roadside
TSSND	Truck Speed Standard Normal Deviation
TTTI	Truck Travel Time Index

TxDOT	Texas Department of Transportation
UPS	United Parcel Service
USACE	United States Army Corps of Engineers
USDOT	United States Department of Transportation
USEPA	US Environmental Protection Agency
USN	United States Navy
VMS	Variable messaging signs
VMT	Vehicle miles traveled
VWS	Virtual Weigh Station
WCS	Waterborne Commerce Statistics
WestCOG	Western Connecticut Council of Governments
ZEV	Zero-emission vehicles

1. INTRODUCTION

The Connecticut Department of Transportation's (CTDOT) Statewide Freight Plan Update (Freight Plan) focuses on providing multimodal freight transportation strategies for Connecticut. Millions of tons and billions of dollars in freight traverse across Connecticut's multimodal freight transportation network each year. The purpose of the Freight Plan is to serve as a strategic planning tool for CTDOT, its partner agencies, and the private-sector. The need for a comprehensive strategy for goods movement across the state results from significant growth and changes in freight movement that has put pressure on the existing network.

It is the intent of CTDOT that the activities conducted under this Freight Plan will enhance reliability and redundancy of freight transportation and will incorporate the ability to rapidly restore access and reliability with respect to freight transportation.

1.1 FEDERAL FREIGHT PLAN REQUIREMENTS

The development of this plan update is guided by the 2015 Fixing America's Surface Transportation (FAST) Act and recently passed 2021 Build Infrastructure Law (BIL) requirements, described further in **Chapter 3** and **Chapter 4**. The location within the plan that addresses FAST Act and BIL requirements is identified in **Table 1.1**.

Table 1.1: Applicable Laws and Regulations – Location in the Plan

FAST Act and BIL Requirements	Freight Plan Reference(s)
Identify significant statewide freight trends, needs, and issues within the state.	Chapter 11
Describe freight policies, strategies, and performance measures that will guide freight-related transportation investment decisions.	Chapter 3 Chapter 4 Chapter 11 Chapter 12
List the critical multimodal rural freight facilities and rural and urban freight corridors.	Chapter 5
Describe how the plan will enable the state to meet the national multimodal freight policy goals (49 U.S.C. § 70101[b]) and the national freight program goals (23 U.S.C. § 167).	Chapter 2
Describe innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movements.	Chapter 11 Chapter 12
Describe improvements to mitigate the deterioration of roadways serving heavy vehicles.	Chapter 12
Provide an inventory of facilities within the state with freight mobility issues and describe potential strategies to address such issues for state-owned or operated facilities.	Chapter 5 Chapter 8 Chapter 11 Chapter 12
Describe significant congestion or delay caused by freight movements and potential strategies to mitigate that congestion or delay.	Chapter 8

FAST Act and BIL Requirements	Freight Plan Reference(s)
Include a freight investment plan listing priority projects and funding mechanisms.	Chapter 13
Consult with the State freight advisory committee, as applicable.	Chapter 9
(NEW) Assess the truck parking and rest facilities for commercial vehicles in the State; assess the volume of commercial motor vehicle traffic in the state; and identify areas within the state that have a shortage of adequate commercial motor vehicle parking facilities, including an analysis (economic or otherwise, as the state determines to be appropriate) of the underlying causes of such a shortage.	Chapter 7
(NEW) Describe the most recent supply chain cargo flows in the state, by mode of transportation.	Chapter 6
(NEW) Provide an inventory of commercial ports in the state.	Chapter 5, Section 5.3.1 through Section 5.3.4
(NEW) Describe the findings or recommendations made by any multi-state freight compact to which the State is party under Section 70204, if applicable.	Not applicable
(NEW) Describe the impacts of e-commerce on freight infrastructure in the state.	Chapter 10, Section 10.1.4
(NEW) Describe any considerations of military freight.	Chapter 5, Section 5.1.1
(NEW) Include strategies and goals to decrease: • Severity of impacts of extreme weather and natural disasters on freight mobility • Impacts of freight movement on local air pollution • Impacts of freight movement on flooding and stormwater runoff • Impacts of freight movement on wildlife habitat loss	Chapter 2 Chapter 12
(NEW) Include a requirement that the State, in carrying activities under the State freight plan will: • Enhance reliability or redundancy of freight transportation. • Incorporate the ability to rapidly restore access and reliability with respect to freight transportation.	Chapter 1

1.2 SNAPSHOT OF FREIGHT IN CONNECTICUT

Connecticut's freight transportation system is a large interconnected system of roads, highways, air services, ports, and waterways that connect the state with the rest of the United States and the world. In 2019, $110.5 billion in direct outbound, inbound, and intraregional freight was moved on Connecticut's freight network. Such direct freight sales are associated with 451,100 direct regional jobs, almost 20 percent of the state's economy. These jobs earn $36.5 billion in income.

There are more than 21,577 miles of public roadways in Connecticut, of which CTDOT is directly responsible for operation and maintenance of 20 percent. The National Highway System (NHS) Interstates make up only 7 percent of the state's roadways, yet roughly 80 percent of truck freight travel in the nation moves on the Interstate System. In 2019, freight trucks carried more than 158 million tons across the state and the number of miles traveled by trucks is increasing. I-95 from the New York / Connecticut border to New Haven and I-91 between New Haven and Hartford carry the heaviest truck volumes.

Truck freight may be limited by vehicle size and weight limitations, hours of service regulations, and lack of available safe parking. Freight movement by truck is also increasingly trending to low-emission vehicles and alternative fuel modes. The increase in e-commerce sales in recent years has changed freight movements and increased the need for intermodal facilities that can transfer goods from one mode to another, last-mile direct-to-consumer truck trip solutions, and research into new delivery technologies such as drones.

There are over 628 miles of freight railroad right-of-way within the state consisting of public and privately owned property. Most of the freight rail operations in Connecticut involve shared-use agreements between owners of passenger rail operators (Amtrak, etc.) and freight rail companies. In 2019, an estimated 6.7 million tons of goods traveled on Connecticut rails. Most modern freight rail lines in the United States use the industry standard 286k lb rail, but many smaller railroads and branch lines have not been upgraded, effectively limiting freight capacity on such lines. Capacity and operations issues on key rail lines can lead to freight rail bottlenecks. Improvements to rail have been made for freight rail since 2017 but additional work is needed, and funding sources are limited.

There are three deep-water commercial ports in Connecticut—New London, New Haven, and Bridgeport—as well as ferry operations that handle freight movement. In 2019, Connecticut's Bridgeport and New Haven ports combined to handle 11.1 million tons of goods. Water transportation requires maintenance dredging and nearby multimodal facilities to shift freight across vehicle modes (e.g., ship to rail).

Freight in Connecticut is also transported as air cargo via the Bradley International Airport (BDL). In 2020, BDL landed approximately 1.2 million pounds of air cargo ranking 30th in the nation. There are also approximately 590 miles of gas and oil transmission pipelines.

1.3 ACCOMPLISHMENTS

Since the publishing of the 2017 Freight Plan, Connecticut has been working to perform studies, coordinate with stakeholders, and implement projects that support the goal areas identified in the Freight Plan. The sections below identify actions that have been taken since the 2017 plan by goal area.

1.3.1 Goal 1: Safety and Security

Objective: Enhance the safety and security of the freight transportation system in all modes.

- CTDOT is deploying its first virtual weigh station/weigh in motion system.
- CTDOT continues to install protective devices for at-grade rail crossings.
- CTDOT continues to expand its intelligent transportation systems (ITS) network of variable messaging signs and incident management cameras.
- CTDOT adopted safety and security performance measures for all vehicle miles traveled.
  - Number and rate of traffic fatalities per 100M vehicle miles traveled.
  - Number and rate of serious fatalities per 100M vehicle miles traveled.

1.3.2 Goal 2: Economic Competitiveness and Efficiency

Objectives: Support economic competitiveness, efficiency, and development through investment in the freight transportation system. Enhance goods movement efficiency into, out of, and throughout the state. Work with the private sector to identify needs and deficiencies.

- Port of Bridgeport – U.S. Army Corps of Engineers (USACE) is currently in the process of creating a Dredged Material Management Plan for the future maintenance dredging of Bridgeport's Black Rock Harbor and Bridgeport Harbor.
- Port of New Haven – The New Haven Harbor Navigation Improvement Project is currently underway. The project will deepen the navigation channel in New Haven Harbor to 40 feet.
- Port of New London – Redevelopment of State Pier into a state-of-the-art port facility through a combined public–private investment of $157 million. The infrastructure upgrades will develop State Pier into a modern, heavy-lift capable port and meet the facility requirements of the offshore wind industry. The improvements will benefit the port's long-term growth by increasing its capacity to accommodate heavy-lift cargo for years to come while maintaining its freight rail link. The facility upgrades will be completed in late 2022.
- In 2021, the Connecticut Legislature passed a highway use fee based on the weight of, and distance traveled by, trucks in Connecticut. Beginning in 2023, all weighing more than 26,000 pounds will be subject to an additional per mile fee to operate on highways within Connecticut, helping to offset the damage done to roadways by heavier vehicles.

1.3.3 Goal 3: Optimized Operations, Performance, and Resiliency

Objectives: Attain and maintain adequate capacity and operational efficiency in the Connecticut freight system. Support the use of Intelligent Transportation Systems and technologies. Improve freight system resiliency and redundancy to extreme events or changes in travel demand. Improve intermodal connections.

- In 2017, the CTDOT Oversize/Overweight (OS/OW) Permits office, implemented a cloud-based permit system upgrade which has greatly streamlined the permit process for carriers with faster turnaround times, 24/7 permit ordering and account access, credit card payment method, and electronic transmittal of all permit types.
- In 2021, the OS/OW Permit System was upgraded to allow for all-year renewal of Annual Divisible Load Permits to align with the CT Department of Motor Vehicles (DMV) all-year commercial vehicle registration renewals.
- CTDOT has been implementing Intelligent Transportation Systems (ITS) on multiple freight network roadways within Connecticut, including Interstates 84, 91, 95, 384, and 395. Some examples of ITS projects include updating the real time traveler information systems (CT Travel Smart), installation of variable message signage, and improvements to traffic surveillance.

1.3.4 Goal 4: State of Good Repair

Objective: Proactively maintain freight system infrastructure to preserve CTDOT's capital investments.

- Operations and maintenance funding has increased from $261 million in 2018 to an estimated $307 million in 2021.

- Condition of CTDOT Roadway Bridges – The percentage of State Maintained Roadway Bridges in a 'State of Good Repair' has increased owing to additional staff and budget resources allocated to bridges over the past few years and reduced project delivery resulting in more timely repairs to bridges.
- Condition of Roadway Pavement – The ride quality of Connecticut's State NHS roadways has steadily improved owing to continued investments in its Maintenance Resurfacing and Pavement Preservation Programs. In 2020, a total of 279 lane-miles were resurfaced, which represents 5.6 percent of the NHS roadway network.

1.3.5 Goal 5: Equity, Environmental Protection, and Livability

Objectives: Mitigate freight movement impacts on communities located near freight facilities or freight corridors. Reduce freight transportation-related greenhouse gas (GHG) emissions. Increase electric vehicle charging and alternative fuel infrastructure.

- CTDOT has prepared the Connecticut National Electric Vehicle Infrastructure (NEVI) Plan that creates a robust roadmap for Phase 1 of how the state intends to use USDOT NEVI funds to help expand a safe, reliable, accessible, and equitable electric vehicle fast charging network throughout the state.
- CTDOT has designated Alternative Fuels Corridors and is in the process of implementing signage.
- In 2019, Governor Ned Lamont issued Executive Order No. 3 to reestablish and expand the membership and responsibilities of the Governor's Council on Climate Change.
- In 2020, Connecticut joined 14 other states and the District of Columbia in signing a Memorandum of Understanding (MOU) to advance the market and use of electric, medium-, and heavy-duty vehicles.
- Emissions standards for medium- and heavy-duty trucks were adopted in early 2022.
- In 2022, Connecticut joined New York, New Jersey, and Massachusetts to develop a Regional Hydrogen Hub Proposal to become one of at least four regional clean hydrogen hubs.
- In 2022, CTDOT participated in the Connecticut Public Utilities Regulatory Authority's docket on expanding electrical charging for and medium- and heavy-duty vehicles.

1.3.6 Goal 6: Program and Service Delivery

Objectives: Deliver projects and services faster, cost-effectively, and with greater customer satisfaction. Create strong partnerships with state agencies, local governments, neighboring states and the private sector to foster collaboration, improve program delivery and facilitate public-private partnerships.

- CTDOT has continued engagement on freight modal issues through an Internal Freight Working Group.
- CTDOT works regularly with the Connecticut State Police and the CT DMV Commercial Motor Vehicle Safety Division, NASTO Subcommittee on Highway Transport, and industry organizations such as the Motor Transport Association of Connecticut, the Connecticut Construction Industries Association, and the Specialized Carriers & Rigging Association, to improve OS/OW permitting practices and harmonize rules and regulations with neighboring states.

- Connecticut Port Authority (CPA), a quasi-public agency, was established in 2014. CTDOT supports the ongoing management and oversight of the CPA in providing funds for port improvements through the capital improvement program.

2. Goals, Objectives, and Performance Measures

Coordinated and mutually reinforced strategic goals provide the framework for implementing the Connecticut Statewide Freight Plan in a consistent way across federal, state, regional, and local planning efforts. Connecticut's freight goals and objectives were initially established in the 2017 Connecticut Statewide Freight Plan and are updated to reflect the 2020 National Freight Strategic Plan's goals as well as the policy guidance on equity and resiliency in the new federal surface transportation legislation reauthorization, the Bipartisan Infrastructure Law (BIL), also known as the Infrastructure Investment and Jobs Act of 2021. These goals and objectives maintain their consistency with the previous 2015 FAST Act and multimodal transportation goals established in the 2018 Connecticut's Statewide Long Range Transportation Plan and Connecticut State Rail Plan 2022-2026. In addition, the CTDOT has adopted performance measures and set targets as part of the federal planning requirements for state Department of Transportations (DOT). Those performance measures that contribute to these freight goals and objectives are defined in this chapter.

The freight goals, objectives, and performance measures address Connecticut's freight transportation system needs and articulate a consensus of thought about the future performance of the freight network. They also help CTDOT identify new policies, assess performance, and prioritize future investments.

2.1 Goals and Objectives

The freight plan's goals and objectives reflect Connecticut's focus on maintaining and improving the freight transportation system in the state. They also reinforce the federal and regional freight goals while introducing new and revised goals and objectives to address equity and climate change. The six goal areas and related objectives are:

Goal 1: Safety and Security

- **Objective**: Enhance the safety and security of the freight transportation system in all modes.

Goal 2: Economic Competitiveness and Efficiency

- **Objectives:** Support economic competitiveness, efficiency, and development through investment in the freight transportation system. Enhance goods movement efficiency into, out of, and throughout the state. Work with the private sector to identify needs and deficiencies.

Goal 3: Optimized Operations, Performance, and Resiliency

- **Objectives:** Attain and maintain adequate capacity and operational efficiency in the Connecticut freight system. Support the use of Intelligent Transportation Systems and technologies. Improve freight system resiliency and redundancy to extreme weather and natural disaster events or changes in travel demand. Improve intermodal connections.

Goal 4: State of Good Repair

- **Objective:** Proactively maintain freight system infrastructure to preserve CTDOT's capital investments.

Goal 5: Equity, Environmental Protection, and Livability

- **Objectives**: Mitigate freight movement impacts on communities located near freight facilities or freight corridors. Reduce freight-transportation-related greenhouse gas (GHG) emissions. Increase electric vehicle charging and alternative fuel infrastructure. Reduce impacts of freight movement on flooding and stormwater runoff. Reduce impacts of freight movement on wildlife habitat loss.

Goal 6: Program and Service Delivery

- **Objectives:** Deliver projects and services faster, cost-effectively and with greater customer satisfaction. Create strong partnerships with state agencies, local governments, neighboring states and the private sector to foster collaboration, improve program delivery and facilitate public–private partnerships.

Table 2.1 illustrates the alignment of the Freight Plan goals with National freight goals and the Connecticut Statewide Transportation Plan.

Table 2.1: Alignment of Freight Plan Goals with National Freight Goals and Connecticut's Statewide Long-Range Transportation Plan Goals

Connecticut Freight Plan Goals	National Freight Policy Strategic Goal Area[1]	2018 Connecticut's Statewide Long-Range Transportation Plan Goal Category[2]
Safety and Security	Safety	Quality of Life
Economic Competitiveness and Efficiency	Infrastructure	Economic
Optimized Operations, Performance, and Resiliency	Infrastructure Innovation	Quality of Life Livability and Resilience
State of Good Repair	Infrastructure	Economic
Equity, Environmental Protection, and Livability	Infrastructure	Livability and Resilience
Program and Service Delivery	Innovation	Deliverability

Notes:

[1] *The National Freight Policy Strategic Goals can be found at: https://www.transportation.gov/freight/NFSP*

[2] *https://portal.ct.gov/-/media/DOT/documents/dpolicy/lrp/2018lrp/FINALConnecticutSLRTP20180313pdf.pdf*

2.2 FREIGHT-RELATED FEDERAL PERFORMANCE MANAGEMENT MEASURES

CTDOT has a long history of measuring the condition and performance of its transportation system and basing its investment decisions on the data it collects and analyzes. The Federal Highway Administration (FHWA) has gradually introduced a national transportation performance management system to monitor and base investment decisions on transportation performance. CTDOT is implementing this system, which encompasses system condition, safety, air quality, congestion, and mobility performance considerations. These system-wide highway measures address the condition and performance of the shared use highway system, which serves many travel markets, including long- and short-distance freight needs.

CTDOT uses the freight-relevant performance measures that are required as part of the current performance management framework established in law, as listed in **Table 2.2**. These performance measures help monitor plan implementation success. By tracking performance over time, CTDOT can understand whether the plan's recommendations are being implemented and to what extent they help to achieve intended outcomes.

Table 2.2: Connecticut Freight Plan Performance Measures

Freight Goal	Relevant Performance Measure
Safety and Security	Number and rate of traffic fatalities per 100M vehicle miles traveled
	Number and rate of serious injuries per 100M vehicle miles traveled
Economic Competitiveness and Efficiency	Annual peak hour excessive delay (PHED) per capita
	Truck travel time reliability on the Interstate system
Optimized Operations, Performance, and Resiliency	Annual peak hour excessive delay (PHED) per capita
	Truck travel time reliability on the Interstate system
State of Good Repair	Percentage of National Highway System (NHS) bridges by deck area classified as Good condition
	Percentage of NHS bridges by deck area classified as in Poor condition
	Percentage of Interstate pavements in Good condition
	Percentage of Interstate pavements in Poor condition
	Percentage of non-Interstate NHS pavements in Good condition
	Percentage of non-Interstate NHS pavements in Poor condition
Equity, Environmental Protection, and Livability	Air quality criteria emission levels in areas that have not met standards: Volatile Organic Compounds, Nitrous Oxides, Carbon Monoxide, and particulate matter (PM_{10}/$PM_{2.5}$)[1]

[1] Greenhouse gas emissions measure had not been determined at the time of this writing.

3. CONNECTICUT FREIGHT POLICY CONTEXT

Freight policies guide the development and implementation of a freight plan. They provide the framework for the actions to be taken to understand and improve goods movement. Statewide freight plans are guided by not only state policies, but also those at the federal level. Federal policies must be complied with to take advantage of federally supported freight programs, initiatives, and projects. This chapter documents state and federal freight policies and the institutions that support them. It also reviews several long-range planning efforts that support freight movement.

3.1 HIGHWAYS

CTDOT's mission is "to provide a safe and efficient intermodal transportation network that improves the quality of life and promotes economic vitality for the State and the region."[2] One of CTDOT's major responsibilities is to plan, construct, and maintain state highways and bridges but it is also involved with other modes (e.g., rail, waterways, aviation, bicycle/pedestrian), some of which involve goods movement.

Per federal statute,[3] CTDOT periodically prepares a long-range transportation plan (LRTP) and submits it to FHWA. The LRTP forms the policy framework for programming transportation funds through the State Transportation Improvement Program and CTDOT Capital Improvement Program. The most recent LRTP was published in 2018 and established four goals for the state's transportation network:

- Economic Growth
- Deliverability
- Quality of Life
- Livability and Resilience[4]

The Economic Growth goal is directly related to freight via objectives promoting efficient transportation for people and goods, connectivity to key national/global markets, state of good repair policies to improve system reliability and reduce costs, and reduced business costs through improved goods movement. The other goals and associated objectives impact freight through improved project delivery, safety and security, and transportation system resiliency.

The LRTP notes that much of the state's transportation network is more than a century old; hence, significant investment is required to maintain a state of good repair and reduce congestion. Freight-related preservation policies in the LRTP include upgrading bridges to the 80,000 lb national weight standard. Expansion strategies include providing more overnight truck parking, implementing an automated oversize/overweight permitting system, and improving rail intermodal linkages.

[2] https://portal.ct.gov/DOT/General/About-Us

[3] 49 USC Section 5304, 23 USC Section135.

[4] CTDOT, Connecticut's Statewide Long-Range Transportation Plan, March 2018.

3.2 FREIGHT RAIL

Connecticut's freight rail system is owned and operated by several private rail companies, Amtrak, and CTDOT. Public funds for rail capital improvements are allocated through the CTDOT capital plan, which is updated annually. Improvements to the CTDOT-owned rail system and private rail support programs are funded through this process.

The most recent CTDOT LRTP (2018) recommends improving rail infrastructure in Eastern Connecticut to promote freight efficiency. Freight-related preservation policies in the LRTP include upgrading key rail lines to meet the national 286,000 lb rail car standard. Expansion strategies include improving rail intermodal linkages and upgrading or eliminating at-grade rail crossings.

CTDOT is currently developing the *Connecticut State Rail Plan 2022–2026*. The rail plan updates the state rail goals and objectives, identifies strategies and programs to ensure existing passenger and freight rail infrastructure is maintained, and identifies programmed and proposed rail projects (including costs and associated public benefits). The updated goals and freight rail-related objectives included below encompass safety, system reliability, mobility, and the economy:

Safety goal and objectives:

- Enhance Safety of the Rail System
  - Continue to support grade crossing improvement projects to enhance safe conditions
  - Develop initial Highway-Rail Grade Crossing Action Plan to comply with new federal requirements under U.S. Code of Federal Regulations (CFR) Part 234.11
  - Continue to support Connecticut Operation Lifesaver (CT OL) programs
  - Continue to support disaster and hazard response planning in partnership with local, state, and federal authorities
  - Enhance signals and communications to promote safe operations
  - Continue to support fully Americans with Disabilities Act (ADA) accessible facilities and services

System reliability goal and objectives:

- Maintain the State's Rail System in a State of Good Repair (SOGR)
  -
  - Advance priority SOGR projects, such as Walk Moveable Bridge Project, and those identified in the 2021–2025 Capital Program and NEC Commission's CONNECT NEC 2035

Mobility goal and objective:

- Improve Intermodal Connectivity
  - Promote intermodal freight connections to ports through capital infrastructure improvements

Economic goals and objectives:

- Provide a Rail System that is Financially Sustainable
  - Reduce public expenditures through transportation efficiency and infrastructure preservation

  - Support a rail freight investment program

- Increase System Efficiency and Support Economic Competitiveness
  - Increase freight rail usage to reduce truck traffic and energy consumption
  - Leverage existing railroad bridge management programs to evaluate existing bridge routes and develop corridors that support 286,000 lb full potential to promote economic growth, reduce fuel use, and reduce truck traffic on the state's highway system
  - Coordinate with freight railroads to identify a strategy to increase clearances to 19 feet 6 inches, where possible, to permit the movement of larger cars in Connecticut to support increased freight market capture
  - Revitalize intermodal facilities and inland ports in the state to serve the rapidly growing container segment of rail traffic that will help remove long-haul trucks from highways and deliver products to consumers faster

- Increase Rail System Speed and Capacity to Accommodate Growth Objectives
  - Invest in projects such as rail yard facilities statewide and new equipment to support increased system capacity needs
  - Identify projects that link SOGR goals with potential for increasing track speed to access new markets

3.3 PORTS AND WATERWAYS

Ports are major economic drivers for Connecticut. In 2019, the Connecticut Port Authority (CPA) reported that the Connecticut maritime industry supports over $11 billion in economic output and nearly 60,000 jobs.[5] These impacts ripple into all sectors of the state's economy via cargo handling and transportation, business production that uses goods traveling through the ports, and maritime-related tourism and recreation.

The CPA relies on state bond funds for port improvements, dredging and property acquisition.

In 2018, the CPA published the Connecticut Maritime Strategy. This document outlined eight strategic objectives to guide investment decisions and resource allocations in the state's deep water ports:

- Manage the State Pier to increase utilization and profitability
- Build more volume in our commercial ports
- Support dredging of Connecticut's ports and waterways
- Support Small Harbor Improvement Projects Program (SHIPP)
- Create intermodal options
- Leverage emerging opportunities
- Enhance ferry systems and cruise coordination activities
- Ensure future support of the CPA[6]

[5] Connecticut Port Authority, Impacts of the Connecticut Maritime Industry, July 2019.

[6] Connecticut Port Authority, *Connecticut Maritime Strategy*, 2018.

The most recent CTDOT LRTP (2018) recommends improving intermodal linkages and improving port infrastructure in Eastern Connecticut to promote freight efficiency.

3.4 AIRPORTS

The Connecticut Airport Authority (CAA) was established in July 2011 to develop, improve, and operate Bradley International Airport (BDL) and the state's five general aviation airports (Danielson, Groton-New London, Hartford-Brainard, Waterbury-Oxford, and Windham airports). The board consists of 11 members with a broad spectrum of experience in aviation-related and other industries as well as government. The CAA serves as an economic driver in Connecticut, making the state's airports more attractive to new routes, commerce, and companies who may be considering making Connecticut their home.

3.5 METROPOLITAN PLANNING ORGANIZATIONS

Metropolitan Planning Organizations (MPOs) serve a critical role in Connecticut's statewide freight planning efforts. While MPOs may develop freight-related plans and studies for their regions, many choose to address freight via their long-range plans. Such activities can inform statewide efforts because of their focus on local issues that may have statewide ramifications.

Connecticut has nine regional Councils of Governments, which function as the host agencies for Connecticut's eight Metropolitan Planning Organizations (MPOs, **Figure 3.1**) and two rural transportation planning organizations:

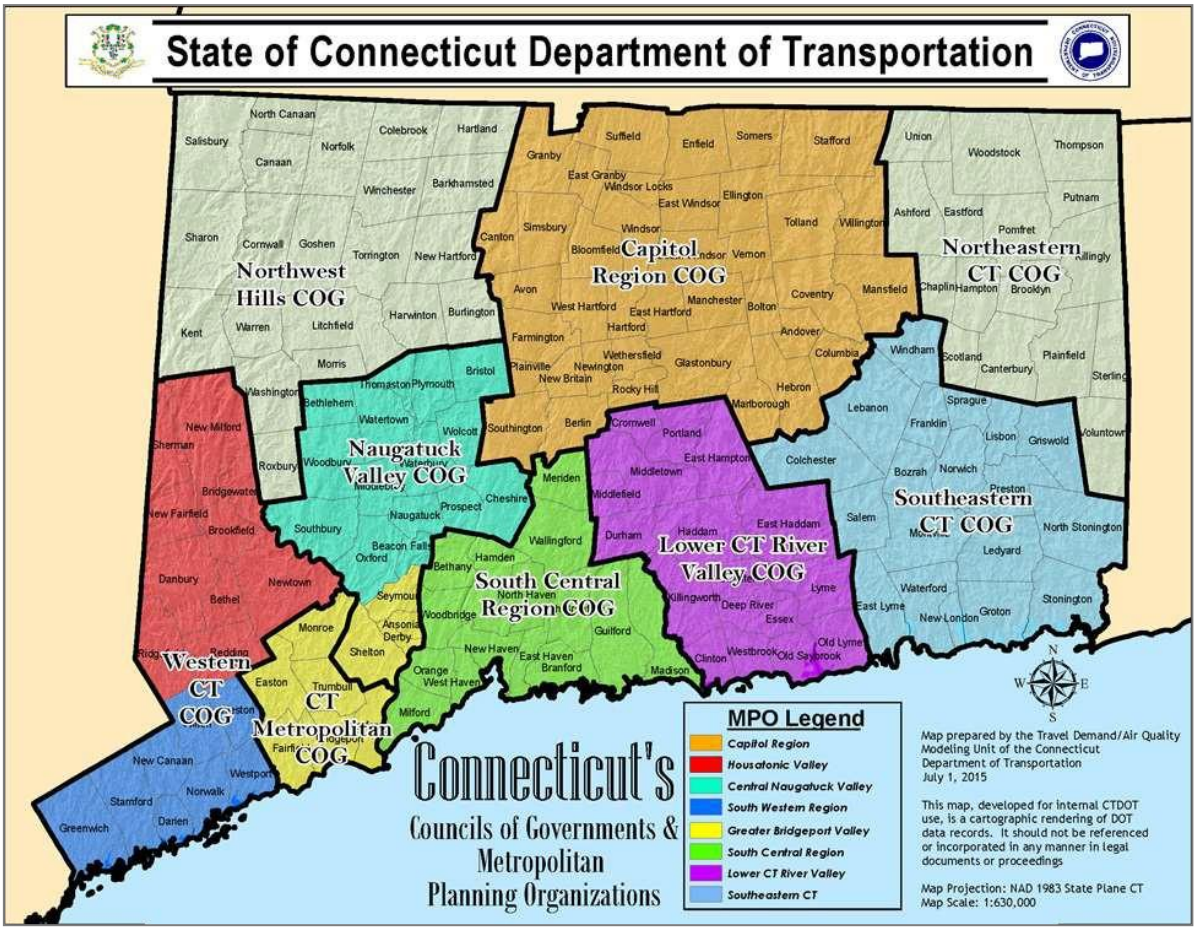
- Capitol Region Council of Governments
- Western Connecticut Council of Governments
- South Central Regional Council of Governments
- Naugatuck Valley Council of Governments
- Lower Connecticut River Valley Council of Governments
- Southeastern Connecticut Council of Governments
- Connecticut Metropolitan Council of Governments
- Northeastern Connecticut Council of Governments
- Northwest Hills Council of Governments

COGS and MPOs

Councils of Government are governing and/or coordinating bodies that represent and serve local governments. Metropolitan Planning Organizations develop area transportation plans and coordinate the transportation planning process. Often, COGs provide the technical support staff for the MPOs.

Connecticut's MPOs are key stakeholders for the Statewide Freight Plan and CTDOT involved them in the update process through interviews and ongoing coordination. The following sections summarize recent MPO freight planning efforts and policy in Connecticut.

Figure 3.1: Connecticut Councils of Government and Metropolitan Planning Organizations



Source: Connecticut Department of Transportation

3.5.1 Capitol Region Council of Governments (CRCOG)

The CRCOG 2019 Metropolitan Transportation Plan update contains a freight chapter that describes existing conditions, issues, and deficiencies/needs by mode and provides time-phased recommendations to improve regional freight transportation. In 2020, the CRCOG also developed a Capitol Region Freight Fact Sheet that identified existing freight infrastructure and activity, network constraints, and potential improvements for the freight system within the Capitol Region. Recommendations included:

- Develop and improve parking and rest stop facilities for trucks
- Improve highway conditions (address truck bottlenecks and advance key highway construction projects)
- Upgrade rail tracks to meet national rail freight standards (double tracking and 286,000 lb rail car weight)
- Upgrade rail bridges along the Hartford Line
- Explore and pursue airport area development

- Construct a new cargo facility at Bradley International Airport to accommodate future air cargo demand

CRCOG has also been participating in truck parking conversations via the Metropolitan Area Planning (MAP) Forum's Multi-State Freight Working Group. (Section 3.6.2 contains further discussion of the MAP Forum.)

3.5.2 Western Connecticut Council of Governments (WestCOG)

WestCOG is currently developing a Freight Profile, the purpose of which is to provide an overview of freight in the WestCOG region and to highlight freight stakeholders' importance to the region's overall transportation network.

3.5.3 South Central Region Council of Governments (SCRCOG)

The SCRCOG Metropolitan Transportation Plan (2019) includes discussion of freight movement primarily in reference to the Statewide Freight Transportation Plan. The plan noted that freight movement is a critical component of the regional transportation system and that increasing the utilization of rail would remove trucks from the region's highways and help reduce congestion.

The SCRCOG Congestion Management Process report was developed in 2018 to identify and address congestion in the region. It noted that the region contains vital national freight infrastructure and Connecticut has some of the lowest Interstate highway truck speeds in the nation, per USDOT.[7] The report identified widening of roadways and an increase in the use of rail as congestion mitigation strategies.

3.5.4 Naugatuck Valley Council of Governments (NVCOG)

The Naugatuck Valley Council of Governments (NVCOG) functions as a host agency for the Central Naugatuck Valley MPO and has a contract with the MetroCOG to undertake transportation planning for four towns (Derby, Shelton, Seymour, and Ansonia) that are part of the Greater Bridgeport & Valley MPO.

NVCOG is currently preparing a region-wide supplement to the state's freight plan and expects to release a draft in the summer of 2023. This plan will aim to examine the region's freight generators and identify projects that can help to improve the safety and efficiency of freight movement throughout the region. This project will look at all modes of freight.

Additionally, NVCOG is participating in a study of clean freight corridors as part of the MAP Forum. This study aims to identify routes that meet the needs of alternative fuel trucks, ensuring they can safely carry goods through the region and have access to fueling stations and other necessary facilities.

[7] South Central Regional Council of Governments, *SCRCOG Congestion Management Process*, June 2018.

3.5.5 Lower Connecticut River Valley Council of Governments (RiverCOG)

RiverCOG's Metropolitan Transportation Plan (MTP) (2019) identifies the importance of freight movement and the freight system throughout the region. The plan identified major constraints along the freight network and recommended improvements to Route 9, yearly bridge maintenance, analysis of economic constraints, to investigate solutions using roadway design, and to integrate freight mobility into all future transportation planning.

Lower Connecticut River Valley Council of Governments

RiverCOG also analyzed freight issues in relation to Route 81 and Route 66 through corridor studies. The Route 81 corridor study noted there is limited truck traffic along the corridor. Trucks typically come off the I-95 ramp and travel freely about 400 yards northbound to Clinton Crossing and back to ramps near Exit 63. There is a low clearance bridge (11 feet 5 inches) in the southern section of the corridor about 100 yards north of Route 81. Route 66 was not indicated as having much truck traffic or freight needs. Issues identified for both corridors were not significant enough to warrant specific recommendations.

3.5.6 Connecticut Metropolitan Council of Governments (MetroCOG)

METROCOG
Connecticut Metropolitan Council of Governments

MetroCOG's MPO Freight Program Assessment (MPOFPA) (2021) provides the freight transportation planning and program delivery actions for its region. Most freight routes through the region are part of the statewide network; therefore, a state-level public-private freight advisory group is recommended to efficiently hold discussions and develop solutions for freight needs. The MPOFPA also identified training is needed on how to engage freight stakeholders as well as for data collection, and existing data sources, analysis, and modeling.

The 2019–2045 MTP was developed in partnership with the NVCOG and noted that one of the fastest growing freight segments in the region is rail-truck intermodal shipment; and containers are increasingly being loaded onto rail for shipment and to trucks at a larger intermodal yard. Other modes increasing in use include truck-water and rail-water combinations. Freight rail shipments by long-haul Class I railroads and regional short line partners are a strong and competitive market. Investment in I-95 and supporting/surrounding infrastructure are key short- and long-term needs to reduce congestion. ITS is also needed to make better use of the existing capacity. Three freight-related needs were identified in the MTP to be implemented at the local, regional, and statewide level:

- **Bridgeport:** Modest infrastructure investments targeted at the critical freight corridors to improve access to key commercial and industrial areas, including Bridgeport Foreign Trade Zone and Urban Enterprise Zone, and enhance connections to the Port of Bridgeport. Actions include rehabilitating pavement structure and markings, retiming/interconnecting traffic signals and placing them under computer control, installing large curb radii along truck corridors, and installing directional signs.

- **Region:** Long-term freight enhancements (includes road, ferry, and air).
- **Statewide:** Annual state funding program for freight rail network.

3.5.7 Southeastern Council of Governments (SCCOG)

As part of the stakeholder engagement, SCCOG expressed interest in expanding multimodal freight capacity within the region and in improving efficiency across the interstate system, particularly through expanding capacity along I-95. SCCOG also noted that anti-idling technology for truck freight was of interest due to ozone issues within the region.

In 2017, the SCCOG developed a Freight Profile that identified the top commodities, freight infrastructure, and freight supported land uses in the region. The region also includes the Port of New London which, in 2014, moved 467,000 tons of goods and generates more than $0.5 million in revenue per year.

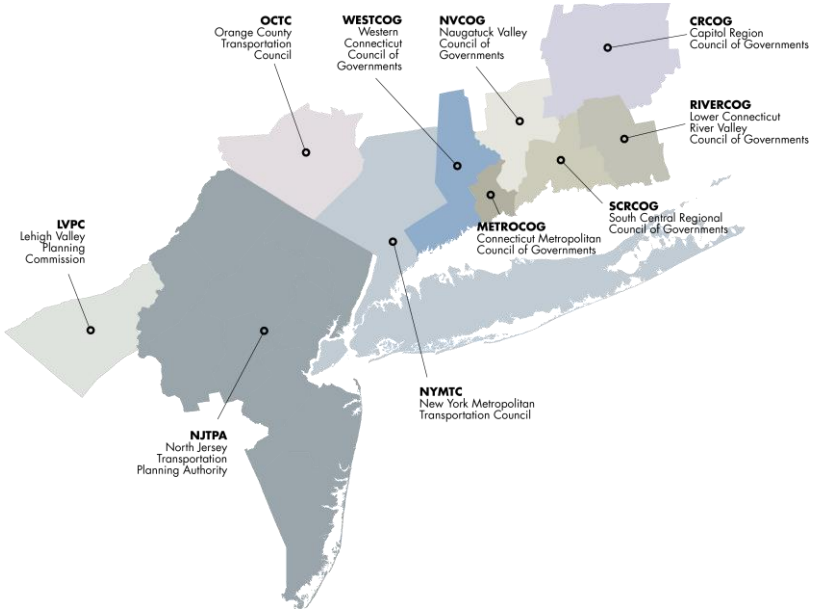
3.6 INTERGOVERNMENTAL PARTNERSHIPS

3.6.1 Eastern Transportation Coalition

The Eastern Transportation Coalition (previously known as the I-95 Corridor Coalition) represents transportation agencies and toll authorities, as well as public safety and related organizations, from the State of Maine to the State of Florida along the I-95 corridor. Transportation management and operations issues of common interest are addressed through this coalition as freight often crosses jurisdictional lines. Through this consensus-driven, volunteer-based organization, key decision makers from state, local and regional member agencies collaborate to improve transportation system performance. The Coalition is viewed as a successful model for multi-state interagency cooperation and coordination.

3.6.2 Metropolitan Area Planning (MAP) Forum

The MAP Forum consists of 10 MPOs from New Jersey, New York, Connecticut, and Pennsylvania that coordinate planning activities in the multi-state region. The 10 signatory MPOs agree to certain planning coordination activities, including:



- Exchanging information, discussing opportunities for collaborative activities, and engaging in consultations on the following program areas:
  - Unified Planning Work Program (UPWP)
  - Modeling
  - Long Range Transportation Plan
  - Transportation Improvement Program (TIP)
  - Air Quality State Implementation Plan Conformity

Within Connecticut, the consortium includes the NVCOG, CRCOG, RiverCOG, SCRCOG, MetroCOG, and WestCOG.

3.6.3 Governor's Council on Climate Change

In 2019, Governor Ned Lamont issued Executive Order No. 3 to reestablish and expand the membership and responsibilities of the Governor's Council on Climate Change. The council's role is to monitor and report on the state's implementation of the greenhouse gas emissions reduction strategies and to develop and implement adaptation strategies to assess and prepare for the impacts of climate change. Several recommendations related to freight were included in the 2021 report:

- Maintain increasing fuel economy and low- and zero-emission standards
- Advance initiatives that increase adoption of zero-emission medium- and heavy-duty vehicles
- Reduce emissions from freight transportation

The recommendation to reduce emissions from freight transportation identified three actions to include in the Statewide Freight Plan:

1. Address greenhouse gas emissions in state-level freight planning
2. Seek opportunities to shift freight from trucks to rail and ports
3. Consider co-benefit of expanding waste reduction and recycling programs that will also reduce waste-stream freight

3.6.4 Governor's Executive Order No. 21-3

On December 16, 2021, the Governor signed Executive Order No. 21-3 calling for 23 actions that direct State executive brand state agencies to take significant actions within their authority to reduce carbon emissions. The actions directing CTDOT include:

- Action #6: Solar Arrays on Department of Administrative Services and Department of Transportation State Properties – Directs the Department of Transportation and Department of Administrative Services to identify opportunities to deploy solar on their properties and rights-of-way.
- Action #7: Statewide Battery Electric Bus Fleet by 2035 – Directs the Department of Transportation to cease purchasing or providing state funding to third parties for the purchase

of diesel buses by the end of 2023 and create an implementation plan which identifies any barriers to full bus fleet electrification.

- Action #8: 2030 Vehicle Miles Traveled Reduction Target – Directs the Department of Transportation to set a 2030 vehicle miles traveled (VMT) reduction target and develop a plan of investments to influence the reductions.

3.6.5 Connecticut EV Commitment

On July 14, 2020, Connecticut joined 14 other states and the District of Columbia in signing a Memorandum of Understanding (MOU) to advance the market and use of electric medium- and heavy-duty vehicles. The MOU identifies steps to achieve 100 percent of all new medium- and heavy-duty vehicle sales (including large pickup trucks and vans, delivery trucks, box trucks, and long-haul delivery trucks) be zero-emission vehicles (ZEVs) by 2050 with an interim target of 30-percent ZEV sales by 2030.

3.6.6 Regional Clean Hub Proposal

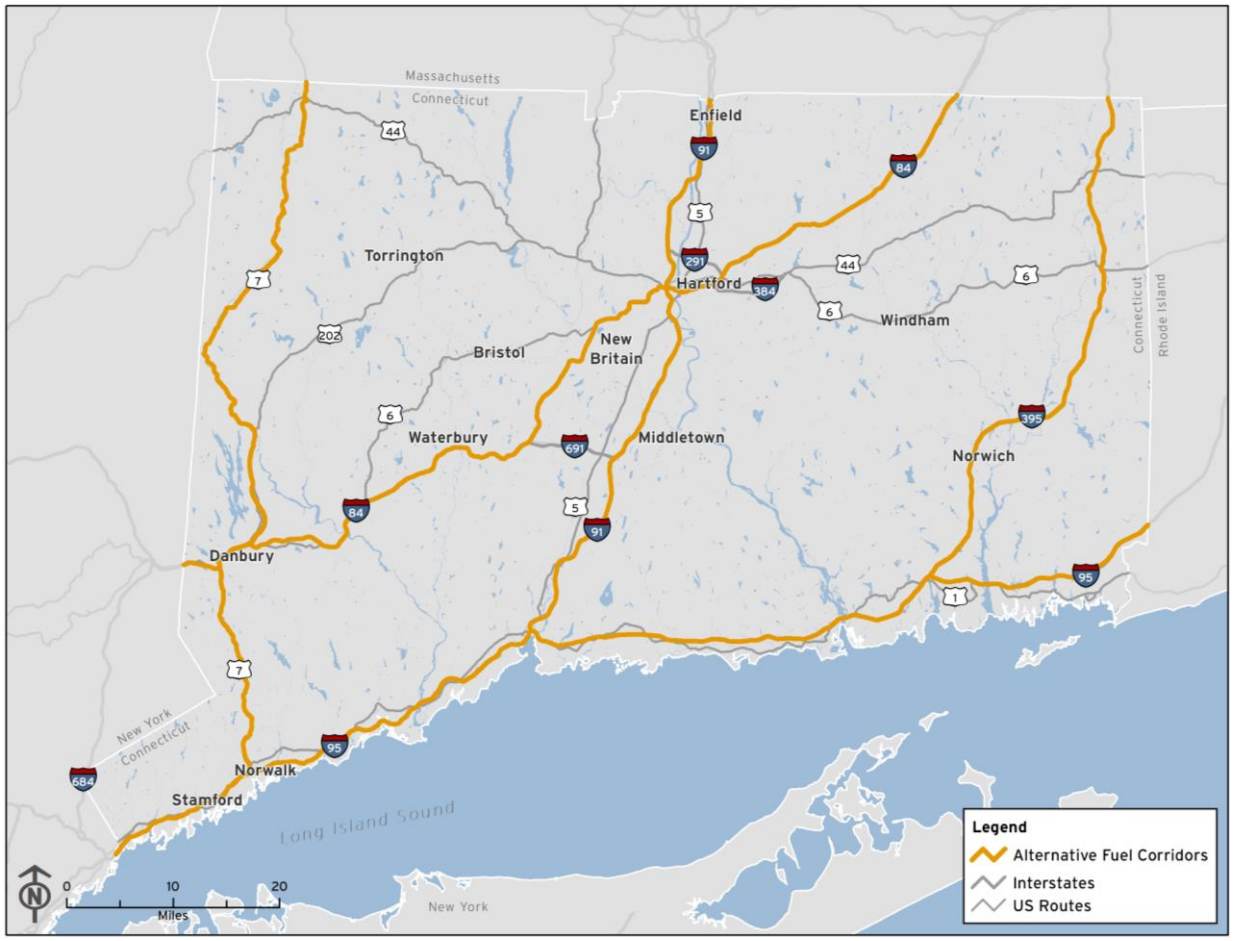
In 2022, Connecticut joined New York, New Jersey, and Massachusetts to develop a proposal to become one of at least four regional clean hydrogen hubs as designated through the federal Clean Hydrogen Hubs program (included in the 2021 Bipartisan Infrastructure Law, discussed further in **Section 4.1**). As part of the collaboration, the Connecticut Department of Energy and Environmental Protection (DEEP) will partner with agencies representing the entire chain of hydrogen. Partners will work to define a vision that advances safe and green hydrogen energy investment that addresses climate change, research the best approach to quantifying GHG emissions reductions from deployment of hydrogen technology, develop a framework for related workforce development and support environmentally responsible opportunities to develop hydrogen.[8]

3.6.7 Alternative Fuel Corridors

Federally designated alternative fuel corridors lay the groundwork for easy access to clean alternative fuels that help reduce transportation related carbon emissions. CTDOT and the DEEP will be posting signs to delineate these corridors within the state to promote public awareness about the availability of alternative fuels (**Figure 3.2**).

[8] https://portal.ct.gov/Office-of-the-Governor/News/Press-Releases/2022/03-2022/Governor-Lamont-Announces-Connecticut-Partners-To-Develop-Regional-Clean-Hydrogen-Hub-Proposal

Figure 3.2: Alternative Fuel Corridors



3.7 CONNECTICUT FREIGHT REGULATIONS

The Federal Motor Carrier Safety Administration (FMCSA) has established regulations that govern the licensing and operation of trucks on the highway system. They provide a consistent and predictable set of operating rules for motor carriers across all states. Connecticut has generally adopted these FMCSA regulations which cover truck size and weight and driver hours of service, among other things. The following sections discuss federal truck size and weight limits (including some Connecticut-specific requirements), driver hours of service rules, and a new highway user fee to be levied on trucks operating in the state.

3.7.1 Truck Size and Weight

The 1982 Surface Transportation Assistance Act (STAA) sets weight and dimension limits for vehicles operating on the National Network and more specifically, on the Interstate system. While the federal weight limit for vehicles operating on the Interstate system without a special permit is 80,000 lbs, there are exemptions and preexisting state statues that allow higher weight limits, and these exceptions vary by state.

Connecticut generally adheres to the federal standards, with some exceptions. Milk tankers and other trucks hauling agricultural commodities up to 100,000 in gross vehicle weight (GVW) may travel on the

Interstate system. Single-axle and tandem-axle vehicles meeting axle-spacing limits may travel at slightly higher weights than the federal provisions allow. In 2018, the oversize and overweight weekend travel restrictions were adjusted to be more flexible with industry needs.

Some neighboring states with provisions that predate the STAA allow trucks to exceed the 80,000 lb limit. For example, a grandfather provision allows vehicles up to 127,400 lbs GVW to travel on the Massachusetts Turnpike. The Connecticut trucking industry has communicated its preference for a harmonized system of truck size and weight regulations across state lines. CTDOT works regularly with the Connecticut State Police and the CT DMV Commercial Motor Vehicle Safety Division, Northeast Association of State Transportation Officials (NASTO) Subcommittee on Highway Transport, and industry organizations such as the Motor Transport Association of Connecticut, the Connecticut Construction Industries Association, and the Specialized Carriers & Rigging Association, to improve permitting practices and harmonize rules and regulations with neighboring states.

Connecticut General Statutes Section 13b-61 indicates that all monies collected or received by the state from license, permit, and fee revenues—which includes vehicle permit fees for oversize and overweight vehicles—must be credited to the Special Transportation Fund (STF) monthly (fines levied to overweight vehicles go to the General Fund). As part of the permitting process, CTDOT assigns truck routes for oversize/overweight vehicles, and reviews the vehicle management procedures suggested by the applicant.

CTDOT is a longtime partner in the Innovative Technology Deployment (ITD) Program and utilizes a multiagency system called the Commercial Vehicle Operations Portal (CVO). This portal allows freight carriers to conduct multiple commercial vehicle related transactions including permitting, registration, fuel tax transactions, e-screening transponder registration, and commercial driver's license (CDL) tracking. Since 2017, CTDOT implemented a cloud-based permit system upgrade which has greatly streamlined the permit process for carriers. The system allows for faster permit turnaround times including 24/7 permit ordering and account access, credit card payment methods, and electronic transmittal of all permit types. In 2021, the permit system was upgraded to allow for all-year renewal of Annual Divisible Load Permits to align with DMV's all-year commercial vehicle registration renewals. The Permit Office is currently in the process of upgrading to an automated permit system that will allow auto issuance of most single trip permits. In addition, CTDOT is participating jointly with the CT DMV in deploying a pilot Virtual Weigh Station/Weigh in Motion system on I-95, located at the former I-95 southbound weigh station in Waterford. The project will serve as a pilot to replace all of the static weigh stations currently in use by DMV throughout Connecticut.

3.7.2 Hours of Service

The federal hours of service regulations were established to maintain safe truck operations. The regulations stipulate the following:[9]

- Freight operators may not drive more than 11 hours following 10 consecutive hours off duty.
- Freight operators may not drive for any period after having been on duty 14 hours, following 10 consecutive hours off duty.

[9] https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations

- Drivers are required to take a 30-minute break after driving 8 cumulative hours where a 30-consecutive-minute break has not already occurred.
- Freight operators may not drive more than 60 hours in 7 consecutive days or 70 hours in 8 consecutive days.
- Driver must take 34 or more consecutive hours off duty between 7 consecutive-day drive periods.

An unintended consequence of these rules is that drivers seek unsanctioned parking locations rather than continue driving at the end of their legal operating hours when there are no vacancies in the sanctioned parking areas.

Historically, drivers and firms were allowed to track hours of service via paper logbooks showing their on- and off-duty times. However, as of December 2019, drivers must use electronic logging devices to track driving and rest time.[10] These devices improve compliance with hours of service (HOS) rules, but they could result in additional unsanctioned parking because drivers must pull over whenever their hours run out, regardless of whether there is a safe place to park. This freight plan update includes a detailed truck parking study to assess current and future parking supply and demand, estimate utilization at key parking facilities, and propose concepts for improvements in high-demand parking corridors.

3.7.3 Highway Use Fee

House Bill No. 6688, approved on July 1, 2021, created a highway use fee for trucks traveling in Connecticut. Beginning in 2023, all vehicles weighing more than 26,000 lbs will be subject to an additional per-mile fee to operate on highways within Connecticut. The fee structure will be determined by the weight of the vehicle and would range from 2.5 cents per mile (for trucks weighing between 26,000 and 28,000 lbs) to 17.5 cents per mile (for trucks over 80,000 lbs). Funds collected from the bill will be deposited into the Special Transportation Fund established under Section 13b-68 of the general statutes.

The trucking industry has voiced opposition to the law. Reasons include its potential impact on the cost of goods moved in the state (which may be passed on to consumers via higher prices) and logistical difficulties in collecting the fee (which requires mileage reporting, as opposed to state and federal excise taxes which are typically charged to fuel suppliers before the fuel reaches the retail pump).

3.7.4 Senate Bill No. 4, Public Act No. 22-25

In early 2022, the Connecticut General Assembly passed Senate Bill (SB) No. 4 adopting medium- and heavy-duty vehicle emissions standards of the State of California to reduce vehicle emissions for some of the state's highest rates of greenhouse gases. In addition, by 2026, at least 50 percent of State of Connecticut cars and light-duty trucks purchased vehicles must be battery-electric vehicles (BEVs) and 100-percent electric vehicles (EV) purchases by 2030.

[10] 49 CFR Parts 385, 386, 390, and 395.

4. Federal Freight Policy Context

To develop implementable recommendations that will maintain and improve Connecticut's freight transportation system, it is important to understand the national policy environment in which the freight system functions. Funding programs as well as national policy and regulatory restrictions all establish areas of emphasis and create the framework for implementation. This chapter summarizes recent federal policy and legislation with respect to freight, including funding authorizations and truck parking best practices.

4.1 Bipartisan Infrastructure Law (BIL)

The Bipartisan Infrastructure Law (BIL), also known as the Infrastructure Investment and Jobs Act, was signed into law on November 15, 2021, reauthorizing transportation funding for five fiscal years (2022–2026). The BIL continues and increases funding for many FAST Act programs,[11] initiates several new programs and grant opportunities, and mandates studies relevant to freight, as described below.

- **National Infrastructure Project Assistance:** This program authorized $10 billion through the general fund over 5 years for national or regional significant projects that generate economic, mobility, or safety benefits. Eligible projects include bridges, highways, freight intermodal, rail/highway separation, intercity passenger rail, and limited public transportation.
- **Reduction of Truck Emissions at Port Facilities:** This program requires the USDOT Secretary of Transportation to study how ports would benefit from electrification and to study emerging technologies that reduce emissions from idling trucks. Projects through this section of the act will be coordinated and funded through competitive grants that reduce port-related emissions from idling trucks. Any project funded under a grant under this section will be treated as a project on a federal-aid highway.
- **Consolidated Rail Infrastructure and Safety Improvement (CRISI) Grants:** This program is extended from the FAST Act and authorized at $1 billion per year.
- **Multi-State Freight Corridor Planning:** This grant program was established to provide financial assistance to compacts between states and certain other local governmental entities that are regionally linked through multi-state freight corridors (e.g., the Eastern Transportation Coalition). The compacts will promote improved freight mobility. Up to $2 million can be provided for a new multi-state compacts and $1 million can be provided for an existing multi-state compact.
- **National Freight Strategic Plan:** The National Freight Strategic Plan will be updated to include best practices for reducing environmental impacts including strategies for decarbonization, consider potential impacts of the freight system on rural and historically

[11] The FAST Act was the prior federal transportation authorization, passed in 2016. It is briefly described in Section 4.2 below.

disadvantaged communities, and the impacts of e-commerce on the national multimodal freight system.

- **State Freight Plans:** State freight plans must now be updated every 4 years instead of 5, and include additional freight considerations, specifically supply chain cargo flows, an inventory of commercial ports, findings and recommendations from any multi-state freight compacts, the impacts of e-commerce on freight infrastructure, a truck parking assessment, and military freight needs.

- **National Multimodal Cooperative Freight Research Program:** This program authorizes $3.75 million annually for a national cooperative freight transportation research program. The USDOT Secretary of Transportation must enter into an agreement with the National Academy of Sciences to establish an advisory committee to recommend a national research agenda focused on improving the efficiency and resiliency of freight movement.

4.1.1 Other BIL Components that May Impact Freight

In addition to the components of the BIL noted above, the act includes several programs, funding sources, and research that may impact freight. These components of the act include:

- **Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Grant Program:** Established a new funding formula to help states improve the resilience of transportation infrastructure. States that voluntarily develop a resilience improvement plan would receive an increased federal share of funding for projects.

- **Formula Carbon Reduction Program:** Aimed to reduce transportation emissions, eligible projects establish or operate traffic monitoring, management, and control facility or program. Projects that could impact freight under this may include advanced truck stop electrification systems, advanced transportation and congestion management technologies, deployment of infrastructure-based intelligent transportation systems, capital improvements and the installation of vehicle to infrastructure communications equipment, and carbon reduction strategy development.

- **Congestion Relief Program:** State DOTs, MPOs, and local governments in large, urbanized areas are eligible for grants over $10 million to plan, design, implement, and construct congestion relief projects with a federal cost share of 80 percent. This includes the use of tolls on the federal interstate system.

- **Grants for Charging and Fueling Infrastructure:** This competitive grant program makes available $2.5 billion over 5 years (50 percent of which is allocated to the Community Grants Program) to states, MPOs, special purpose districts/public authorities, Indian tribes/territories, and local governments to deploy publicly accessible charging infrastructure.

- **National Electric Vehicle Infrastructure (NEVI) Program:** This program makes available $5 billion over 5 years allocated to states based on a funding formula to deploy charging facilities and establish an interconnected network to facilitate data collection. State DOTs are required to develop a plan to submit to FHWA.

- **Safe Streets and Roads for All Grant Program:** Established a competitive grant program for MPOs, local governments, and tribal governments to develop and carry out comprehensive safety plans to prevent death and injury on roads and streets, commonly known as 'Vision Zero' or 'Toward Zero Deaths' initiatives. One billion dollars are allocated for the program, no less than 40 percent of which will support the development of safety plans.
- **Bridge Investment Program:** A new competitive grant program to assist state, local, federal, and tribal entities in rehabilitating or replacing bridges, including culverts, and eligibility for large projects and bundling of smaller bridges. Administered through a funding formula, $27.5 billion has been allocated over 5 years to award each state no fewer than one large project or two non-large projects.
- **Strengthening Mobility and Revolutionizing Transportation (SMART) Grant Program:** Establishes a competitive grant program for city or community demonstration projects that incorporate innovative transportation technologies or uses of data, including coordinated automation, connected vehicles, and intelligent sensor-based infrastructure. Annually, $100 million is authorized to fund projects across rural, midsize, and large communities.
- **Rural Surface Transportation Grant Program:** Establishes a rural surface transportation grant program to provide competitive grants to improve and expand the surface transportation infrastructure in rural areas.
- **Congestion Mitigation and Air Quality Improvement Program:** This section of the act adds flexibility to the Congestion Mitigation and Air Quality Improvement Program (CMAQ). It allows states to spend up to 10 percent of CMAQ funds on certain lock and dam modernization or rehabilitation projects and certain marine highway corridor, connector, or crossings projects that are functionally connected to the federal-aid highway system and contribute to the attainment or maintenance of a national ambient air quality standard.
- **Emerging Technology Research Pilot Program:** Establishes a pilot program to conduct emerging technology research and authorizes $5 million from the General Fund to support the program. Eligible emerging technologies include advanced and additive manufacturing (3D printing) technologies and research into activities to reduce the impact of automated driving systems and advanced driver automation systems technologies on pavement and infrastructure performance, as well as to improve transportation infrastructure design.
- **Research and Technology Development and Deployment:** Supports research on non-market-ready technologies in consultation with public and private entities, adds a focus on accelerated market readiness efforts to the Technology and Innovation Deployment Program, and extends the authorization for the Accelerated Implementation and Deployment of Pavement Technologies program to consider how pavement can enhance the environment and promote sustainability. Additionally, this section of the act authorizes the Center of Excellence on New Mobility and Automated Vehicles to research the impact of automated vehicles and new mobility.

4.2 FAST Act Freight Policy and Provisions

The FAST Act, passed by Congress in 2015, dedicated freight funding for the first time, required states to develop freight plans, and contains several initiatives and provisions to improve the condition and performance of the freight network and support investment in freight-related surface transportation projects.[12] Key programs of the FAST Act which are further continued under the BIL include:

- **National Highway Freight Program (NHFP) –** Connecticut is estimated to receive about $90 million from this program for FY 2022 – FY 2026[13] to make improvements to the National Highway Freight Network (NHFN). States are permitted to use a portion of their NHFP funding for public or private freight rail, ports and water facilities, and intermodal facilities.[14] States are required to have a federally approved freight plan to obligate NHFP funds. The Connecticut roadways that are part of the NHFN are listed in **Table 4.1** and mapped in **Figure 4.1**. Connecticut may use NHFP funds to improve any part of its Interstate System. Interstate 395 is not part of the Primary Highway Freight System (PHFS) but is eligible for NHFP funds because Connecticut's PHFS mileage falls below a threshold of two percent of the total U.S. PHFS mileage, as set in law.

Table 4.1: National Highway Freight Network in Connecticut

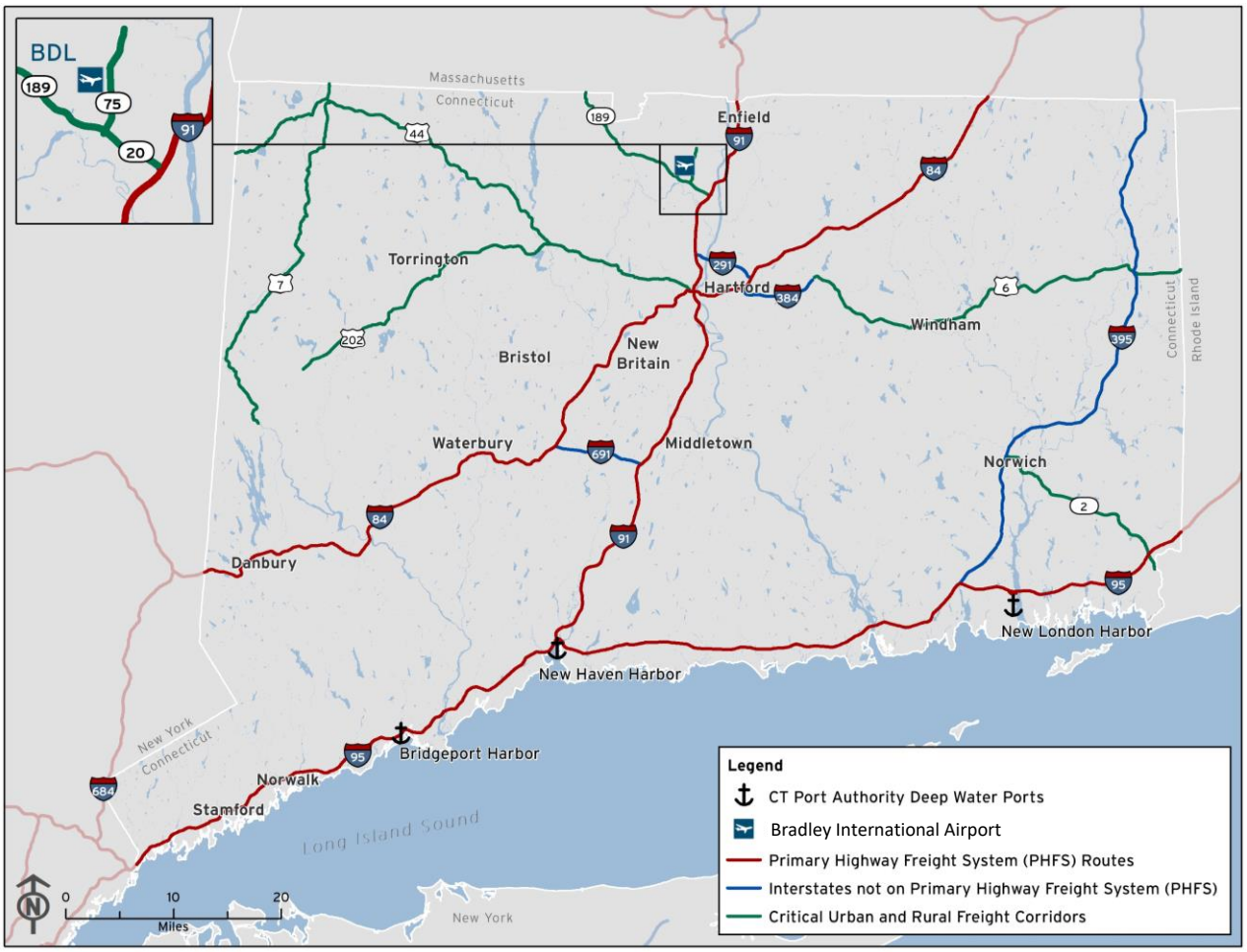
Designation	Connecticut Roadways
Primary Highway Freight System (PHFS) Routes	– Interstate 684 – Interstate 84 – Interstate 91 – Interstate 95 – CT 32
PHFS Intermodal Connectors	– CT 2P: Bridgeport Terminal – CT 3P: New London State Pier
Interstates not on the PHFS	– Interstate 291 – Interstate 384 – Interstate 395 – Interstate 691
Critical Urban/Rural Freight Corridors (designated in 2017)	– CT 189-N – CT 189L-W – CT 189M-W – CT 189N-N – CT 2-E – CT 20-E – US 202-N – US 44-E – US 6-E – US 7-N – CT 75-N

[12] 49 U.S.C. 70101

[13] Funding estimates for Connecticut are from the AASHTO publication located at: https://policy.transportation.org/wp-content/uploads/sites/59/2021/11/IIJA-Highway-Apportionment-Estimates-August-2021.pdf, retrieved 8/22/22.

[14] The FAST Act limited such multimodal funding to 10 percent of states' NHFP funding; the BIL increased it to 30 percent.

Figure 4.1: National Highway Freight Network in Connecticut



Source: FHWA

- **National Multimodal Freight Network (NMFN) –** The FAST Act directed the USDOT to establish an interim NMFN in 2016 to identify critical national transportation assets for freight movement. The 2016 interim NMFN includes the NHFN, all Class I railroads, public ports and airports meeting certain tonnage/landed weight criteria set in law, key inland and intracoastal waterways, and other strategic freight assets defined by USDOT. In Connecticut, the 2016 interim NMFN includes the NHFN, Amtrak-owned rail lines over which some freight railroads operate, the ports of New Haven and Bridgeport, Marine Highways M-295 and M-95, and Bradley International Airport.[15] USDOT is working to update the network based on feedback received and must re-designate this network every 5 years thereafter with stakeholder input. As such, the Connecticut facilities noted above may change.

- **National Freight Strategic Plan –** USDOT released the final National Freight Strategic Plan in 2020. The vision of the plan is for the U.S. freight system to strengthen economic competitiveness via safe and reliable supply chains that connect producers, shippers, and

[15] https://www.transportation.gov/sites/dot.gov/files/docs/US_Interim_MFN_4_28_16_alt_text_0.pdf

consumers. The plan highlights key trends and challenges, including safety risks, congestion, and deteriorating infrastructure and describes a range of possible public and private sector actions to improve freight infrastructure and planning processes. The plan includes three strategic policy goals:

1. Improve the safety, security, and resilience of the national freight system.
2. Modernize freight infrastructure and operations to grow the economy, increase competitiveness, and improve quality of life.
3. Prepare for the future by supporting the development of data, technologies, and workforce capabilities that improve freight system performance.

The goals are supported by strategic objectives aimed at integrating freight into planning, policy, and funding priorities.

- **Performance-Based Planning and Reporting –** The FAST Act established national goals and related performance measures so that agencies track and report performance data using a national framework of consistent performance measures. For freight, the FAST Act requires states to analyze and report on truck bottlenecks. CTDOT is preparing its baseline performance reporting through this Freight Plan update. This plan is following FHWA guidance provided in the *Truck Freight Bottleneck Reporting Guidebook*. **Chapter 8** contains the truck bottleneck analysis.
- **State Freight Advisory Committees –** The FAST Act encourages states to establish a freight advisory committee composed of a representative cross-section of public- and private-sector freight stakeholders.

4.3 FEDERAL TRUCK PARKING POLICY

4.3.1 Jason's Law

Jason's Law, effective as of October 1, 2012, makes construction of safety rest areas and truck parking facilities eligible for federal funding on the NHS. Projects eligible to receive funding under the law include:

- Construction of safety rest areas with truck parking
- Construction of truck parking areas adjacent to commercial truck stops and travel plazas
- Opening existing facilities to truck parking, including inspection and weigh stations and park-and-ride facilities
- Promoting availability of publicly or privately provided truck parking on the NHS
- Construction of turnouts along the NHS for commercial motor vehicles
- Making capital improvements to public truck parking facilities closed on a seasonal basis that will allow those facilities to remain open all year

- Improving the geometric design of interchanges on the NHS to improve access to truck parking facilities

The law also required the USDOT to survey states about their truck traffic and capability to provide truck parking, and to update the survey periodically. Results from the first survey found that most states have truck parking shortages, including Connecticut.[16]

In late 2020, USDOT released updated (2019) survey results. The updated survey reconfirmed the shortage in Connecticut and noted a new shortage in the entire I-95 corridor. It also found that states have become more aware of the problem, and hence more engaged in finding solutions. Some multistate coalitions have partnered with USDOT to deploy technologies that track and share truck parking space availability for interstate freight corridors. State DOTs observed that not many new public spaces are being developed, and that it is challenging to plan and develop new truck parking. Overall, the survey found that parking shortages are still a major concern, new business models are needed so private operators can profitably construct more capacity, and local governments/citizens need to be aware and involved to develop realistic plans for addressing the issue.[17]

4.3.2 Truck Parking Case Studies and Peer State Example

The following case studies and peer state example are offered as options for CTDOT and its partners to consider when developing truck parking solutions.

Texas Truck Parking Study

In 2020, the Texas Department of Transportation (TxDOT) conducted a truck parking study to assess and address existing and future truck parking needs within the state. The study noted that having sufficient safe parking for truck freight was important to reduce crashes (including fatalities), prevent roadway damage from illegal parking on shoulders and ramps, and to keep truck drivers safe. Like Connecticut, parking capacity is lacking across the state. To prioritize expanding parking capacity, the study identified high priority and medium priority corridors in need of additional parking based on existing and future truck parking needs as well as identified 12 policy, coordination, and outreach strategies, two technology strategies, four program strategies, and four infrastructure strategies for TxDOT to address these needs.

Policy, coordination, and outreach strategies included:

- Develop guidelines for integrating truck parking into the TxDOT project development process.
- Consider truck parking needs prior to purchase or sale of TxDOT right-of-way.
- Reassess public facility closures in high demand areas.
- Allow truck parking in auto-designated areas at existing TxDOT facilities during off-hours where feasible.
- Prepare corridor truck parking plans.

[16] https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/jasons_law.pdf

[17] https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/workinggroups/2020/mtg/mtg12012020.htm

- Integrate truck parking into the Strategic Highway Safety Plan (SHSP).
- Collaborate with planning partners to examine the feasibility of truck parking at non-TxDOT public facilities.
- Coordinate with private property owners to allow truck parking at large parking facilities when not in use.
- Create guidance to help local agencies include truck parking demand as part of Traffic Impact Analyses for new developments.
- Develop guidelines for integrating truck parking plans into local and regional transportation and
- land use plans.
- Encourage commercial and industrial property owners to provide truck parking on-site.
- Create guidance for next generation logistics parks that include integrated and full-service truck parking facilities.

Technology strategies included:

- Invest in Truck Parking Availability Systems.
- Provide truck parking information for integration into mobile applications.

Program strategies included:

- Collect truck and car parking utilization data at publicly owned parking facilities.
- Install static signs and use existing ITS signs indicating upcoming locations for truck parking.
- Collaborate with privately owned truck stop operators to develop new or expand existing truck parking.
- Include truck driver outreach in 'Don't Mess with Texas' campaign to encourage them to not litter.
- Develop a public education campaign to inform the public on the importance of truck parking.

Infrastructure strategies included:

- Enhance amenities at existing TxDOT maintained truck parking facilities.
- Expand and upgrade truck parking at existing TxDOT maintained facilities.
- Repurpose underutilized or closed/closing TxDOT maintained facilities where feasible in high-need corridors.
- Develop new publicly owned truck parking.

Weed, California Truck Parking

The City of Weed, California constructed a municipal parking lot by leasing land from private owners for truck-only parking. The city first acknowledged a need for truck parking along I-5 through Weed, and then assessed the best location for placing the parking. The location selected is adjacent to a pilot travel center, with lodging and food options available within walking distance. The site was developed to contain 30 parking spaces, and no parking fees are charged for trucks that stay less than 72 hours.

Maintenance is provided by the pilot travel center, and in exchange, they enjoy the increased business from truckers parked at the location. The site is patrolled by City of Weed police to ensure safety, and thus far no issues have arisen. Since 2012, only five tickets have been issued to trucks parked on this

location. To ensure that truck parking within the city remains curbed, the city has required new travel center developments to have truck parking spaces.

Brainerd Lakes Welcome Center Truck Parking

This tourism center in Crow Wing County, Minnesota features a partnership between the Minnesota DOT, the Brainerd Lakes Chamber of Commerce, Crow Wing County, the Minnesota Department of Natural Resources, and the Minnesota State Patrol. The center was developed within the right-of-way of an interchange off U.S. Highway 371, which was leased by the Minnesota DOT.

The site features 30 truck parking spaces that were funded through a gift shop featuring local products that was built on-site. These funds cover the operating costs of the facility, with capital costs sourced through the DOT, Chamber of Commerce, and Department of Natural Resources. In addition to the gift shop and truck parking, the site features bathrooms and vending machines that are accessible from both directions of travel. Security is provided through the Minnesota State Patrol.

4.4 Additional Freight Funding Programs

Various federal grant/loan opportunities are available for freight-related projects and each of the programs has its own unique requirements. Most of the funding for freight-related improvements is administered through the USDOT, with additional funding from non-USDOT sources. Federal transportation infrastructure funding and financing programs are detailed in **Table 4.2**.

Table 4.2: Additional Freight Funding Programs Summary

Program	Key Notes	Qualifications
Infrastructure for Rebuilding America Grants	▪ Formerly known as the Nationally Significant Freight and Highway Projects (FASTLANE) program. ▪ Offers funding assistance for freight-beneficial projects on a competitive grant basis.	▪ Available to states, MPOs, tribes, localities, and federal land management agencies pursuing higher- cost mega-projects. ▪ Selection criteria include degree of enhancement to local economic vitality, innovation in delivery and project streamlining, leveraging of federal funds and project readiness.
National Highway Performance Program (NHPP)[a]	▪ Guides activities related to the condition and performance of the National Highway System (NHS). ▪ Provides funding for the construction of new facilities on the NHS. ▪ Ensures that investments of federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a state's asset management plan for the NHS. ▪ Estimated funding for Connecticut[18] is $1.8 billion through FY 2026.	The BIL expands eligibility beyond the FAST Act for States to use funds for resiliency, cybersecurity, and undergrounding utility infrastructure and allows a State to use up to 15 percent of its NHPP funding for protective features on a Federal-aid highway or bridge that is off the National Highway System. Protective features must be designed to mitigate the risk of recurring damage or the cost of future repairs from extreme weather, flooding, or natural disasters.

[18] Funding estimates for Connecticut are from the AASHTO publication located here: https://policy.transportation.org/wp-content/uploads/sites/59/2021/11/IIJA-Highway-Apportionment-Estimates-August-2021.pdf, retrieved 8/22/22.

Program	Key Notes	Qualifications
Surface Transportation Block Grant Program[b]	▪ Previously known as the Surface Transportation Program. ▪ Block grant program under the FAST Act; amended under the BIL. ▪ Provides flexible funding for projects on any Federal-Aid highway, bridges on public roads, bridge and tunnel inspection and inspector training. ▪ $888.8 million is allocated to Connecticut[19] through FY 2026.	The BIL added additional eligibilities beyond the FAST Act including: ▪ Construction of wildlife crossing structures, electric vehicle charging infrastructure and vehicle-to-grid infrastructure, installation and deployment of intelligent transportation technologies, projects that facilitate intermodal connections between emerging transportation technologies, resilience features, cybersecurity protections, and rural barge landings, docks, and waterfront infrastructure projects, and the construction of certain privately owned ferry boats and terminals. ▪ Increases off-system bridge set-aside and allows low water crossing replacement projects to be eligible. ▪ New set-aside for projects in rural areas ▪ A new population category for 50,000 to 200,000 and provides for state consultation with MPOs.
Congestion Mitigation and Air Quality Program (CMAQ)	▪ Continued through MAP-21, through the FAST Act, and most recently through the BIL. ▪ Provides a flexible funding source to state and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. ▪ CMAQ funding is administered jointly by the FHWA and the Federal Transit Administration (FTA) and is allocated among the states based on the severity of their air quality status. ▪ $250 million is allocated to Connecticut[20] through FY 2026.	The BIL added flexibility to this program by: ▪ Allowing States to spend up to 10 percent of CMAQ funds on certain lock and dam modernization or rehabilitation projects and certain marine highway corridor, connector, or crossings projects if such projects are functionally connected to the Federal-aid highway system and are likely to contribute to the attainment or maintenance of a national ambient air quality standard. ▪ Adding eligibility for shared micro-mobility, including bike share and shared scooter systems, as well as for the purchase of medium- or heavy-duty zero emission vehicles and related charging equipment. ▪ Permitted the Secretary, at the request of an MPO, to assist that MPO with tracking progress made in minority or low-income populations as part of a performance plan.
Highway Safety Improvement Program (HSIP)	▪ Supports projects that improve the safety of road infrastructure. ▪ BIL allocated $200 million to Connecticut[21] through FY 2026.	The BIL restored flexibility to fund certain non-infrastructure activities and behavioral safety projects, such as educational campaigns and enforcement activities and allows a state to spend up to 10 percent of its HSIP funding on such projects. Additional eligible projects include:

[19] Funding estimates for Connecticut are from the AASHTO publication located at: https://policy.transportation.org/wp-content/uploads/sites/59/2021/11/IIJA-Highway-Apportionment-Estimates-August-2021.pdf, retrieved 8/22/22.

[20] Funding estimates for Connecticut are from the AASHTO publication located at: https://policy.transportation.org/wp-content/uploads/sites/59/2021/11/IIJA-Highway-Apportionment-Estimates-August-2021.pdf, retrieved 8/22/22.

[21] Funding estimates for Connecticut are from the AASHTO publication located at: https://policy.transportation.org/wp-content/uploads/sites/59/2021/11/IIJA-Highway-Apportionment-Estimates-August-2021.pdf, retrieved 8/22/22.

Program	Key Notes	Qualifications
		▪ Leading pedestrian intervals, construction or installation of features, measures, and road designs to calm traffic and reduce vehicle speeds. ▪ Installation or upgrades of traffic control devices for pedestrians and bicyclists ▪ Roadway improvements that provide separation between pedestrians and motor vehicles or between bicyclists and motor vehicles. ▪ Pedestrian security features designed to slow or stop a motor vehicle.
The Transportation Infrastructure Finance and Innovation Act	▪ Provides federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance. ▪ The goal is to leverage federal resources and stimulate private capital investment in transportation infrastructure by providing credit assistance to projects of national or regional significance.	Available for large-scale public or private transportation projects, including highway, bridge, and rail intermodal freight improvements. The BIL amended eligibility to include: ▪ Public infrastructure located near transportation facilities to promote transit-oriented development subject to a September 30, 2025 letter of interest deadline and a cap on the funding available for such projects. ▪ Airport-related projects subject to a September 30, 2024 letter of interest deadline and a cap on the funding available for such projects. ▪ Projects to acquire plant and wildlife habitats pursuant to a transportation project environmental impact mitigation plan.
Railway-Highways Crossing (Section 130) Program	▪ Funds to improve rail-highway crossings are set-aside from the federal HSIP apportionment. ▪ Provides funds for the elimination of hazards at railway-highway crossings. ▪ Apportioned to states by formula. ▪ There are 313 highway grade crossings in Connecticut, with 231 listed as freight railroad crossings, in which the railroad company is responsible for maintenance of the track and any pavement between the rails. Many of these crossings need replacement or repair of crossing surfaces on the approach as well as repair or replacement of signs, signals, crossing gates and other warning or protective devices.	▪ Eligibility includes the relocation of highways to eliminate railway-highway grade crossings and projects at railway-highway grade crossings to eliminate hazards posed by blocked crossings due to idling trains. ▪ BIL emphasizes eligibility for projects to reduce pedestrian fatalities and injuries from trespassing at grade crossings.
Federal Rail Safety Improvement Act of 2008	▪ Addresses rail safety through regulations.	▪ Authorizes grants for investing in rail technology, railroad safety infrastructure, rail grade crossing improvements, and education, subject to annual appropriations. ▪ Provisions administered by the Federal Railroad Administration (FRA).

Program	Key Notes	Qualifications
Rail Line Relocation and Improvement Capital Grant Program	▪ Improves the route or structure of a rail line. ▪ Involves a lateral or vertical relocation of a portion of rail line or mitigates the adverse effects of rail traffic on safety, motor vehicle traffic flow, community quality of life, or economic development.	▪ State (or political subdivision such as a parish) is eligible for a grant from FRA for any construction project.
Railroad Rehabilitation and Improvement Financing Program	▪ Provides direct federal loans and loan guarantees to finance the development of railroad infrastructure.[c] ▪ Helps to finance project investments directly, up to the total cost of the project. ▪ Established in 1998, the FRA provides up to $35 billion in direct loans and loan guarantees, with $7 billion reserved for Class I railroad projects.	▪ Loans can be used to refinance outstanding infrastructure debt. ▪ State and local governments, government-sponsored authorities, corporations, railroads, and others can participate in the program.
Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Grant[d]	▪ Previously knowns as Better Utilizing Investments to Leverage Development (BUILD) and Transportation Investment Generating Economic Recovery Discretionary Grants (TIGER) grants. ▪ Provides a unique opportunity for USDOT to invest in road, rail, transit and port projects that have the potential to achieve national objectives. ▪ Grant flexibility allows state and local partners to work directly with entities that own, operate, and maintain transportation infrastructure that cannot otherwise turn to the Federal government for financial support.	▪ RAISE can fund port and freight rail projects. ▪ RAISE can provide capital funding directly to any public entity, including municipalities, counties, port authorities, tribal governments, MPOs, or others in contrast to traditional Federal programs which provide funding to very specific groups of applicants (mostly State DOTs and transit agencies).
USACE Harbor Maintenance Trust Fund (HMTF)	▪ USACE is responsible for maintaining federal navigation channels ▪ Is the principal legislative vehicle for guiding the USACE Civil Works Program under the 2014 Water Resources Development Act (WRDA) ▪ Expenditures will increase each year until 2025, when 100 percent of available funds will be directed towards operations and maintenance activities ▪ Funded by a harbor maintenance tax (HMT) on imported and domestic waterborne cargo and cruise passengers	▪ HMTF is used to cover the USACE's cost of dredging channels, maintaining jetties and breakwaters, and operating locks along the coasts and in the Great Lakes. The HMTF may be used only with an appropriation by Congress
Inland Waterways Trust Fund for Locks and Dams	▪ Established by the Water Resources Development Act of 1986 ▪ Established a Federal marine fuel tax of $0.20 per gallon to support 50 percent of the cost of inland waterway infrastructure development and rehabilitation. ▪ Tax generates approximately $85 million annually ▪ Trust Fund balance began to decline in 2003 when increasing amounts were	▪ Approximately 11,000 miles of the nation's inland waterways are part of this system ▪ Funds are used to finance construction and major rehabilitation projects on the system of waterways ▪ Funds are used to match federal appropriations from the General Fund of the Treasury

Program	Key Notes	Qualifications
	used to modernize the inland waterway system. This continued until 2009 when the Trust Fund balance was exhausted, limiting the amount of spending to the annual tax revenues available. There is now a substantial backlog of authorized projects, and the limited funding available has been spread over a list of projects, which has extended the construction time for each project ▪ The 2014 WRDA directs the Secretary of the Army to conduct a study to report on potential revenue sources for the Inland Waterway Trust Fund. With the passing of the Able Act, as of April 1, 2015, the Inland Waterway Trust Fund tax was increased to $0.29 per gallon	
FAA Airport Improvement Program (AIP)	▪ Administered by the Federal Aviation Administration (FAA) and provides grants for planning and developing public-use airports that are included in the National Plan of Integrated Airport Systems (NPIAS) ▪ For large and medium primary hub airports, the grant covers 75 percent of eligible costs (or 80 percent for noise program implementation) ▪ For small primary, reliever, and general aviation airports, the grant covers a range of 90 to 95 percent of eligible costs, based on statutory requirements	▪ Eligible projects include improvements related to enhancing airport safety, capacity, security, and environmental concerns ▪ In general, sponsors can use AIP funds on most airfield capital improvements or repairs and, in some specific situations, for terminals, hangars, and non-aviation development

Notes: [a] USDOT, FHWA, retrieved October 26, 2021 https://www.fhwa.dot.gov/fastact/factsheets/nhppfs.cfm; BIL Act, retrieved November 22, 2021 https://www.congress.gov/bill/117th-congress/house-bill/3684

[b] USDOT, FHWA, retrieved October 26, 2021 from https://www.fhwa.dot.gov/fastact/factsheets/stbgfs.cfm; amended by the BIL Act, https://www.congress.gov/bill/117th-congress/house-bill/3684

[c] USDOT, FRA, retrieved August 14, 2014, from http://www.fra.dot.gov/Page/P0128

[d] https://www.transportation.gov/RAISEgrants/about

5. Connecticut Freight Transportation Assets

Connecticut's freight transportation system is a large interconnected system of roads, highways, air services, ports and waterways that connect the state with the rest of the United States and the world. The system is owned and operated by a variety of private and public entities, each operating under different cost structures, business models and objectives. This section reviews the extent and attributes of the networks that carry freight into, through and within Connecticut.

5.1 Highways

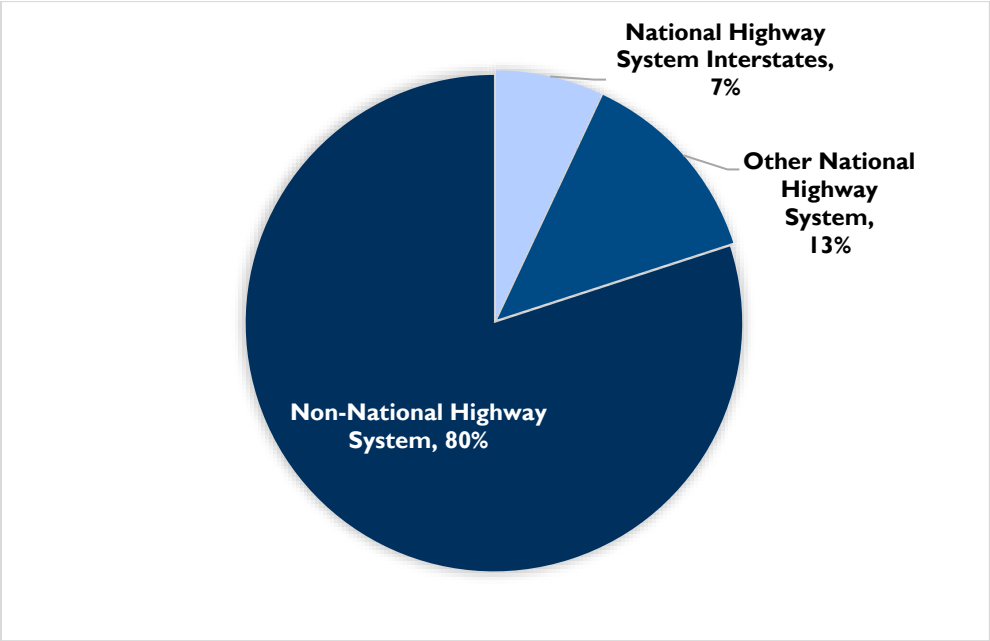
In Connecticut, there are over 21,577 miles of public roadways. CTDOT is directly responsible for overseeing all design, construction, maintenance, and improvements for nearly 20 percent of the state's roadway mileage. The state-maintained roads comprise Connecticut's most heavily traveled roads—the Interstate System—and most of the major arterials.

Source: CTDOT

As shown in **Figure 5.1**, the National Highway System Interstates make up just 7 percent of state-maintained roads; however, roughly 80 percent of truck freight travel in the nation moves on the Interstate System.[22]

[22] CTDOT 2020 Fast Facts.

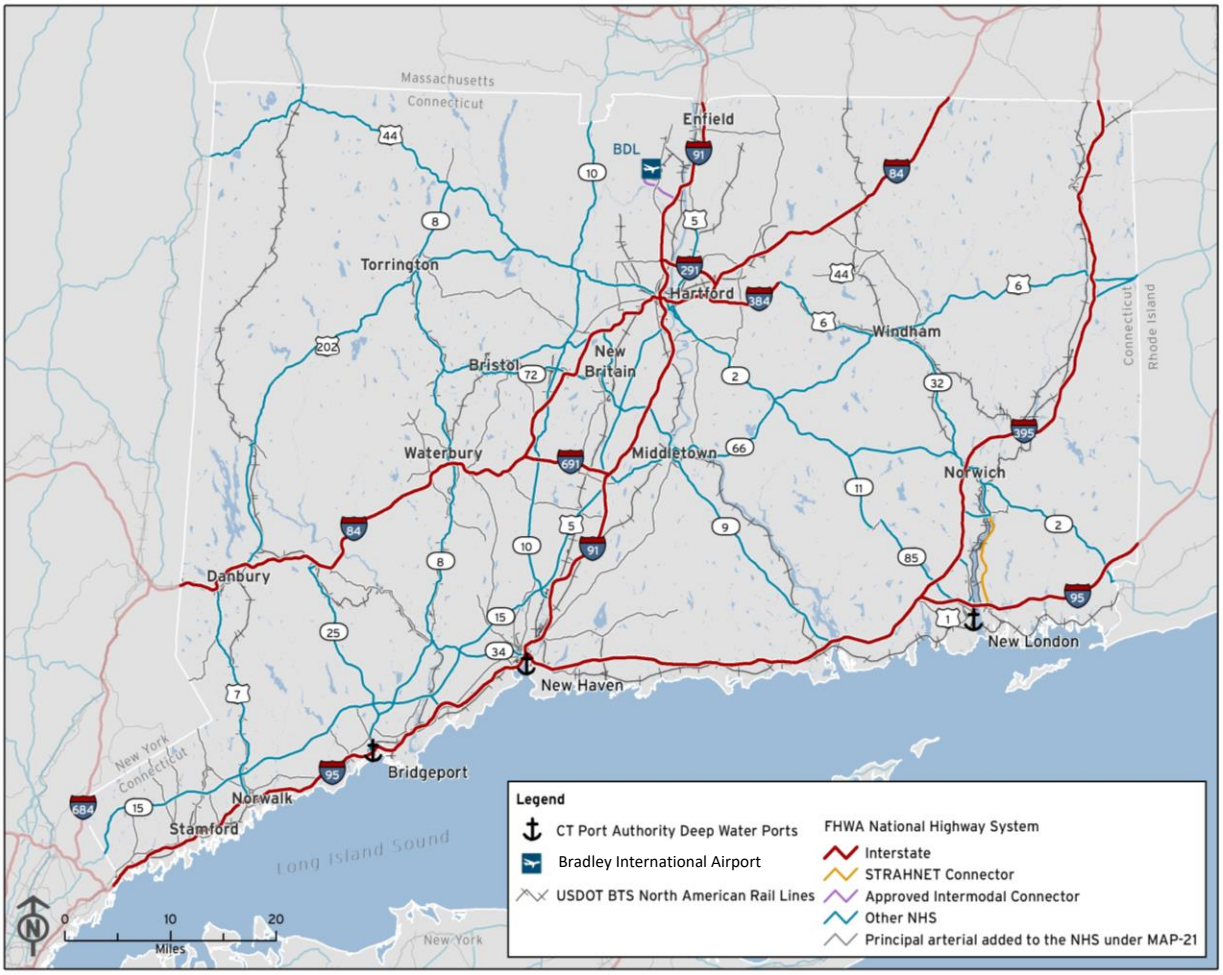
Figure 5.1: Connecticut Classified Roads, Share of Total Miles



Source: CTDOT 2020 Fast Facts

As shown in **Figure 5.2**, the 1,406 miles of the NHS in Connecticut connect population and employment centers within the State and form connections with neighboring states. The rest of the state-maintained system (2,725 miles) and the non-state system (17,446 miles) provide access between regions within the state, and they also provide local connections to factories, stores, warehouses and distribution centers, and intermodal facilities. For the most part, the first and last-mile connections of the highway freight system are on the non-state maintained highway system.

Figure 5.2: National Highway System Roads



Source: CTDOT

5.1.1 Military Freight Considerations

The BIL, enacted in 2021 requires state freight plans to include consideration of military freight. Connecticut has three military bases where military personnel and military freight are located. All three military bases are located along or adjacent to the Thames River and located in proximity to the New London Harbor. The New London Harbor has authorized dredging to 35-foot depths or more to support the navigation needs of national defense. All three facilities are located in close proximity to commercial rail lines, including the USG Railroad, Providence and Worcester Railroad, and the New England Central Railroad (**Section 5.2**). The closest interstate to these military facilities is northern I-95 which has segments of poor pavement conditions and two bridges in poor condition (Corridor Segment 1-6, per **Chapter 11**). The stretch of I-95 closest to these military facilities is currently being studied under the I-95 Eastern Connecticut Planning and Environmental Linkages Study, which will further define the needs and deficiencies along the corridor and identify project alternatives to address those needs. In addition, the CTDOT submitted a USDOT grant application for bridge improvements on the Gold Star Memorial Bridge. Programmed projects on this segment of I-95 include the I-95 NB Improvements B/O of 58-307 and D2 Pavement Preservation – Ultra-Thin (**Chapter 12**). Additional details on these military facilities include:

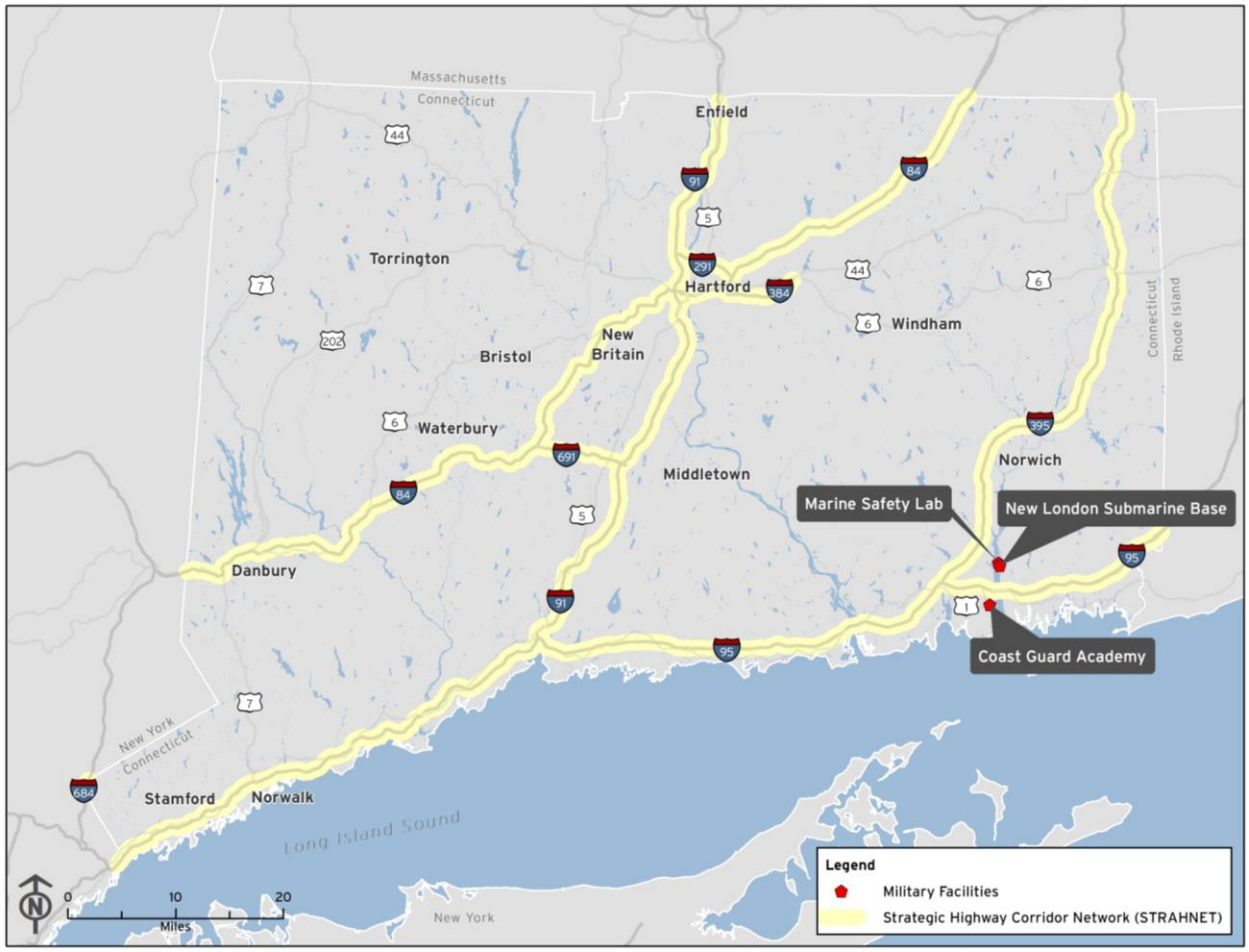
- **U.S. Coast Guard Academy** in New London, CT: a prestigious institution and the one and only academy with military purposes for the U.S. Coast Guard. This academy offers training in at least eight different fields (e.g., civil engineering, marine and environmental sciences, aviation) and admission is based on merit, in contrast to other academies where a nomination is required. This academy is located approximately 0.9 miles northeast from the freight network, namely I-95.

- **Naval Submarine Base New London** in Groton, CT: an important submarine based controlled by the U.S. Naval Forces, the base consists of ten permanent units including the Submarine Learning Center, the Naval Branch Health Clinic, the Naval Submarine School, and the Commander Submarine Group 2. Approximately 15 ships are hosted at this site. This submarine base is located adjacent to the Thames River and approximately 1.9 miles northwest from the freight network, namely I-95.

- **Marine Safety Center Marine Base** in Groton, CT: this lab tests U.S. waters for detailed and advanced tests to determine contamination. Contamination can occur for a variety of reasons including oils spills. While large oil spills are easily noticed by ships and from air, smaller oil spills may go unnoticed without proper water testing. The lab's testing is important for the safety of the maritime resources and coastal communities and to ensure accountability of responsible companies. This lab is also open for civilian use. Any civilian with concerns about water contamination can bring in water samples and request an investigation. This marine base is located adjacent to the Thames River and approximately 1.9 miles northwest from the freight network, namely I-95.

In addition to military bases, Connecticut has approximately 732 miles of roadway considered part of the Strategic Highway Network (STRAHNET), highways important to the United States strategic defense. The STRAHNET provides defense access, continuity, and emergency capabilities for the movement of personnel, materials, and equipment. STRAHNET in Connecticut include I-95, I-395, I-84, I-384, I-91, I-291, and I-691. **Figure 5.3** depicts the STRAHNET and military facilities in Connecticut.

Figure 5.3: Strategic Highway Network and Military Facilities in Connecticut



5.1.2 Truck Routing

Although the state does not have designated truck routes, Interstate routes are the primary roads used by trucks. Roughly 42 percent (by weight) and 49 percent (by value) of truck freight movement in Connecticut pass through the state destined for other states.[23] Nearly all (99 percent) of the freight transported by truck uses the Interstate System.[24]

5.1.3 Truck Size and Weight

Freight operations in Connecticut must comply with size and weight limitations cited in Connecticut General Statutes (CGS section14-267a and 14-269). Size and weight limitations are based on truck and trailer axle configurations. The maximum weight limit is 80,000 lbs given the appropriate number of axles. Tractors with 48-foot trailers have unrestricted travel routes throughout the state. These

[23] IHS Markit TRANSEARCH.
[24] CTDOT 2020 Fast Facts.

regulations reflect federal standards for trucks traveling on the National Network.[25] Large combinations such as 53-foot trailers or twin 28-foot trailers are restricted to the Interstate highway system.[26] **Chapter 3** contains more information about Connecticut truck size and weight regulations.

5.1.4 Critical Urban and Rural Freight Corridors

Critical urban and rural freight corridors are designated highways that provide access and connection between the primary highway freight system and Interstates with ports, multimodal facilities, and public transportation facilities. States are authorized to designate these roads per the FAST Act, subject to mileage limitations specified in statute.[27] Under the FAST Act, Connecticut could designate up to 150 miles of critical rural freight corridors and 75 miles of critical urban freight corridors. However, under the recently enacted BIL, these limits have been increased to 300 miles of critical rural freight corridors and 150 miles of critical urban freight corridors.

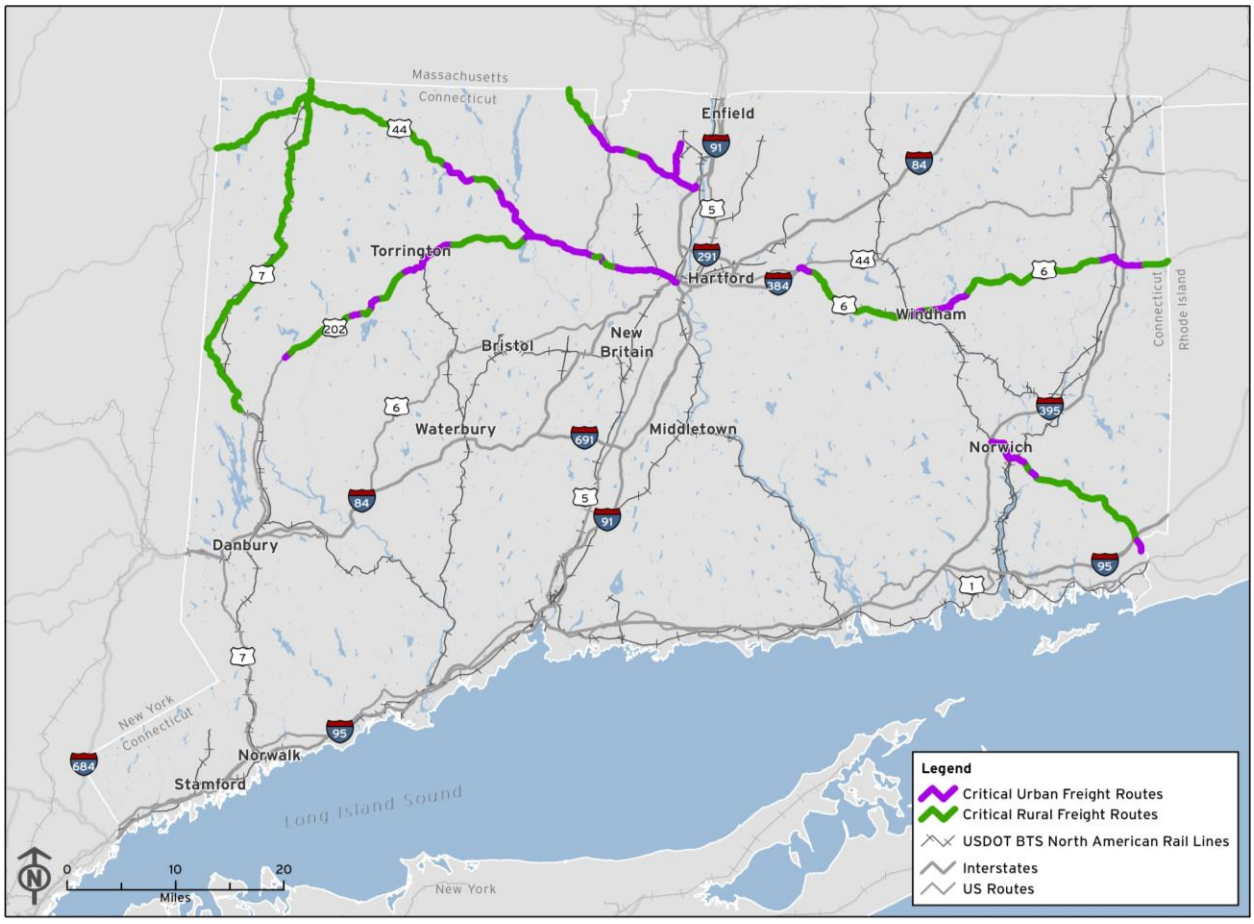
CTDOT has designated 139.5 miles of critical rural freight corridors and 62.75 miles of critical urban freight corridors (**Figure 5.4**).

[25] Federal Highway Administration, *Federal Size Regulations for Commercial Motor Vehicles* (Washington, DC: 2015), accessed December 6, 2021, https://ops.fhwa.dot.gov/FREIGHT/publications/size_regs_final_rpt/index.htm. The National Network is a federally designated set of highways where conventional trucks are allowed to travel.

[26] CT General Statutes, Title 14 – Motor Vehicles Use of the Highway by Vehicles, Chapter 248 – Vehicle Highway Use, Section 14-268 Weight of Vehicles and Trailers, CT Gen Stat § 14-268 (2019).

[27] 23 U.S.C. 167(e) and (f).

Figure 5.4: Critical Urban and Rural Freight Corridors



Source: CTDOT

5.1.5 Freight-Beneficial Highway Improvements Since the 2017 Plan

Since 2017, freight-beneficial highway and roadway bridge projects identified in the 2017 Freight Transportation Improvement Strategy have been constructed or are currently under construction that benefit the freight transportation network. These projects include:

- Reconstruction of the I-84 interchange at Route 4 and Route 6 in Farmington
- Construction of an operational lane on I-84 between Exits 40 and 42 in West Hartford
- Operational and safety improvements at Route 9/Route 17 on ramp
- Replacement of I-84 Mixmaster in Waterbury
- Relocation of I-91 Northbound Exit 29 and Widening of I-91 Northbound and Routes 5/15 Northbound to I-84 Eastbound
- Resurfacing, bridge and safety improvements on I-91 between Elm Street overpass in Wethersfield and Exit 29 off-ramp in Hartford

5.2 FREIGHT RAIL

There are ten privately owned freight railroad companies operating in Connecticut and the Connecticut Department of Transportation provides freight rail support through the State Rail Program Funding,

Capital Planning Process, and Federal Rail Program Funding. The latter two programs are transit-focused but can provided benefits to freight rail if improvements are on shared freight/passenger lines. The railroad companies own most of the rail freight infrastructure and all the rail freight equipment operating within the state. The rail service operators include CSX Transportation, Providence & Worcester Railroad Company, Housatonic Railroad Company, Pan Am Southern Railway (operated by Springfield Terminal Railroad), New England Central Railroad, Naugatuck Railroad Company, Central New England Railroad, Connecticut Southern Railroad, Valley Railroad,[28] and Branford Steam Railroad.

There are over 628 miles of freight railroad right-of-way within the state consisting of public and privately owned property, as shown in **Table 5.1**. Publicly owned railroad lines include Amtrak (passenger), state-owned railroads, and municipal-owned railroads. Connecticut has three Amtrak routes (Acela Express, Northeast Regional, and Vermonter) served by 13 Amtrak stations.

Table 5.1: Connecticut Freight Railroad Right-of-Way Miles

PUBLIC	ROW Miles
Freight Railroad Operating Rights	
Federal – Amtrak owned (Shore Line and Springfield Line)	122.5
State of Connecticut owned (New Haven Line, Branch Line and misc.)	128.2
Freight Railroad Lease Agreements	
State of Connecticut owned	129.1
Municipal – City of Bristol owned	2.0
Total Public	**381.8**
PRIVATE	
Freight Railroad Companies (privately owned)	246.7
Total Private	**246.7**
TOTAL	**628.5**

Source: Connecticut State Rail Plan 2022-2026 Draft, CTDOT.

The locations of freight- and public-owned rail lines by railroad operator and ownership are shown in **Figure 5.5**. Most of the freight rail operations in Connecticut involve shared-use agreements between owners of passenger rail operators (Amtrak, etc.) and freight rail companies.

5.2.1 Freight-Beneficial Rail Improvements Since the 2017 Plan

CTDOT is aware of the following freight-beneficial rail improvements completed since the 2017 Plan.

Branford Steam Railroad

Installed a turnout, replaced two railroad crossings, and replaced 950 feet of rails with new ties and ballast.

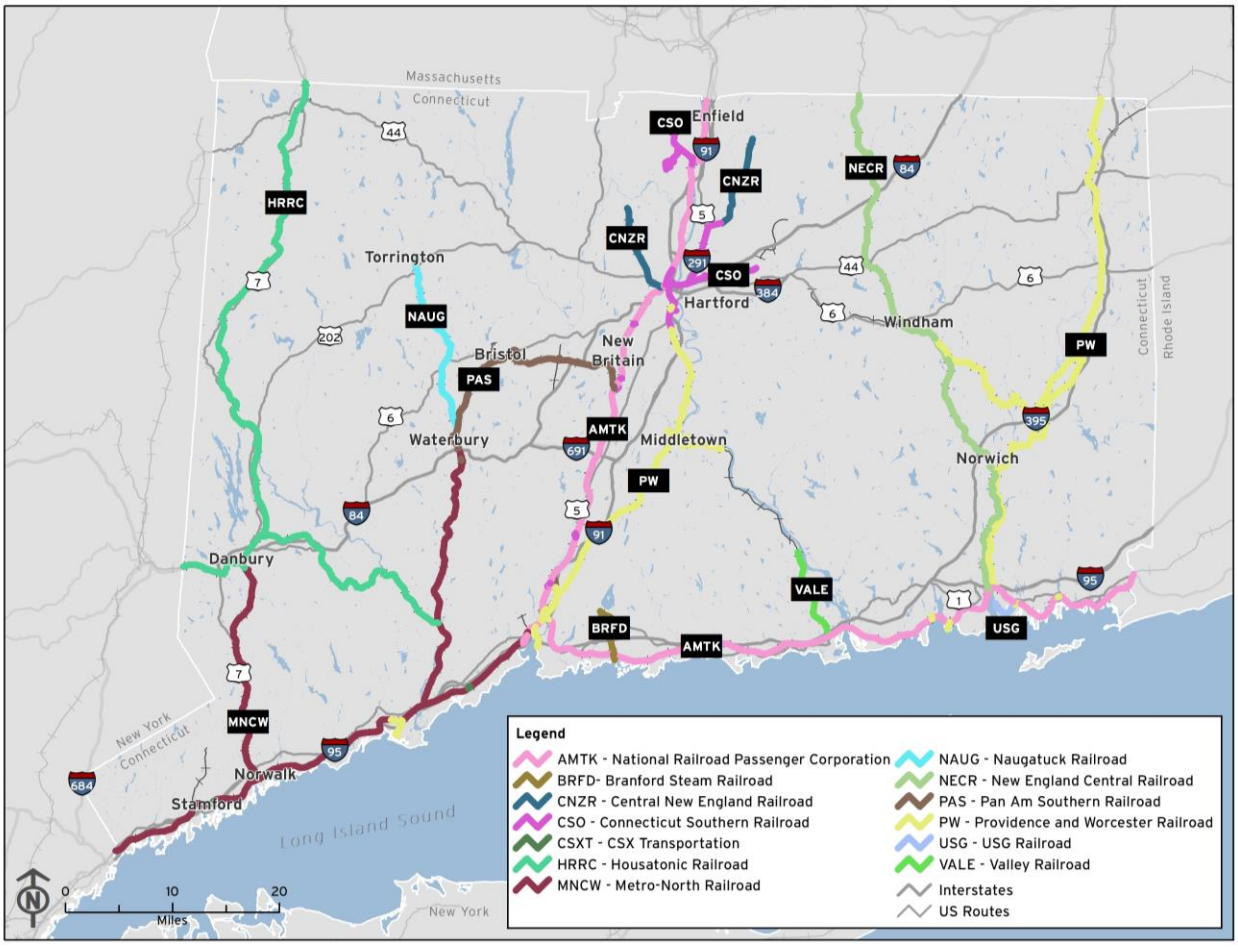
Central New England Railroad

Installed 3,900 wood ties, surfaced 5.2 track miles, and installed 4 track miles of fit 131RE continuous welded rail (CWR). Installed four turnouts, two Grade Crossing Warning Devices, and replaced track

[28] Valley Railroad is a scenic railroad and does not haul freight at this time.

structure/crossing pads at Mills Lane and Wintonbury Avenue. Drainage and track stabilization improvements were made along the Griffin line. Installed new bridge timbers on the Scantic River bridge on the Armory Branch.

Figure 5.5: Rail Operators in Connecticut, and Ownership



Source: CTDOT

Connecticut Southern Railroad

Installed 3,500 ties on the East Windsor Subdivision, distributed 4,200 tons of ballast, surfaced 7 miles, two grade crossings surfaces, and steel repairs to the Connecticut River bridge resulting in the line being upgraded from FRA excepted track to FRA Class 1. Installed 2,600 ties, 75 switch ties, distributed ballast, surfacing, replaced three crossings surfaces, upgraded warning devices, and upgraded from FRA excepted track to Class 1 track. Replaced 1,600 ties on the Wethersfield Subdivision along with ballast and surfacing, installed 75 switch ties, and replaced three crossing surfaces. Installed 6,500 ties, 411 switch ties, surfaced 12 miles and 22 turnouts, replaced one turnout, and distributed 1,100 tons of ballast in the Hartford Yard.

Housatonic Railroad Company

Installed 11,000 wood ties, surfaced 6.0 track miles, and installed fit 140RE CWR. Replaced ties, ballast, and surfaced from MP 3-6, MP 10-18, and MP 32-40. Installed turnout and siding between MP 45 and MP 48. Completed ditching and drainage work.

Naugatuck Railroad Company

Purchased and installed 10,000 wood ties. Surfaced 8 track miles. Installed 3,000 track feet of fit 131RE CWR. Rehabilitated one at-grade crossing. Drainage improvements at various locations. Re-gauged several curves.

New England Central Railroad

Upgraded or repaired various bridges and performed repairs to the Norwich tunnel. Installed 7.5 miles of rail, 64,000 ties, 55 miles surfacing, 17 turnouts, replaced 17 grade crossing surfaces, and installed 20 automatic warning devices.

Providence & Worcester Railroad

Installed 31,800 ties, 408 switch ties, 16,000 linear feet of 115RE CWR, ballast, and surfaced on the Norwich Branch. Completed a tie deck replacement on the Wethersfield bridge. Installed 17,500 ties, 200 switch ties, distributed ballast, surfaced the entire Middletown Cluster, and replaced two crossing surfaces at Butternut Street and Cider Mill Road. The work performed allowed the re-opening of the line between Middletown and Hartford. A deteriorated floor beam on Middletown Swing Bridge was also replaced.

The Valley Railroad Company

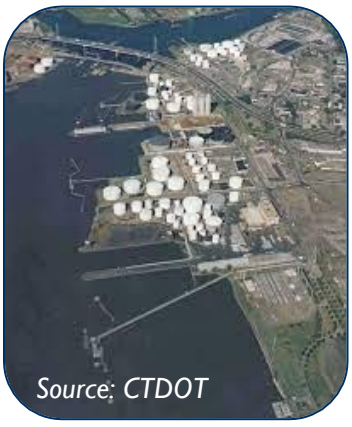
Installed approximately 1,500 ties. Repaired culverts and slopes. Protective rip rap was also installed.

5.3 WATER TRANSPORTATION

There are three deep-water commercial ports in Connecticut—New London, New Haven and Bridgeport—that handle freight movement (**Figure 5.6**). An overview of each deep-water commercial port is provided below.

5.3.1 Port of New Haven

The Port of New Haven is the busiest port between New York and Boston, is the largest deep-water port in the State of Connecticut, and includes intermodal connections. With a federally authorized channel depth of 35 feet and a width of 400 to 800 feet, New Haven Harbor can accommodate ships ranging from 20,000 to 40,000 deadweight tons. The 366-acre port district includes eight privately owned terminals and 10 berths, and is primarily comprised of a cluster of privately owned facilities that handles petroleum products, general bulk, cargo, scrap metal, metallic products, cement, sand, stone, salt, break bulk and project cargo.

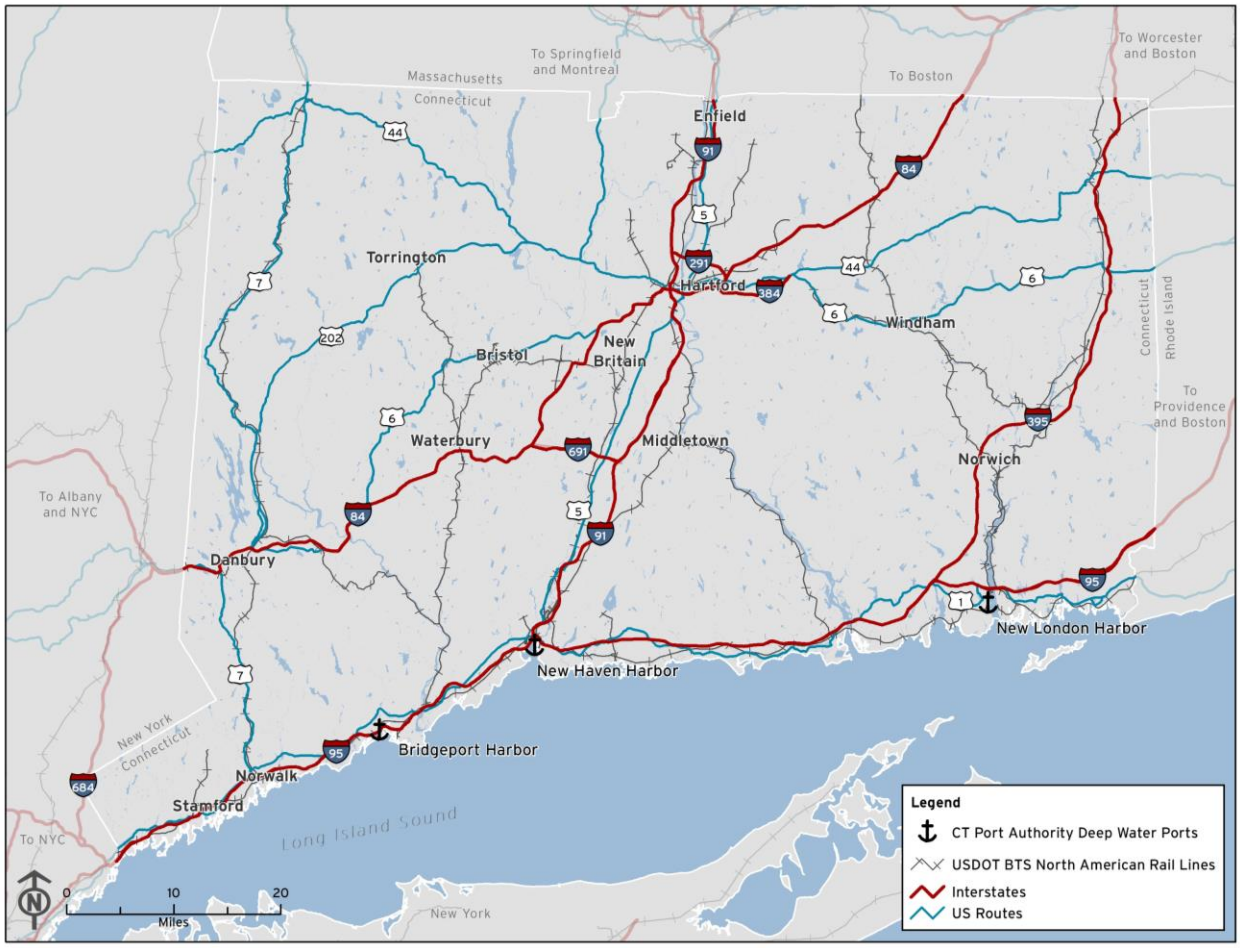

Source: CTDOT

5.3.2 Port of Bridgeport

The Port of Bridgeport includes two natural harbors with ferry terminus, private marinas, ship repair and maintenance facilities, tank farm, and construction firms. Commerce in both harbors includes the movement of stone and aggregate materials, petroleum products and other liquid bulk, coal, and general cargo.

The majority of waterfront facilities in both harbors are privately owned and operated. The channel is less than 30-feet deep.

Figure 5.6: Connecticut Deep Water Commercial Ports



Source: CTDOT and CDM Smith

5.3.3 Port of New London

The Port of New London includes several piers for commercial and recreational activities including multiple ferry companies with trips to Long Island, Block Island, and Fishers Island. New London's Thames River includes a federal channel with 35- to 40-foot depth. The port is also home to General Dynamics Electric Boat, the U.S. Navy Sub Base, and the U.S. Coast Guard Academy.

Historically, the state-owned Admiral Harold E. Shear State Pier facility had handled break bulk commodity traffic, including steel, lumber, salt and copper. The ≈30-acre facility featured 35-foot depth with direct highway and railroad connections. Ownership of the facility was transferred to the newly created quasi-public Connecticut Port Authority (CPA) in 2020.

The CPA and State of Connecticut are leading a once-in-a-generation transformation of the CPA-owned State Pier, Central Vermont Pier, and adjacent land (owned by the New England Central Railroad) in New London, from an underutilized asset to a state-of-the-art modern, heavy-lift capable terminal that will be completed in early 2023. The improvements will benefit the port's long-term growth by increasing its capacity to accommodate heavy-lift cargo for years to come while maintaining its freight rail link. More information on the improvements can be found in **Section 5.3.5**.

5.3.4 Ferry Operations

Ferry services located at the Port of New London that handle freight include:

Cross Sound Ferry – A passenger and road vehicle ferry service, operating between New London, Connecticut and Orient Point, Long Island, New York. The service is privately owned and operated by Cross Sound Ferry Services, Inc., and is headquartered in New London. According to the company's website, it serves more than 1-million passengers annually. The ferry handles trucks moving freight between Connecticut and Long Island. Outside of the peak summer season, the ferry has excess capacity that is used for trucks and freight, which includes gravel and other heavy items (Connecticut Office of Policy and Management 2013).

The Fishers Island Ferry District – A passenger, auto, and freight service operating between New London and Fishers Island, New York.

The Block Island Express – A passenger-only service operating between New London and Block Island, Rhode Island.

CTDOT owns and operates two seasonal ferries across the Connecticut River. The Rocky Hill to Glastonbury Ferry operates from April to November and is important to local vehicle and bicycle travel. The Chester to Hadlyme Ferry operates from April to November.

The Bridgeport and Port Jefferson Steamboat Company has ferry service between Bridgeport and Long Island. It carries mostly passenger vehicles with some freight.

5.3.5 Freight-Beneficial Port Improvements Since the 2017 Plan

The following freight-beneficial port improvements have been completed since the 2017 Plan.

Port of Bridgeport

A federal navigation project for the maintenance dredging of Bridgeport's Black Rock Harbor and Bridgeport Harbor is in progress. The harbor channel is less than 30-foot depth and the USACE is considering a maintenance dredge to 33 feet for Bridgeport Harbor (or 35 feet, but the state would be responsible for the cost difference associated with the deeper dredge) and to 14 feet (or 18 feet at state's responsibility) for Black Rock Harbor.

USACE is currently in the process of creating a Dredged Material Management Plan (DMMP), anticipating DMMP approval in by the end of calendar year 2022. Per current USACE planning, the soonest that a dredge of the Federal Channel and Berthing Area could be completed is ≈January 31, 2025. FY25 refers to the U.S. Government's Fiscal Year 2025, which runs from October 1, 2024 to September 30, 2025. The project is anticipated to only require one dredging season (November through January) to complete. This also requires the construction of a Contained Aquatic Disposal (CAD) cell, which is in the early stages of permitting.

In May of 2021, Vineyard Wind, a joint venture between Avangrid Renewables, a subsidiary of AVANGRID, Inc. and Copenhagen Infrastructure Partners, announced that space in downtown Bridgeport will serve as the Connecticut headquarters for the company's Park City Wind project. Additionally, the developer also announced that a lease at Barnum Landing has been signed to use the property as a construction and staging location for the 804-megawatt (MW) project.

Vineyard Wind also announced that Barnum Landing, a 15-acre parcel located at 525 Seaview Avenue, will be used during the construction phase of the Park City Wind project, which will include storage and assembly of the transition pieces, the portion of the turbine that anchors the body of the machines to the steel foundation. Once construction is completed, Vineyard Wind intends to use 3 acres of the port site for an operations and maintenance hub that will support local jobs for the 20+ year lifespan of the project.

Port of New Haven

A New Haven Harbor Navigation Improvement Project, currently underway with the USACE, seeks to deepen the navigation channel in New Haven Harbor to 40 feet. The deepening project is anticipated to advance to the Pre-Construction, Engineering, and Design (PED) phase in 2022.

Port of New London

As mentioned above, the State Pier is in the process of being transformed into a state-of-the-art modern, heavy-lift capable terminal that will be completed in early-2023. The improvements will benefit the port's long-term growth by increasing its capacity to accommodate heavy-lift cargo for years to come and will bring hundreds of well-paying jobs to the area. The completed facility will maintain its freight rail link. The facility upgrades will be completed by spring 2023.

The infrastructure improvements taking place at State Pier in New London have been designed to address previously identified facility shortcomings (pointed out in multiple prior studies commissioned by CTDOT going back decades) and enhance the State Pier facility to accommodate future cargo needs

through greater versatility and resilience. Specifically, prior reports recommended that redevelopment of the facility should not be pursued until private capital was attracted to invest in the public facility and a user was identified to maximize utilization of the expanded facility.

In 2019, the Authority completed its terminal operator solicitation resulting in Gateway New London as concessionaire of the port. In 2020, a Harbor Development Agreement (including terminal operator Gateway Terminal and partners Ørsted and Eversource) was executed. The Authority and State of Connecticut, together with our partners Ørsted and Eversource, are investing more than $250 million to redevelop the Authority's State Pier facility in New London. Ørsted and Eversource have contributed over $75 million to the project.

The upgraded facility will be utilized by the partners until at least 2033 for the staging and assembly of offshore wind turbines, a high-volume and labor-intensive cargo that supports the achievement of the state's clean energy goals. During periods that the facility is not supporting the partners' projects, the facility will be marketed to other prospective users and cargoes to maintain maximum utilization of the terminal.

The infrastructure upgrades will re-make State Pier as a modern, heavy-lift capable port and meet the facility requirements of the offshore wind industry. Three offshore wind projects commissioned by Connecticut, New York and Rhode Island—totaling more than 1,700 MW—are already scheduled to be delivered from the completed facility. The upgrades include the creation of two heavy-lift pads, each capable of handling loads of 5,000 psf. The rest of the facility's load bearing capacity has been enhanced to 3,000 psf. The improvements will benefit the port's long-term growth by increasing its capacity to accommodate heavy-lift cargo for years to come while maintaining its freight rail link.

Following the completion of the infrastructure upgrade project, the project's private partners will enter into a 10-year lease agreement, which will allow it to use State Pier for wind turbine generator pre-assembly and staging. Three offshore wind projects totaling more than 1,700 MW are already scheduled to be delivered from the completed facility: South Fork Wind (132 MW, State of New York), Revolution Wind (304 MW, State of Connecticut and 400 MW, State of Rhode Island), and Sunrise Wind (880 MW, State of New York).


Source: CTDOT

The first U.S.-built wind turbine installation vessel, Dominion's *Charybdis*, which is expected to be sea ready in late-2023, will first be deployed out of State Pier to support the construction of the Revolution Wind and Sunrise Wind projects. During periods where the private partners are not using State Pier, the facility will be marketed to other customers to ensure maximum utilization.

5.4 AIR CARGO

Air cargo in Connecticut is handled through the CAA-owned Bradley International Airport (BDL). BDL has three cargo complexes: Roncari Freight Facility, Aviation Facilities Company, and UPS Air Express Sorting Hub.[29] BDL also services several dedicated cargo airlines: FedEx Express, DHL, Amazon Prime Air, and UPS Airlines.[30] UPS also operates a regional ground cargo supporting facility at BDL. BDL occasionally receives heavy cargo such as Sikorsky helicopters or Pratt & Whitney engines internationally, from Volga-Dnepr Airlines, Polet Airlines, and Antonov Airlines as well as other heavy cargo. In 2020, BDL landed approximately 1.2 million pounds of air cargo, ranking 30th in the nation.[31]

5.5 PIPELINE

Connecticut is served by both gas and oil pipelines. There are approximately 590 miles of gas transmission pipelines in Connecticut, with three interstate pipelines. The principal lines in Connecticut are:[32]

- Algonquin Gas Transmission (AGT-Enbridge) originates in New Jersey where it connects to Texas Eastern and runs from Danbury northeasterly to Thompson, with major spurs to North Haven and New London.
- Iroquois Gas Transmission System (IGT) starts at the Canadian border, enters Connecticut at Sherman and runs southeast through Milford, then offshore to Long Island.
- Tennessee Gas Transmission (TGP-Kinder Morgan) starts in the Gulf, enters Connecticut in Greenwich, runs northeasterly leaving Connecticut in Suffield, with a spur from Massachusetts to Torrington.

The principal oil pipeline in Connecticut transports jet fuel from the Port of New Haven (Buckeye terminal) to BDL and for the Massachusetts Air National Guard Base inWestover, Massachusetts.[33]

5.6 MULTIMODAL FREIGHT

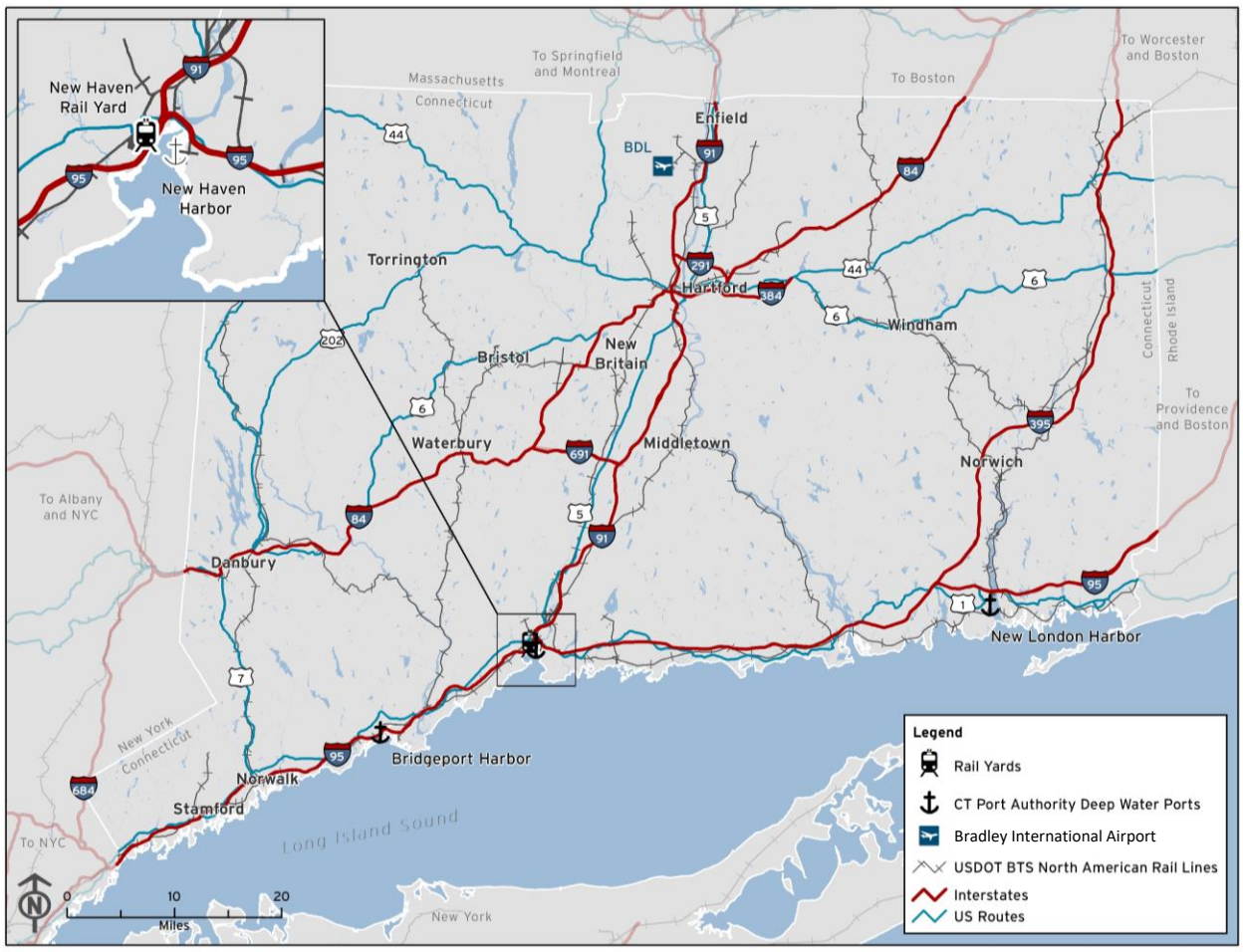
Multimodal facilities are locations where freight is transferred between modes. In the case of air and water ports, the facility is both a freight facility and a multimodal facility. Highway and rail have distinct networks with specific multimodal facilities. Each of the multimodal facilities have access to the interstate highway and rail systems. This allows for freight to be efficiently distributed across the nation on the national network of highways and rail lines.

[29] BDL Airport Master Plan, March 2019.
[30] CTDOT 2020 Fast Facts
[31] FAA, https://www.faa.gov/airports/planning_capacity/passenger_allcargo_stats/passenger/, 2020.
[32] https://portal.ct.gov/PURA/Gas-Pipeline-Safety/What-transmission-pipelines-serve-CT
[33] Connecticut Deep-Water Ports Strategy Study, 2012.

In Connecticut, the key multimodal facilities (**Figure 5.7**) include:

- Port of New Haven/ New Haven Rail Yard
- Port of Bridgeport
- Port of New London
- Bradley International Airport

Figure 5.7: Multimodal Freight Facilities



Source: CTDOT and CDM Smith

6. Freight Demand and Economic Analysis

6.1 Introduction

Millions of tons and billions of dollars in freight annually traverse Connecticut's transportation infrastructure, including finished goods and intermediate materials. The following analysis assesses the various freight databases, summarizes freight volumes, identifies regional relevance, and quantifies economic impacts of freight in Connecticut.

Freight data are reported as sourced, but each source has limitations. The various sources explain freight movements within and between modes by volume (tons, value, units), commodity, and direction. The major freight data challenge was identifying the share of IHS Markit TRANSEARCH reported data (the primary source for truck and rail) that originated or terminated at the Ports of New Haven and Bridgeport, which was overcome using USACE and U.S. Census Online.

Refined freight values by direction (inbound, outbound, internal, and through) and commodity type are used in conjunction with the IMPLAN economic model to identify how the production and consumption of regional freight result in direct economic impacts. The IMPLAN model was also used to estimate the total economic impacts associated with additional indirect supplier and induced re-spending impacts (multiplier impacts). Impacts were measured in terms of employment, labor income, value-added, and output. The IMPLAN model also supplied baseline socioeconomic data for the same impact measures used to compare the freight-related impacts to the overall regional economy.

6.2 Freight Dimensions and Sources

A universal freight database encompassing all data dimensions is not publicly available. Each database is limited across one or more dimensions; therefore, multiple sources are considered to comprehensively analyze freight movements.

6.2.1 Data Dimensions

Freight data are always characterized relative to a facility and/or geography (i.e., Connecticut), by direction, within a given time frame, and by mode, typically measured by weight and/or monetary value, in aggregate or by commodity detail.

Geography/Facility – Data are presented relative to Connecticut, the eight counties, and/or the individual port facilities, depending on the data source.

Direction – Freight is typically delineated by four major movement directions relative to the geography/ facility: outbound, inbound, intra, and through. Direction is determined from origins and destinations.

Time – Freight data from the sources herein are in annual terms, always with a historical base year (i.e., 2019). Some sources include forecasts, some do not.

Mode – Freight is sometimes multimodal; however, most freight databases identify only the primary mode. As such, freight data are typically sorted into modal groups, including truck, rail, water (ports and waterways), airports, pipeline, and sometimes 'other.'

Volume – Freight is typically measured by weight (e.g., tons) and/or monetary value. Some sources also provide truck trailers or rail cars, which TRANSEARCH categorizes as units. Given source disparity, tonnage data are presented mostly herein for comparability.

Commodity – Freight comprises all goods movements, which includes both intermediary and final products. Three commodity conventions are used in the freight databases, which do not agree perfectly. Consequently, commodity data are presented within each source's unique convention. The two primary conventions used (by source and mode) are:

- Standard Transportation Commodity Code (STCC) – by TRANSEARCH for truck and rail
- Lock Performance Monitoring System (LPMS) – by USACE for water

6.2.2 Data Sources

Two primary multimodal freight databases include the for-hire TRANSEARCH and the publicly available FHWA Freight Analysis Framework (FAF). Both cover all major modes but have limitations. TRANSEARCH was used since it is more thorough and recent. TRANSEARCH rail data was supplemented with the Surface Transportation Board (STB) Waybill rail data. USACE Waterborne Commerce Statistics (WCS) were used to supplement waterborne freight.

TRANSEARCH – IHS Markit develops a North American freight database[34] compiled from various sources, including rail and truck carriers. Base- and future-year estimates are available at a county level. It establishes production tonnages by industry/commodity—drawn from IHS's Business Markets Insights database and supplemented by trade associations, industry reports, and federal government data. Rail data are supplemented by the STB Waybill sample. Originally developed for private truck and rail users, other modal data are limited, specifically non-NAFTA water and air movements are excluded. Nonetheless, TRANSEARCH provides a comprehensive database of truck and rail freight using the STCC commodity code convention.

STB Waybill – The STB Waybill provides annual freight rail data, using a 2-percent stratified sample of carload waybills for freight rail traffic submitted by carriers terminating 4,500 or more revenue carloads annually. While STB Waybill data are more robust and accurate than TRANSEARCH estimations, they lack forecasts and routing information. TRANSEARCH incorporates the more robust STB Waybill data and amends it with routing and corresponding forecasts. As such, the rail data presented herein are sourced from TRANSEARCH, but stem from the STB Waybill.

FHWA FAF 4 – An integrated freight database for all primary transportation modes, produced in collaboration with the Bureau of Transportation Statistics. Estimates are based on the 2017 Commodity Flow Survey data and international trade Census data. FAF uses the Standard Classification of Transported Goods (SCTG) commodity code convention. However, FAF was not used because of various limitations. Limited routing information precludes freight density mapping and through volumes

[34] North American Free Trade Agreement (NAFTA) countries only, i.e., excludes freight movement with Europe, Asia, South America, Africa, etc.

estimates. Such through volumes are often significant, especially for interstate truck freight. Geography is constrained by state and/or large regional totals that preclude county area analysis. The SCTG commodity convention differs from the STCC used by TRANSEARCH.

USACE WCS – Publicly available waterborne freight tonnage and container data for both foreign and domestic movements, by direction, port, commodity, and year. It compiles domestic waterborne movements reported by vessel operators of record on ENG Forms 3925 and 3925b (or equivalent) and approved by the Office of Management and Budget. Foreign-related import, export, and in-transit statistics are derived primarily from Port Import/Export Reporting Service (PIERS) via IHS and Customs Service using the LPMS commodity code convention.

Other – Water and air freight volume data from TRANSEARCH are supplemented with facility data from the U.S. Census and the Bradley International Airport.

- *Ports* – USA Trade Online compiled by the US Census provided access to current and cumulative U.S. export and import data by port. While the international trade focus details freight volume (tons, value) differently than TRANSEARCH and WCS, it provides a direct source for comparing/confirming TRANSEARCH and USACE volumes.
- *Airport* – Bradley International Airport provides limited air freight volumes (tons and/or value) used to supplement and confirm the limited TRANSEARCH data.

6.3 FREIGHT DEMAND

The following subsections summarize modal freight demand data from the various sources. Additional detailed freight data tables and maps are in the appendix.

6.3.1 Truck and Rail Freight Demand

TRANSEARCH data is presented below for the two surface modes: truck and rail. Although the database includes additional modes, NAFTA-level trade restriction limits the usefulness of the water and air freight data. The pipeline and 'other' categories[35] are questionable/irrelevant given their relatively minor role. The multimodal summary is provided below by mode and direction, with the non-surface modes grayed out. Directional data is relative to the State of Connecticut.

TRANSEARCH reports 173 million tons moved across the regional surface network, valued at $262 billion in 2019 (**Table 6.1**). More than 91 percent of the tons (158 million) are carried via truck (**Figure 6.1**), representing 89 percent of the value ($234 million). The remainder are primarily carried by rail. Through traffic leads directional volumes, comprised almost entirely of interstate truck trade (**Figure 6.2**). Note, 39 percent of freight by tonnage and 44 percent by value is through traffic for which Connecticut provides facilities but may not derive direct value from except gas taxes.

[35] 'other' in TRANSEARCH is either unspecified 'other,' mail, or foreign trade zone-related movements

Table 6.1: TRANSEARCH Freight Volume Summary, 2019

Direction	Truck	Rail	Water	Air	Total
Tons					
Outbound	27,145,302	4,350,456	236,587	71,955	31,804,300
Inbound	46,902,176	1,747,296	6,811,884	97,478	55,558,834
Intra	17,251,790	560,328	1,128,022	0	18,940,140
Through	66,903,634	3,920	0	0	66,907,554
Total	158,202,902	6,662,000	8,176,493	169,433	173,210,828
Units*					
Outbound	2,057,882	43,744	0	0	2,101,626
Inbound	2,711,886	19,240	0	0	2,731,126
Intra	1,289,191	5,584	0	0	1,294,775
Through	3,667,072	40	0	0	3,667,112
Total	9,726,031	68,608	0	0	9,794,639
Value (millions)					
Outbound	$27,609	$1,469	$60	$9,404	$38,542
Inbound	$67,065	$1,509	$4,113	$11,921	$84,609
Intra	$24,262	$6	$233	$0	$24,502
Through	$114,721	$1	$0	$0	$114,722
Total	$233,657	$2,986	$4,406	$21,325	$262,374

*number of trucks or railcars

Figure 6.1: TRANSEARCH Total Tons and Value by Mode, 2019

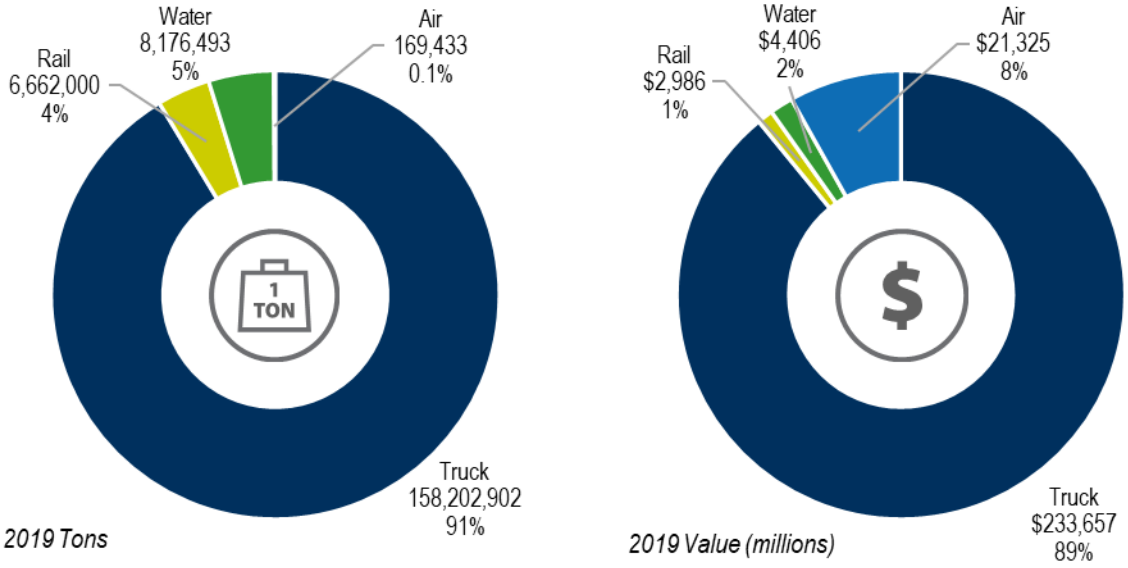
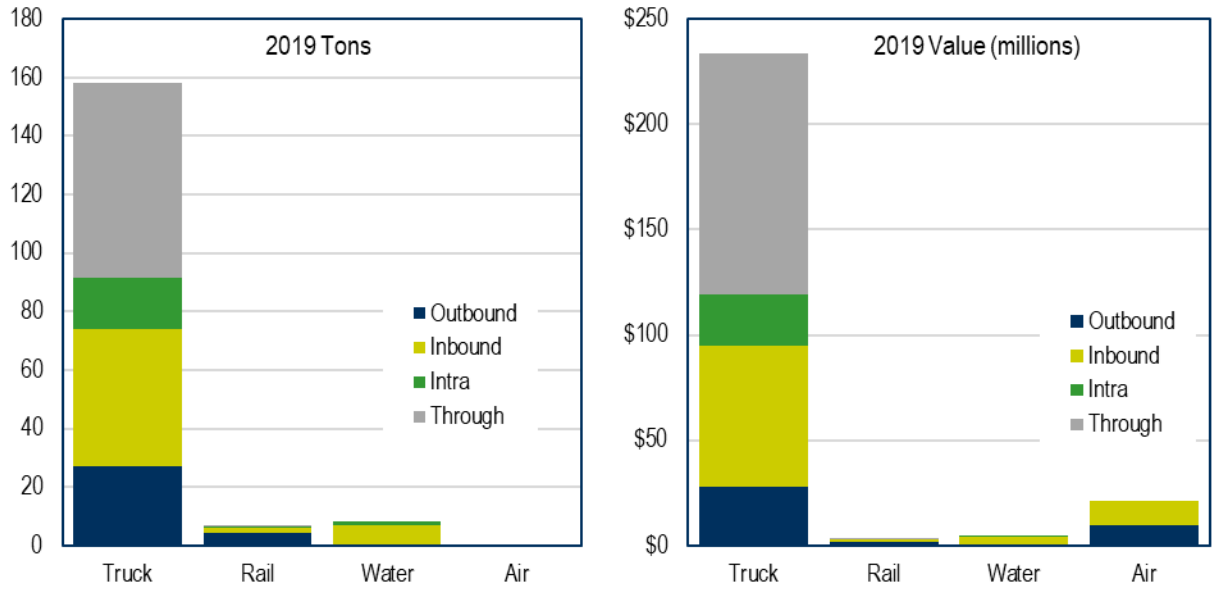


Figure 6.2: TRANSEARCH Total Tons and Value by Direction, 2019



Truck

TRANSEARCH estimates 158 million tons of goods traveled on Connecticut's highway network in 2019, within 9.7 million units (truck-trailers), and valued at $234 billion (**Table 6.2**). The following subsection summarizes truck freight by direction, network density, average trip distances, origins/destinations, commodities, COVID-19, and future growth.

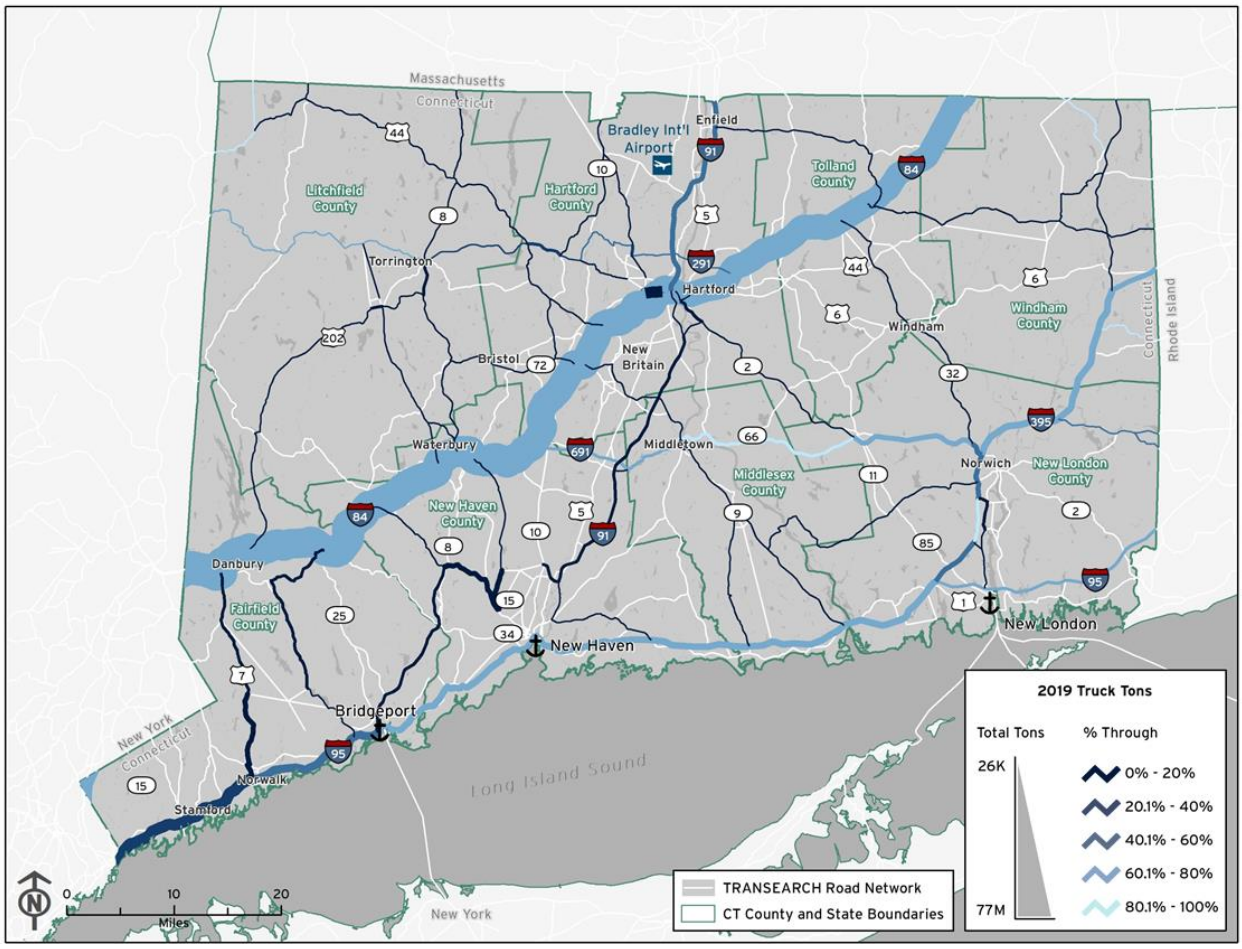
Table 6.2: TRANSEARCH Truck Volume Summary, 2019

Direction	Tons		Units		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	Amount	Percent	
Outbound	27,145,302	*17.2%*	2,057,882	*21.2%*	$27,609	*11.8%*	$1,017
Inbound	46,902,176	*29.6%*	2,711,886	*27.9%*	$67,065	*28.7%*	$1,430
Intra	17,251,790	*10.9%*	1,289,191	*13.3%*	$24,262	*10.4%*	$1,406
Through	66,903,634	*42.3%*	3,667,072	*37.7%*	$114,721	*49.1%*	$1,715
Total	158,202,902	*100.0%*	9,726,031	*100.0%*	$233,657	*100.0%*	$1,477

Directions – Through-state truck tonnage (42 percent) and value (38 percent) lead directional movement, which is typical of regions situated on a major interstate, such as I-84 and I-95. The state exhibited a negative truck-bound trade balance, with more inbound than outbound volume (tons, units, and value). Hence, the state is a net consumer of truck-borne freight (consumes more than it produces). Intra-regional truck movements represent the smaller directional share.

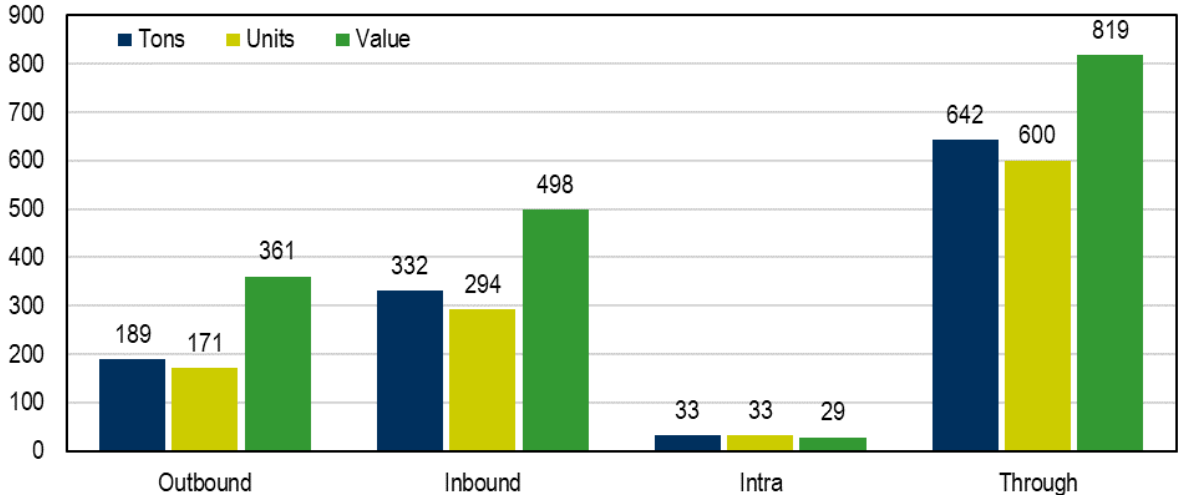
Network Density – Most trucks travel through the state via I-84, reflecting the high share of non-Connecticut interstate trade, as shown by route-volume thickness in **Figure 6.3**. Additionally, the map illustrates through-volume share, which averages 74 percent on I-84. Comparatively, through-volume ranges notably on I-95 from a low of 37 percent in the New York City metro area to a high of 77 percent east of Bridgeport.

Figure 6.3: TRANSEARCH Truck Ton Density, 2019



Average Trip Distance – Varies notably depending on the dimension viewed (volume and/or direction), per **Figure 6.4**. For example, through-state truck trip distances (range from 600 miles by units to 819 miles by value) were notably longer than the other directions (less than 500 miles). Conversely, average intra-state trip distances were shortest (ranging between 29 to 33 miles). From the volume perspective, average trip *value* is notably longer for each direction than average *tons* or *units*, except for the much shorter intra-state trips.

Figure 6.4: TRANSEARCH Average Truck Trip Distance (miles)



Origins/Destinations –Truck traffic primarily moves along the interstates, especially I-84/I-95. Out-of-state origin and/or destinations primarily include Massachusetts, New York, and New Jersey, While in-state origins/destination are led by Hartford County. Truck ton volume characteristics by direction are summarized below.

- *Through Truck Tonnage* – Primarily originate/terminate in Massachusetts (31 percent), New York (17 percent), Pennsylvania (7 percent), and New Jersey (7 percent), per **Figure 6.5**.
- *Inbound Truck Tonnage* – Primarily originate in New York (26 percent), Massachusetts (17 percent), New Jersey (10 percent), and Pennsylvania (9 percent), per **Figure 6.6**. In-state destination are led by Hartford (30 percent) Fairfield (27 percent), and New Haven (19 percent).
- *Outbound Truck Tonnage* – Primarily originate in Hartford (30 percent), Fairfield (27 percent), and New Haven (19 percent). Out-of-state destinations are led by Massachusetts (29 percent), New York (26 percent), and New Jersey (13 percent), per **Figure 6.7**.

Figure 6.5: TRANSEARCH Truck-Through Tons, 2019

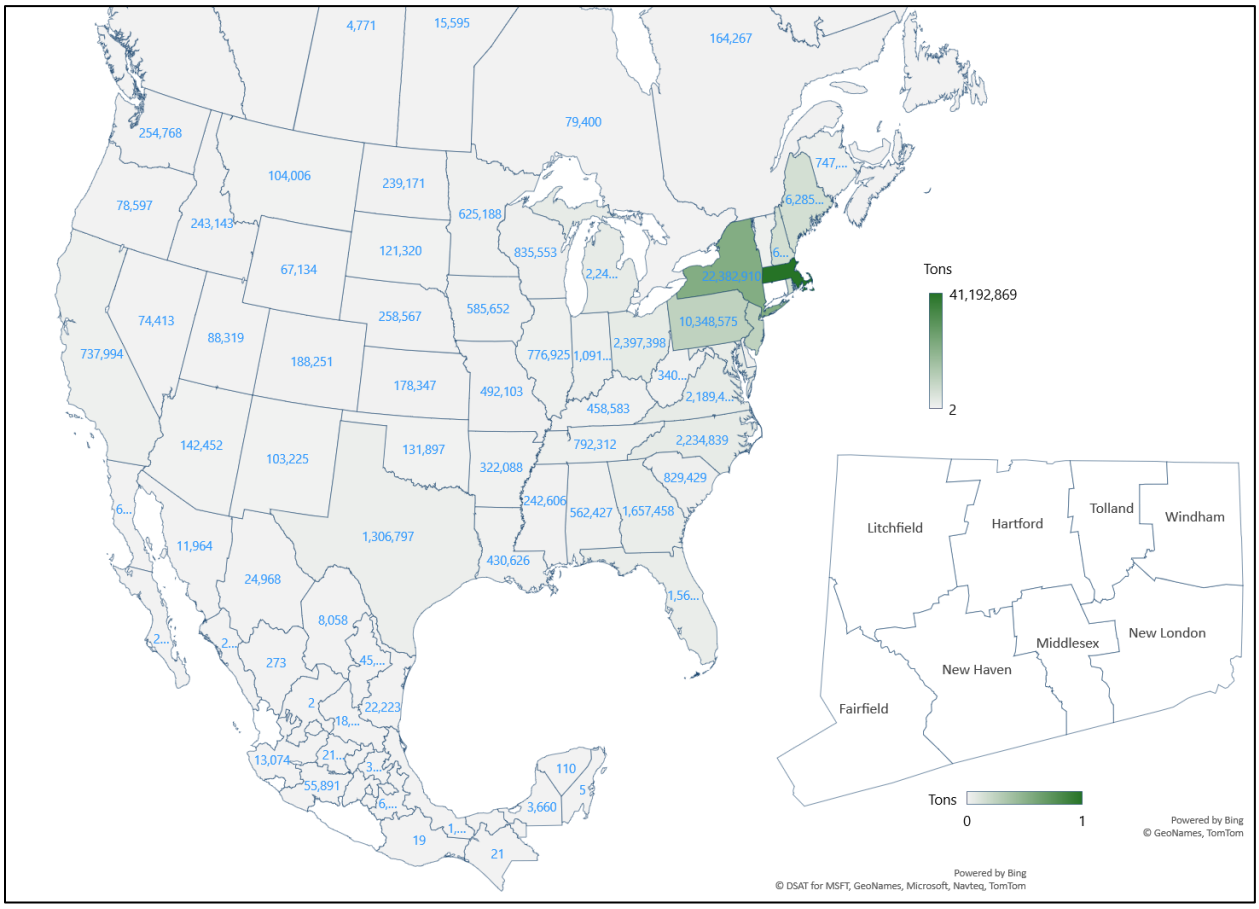


Figure 6.6: TRANSEARCH Truck-Inbound Tons, 2019

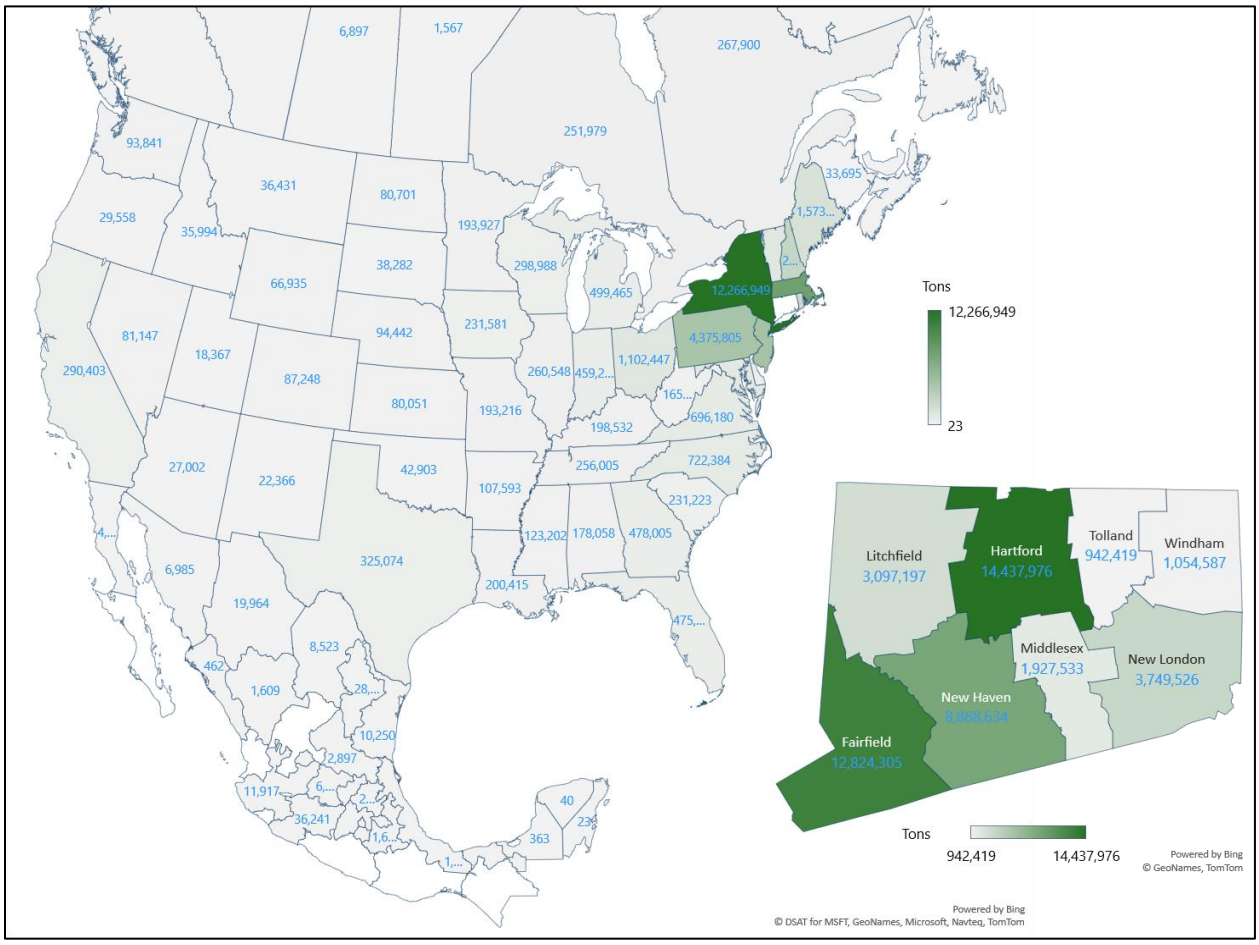
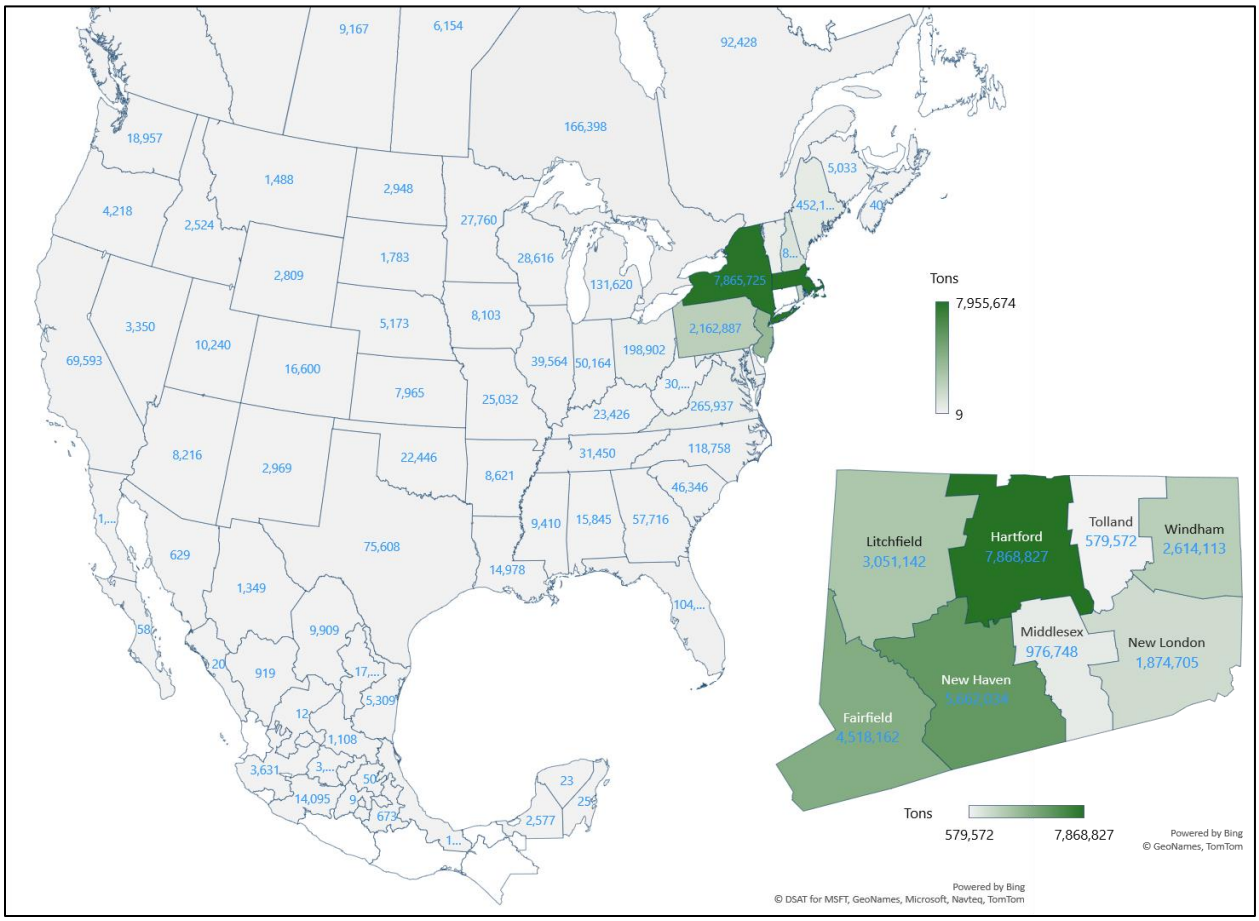


Figure 6.7: TRANSEARCH Truck-Outbound Tons, 2019



Commodities – Various commodity groups traverse Connecticut, including major long-distance interstate trade. Value per ton and trip distance also vary significantly by commodity. As such, leading commodities vary by volume type viewed (tons, units, value) and whether through movements are included. Leading commodities are listed below by volume type for all directions (including through) and charted in **Figure 6.8**.[36]

- By tons
  - Nonmetallic minerals (38.9 million, 25 percent of total)
  - Petroleum or coal products (18.6 million, 12 percent of total)
  - Food or kindred products (17.6 million, 11 percent of total)
  - Secondary traffic (16.2 million, 10 percent of total)
  - Waste or scrap materials (14.5 million, 9 percent of total)

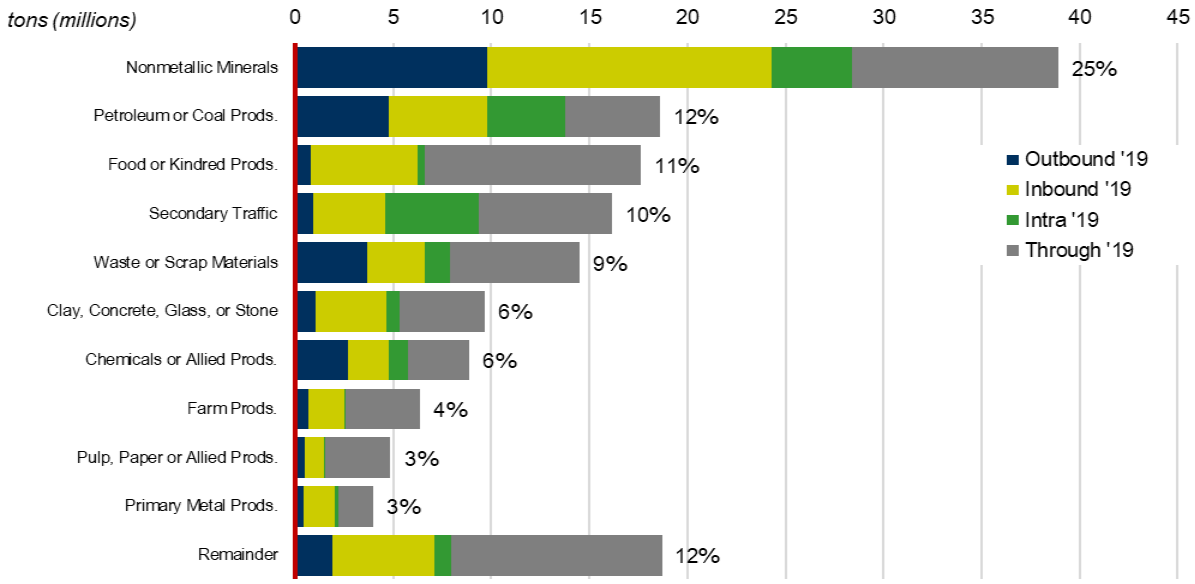
- By units
  - Shipping containers (2.3 million units, 24 percent of total)
  - Nonmetallic minerals (1.6 million units, 16 percent of total)
  - Secondary traffic (0.8 million units, 8 percent of total)

[36] See appendix for tabular truck commodity volume (tons, units, value) by direction.

  - Petroleum or coal products (0.8 million units, 8 percent of total)
  - Food or kindred products (0.8 million units, 8 percent of total))

- By value
  - Transportation equipment ($34,308.7 million, 15 percent of total)
  - Food or kindred products ($26,823.2 million, 11 percent of total)
  - Chemicals or allied products ($26,663.8 million, 11 percent of total)
  - Secondary traffic ($24,326.6 million, 10 percent of total)
  - Electrical equipment ($19,193.4 million, 8 percent of total)

Figure 6.8: TRANSEARCH Truck Ton Commodities, 2019



Detailed information on modal commodities by direction are provided in **Appendix A**.

COVID – TRANSEARCH freight data was also obtained for Year 2021 to provide a proxy understanding of the pandemic effect on transportation. Truck freight volume decline between 2019 and 2020 was uniform in aggregate, falling between -2.0 to -2.2 percent, depending on volume type. However, truck freight direction varied somewhat as shown in **Table 6.3** and summarized below:

- *Outbound* – performed best in value terms rising 0.3 percent, but tons and units fell (-0.9 and -1.4 percent, respectively)
- *Inbound* – fell the most (-2.4 to -3.2 percent)
- *Intra* – mixed change (value fell -2.8 percent, while tons and units barely fell)
- *Through* – similar drop to inbound (-2.0 to -2.7 percent)

Table 6.3: TRANSEARCH Truck Volume Change by Direction, 2019–2021

Direction	Tons	Units	Value
Outbound	-0.9%	-1.4%	0.3%
Inbound	-2.9%	-2.4%	-3.2%
Intra	-0.1%	-0.3%	-2.8%
Through	-2.7%	-2.6%	-2.0%
Total	-2.2%	-2.0%	-2.2%

Future Growth – By TRANSEARCH Horizon Year 2040, Connecticut truck freight is projected to increase over 31 million tons to 189 million tons, a 20-percent total increase (0.9 percent annually). Similarly, truck units are projected to grow by 2.1 million (21-percent increase, 0.9 percent annually). And truck value is projected to grow by 91 billion (39-percent increase, 1.6 percent annually). These growth rates are summarized in **Table 6.4**.

Table 6.4: TRANSEARCH Truck Volume Change by Direction, 2019–2040

Direction	Tons	Units	Value
Outbound	13.5%	18.2%	39.3%
Inbound	17.6%	18.9%	37.0%
Intra	28.8%	28.8%	43.9%
Through	20.8%	21.9%	39.0%
Total	19.5%	21.2%	39.0%

In tonnage terms, the same ten commodities will lead, although slight ordering change arises, as shown in **Figure 6.9**. Major commodity growth includes Food or Kindred products (46 percent) and Secondary Traffic (52 percent). Conversely, Petroleum or Coal Products are forecast to decline by 17 percent. From a network density perspective (**Figure 6.10**), growth primarily arises on I-84, followed by I-95. However, some U.S. highway and state routes in northwest Connecticut are forecast to see tonnage volume decline, which reflects the changing commodity mix.

Figure 6.9: TRANSEARCH Truck Ton Growth, 2019–2040

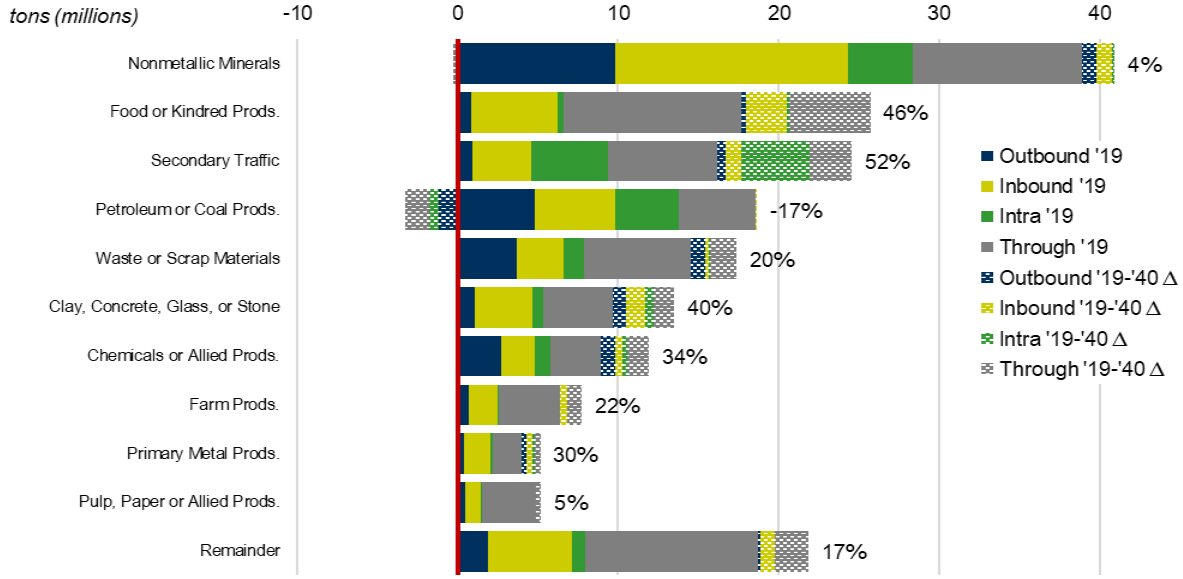
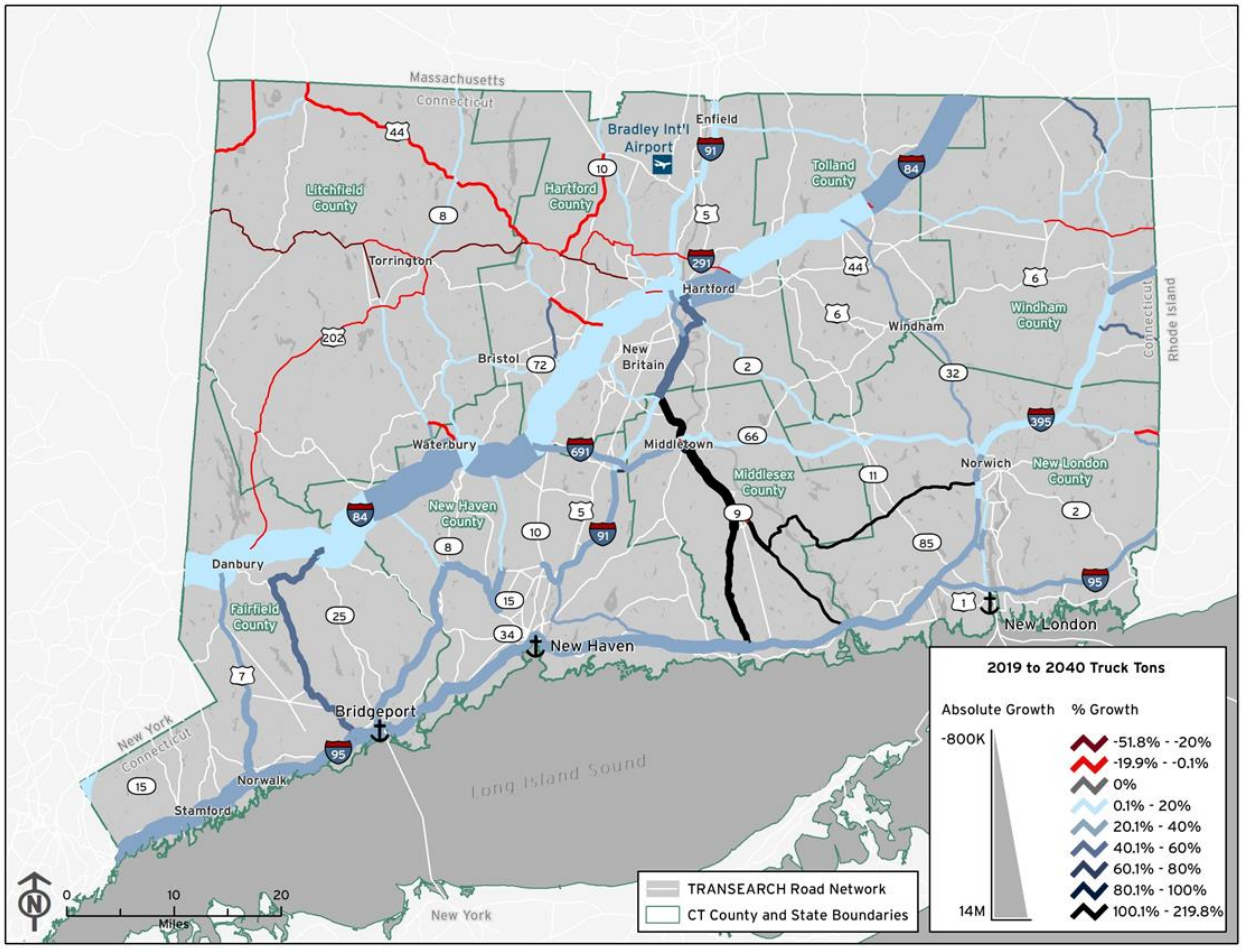


Figure 6.10: TRANSEARCH Truck Ton Density Growth, 2019–2040



Rail

TRANSEARCH estimates 6.7 million tons of goods traveled on Connecticut railroads in 2019, within 68,608 carloads, and valued at $3.0 billion (**Table 6.5**). The following subsection summarizes rail freight by direction, network density, commodities, and future growth.

Table 6.5: TRANSEARCH Rail Volume Summary, 2019

Direction	Tons		Units		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	Amount	Percent	
Outbound	4,350,456	*65.3%*	43,744	*63.8%*	$1,469	*49.2%*	$338
Inbound	1,747,296	*26.2%*	19,240	*28.0%*	$1,509	*50.6%*	$864
Intra	560,328	*8.4%*	5,584	*8.1%*	$6	*0.2%*	$11
Through	3,920	*0.1%*	40	*0.1%*	$1	*0.0%*	$150
Total	6,662,000	*100.0%*	68,608	*100.0%*	$2,986	*100.0%*	$448

Directions – Unlike trucks, freight rail volumes are primarily originating or terminating in Connecticut (including at the ports and intermodal transfer facilities), representing 99 percent of rail volume. Outbound comprises the largest share of tons (4.4 million, 65 percent) and railcars (43,744, 64 percent).

However, higher-valued inbound rail freight (i.e., Primary Metal Products) versus low-value outbound freight (i.e., Waste or Scrap Materials) result in slightly higher inbound rail value ($1.50 billion, 51 percent) than outbound ($1.47 billion, 49 percent). Low through-volumes reflect limited Hudson River crossings constraints for most rail activity into/out of New England.[37]

Network Density – **Figure 6.11** illustrates rail line densities led by the high volumes on MNCW (CSXT/PW), which primarily reflect outbound volume from New Haven County headed southeast towards the New York City metro area.

Commodities – Rail tonnage volumes are led by Nonmetallic Minerals and Waste/Scrap Materials as shown in **Figure 6.12** (including through). Rail volumes pertain mostly to the following STCC2 groups:

- By tons
  - Nonmetallic Minerals (2.3 million tons, 35 percent of total)
  - Waste or Scrap Materials (2.0 million tons, 30 percent of total)
  - Clay, Concrete, Glass, or Stone (0.7 million tons, 11 percent of total)
  - Primary Metal Products (0.6 million tons, 8 percent of total)

- By value
  - Primary Metal Products ($940.4 million, 31 percent of total)
  - Clay, Concrete, Glass, or Stone ($674.7 million, 23 percent of total)
  - Waste or Scrap Materials ($504.6 million, 17 percent of total)
  - Chemicals or Allied Products ($429.2 million, 14 percent of total)

[37] TRANSEARCH rail through-volume reported by IHS are notably less than the previous freight plan due to some minor methodological and source data changes over the intervening five years. IHS adjusted some tonnages to match the year 2017 Commodity Flow Survey versus the previous year 2012 CFS. This includes adjusting for a previous overstatement of long-haul petroleum products movements.

Figure 6.11: TRANSEARCH Rail Ton Density, 2019

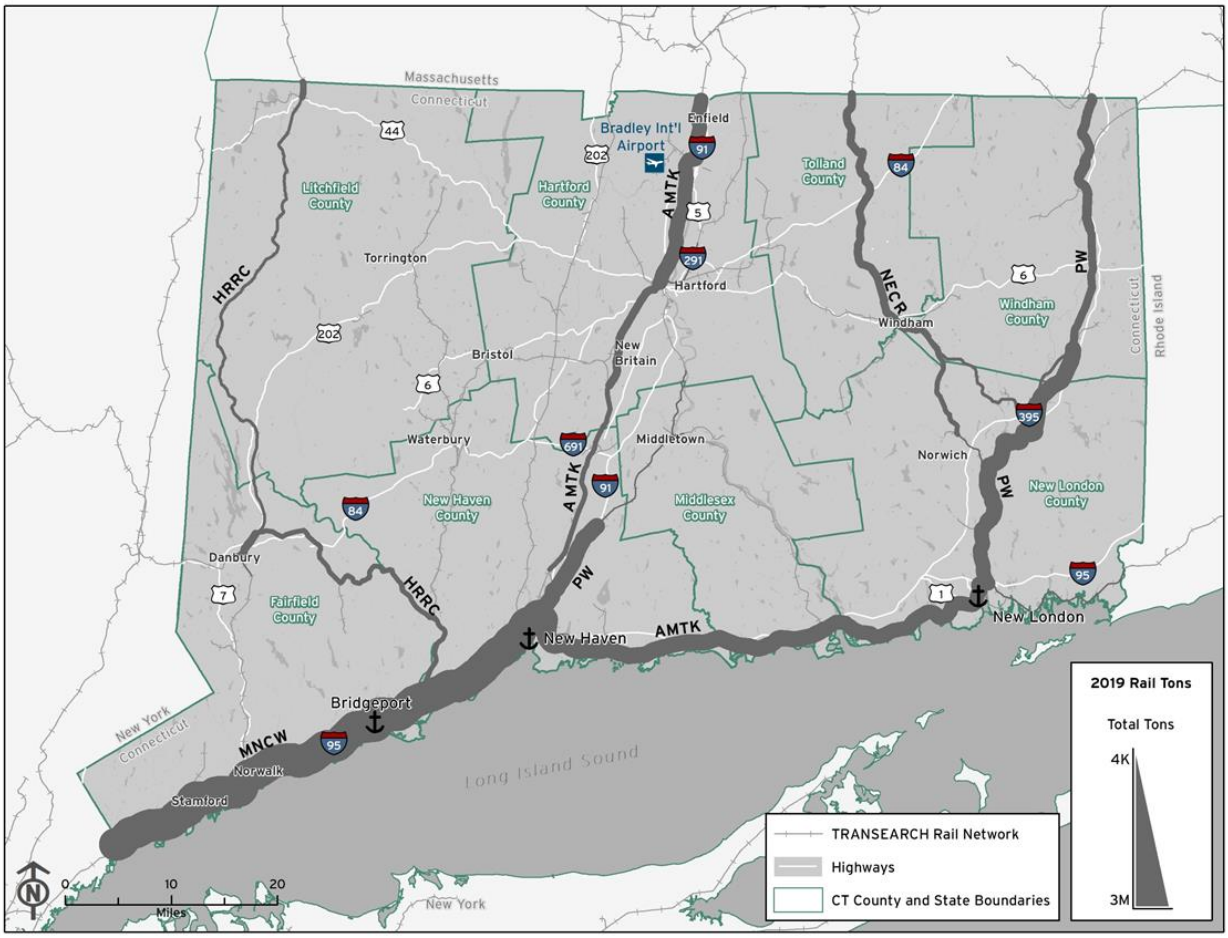
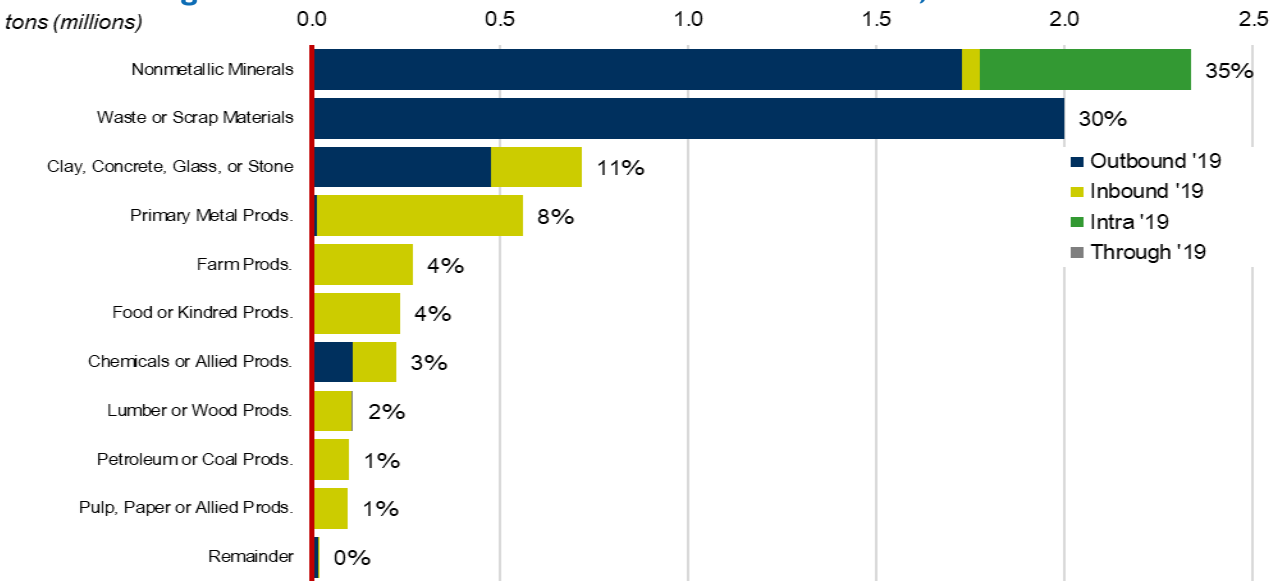


Figure 6.12: TRANSEARCH Rail Ton Commodities, 2019 Tons



Future Growth – By TRANSEARCH horizon year 2040, Connecticut rail freight is projected to increase to almost 8.6 million tons, a 30-percent total increase, or 1.3 percent annually. While most commodities are forecast to grow, some are forecast to decline, such as petroleum or coal products, as shown in **Figure 6.13**. Most tonnage growth connects to NYC metro area and to MA in the northwest, per **Figure 6.14**.

Figure 6.13: TRANSEARCH Rail Ton Growth, 2019–2040

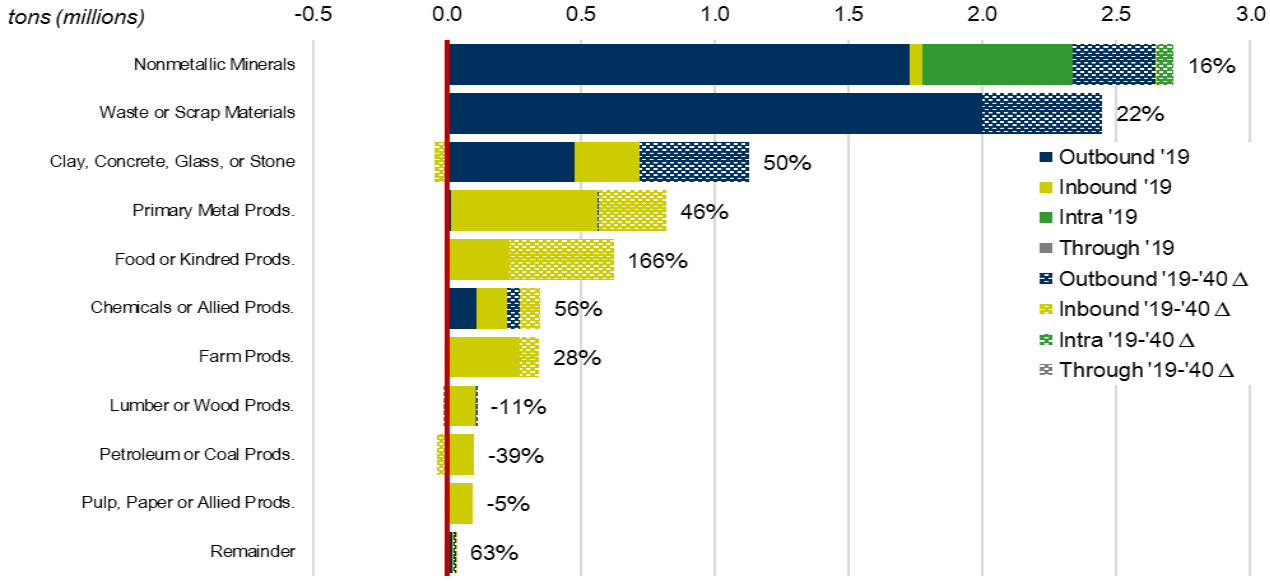
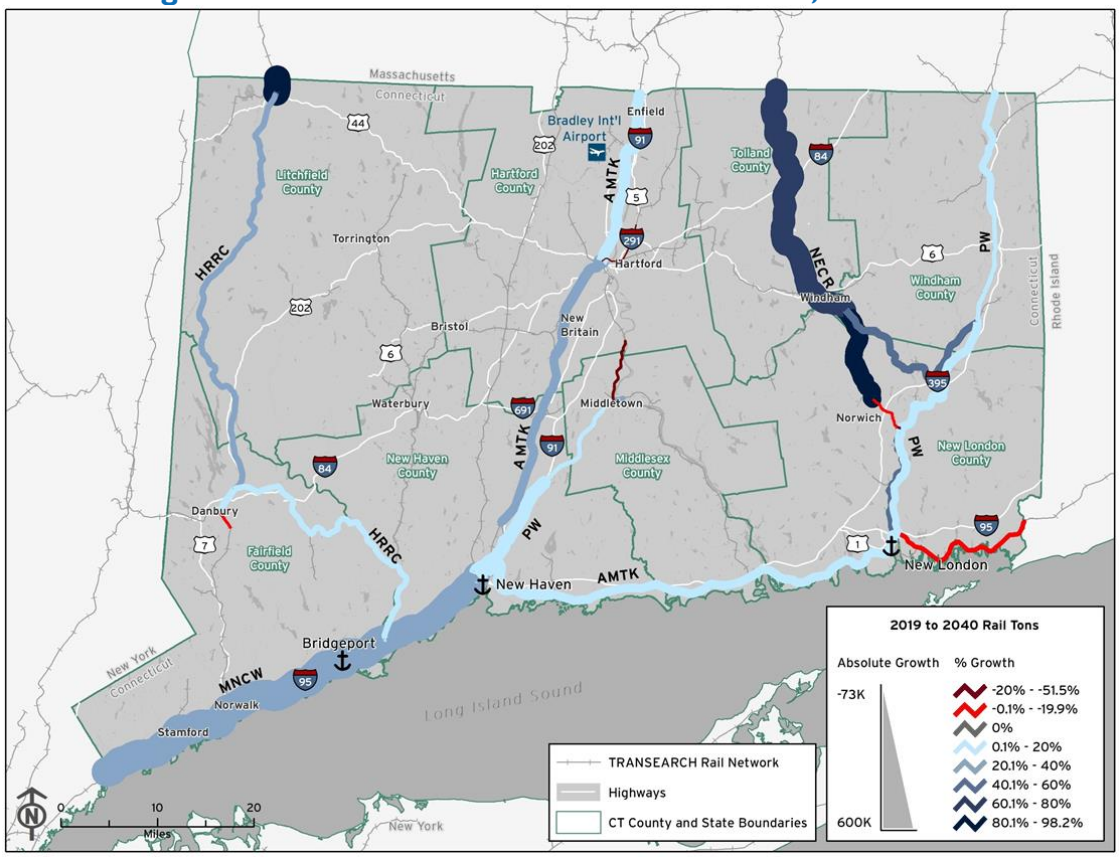


Figure 6.14: TRANSEARCH Rail Ton Growth, 2019–2040



Freight Generators

IHS's Global Insight's *Freight Finder* was used to identify the location, industry, and employment levels of Connecticut's major shippers/receivers. It links specific freight facility generation and attraction information (i.e., outbound/inbound tons) of over 5,000 establishments to TRANSEARCH's freight shipment data.

Information was processed, summarized, and mapped. Freight location information analyzed includes generator type, tonnage, industry type, and employment. Generator type identifies freight versus non-freight facilities. Detailed eight-digit NAICS industry code information was distilled into four general categories (transportation, services, goods, and unknown). Employment and tonnage data were both categorized into five groups.

Results are summarized into two maps, each showing two metrics based on size and coloring. The first, **Figure 6.15**, shows total tons (size) by industry type (color). The second, **Figure 6.16**, shows total employment (size) by industry type (color). While the freight generator locations are the same, the graduated cylinder varies by tonnage and employment. This often illustrates the variance in freight volume versus associated economic activity (i.e., employment) of such freight generators. For example, while a facility with low employment may transport high volumes of low value freight, another facility may reflect the opposite (high employment with low volumes of high value freight).

Figure 6.15: TRANSEARCH Freight Generators – Tons by Industry, 2019

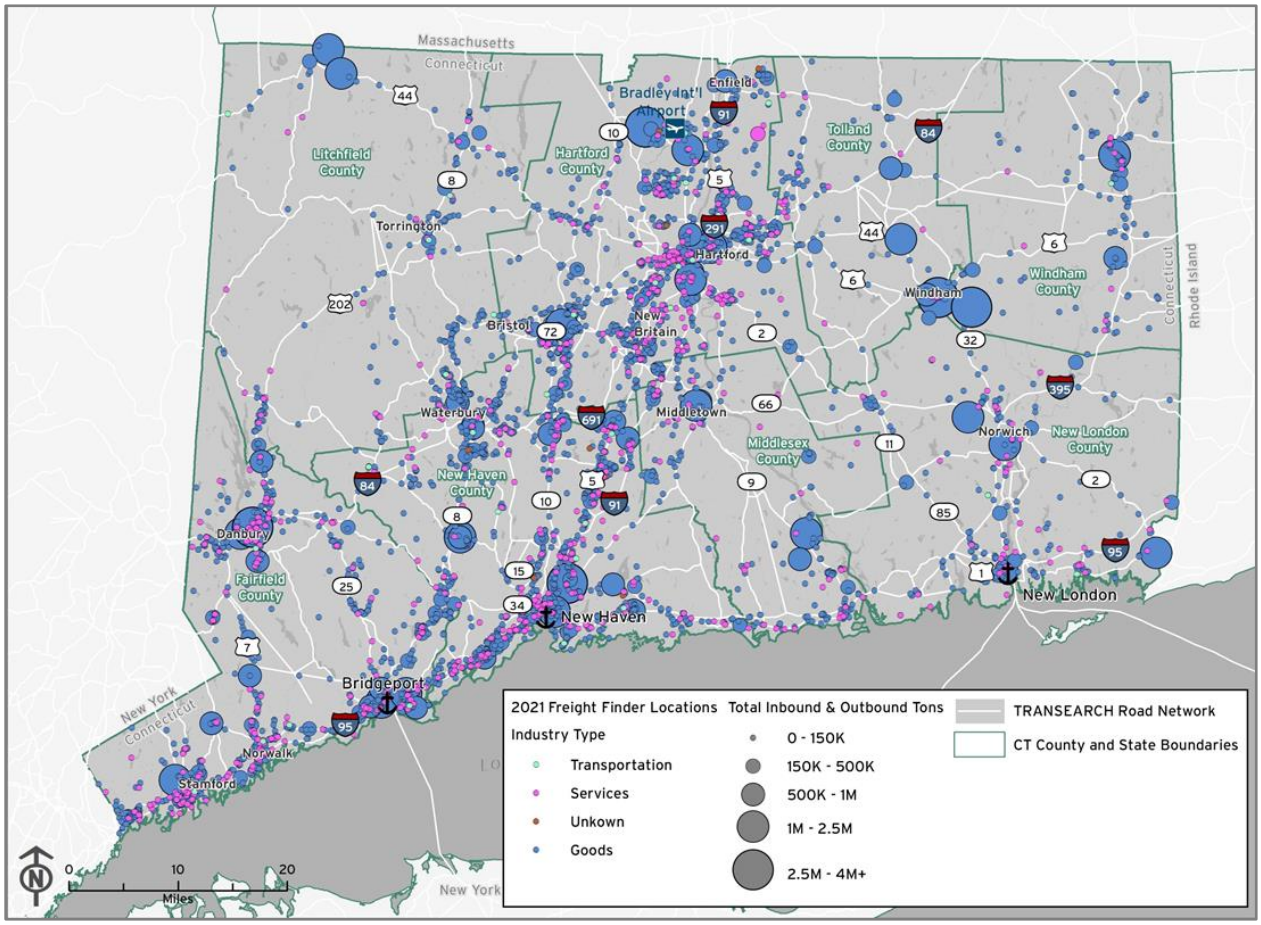
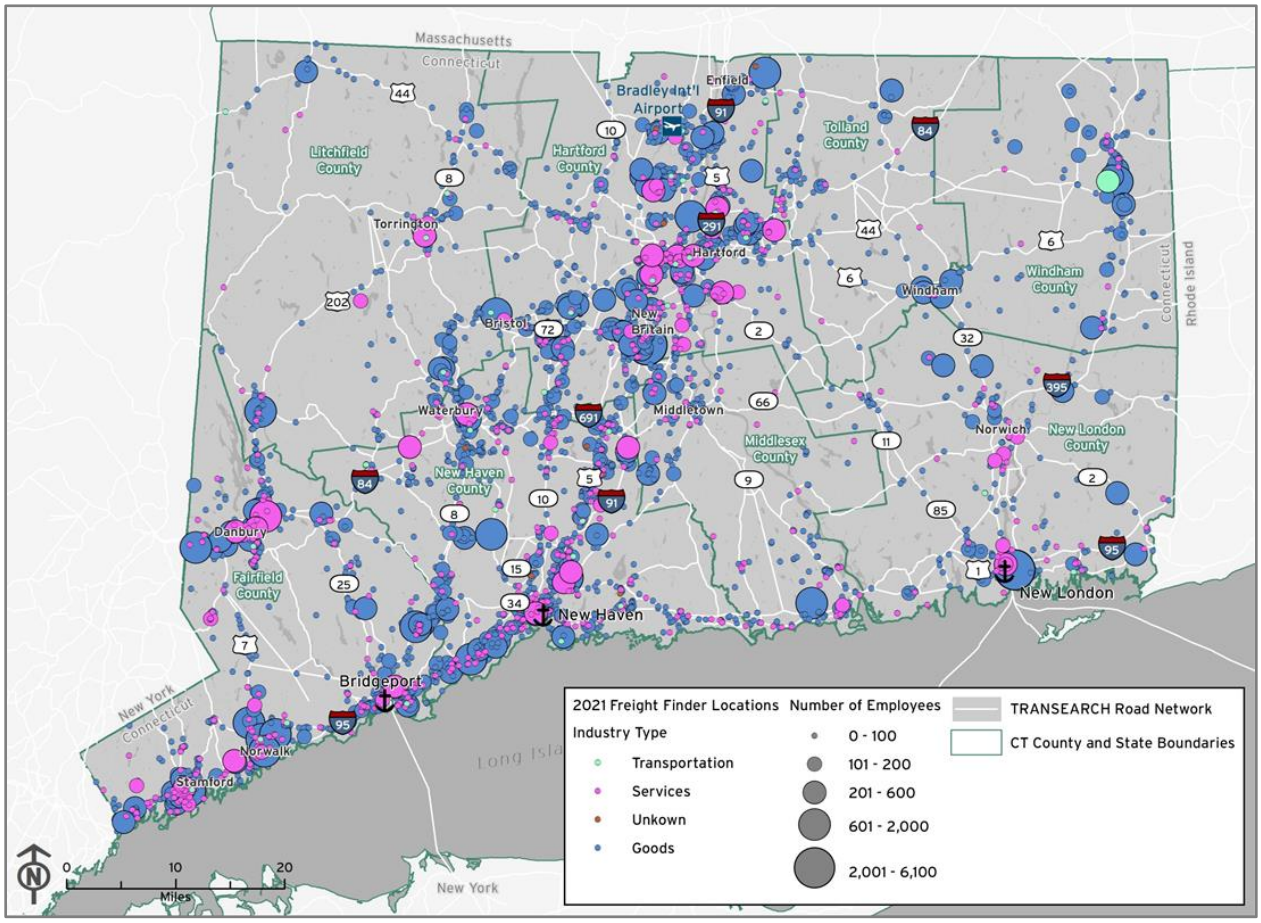


Figure 6.16: TRANSEARCH Freight Generators – Employees by Industry, 2019



6.3.2 Marine and Air Cargo Freight Demand

TRANSEARCH data pertains to NAFTA/ United States-Mexico-Canada Agreement countries (Canada, Mexico, and the United States). Hence, the non-surface modal data (airports and ports) excludes trade with overseas partners (i.e., China). Given such limitations, seaport and airport data are supplemented with other freight data sources.

Ports – Various public and private sources are listed below. As with other freight sources, each has limitations. USACE data are presented for tons but do not publish commodity value. USA Trade Online data provide foreign-borne tons and value data (the majority) but exclude domestic data.

- USACE WCS Center
- U.S. Census Bureau's USA Trade Online
- IHS-produced PIERS
- American Association of Port Authorities
- U.S. Department of Transportation Maritime Administration

Airports – Fewer, less detailed, alternative sources are listed below. These were used to confirm the reasonableness of TRANSEARCH estimates.

- Direct airport records
- USDOT T-100 dataset
- U.S. Census Bureau USA Trade Online

Other Freight Source Summary – Reporting seaport (water) and airport freight data is important in the context of intermodal transfers. This is especially true for water movements, because most water is transferred to trucks or rail and moved through the region to Connecticut or other states. Such distinction is important for the economic impact estimates, as such movements are not directly part of the Connecticut economy other than the regional carriers and facility operations (i.e., the goods are neither produced nor consumed regionally).

Ports

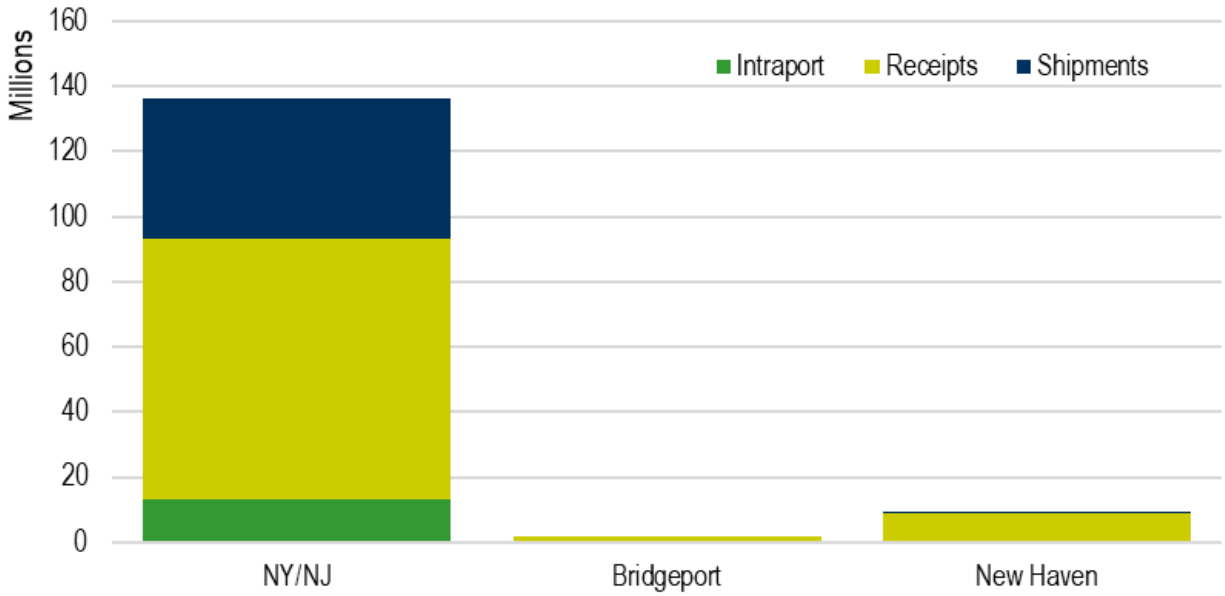
The USACE WCS provides foreign and domestic waterborne commerce tonnage data at U.S. ports and harbors (i.e., nodes), and on the waterways and canals (i.e., links). This includes comprehensive historical *port-specific* freight data, which TRANSEARCH and FAF do not provide. While the USACE WCS data are facility-specific, data are limited to historical tons; value and forecasts are unavailable. Connecticut's Bridgeport and New Haven Ports are compared to data for the Port of New York and New Jersey due to its continued strong competitive position and the relative inaccessibility of Connecticut's ports in the Long Island Sound. Data for the Port of New London is not included, as the State Pier facility is currently being redeveloped into a state-of-the-art modern, heavy-lift capable terminal. The facility will resume operations once infrastructure improvements are completed in early-2023.

USACE Tons – In 2019, Connecticut's Bridgeport and New Haven ports combined to handle 11.1 million tons of domestic freight. Compared to the NY/NJ Port Authority, Connecticut ports handled only 8.2 percent of the domestic port tonnage volume handled at the NY/NJ Port Authority, as summarized in **Table 6.6** and **Figure 6.17**.

Table 6.6: USACE Port Tonnages, 2019

Port	Intraport	Receipts	Shipments	Total
NY/NJ	13,209,678	79,993,807	43,371,549	136,575,034
Bridgeport	0	1,834,962	0	1,834,962
New Haven	370,017	8,575,569	363,102	9,308,688
Connecticut	370,017	10,410,531	363,102	11,143,650

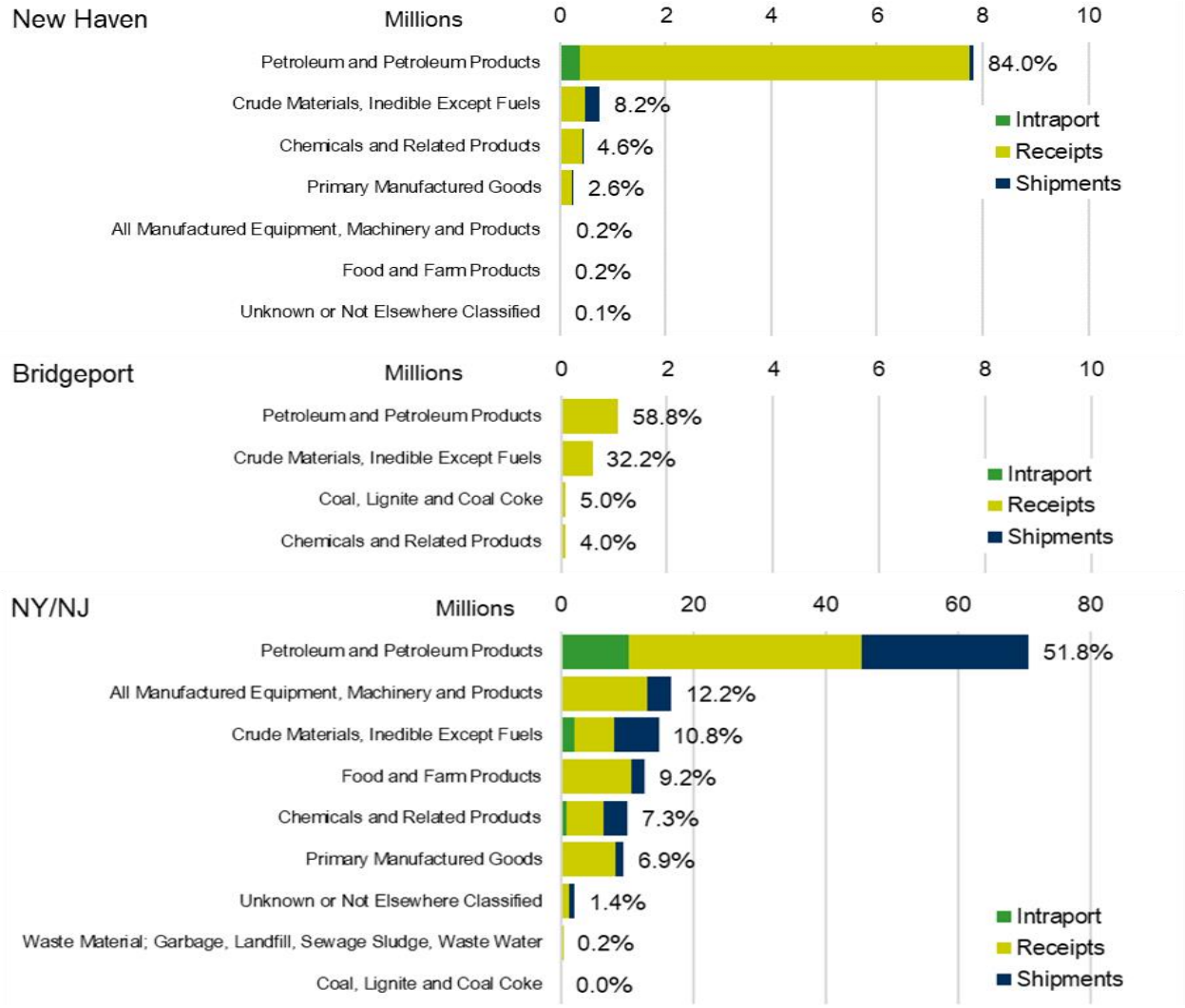
Figure 6.17: USACE Port Tonnages, 2019



Leading domestic commodity movements by port and direction are illustrated in **Figure 6.18**.

- *Port of New Haven* – Inbound petroleum products (7.4 million tons) dominated movements (79 percent), other directional freight (outbound, intra, and through), 1.9 million tons, comprised the other 21 percent.
- *Port of Bridgeport* – Similarly, inbound petroleum products (1.1 million tons) led all movements (59 percent), Various directional freight, 0.8 million tons, comprised the other 41 percent.
- *Port of NY/NJ* – Petroleum products are also the major tonnage volume, accounting for more than half (52 percent, 70.7 million tons). However, directional petroleum volumes are more balanced with inbound petroleum (36.2 million tons) accounting for 26 percent of total tons, outbound accounting for 19 percent (25.4 million tons), and intraport accounting for 7 percent (10.2 million tons). Other directional freight, 65.6 million tons (41 percent) were led by manufactured goods (16.6 million tons), crude materials (14.8 million tons), and food/farm products (12.6 million tons).

Figure 6.18: USACE Tonnage by Port and Commodity, 2019



USA Trade Online Value – Aggregate port value, including both domestic and foreign volume, is not available from a single source. TRANSEARCH lacks non-NAFTA data,[38] and USACE lacks freight value. USA Trade provides the missing non-NAFTA international trade values. These values and the other ton and value data from TRANSEARCH and USACE are summarized in **Table 6.7** for both Connecticut and the NY/NJ ports. Comparatively, the 29.3 million tons through Connecticut ports is only 29 percent of the tonnage through NY/NJ ports. From a value perspective, foreign waterborne trade through Connecticut ports ($2.0 billion) is only 1 percent of NY/NJ port traffic. This reflects variance in commodity flows through the ports.

[38] For Connecticut, TRANSEARCH reported no freight to/from Canada or Mexico, hence all freight reflects domestic movement.

Table 6.7: USA Trade Online Port Volumes, 2019

Source/Port	Tons (million)				Value (million)			
	Foreign		Domestic	Total	Foreign		Domestic	Total
	Imports	Exports			Imports	Exports		
Connecticut								
TRANSEARCH	#N/A	#N/A	8.2	#N/A	#N/A	#N/A	$4,406	#N/A
USACE WCS	3.3	0.3	25.8	29.3	#N/A	#N/A	#N/A	#N/A
USA Trade Online	3.2	0.3	#N/A	#N/A	$1,956	$70	#N/A	#N/A
New York, NY & NJ								
USACE WCS	73.5	17.7	45.3	136.6	#N/A	#N/A	#N/A	#N/A
USA Trade Online	62.7	16.6	#N/A	#N/A	$159,760	$42,300	#N/A	#N/A

Average value per waterborne ton varies significantly by commodity type. For CT, the average TRANSEARCH value of $540 reflects a high proportion of low value, bulk commodities (i.e., petroleum products), which approximates the USA Trade average value of foreign freight movements ($577). Conversely, NY/NJ port average ton value of $2,550 reflects higher value freight associated with container movements.

Air Cargo

Regional airborne freight is relatively very small volume-wise compared to other modes. TRANSEARCH reported 169,433 tons of air cargo moved via the state (i.e., Bradley International Airport) in 2019, with an aggregate value of $21.3 billion, as shown in **Table 6.8**. More than half is inbound (58-percent tons, 56-percent value).

Table 6.8: TRANSEARCH Air Volumes, 2019 and 2040

Year/ Direction	Tons		Value (in millions)		Average Value/Ton
	Amount	Percent	Amount	Percent	
2019					
Outbound	71,955	*42.5%*	$9,404	*44.1%*	$130,693
Inbound	97,478	*57.5%*	$11,921	*55.9%*	$122,295
Total	169,433	*100.0%*	$21,325	*100.0%*	$125,861
2040					
Outbound	145,443	*50.8%*	$14,306	*43.4%*	$98,361
Inbound	140,673	*49.2%*	$18,656	*56.6%*	$132,623
Total	286,116	*100.0%*	$32,962	*100.0%*	$115,206

Small package shipments are the leading commodity (55,846 tons, 33 percent), which have no assigned value. Electrical Equipment leads the state in value terms ($5.4 billion, 25 percent), most of which is inbound (71 percent). Followed by Miscellaneous Manufacturing Products (4.9 billion, 23 percent), and Transportation Equipment ($3.0 billion, 14 percent). Air Freight tonnage is forecast by TRANSEARCH to grow 70 percent by 2040 (286,116 tons), while value will grow 55 percent ($33.0 billion). Other data sources, such as BDL, yield comparable volumes but lacked the directional detail and values.

6.4 ECONOMIC ANALYSIS

The Connecticut freight economic analysis begins with a brief description of the IMPLAN economic model. IMPLAN and Bureau of Economic Analysis (BEA) data are then used to profile study area socioeconomic characteristics (population, employment, income, etc.). Such data provides context for understanding the regional character and freight demands. Freight data previously presented and the IMPLAN model are then used to estimate the relative economic importance of regional freight, using the same baseline socioeconomic measures.

6.4.1 IMPLAN

IMPLAN is an input-output, social account matrix software used for estimating regional annual economic impacts from assumed industry or commodity changes. A social account matrix reflects economic interrelationships between industries, commodities, households, and governments, measured by impact multipliers and other economic characteristics. Multipliers are developed from regional purchase coefficients, production functions, and socioeconomic data for each geographically specific variable. IMPLAN also provides commodity-to-industry production and absorption coefficients that quantify basic industry supply chain relationships underpinning the production of goods and services. IMPLAN is one of the most used models for quantifying economic interactions along various metrics and dimensions and can be evaluated in many ways.

Characteristics – IMPLAN data are geographically defined at various resolutions (national, states, counties, zip codes). IMPLAN models represent a static, single-year economic snapshot. It does not include forecasts (dynamic multi-time-frame feedback effects). Data presented are for Year 2019, the latest available. The model defines 544 industries, generally structured by the two- and three-digit North American Industry Classification System (NAICS) framework. Industry data presented are collapsed into the two-digit NAICS structure or further collapsed into goods, services, and transportation/ warehousing industry sectors.

Evaluation Measures – All data are in dollar-denominated terms, except employment and baseline demographics (population and households):

- Population – Resident individuals
- Households – Population residences
- Employment (Jobs) – Full-time-equivalent job years
- Output – Total sales value associated with all levels of economic activity; comprises intermediate inputs and value-added, combined.
- Intermediary Inputs – The value of goods and services purchased and applied to production processes (e.g., component parts, supplies)
- Value-Added – Net additional economic activity beyond intermediate inputs in the production of goods and services, synonymous with gross regional product (GRP); includes labor income, other property income types, and taxes
  - *Labor Income* – Includes employee compensation (employee wage/salary earnings) and proprietor income

- *Other Property Type Income* – Income from dividends, royalties, corporate profits, rents, and interest income from capital returns
- *Taxes* – Various production and import taxes (e.g., sales, property, excise), fines, fees, licenses, permits, etc. resulting from business economic activity; includes all federal, state, and local tax revenues

Impact Types – An industry or commodity change applied to the IMPLAN model yields three impact types that aggregate into a total impact for the aforementioned measures (except baseline population and households):

- *Direct* – Impacts attributable to the changed industry or commodity
- *Indirect* – Impacts associated with the suppliers that provide intermediate goods and services to the directly impacted industries; this is a supply-chain effect
- *Induced* – Impacts associated with the re-spending of earned income from both the direct and indirect industries in the region; this is a net regional income gain/loss effect
- *Total* – Summation of direct, indirect, and induced types

Indirect and induced impacts are often collectively referred as 'multiplier' impacts.

6.4.2 Local Economy

The socioeconomic profile below outlines current socioeconomics (e.g., population, employment, GRP), regional industry composition data, and industry employment location quotients (LQs). Such data are sourced from the IMPLAN model for Year 2019 and the BEA and provide context for estimating the economic impacts of regional freight.

Socioeconomics – In 2019, more than 3.5 million people resided in Connecticut, as shown in **Table 6.9**. More than 2.3 million people were employed, earning $183.7 billion in the production of $294.3 billion in GRP. Connecticut represented 1.4 percent of national 2019 GDP ($21.37 trillion, per BEA). Within Connecticut, more than 75 percent of the population resided in Fairfield, Hartford, and New Haven Counties (each representing about 25 percent each of statewide), with those three counties representing more than 80 percent of the employment.

Table 6.9: IMPLAN, Connecticut Economy, 2019 (*in millions)

Metric	CT	Output Percent	Output per Metric
Population	3,565,287		$134,566
Households	1,417,453		$338,472
Employment	2,333,390		$205,610
Value Added			
Labor Income*	$183,703	38.3%	2.61
Property Income*	$91,394	19.0%	5.25
Taxes*	$19,184	4.0%	25.01
Total Value Added*	$294,281	61.3%	1.63
Intermediary Inputs*	$185,487	38.7%	2.59
Output*	$479,768	100.0%	1.00

Industry Composition – IMPLAN defines hundreds of industries that are aggregated into NAICS2 sectors, which are then aggregated into general groups: goods, transportation and warehousing, and services. Goods industries predominately produce, and thus move, physical goods, including agriculture, mining, utilities, construction, manufacturing, and wholesale and retail trade. Such NAICS2-equivilent industries also include many support services that are relatively freight intensive. Services industries also produce physical goods, but to a smaller relative extent, and include information, finance, management, education, health care, etc. Generally, services industries are relatively less freight intensive.

Industry Overview – Per IMPLAN, Connecticut's goods-related industries account for 24.6 percent of employment, 25.7 percent of income, 24.1 percent of GRP, and 30.5 percent of output. Comparatively, transportation and warehousing industries account for 2.0 to 3.7 percent of regional totals. Services account for a far larger component, ranging from 67.4 percent of output to 73.9 percent of GRP, as summarized in **Figure 6.19**.

Industry Detail – More detailed two-digit disaggregation of goods-related industries (**Table 6.10**) indicates that construction, manufacturing, and retail trade industries employ a notable share of goods industry jobs (5.3, 7.4, and 8.3 percent, respectively), with manufacturing comprising 15.8 percent of output, which reflects relatively high output per employee (productivity). In services-related industries, health and social services represent the relatively highest employment proportion, at 13.2 percent, but finance and insurance represent the highest relative output, at 14.2 percent, which represent relatively high differences in output per employee ($76,475 verus $229,804, respectively).

Figure 6.19: IMPLAN, Connecticut Economy by Industry Group, 2019

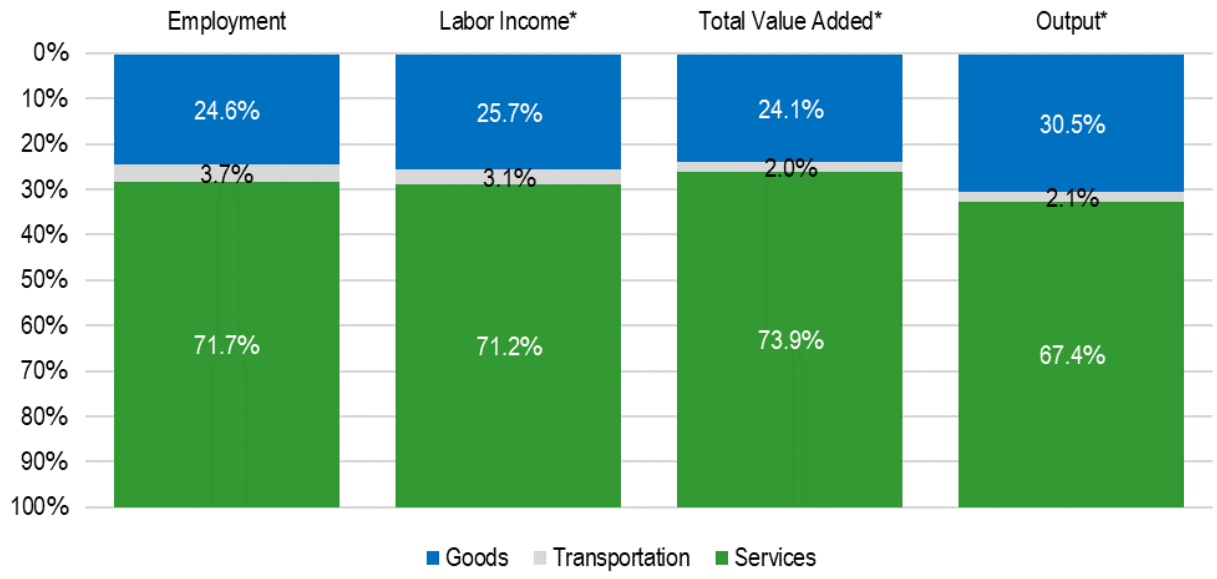


Table 6.10: IMPLAN, Connecticut Economy by Industry, 2019 (*in millions)

	Industry	Employment		Labor Income*		Total Value Added*		Output*	
Goods	11 Ag, Forestry, Fish and Hunting	11,696	0.5%	$285	0.2%	$428	0.1%	$697	0.1%
	21 Mining	2,123	0.1%	$146	0.1%	$300	0.1%	$805	0.2%
	22 Utilities	5,741	0.2%	$1,017	0.6%	$4,652	1.6%	$8,026	1.7%
	23 Construction	122,868	5.3%	$9,704	5.3%	$9,735	3.3%	$17,908	3.7%
	31-33 Manufacturing	171,813	7.4%	$20,161	11.0%	$28,520	9.7%	$76,016	15.8%
	42 Wholesale Trade	65,480	2.8%	$7,399	4.0%	$14,251	4.8%	$22,748	4.7%
	44-45 Retail Trade	193,750	8.3%	$8,508	4.6%	$12,921	4.4%	$20,202	4.2%
	48-49 Transport and Warehousing	85,753	3.7%	$5,625	3.1%	$5,875	2.0%	$10,165	2.1%
Services	51 Information	38,763	1.7%	$4,702	2.6%	$14,362	4.9%	$26,219	5.5%
	52 Finance and Insurance	183,493	7.9%	$27,520	15.0%	$42,167	14.3%	$68,235	14.2%
	53 Real Estate and Rental	126,022	5.4%	$4,006	2.2%	$41,597	14.1%	$60,212	12.6%
	54 Prof-Scientific and Tech Svcs	187,567	8.0%	$19,873	10.8%	$23,970	8.1%	$36,129	7.5%
	55 Management of Companies	36,507	1.6%	$6,140	3.3%	$7,020	2.4%	$10,346	2.2%
	56 Admin. and Waste Services	122,822	5.3%	$6,749	3.7%	$7,809	2.7%	$12,510	2.6%
	61 Educational Svcs	65,323	2.8%	$4,011	2.2%	$4,720	1.6%	$6,002	1.3%
	62 Health and Social Services	308,538	13.2%	$20,990	11.4%	$23,595	8.0%	$36,510	7.6%
	71 Arts-Entertainment and Recr	52,498	2.2%	$1,627	0.9%	$2,478	0.8%	$4,233	0.9%
	72 Accomm. and Food Services	173,332	7.4%	$6,353	3.5%	$9,313	3.2%	$14,520	3.0%
	81 Other Services	137,832	5.9%	$7,085	3.9%	$7,883	2.7%	$11,982	2.5%
	92 Government and Non NAICS	241,467	10.3%	$21,803	11.9%	$32,686	11.1%	$36,303	7.6%
	Total	2,333,390	100.0%	$183,703	100.0%	$294,281	100.0%	$479,768	100.0%
	Goods	*573,471*	*24.6%*	*$47,221*	*25.7%*	*$70,806*	*24.1%*	*$146,401*	*30.5%*
	Transportation	*85,753*	*3.7%*	*$5,625*	*3.1%*	*$5,875*	*2.0%*	*$10,165*	*2.1%*
	Services	*1,674,165*	*71.7%*	*$130,857*	*71.2%*	*$217,600*	*73.9%*	*$323,202*	*67.4%*

Location Quotients – Measure the relative employment within each county, compared to Conecticut's relative industry employment. Specifically, LQs are the ratio of local industry employment percentages versus the state.[39] Relatively concentrated local industry employment is in green, low concentration in red, and close to statewide composition in black, as shown in **Table 6.11**. County employment in Fairfield, Hartford, and New Haven Counties comprise nearly 80 percent of statewide total. Whereas Fairfield County employment is relatively concentrated in services-related industries, Hartford is led by transportation and warehousing, and New Haven is led by goods. Employment in the other five counties are relatively concentrated in goods-related industry.

[39] LQs greater than 1.0 indicate local industry employment is relatively concentrated; LQs less than 1.0 indicate local industry employment is less concentrated relative to Connecticut. LQs around 1.0 (±10%) indicate local industry employment is on par with the state. It does not necessarily suggest that an industry is a large employer relative to other industries, just that there is a relative proportional employment concentration. Example: agriculture/forestry/fishing employment in Tolland County were 273, just 0.4 percent of county-total employment, but total utilities employment in Connecticut, at 2,402, represent just 0.1 percent of statewide employment; thus, Tolland exhibits a 4.08x relative concentration.

Table 6.11: BEA, Connecticut Counties Employment Location Quotients, 2019

	Industry	Fairfield	Hartford	Litchfield	Middlesex	New Haven	New London	Tolland	Windham
Goods	11 Ag, Forestry, Fish and Hunting	0.52	0.55	N/A	N/A	0.64	2.06	4.08	3.61
	21 Mining	1.12	0.36	2.24	N/A	1.13	1.10	N/A	N/A
	22 Utilities	0.80	0.39	N/A	1.43	1.33	3.11	N/A	1.25
	23 Construction	1.02	0.81	N/A	1.31	1.03	0.88	1.18	N/A
	31-33 Manufacturing	0.67	1.17	N/A	1.49	0.85	1.44	N/A	1.62
	42 Wholesale Trade	0.94	1.12	N/A	0.99	1.15	0.67	N/A	0.90
	44-45 Retail Trade	0.95	0.92	1.23	1.11	1.05	1.10	1.02	1.26
	48-49 Transport and Warehousing	0.75	1.24	0.67	0.78	1.13	0.78	0.94	1.53
Services	51 Information	1.54	0.99	0.57	0.59	0.71	0.63	0.54	0.38
	52 Finance and Insurance	1.43	1.33	0.50	0.54	0.57	0.33	0.43	0.28
	53 Real Estate and Rental	1.28	0.80	1.13	0.98	0.99	0.75	0.95	0.73
	54 Prof-Scientific and Tech Svcs	1.27	1.03	0.79	0.88	0.83	0.76	0.74	0.51
	55 Management of Companies	1.46	1.27	0.48	0.50	0.60	0.42	0.13	0.45
	56 Admin. and Waste Services	1.13	1.01	0.94	0.92	1.06	0.55	0.57	0.78
	61 Educational Svcs	0.73	0.64	1.03	0.85	2.05	0.61	0.48	0.72
	62 Health and Social Services	0.88	1.03	0.91	1.07	1.18	0.87	0.79	1.10
	71 Arts-Entertainment and Recr	1.17	0.79	1.39	1.19	0.95	1.00	1.13	0.70
	72 Accomm. and Food Services	0.94	0.93	1.03	1.11	1.00	1.38	1.03	1.16
	81 Other Services	1.18	0.86	1.17	1.00	0.97	0.82	1.09	1.01
	92 Government and Non NAICS	0.67	1.01	0.78	0.94	0.91	2.03	2.47	1.28

6.4.3 Freight Impacts

Economic impacts associated with freight movements arise from local shippers/receivers who use freight service providers.

Freight User Impacts – Associated with the production and/or consumption of locally produced goods and/or materials. TRANSEARCH commodity values are bridged and compared with IMPLAN to assess the freight-related interrelationships and freight-dependency. IMPLAN does not identify directionally specific commodity value movements (only the underlying commodity-to-industry structure). TRANSEARCH does not provide the economic interrelationships necessary to determine how commodity movements interact within the economy. As such, the two are combined to derive direct freight user-related impacts.

However, combining/comparing the disparate sources typically identifies data incongruities (typically TRANSEARCH) that need to be reconciled. Freight data source dimensions, limitations, and intended purposes can under- or overestimate the true value of goods pertinent movements.[40] Such issues are expounded upon in the approach section below.

Freight Service Impacts – Reflect the truckers, railroad workers, stevedores, etc. who physically transport freight to/from/within/through the region. While notable, such service impacts are minor compared with the freight users who produce and/or consume the goods/materials. Such freight service

[40] inbound and outbound movements that are actually through movements, which results in double-counting intermediary products as final products, etc.

impacts are identified from the baseline IMPLAN data and are estimated via the indirect and induced effects from the shippers/receivers.

Approach

Freight user impacts reflect complex supply chain relationships spanning local, domestic, and international movements. Goods industries are mostly freight-dependent, although some are self-supplied intra-industry production.[41] To determine the relative portion of the goods industries that trade (i.e., freight dependent), regional freight data (TRANSEARCH) are compared with the regional economic data (IMPLAN).

Origin and/or Destination Freight – Only inbound, outbound, and intrastate freight values are considered and compared with regional economic data, as through traffic is mostly unrelated to the regional economy.[42] Outbound and intra-regional movements pertain to regional production, and inbound movements reflect regional production inputs or final consumption (direct sales or retail). Certain commodities are economically irrelevant, pertaining to neither consumption (intermediate, or final) or production, such as waste materials and TRANSEARCH's secondary traffic, which encapsulates short-haul intermodal drayage and repositioning by truck from railyards, ports, and warehouse/ distribution facilities.

Adjustments – TRANSEARCH freight value data (measured in dollars), may misrepresent, or double-count, actual economic activity associated with freight. Often, many commodity groups in freight databases designated as inbound and/or outbound are through movements, via an intermodal transfer or warehousing facility. Such freight value movements do not necessarily translate into regional freight user-related economic activity. Inbound freight, especially intermediary products, are used in the production processes for locally consumed final products and outbound freight. Additionally, inbound freight (or imports) movements are sometimes destined for final consumption (households and/or government), and thus do not represent regionally based economic activity and do not circulate throughout the regional economic via multiplier effects.

Summary – Given such overlaps between intermodal transfers, warehousing storage, and production components, freight value data is not equivalent to freight-related economic activity. Typically, freight databases assign values to agricultural, manufacturing, and wholesale/retail goods that exceed actual regional production and consumption as measured via economic data or impact modeling software. As such, freight data values are adjusted downward to exclude such production overlaps, directional misattributions, and final consumption imports. After economically irrelevant movements were expunged, downward freight-value adjustments were applied, and the commodities were bridged with IMPLAN industry sectors.

Impacts

Reconciling freight data values with the observed economic activity facilitates direct economic output (sales) estimates. These estimates provide inputs into the IMPLAN model to estimate total economic impacts, measured via employment, income, and value-added, as depicted in **Table 6.12**.

[41] Examples include the farming industry producing and storing seed for the following season, or an equipment manufacturer with a component part supplier collocated in the same commercial complex.

[42] Beyond freight transport addressed under the following Freight Service Provider subsection.

Table 6.12: Connecticut Freight Economic Impacts, 2019 (*in millions)

	Employment	Labor Income*	Value Added*	Output*
Impact Type				
Direct	451,115	$36,462	$50,450	$110,483
Indirect	150,482	$12,767	$20,485	$33,470
Induced	226,424	$14,848	$25,543	$39,603
Total	828,021	$64,076	$96,478	$183,556
State Economy				
Connecticut	2,333,390	$183,703	$294,281	$479,768
Impact % of State				
Direct	19.3%	19.8%	17.1%	23.0%
Indirect	6.4%	6.9%	7.0%	7.0%
Induced	9.7%	8.1%	8.7%	8.3%
Total	35.5%	34.9%	32.8%	38.3%

Note: TRANSEARCH freight value data (measured in dollars), may misrepresent, or double count, actual economic activity associated with freight. Often, many commodity groups in freight databases designated as inbound and/or outbound are through movements, via an intermodal transfer or warehousing facility.

Direct Effects – Connecticut moved $110.5 billion in direct outbound, inbound, and intra-regional freight. Such direct freight sales are associated with 451,100 direct regional jobs, almost 20 percent of the state economy. These jobs earn $36.5 billion in income to produce $50.5 billion in GRP (value-added).

Total Effects – Direct freight-related economic impacts create regional multiplier effects, including the supply-chain-related indirect and re-spending-induced effects. Many of the indirect and induced multiplier effects include the non-freight intensive goods industry sectors, as well as the freight service providers required to haul such goods. In total, freight-related impacts total 828,000 jobs, $64.1 billion in income, $96.5 billion in GRP (value-added), and $183.6 billion in output.

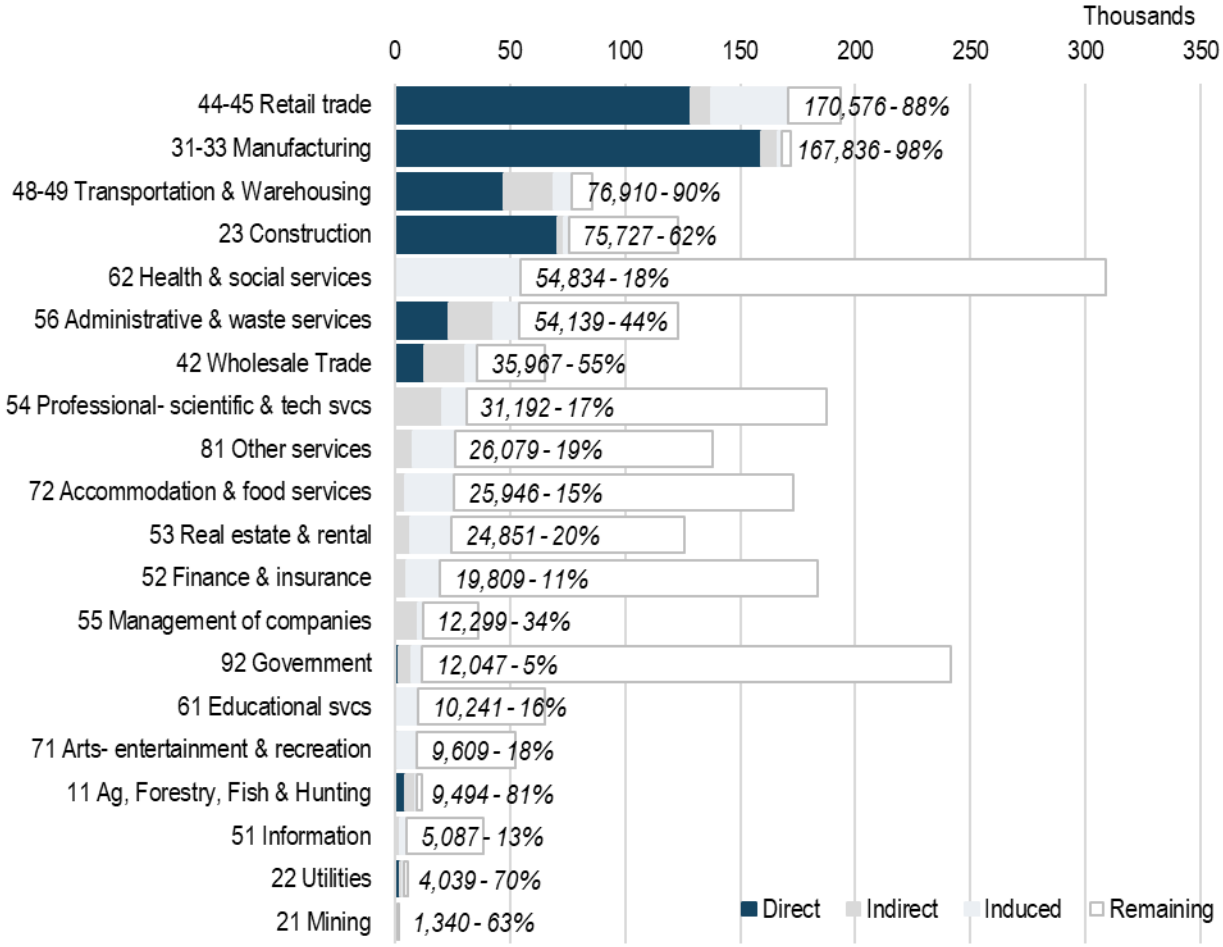
Employment Impacts by Type and Industry – The relationship between direct impacts associated with freight users versus the indirect impacts associated with suppliers (including freight service providers) and the induced re-spending is shown by industry in **Figure 6.20**.

- *Direct Impacts (dark blue bar)* – Predominantly arise in retail trade, manufacturing, transportation and warehousing, construction, administration/ waste services, and wholesale trade
- *Indirect Impacts (gray bar)* – Supplier impacts include some transportation and warehousing (i.e., freight service providers), as well as other services
- *Induced Impacts (blue bar)* – Reflects jobs associated with income re-spending across most all industries, most notably in health and social services
- *Remaining (white bar)* – Reflects the balance of regional employment not associated with freight

Freight Service Provider Impacts – Direct and indirect supply chain effects include freight service providers (among other industries), including trucking, railroad, and warehousing. Per **Figure 6.20**, the

freight user impacts equate to 76,900 transportation and warehousing related employment, which represents most (90 percent) of the entire industry through the multiplier effect.[43]

Figure 6.20: Connecticut Freight Employment Impacts by Industry, 2019



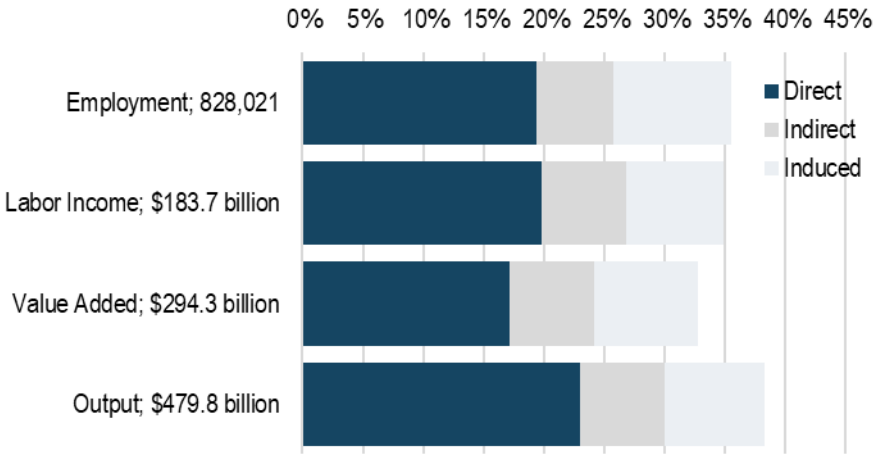
Impact Summary

The 451,100 jobs in Connecticut associated directly with freight shippers and receivers represents 19.3 percent of the state employment base. Such direct employment earns 19.8 percent of statewide income, produces 17.1 percent of regional value-added (GRP), and accounts for 23.0 percent of final sales value. The higher sales share reflects the high-value manufacturing products.

With the indirect and induced multiplier effects, the total freight-related impacts are estimated at 828,000 jobs, earning $64.1 billion in income, producing $96.5 billion in gross regional product with sales of $183.6 billion. In total, such employment, income, value-added, and final sales represent 35.5, 34.9, 32.8, and 38.4 percent of the state economy, respectively.

[43] Other non-freight providers categorized under Transportation & Warehousing include passenger rail, transit, scenic/sightseeing transportation, non-freight storage, and curriers/messengers

Figure 6.21: Connecticut Freight Impact, % of Regional Economy, 2019



7. TRUCK PARKING


Source: Bigstock

As a part of the Connecticut Statewide Freight Plan Update, CTDOT is conducting the *Connecticut Truck Parking Study* to better understand truck parking needs throughout the state. The safe and efficient operation of trucks depends on the ability of truck drivers to have reliable access to designated parking spaces. Currently, truck drivers face a choice of stopping early to take an available parking spot or risking that a designated parking space may not available before their hours of service expire. In the latter case, truck drivers may be forced to park in undesignated locations—such as highway shoulders, roadsides, or automobile parking lots—which may present a safety concern. As a part of this effort to better understand truck parking needs in Connecticut, this chapter summarizes the following tasks from the *Connecticut Truck Parking Study*:

- Inventory of existing truck parking in the state
- Utilization analysis of identified truck parking sites
- Analysis of undesignated truck parking at identified truck parking sites
- Truck parking supply and demand assessment of key corridors
- Truck parking future demand forecast
- Summary of truck driver surveys from a truck parking perspective

Additional tasks include the identification of truck parking needs and identification of potential locations to add truck parking spaces which will be captured in the *Connecticut Truck Parking Study* under separate cover from the Freight Plan.

Truck parking is a critical need throughout the nation and in Connecticut to ensure the safe operation of trucks on the transportation network. **Table 7.1** describes some of the key elements driving the need for truck parking demand.

7.1 ANALYSIS METHODOLOGY

The truck parking assessment for the state consisted of three components: (1) truck parking supply inventory and utilization, (2) undesignated truck parking, and (3) truck parking demand and supply forecast using the data and methodology shown in **Figure 7.1**.

The truck parking supply assessment developed a supply inventory, including the site name, site location (geo-coordinates, address, highway, milepost), and number of truck parking spaces and amenities using trucker information websites and Jason's Law databases.

The truck parking utilization assessment was conducted using American Transportation Research Institute (ATRI) truck parking events sample[44] and sample to population expansion factors.[45] ATRI data were used to estimate total demand at a truck parking site in units of peak hourly parking arrivals.[46,47] Utilization is defined simply as the ratio of the demand in peak hourly parking arrivals to supply in parking spaces. Note that site validation of truck parking arrivals was not a part of this analysis. ATRI data was also used to estimate undesignated truck parking along ramps and shoulders at each truck parking site.

Table 7.1: Drivers for Truck Parking Demand

Reason	Description
Hours of Service	To reduce excessively long work hours that increase both the risk of fatigue-related crashes and long-term health problems, the Federal Motor Carrier Safety Administration introduced hours-of-service regulations[48] in 49 CFR Parts 385, 386, 390, and 395 that have been updated over the years. To comply with these requirements, truckers need truck parking sites to be present uniformly over the transportation system and match the demand, and preferably with parking availability information.
Staging	Trucks need a space to park while waiting for pickup/delivery, which is called as staging. While normally, this is a short-term parking demand, it can become overnight parking demand when a truck misses the last pickup/delivery time window of a business day.
Large Size of Trucks and Safety	Trucks with five or more axles are large in dimensions and when parked on streets they pose safety concerns for smaller vehicles, bikes, pedestrians, and other modes. Thus, moving these trucks to off-street sites would improve safety. Oversized truck parking may need additional safety considerations.
Emissions	Trucks are a major source of nitrogen oxides (NOx) and particulate matter emissions. Providing adequate truck spaces reduces the need for trucks idling while waiting to pickup/deliver.
Overnight Parking	Trucks that travel long-haul do not always have a home base or truck depot to return after the end of day's business and thus require a location for overnight parking.
Amenities	Truckers need amenities such as restroom, food, fuel, shower, ATM, laundry, truck wash/repair, auxiliary power, etc. at truck parking sites to meet their personal and cargo needs, and to maximize the time spent moving cargo.
Undesignated Parking & Safety	Some truckers park in undesignated spaces, which creates a safety concern and thus subject to enforcement. The causes for this can be inability to find truck parking space before hours-of-service run out, unwillingness to pay the cost of parking (which can vary from low to high), no overnight truck parking sites, emergency/weather-related closures, and lack of truck parking availability information.

[44] ATRI provides GPS-based spatial (coordinates) and temporal (time/date stamp) data for a large sample of trucks with onboard, wireless communication systems (probe vehicles) in the U.S. The truck parking events sample is a processed format of data prepared by ATRI using in-house programming. The parking data was collected for 56 days in the year 2019 and obtained as four 2-week periods representing four seasons of the year while avoiding holiday weeks.

[45] The truck parking events sample was expanded to truck population using comparisons between ATRI truck GPS data-based truck flows to the truck AADT in State's Highway Performance Monitoring System (HPMS) data on the highway closest in access to the truck parking facility. This assumes that truck parking arrivals as a share of the highway truck traffic is the same in the sample and population.

[46] 'Hourly parking arrivals' is an average across all 56 days of the ATRI data, and the hour on an average day with the highest number of parking arrivals represented the 'peak hour.' The peak hour varied from truck parking facility to facility.

[47] An alternate measure for utilization is 'parking space occupancy,' which is net of parking arrivals and parking departures. The ATRI data used in this study did not support calculation of the parking space occupancy.

[48] https://www.fmcsa.dot.gov/regulations/hours-of-service (last accessed on July 15, 2022)

Figure 7.1: Truck Parking Assessment Methodology

1: Supply Inventory and Utilization

- **Data**
  - Base (2019) and updated (2021) Jason's Law databases
  - Connecticut Statewide Rest Area and Service Plaza website
  - AllStays.com Pro Account trucker information website
  - ATRI 2019 Truck Parking Events Sample
  - ATRI 2019 Truck GPS Sample based Truck Flows
  - CTDOT 2019 HPMS Bi-directional Combined Unit Truck AADTs
- **Methodology Steps**
  - Compiled supply inventory including name, location (street address, highway and milepost), ownership type (public/private), number of parking spaces and amenities
  - Identified boundaries around designated supply locations
  - Extracted sample truck parking events data
  - Identified freeway link locations near truck parking supply locations for calibration/sample expansion
  - Calibrated/expanded truck parking events sample to truck population
  - Summarized demand as peak hourly arrivals and utilization as ratio of this demand to supply
  - Prepared statewide maps of supply, demand and utilization

2: Undesignated Parking

- **Data**
  - ATRI 2019 Truck Parking Events Sample
  - Online trucker survey via Connecticut Motor Transport Association
- **Methodology Steps**
  - Analyzed GPS records truck parking events near the freeway accessible supply locations and quantified extent of undesignated parking
  - Prepared statewide % undesignated parking map
  - Gathered feedback on limited truck parking supply locations and undesignated truck parking activity through an online interactive map

3: Demand and Supply Forecast

- **Data**
  - CTDOT Highways GIS Data
  - CTDOT 2019 HPMS Bi-directional Combined Unit Truck AADTs
  - CTDOT Travel Demand Model (TDM): base year (2016) and forecast year (2040)
  - CTDOT's TRANSEARCH truck-based commodity flows origin-destination database
  - ATRI-based 2019 utilization results from Task 1
- **Methodology Steps**
  - Identified corridors for truck parking analysis (highways with > 1,000 trucks/day) and label segments
  - Defined 250 miles one-way (or 500 miles two-way) as haul distance threshold to classify truck trips as short- and long-haul types
  - Estimated 2019 and 2040 segment level average combined unit truck volumes by combining HPMS data and TRANSEARCH data
  - Gathered TDM-based segment level average speed and travel time
  - Estimated percentage of short-haul and long-haul by combining TDM-based select link analysis and TRANSEARCH data analysis
  - Applied enhanced FHWA methodology for truck parking demand estimation
  - Adjusted FHWA methodology-based demand estimates upwards using ATRI-based results, where needed
  - Prepared truck parking analysis corridors and current and future demand maps

While ATRI data were useful in understanding utilization at truck parking sites, a corridor-level demand forecasting was conducted using a FHWA truck parking demand estimation methodology[49] enhanced by an hours-of-service factors update in a 2007 Pennsylvania study.[50] The FHWA methodology estimated current (2019) and future (2040) peak hourly short-term and overnight parking demand along state routes with high truck use.[51] The calculated demand is a function of local data on traffic volumes, speeds and percentages of short- and long-haul, and FHWA default parameters for hours-of-service and peaking factors. The FHWA methodology is expected to provide the total truck parking demand, including the following demand components: (a) parking demand met at truck parking sites, (b) parking demand met at locations beside the truck parking sites, and (c) unmet/latent demand. On a few corridors, the demand estimates based on the FHWA methodology were adjusted upwards when the aggregated demand for truck parking sites using ATRI data exceeded the former. The corridor level truck parking demand estimates were compared to the aggregated supply based on the truck parking supply inventory.

7.2 Existing Truck Parking Inventory and Utilization

The state has 30 truck parking sites, as shown in **Figure 7.2** and listed in **Table 7.2**. The map shows the truck parking sites overlaid on corridors used for truck parking analysis, which were identified as the state routes with a minimum truck AADT of 1,000 trucks per day (including both directions) in 2019. Twenty of these are public and on-freeway sites, while the remaining 10 are private and off-freeway sites. The supply locations are fairly uniformly distributed along the I-95 corridor, but the distribution is non-uniform, or interspersed, on the other corridors within the state. At the time of this analysis, CTDOT became aware that a new truck stop[52] is being constructed off of I-84 at Exit 71 (3 Polster Road) that will provide 56 truck parking spaces. This site was not included in the truck parking supply and demand assessment.

The state's 30 truck parking sites have 1,226 truck parking spaces in total. The dimensions of the truck parking stalls generally suit five-axle or greater trucks. The 10 private sites provide 863 truck parking spaces, or approximately 70 percent of the total truck parking supply within the state. The remaining 20 public sites provide 363 truck parking spaces, or approximately 30 percent of the total truck parking supply within the state. There is also variation between the number of truck parking spaces provided between public and private sites. The average number of truck parking spaces provided at private sites are about 86 spaces per site, is much higher than the average number of truck parking spaces provided at of public truck parking sites, about 18 truck parking spaces per public site.

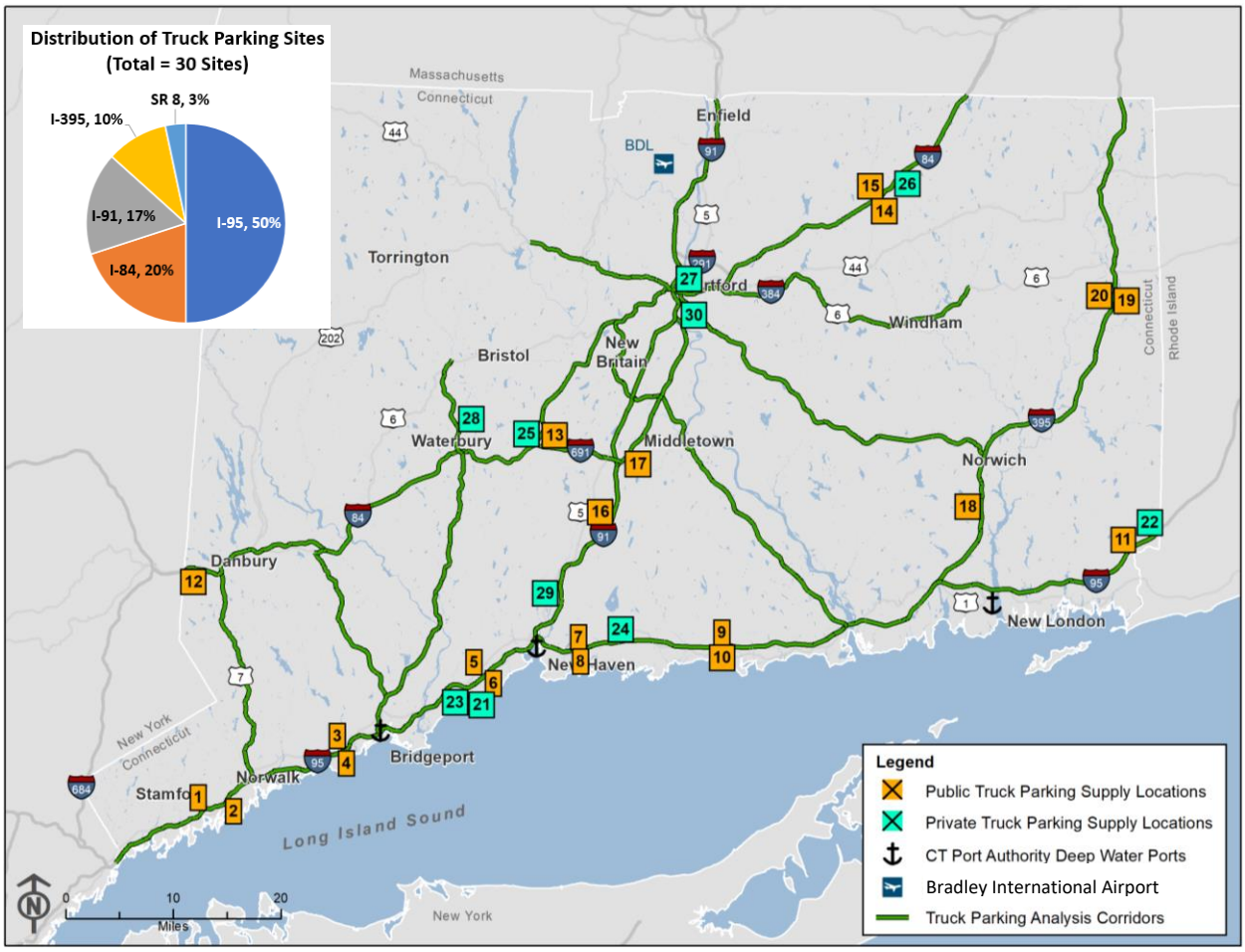
[49] Federal Highway Administration (FHWA), Model Development For National Assessment of Commercial Vehicle Parking, March 2002, Available at: https://www.fhwa.dot.gov/publications/research/safety/01159/01159.pdf (last accessed on July 15, 2022)

[50] Pennsylvania State Transportation Advisory Committee, Truck Parking in Pennsylvania, December 2007, Available at: https://talkpatransportation.com/perch/resources/documents/truck-parking-in-pennsylvania-december-2007-final-report.pdf (last accessed on July 15, 2022)

[51] Corridors with over 1,000 trucks per day and coverage over all existing truck parking facilities were used.

[52] https://www.loves.com/en/news/2022/july/loves-travel-stops-opens-first-location-in-connecticut (last accessed on August 11, 2022)

Figure 7.2: Truck Parking Site Locations



Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website

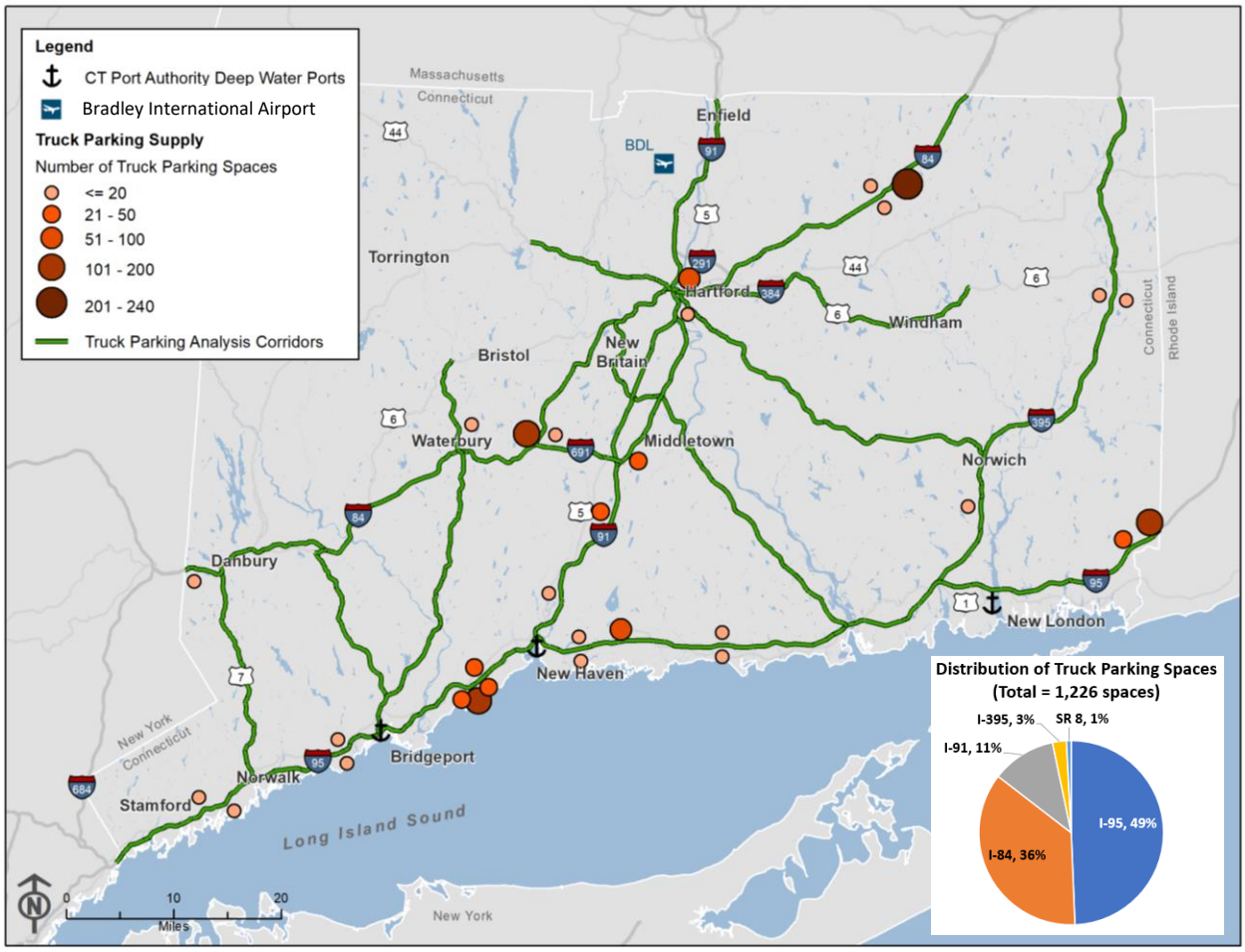
Table 7.2: Truck Parking Sites

Site ID	Site Name	Site ID	Site Name	Site ID	Site Name
1	I-95 SB Darien Service Plaza	11	I-95 SB North Stonington Welcome Center	21*	Pilot Travel Center #255 / TA Milford
2	I-95 NB Darien Service Plaza	12	I-84 EB Danbury Welcome Center	22*	Pilot Travel Center #882
3	I-95 SB Fairfield Service Plaza	13	I-84 EB Southington Rest Area	23*	Wheels Citgo #365 / Secondi Truck Stop
4	I-95 NB Fairfield Service Plaza	14	I-84 EB West Willington Rest Area	24*	TA Express New Haven #171
5	I-95 SB Milford Service Plaza	15	I-84 WB West Willington Rest Area	25*	TA Southington #154
6	I-95 NB Milford Service Plaza	16	I-91 SB Wallingford Rest Area	26*	TA Willington #022
7	I-95 SB Branford Service Plaza	17	I-91 NB Middletown Rest Area	27*	Pride Hartford Truck Stop I-91
8	I-95 NB Branford Service Plaza	18	I-395 SB Montville Service Plaza	28*	Waterbury Valley Truck Stop LLC
9	I-95 SB Madison Service Plaza	19	I-395 NB Plainfield Service Plaza	29*	Gulf Truck Stop
10	I-95 NB Madison Service Plaza	20	I-395 SB Plainfield Service Plaza	30*	Mercury Mobil

Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website. Note: Unstarred: Public and On-freeway Type, Starred (*): Private and Off-freeway Type. Site #29: Gulf Truck Stop and Site #30: Mercury Mobil are service stations.

About 49 percent of all the truck parking spaces are located along I-95 corridor, followed by I-84 and I-91 corridors contributing 36 percent and 11 percent of the supply, respectively. Limited supply is seen on I-395 and SR 8 corridors and none on other corridors within the state. **Figure 7.3** shows the distribution of the truck parking spaces across the state. Only 6 out of the 30 truck parking sites have a capacity that exceeds 50 spaces. Additional information on amenities provided at the truck parking sites are included in **Appendix B**.

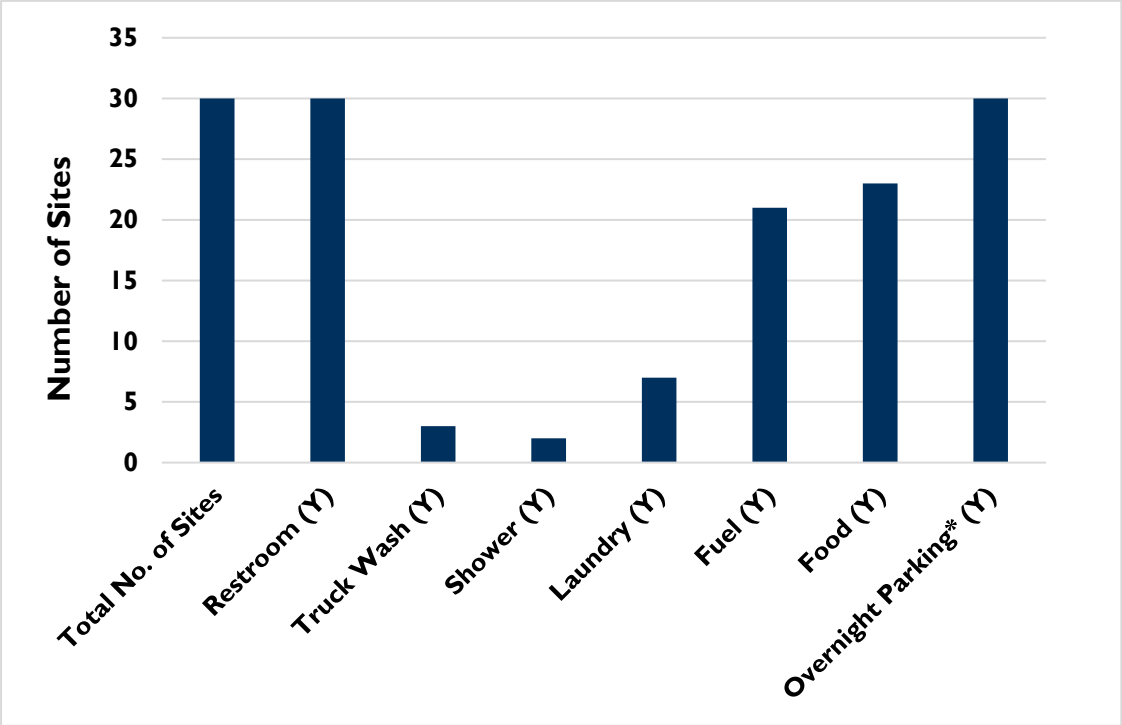
Figure 7.3: Truck Parking Spaces by Truck Parking Site



Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website

Amenities at each truck parking site were also analyzed, as certain amenities are desirable for long-haul and overnight drivers, such as restrooms and food. Restroom, overnight parking, food and fuel are the most common amenities found at the truck parking sites within the state (**Figure 7.4**). The state's truck parking sites have limited amenities such as showers, laundry, and truck washes, which are essential for long-haul truckers.

Figure 7.4: Truck Parking Amenities at Truck Parking Sites



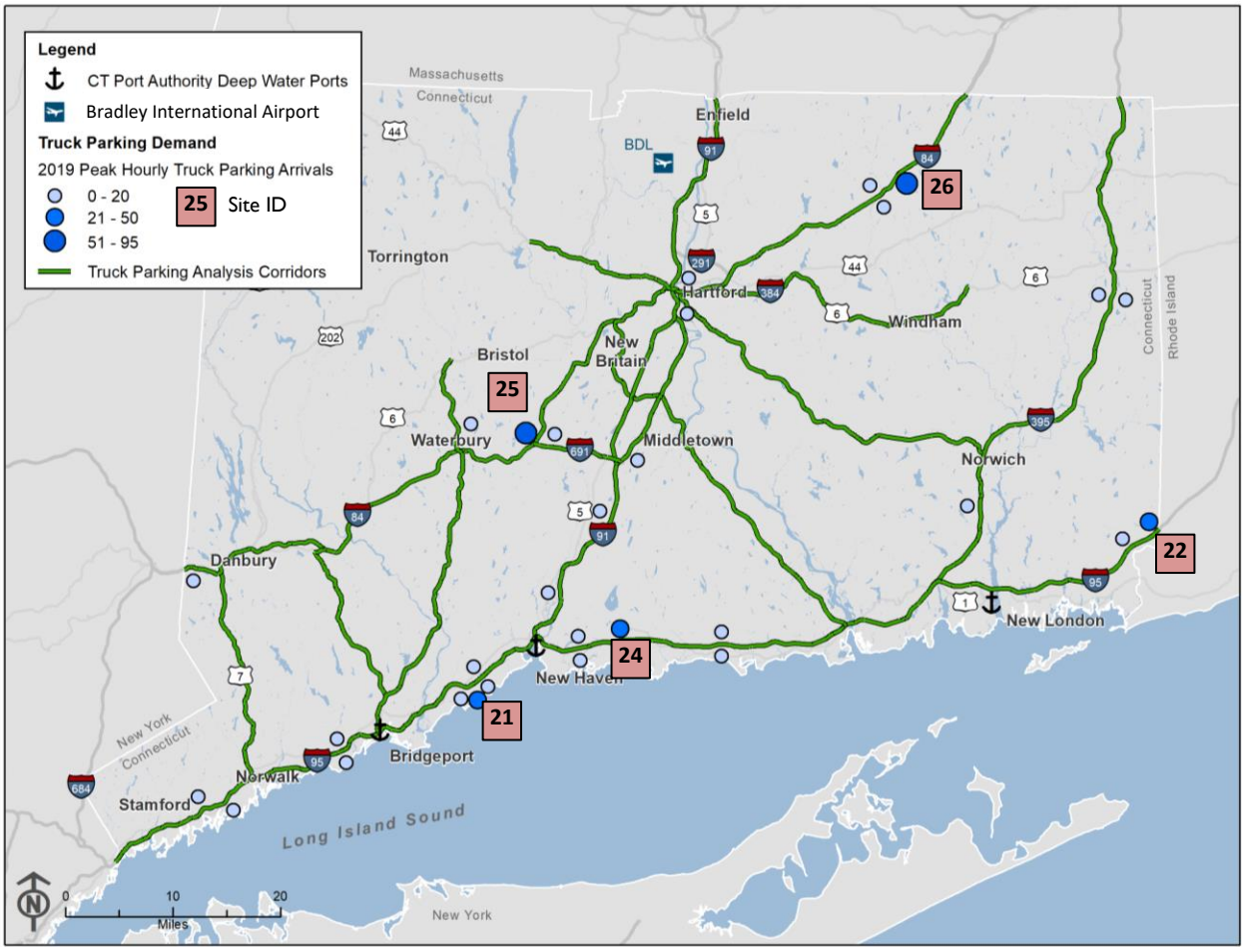
Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website. Note: Starred (*): For 2 supply locations, the overnight parking amenity was verified based on the source, and for the remaining 26 supply locations, this amenity was verified based on overnight use seen in 2019 ATRI Truck Parking Events data.

Using the ATRI analysis, existing peak hour demand at each site was analyzed as well as truck parking utilization. The truck parking sites have a total demand of 467 peak hourly truck parking arrivals. The highest demand is seen at Site #26 TA Willington #022 along I-84 south of CT/MA border with 95 peak hourly arrivals (**Figure 7.5**).

Other top demand locations with over 20 peak hourly arrivals include:

- Site #21: Pilot Travel Center #255 / TA Milford along I-95 west of New Haven
- Site #22: Pilot Travel Center #882.
- Site #24: TA Express New Haven #171
- Site #25: TA Southington #154 close to I-84/I-691 interchange

Figure 7.5: Truck Parking Demand by Truck Parking Site

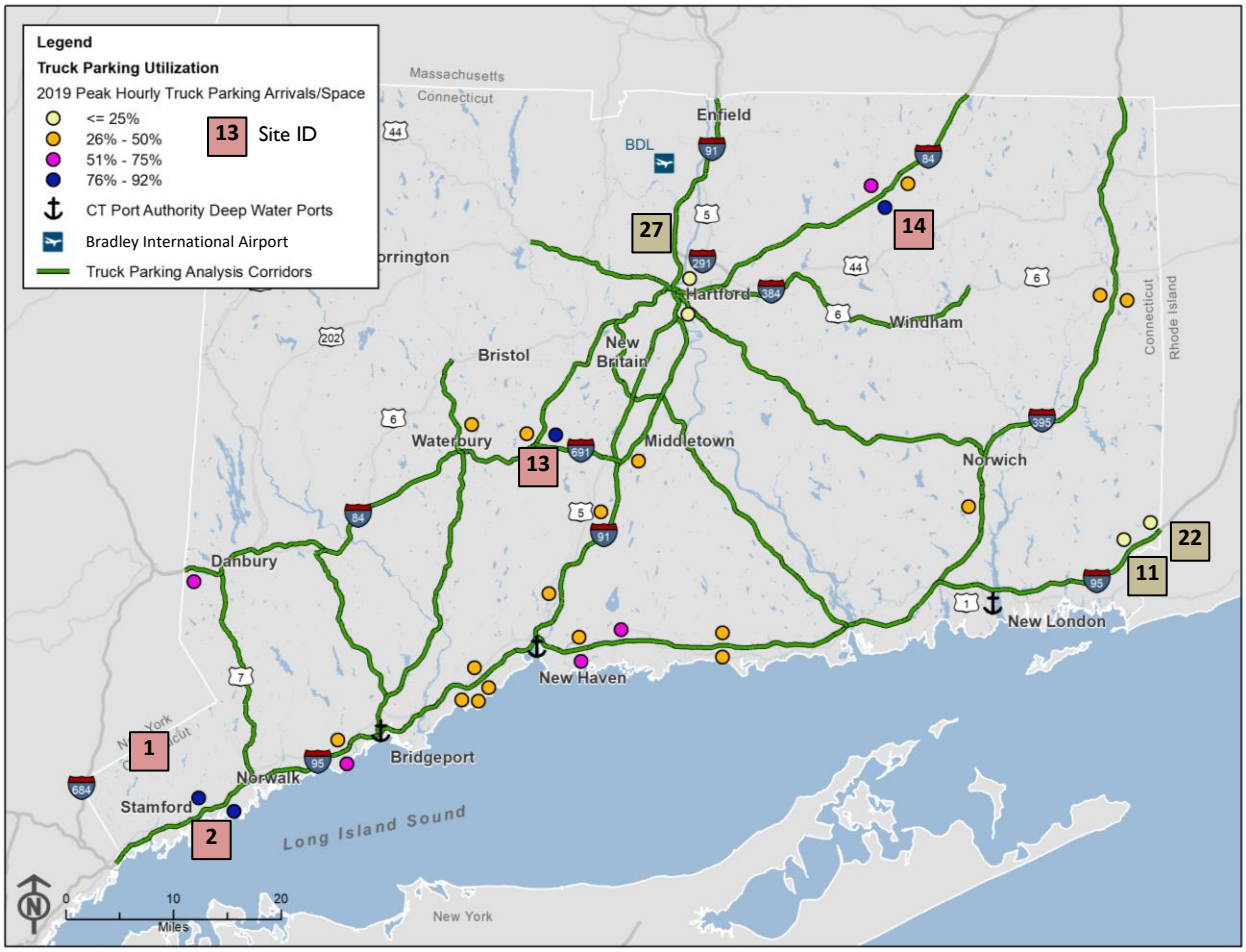


Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample-Based Truck Flows; CTDOT 2019 HPMS Bidirectional Combined Unit Truck AADTs

The truck parking site utilization analysis results are shown in **Figure 7.6**. A high utilization indicates that most or all of the truck parking stalls at that location are occupied by trucks in the peak hour, a low utilization means there are available truck parking stalls at that location. The most highly utilized truck parking sites where utilization exceeded 75 percent are as follows:

- Site #1 I-95 SB and Site #2 I-95 NB Darien Service Plaza between Stamford and Norwalk (close to New York / Connecticut, NY/CT border)
- Site #13 I-84 EB Southington Rest Area near I-84/I-691 interchange
- Site #14 I-84 EB West Willington Rest Area

Figure 7.6: Truck Parking Utilization by Truck Parking Site



Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample based Truck Flows; CTDOT 2019 HPMS Bi-directional Combined Unit Truck AADTs.

Some of the less-utilized sites with fairly large unused truck parking supply are as follows:

- Site #11 I-95 SB North Stonington Welcome Center
- Site #22 Pilot Travel Center #882
- Site #27 Pride Hartford Truck Stop

The utilization metric is below 100 percent at most locations within the state, but this does not mean that the sites do not have parking capacity related issues. Select reasons for this may be the following:

- The utilization metric is based on peak hourly parking arrivals and is not based on peak parking occupancy, which is net of arrivals and departures. If the start of the peak hour has residual parking from prior hours, then spaces available to park for trucks arriving in the peak hour is less than the total supply at the site. This was not captured in the processed ATRI data.

- When the parking occupancy reaches approximately 90 percent of the total supply, then the site is assumed to reach an operational capacity limit. The ability for a driver to reach a site, identify

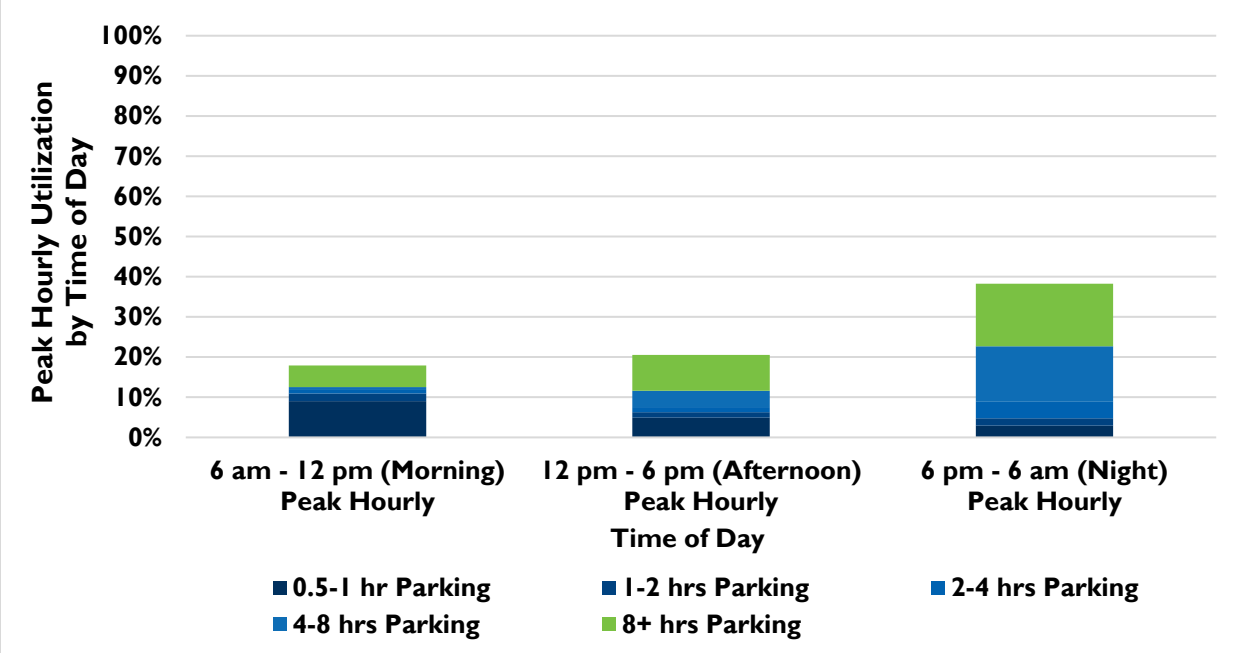
a turned-over space, and re-use it becomes increasingly challenging (unless there is a truck parking availability system in place to indicate to drivers the spaces available).

The utilization metric is useful in understanding the relative levels of use of the truck parking sites. A key observation is that utilization in the state is uneven across the truck parking sites. This means that the truck parking supply is not optimally located and sized to meet the demand and truckers have a preferential use of truck parking sites. The following are possible reasons for this:

- Truckers coming out of/going to Ports of New York / New Jersey (NY/NJ) attempt to park close to NY/CT border. As they move further north and east in the state, they attempt to park at sites with adequate amenities or at truck stops close to their customers, as seen at I-84/I-691 and I-84/Exit 71 locations. So, overcrowding tends to happen at some truck parking sites but not all.
- Some of the truckers that see truck parking sites that are full and also are approaching their hours-of-service limit, get anxious (about not finding parking at the next rest area) and try to park in undesignated areas. This leads to some high-utilized sites with undesignated parking while also some low-underutilized sites.
- The utilization metric may be more sensitive for smaller sites than larger sites.

Combining all truck parking sites, the assessment also studied utilization by time of day (**Figure 7.7**), which shows that arrivals peak in night hours, these arrivals also have a higher share of longer-term parking (4 to 8 hours, and 8+ hours duration).

Figure 7.7: Truck Parking Utilization by Time of Day



Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample based Truck Flows; CTDOT 2019 HPMS Bidirectional Combined Unit Truck AADTs

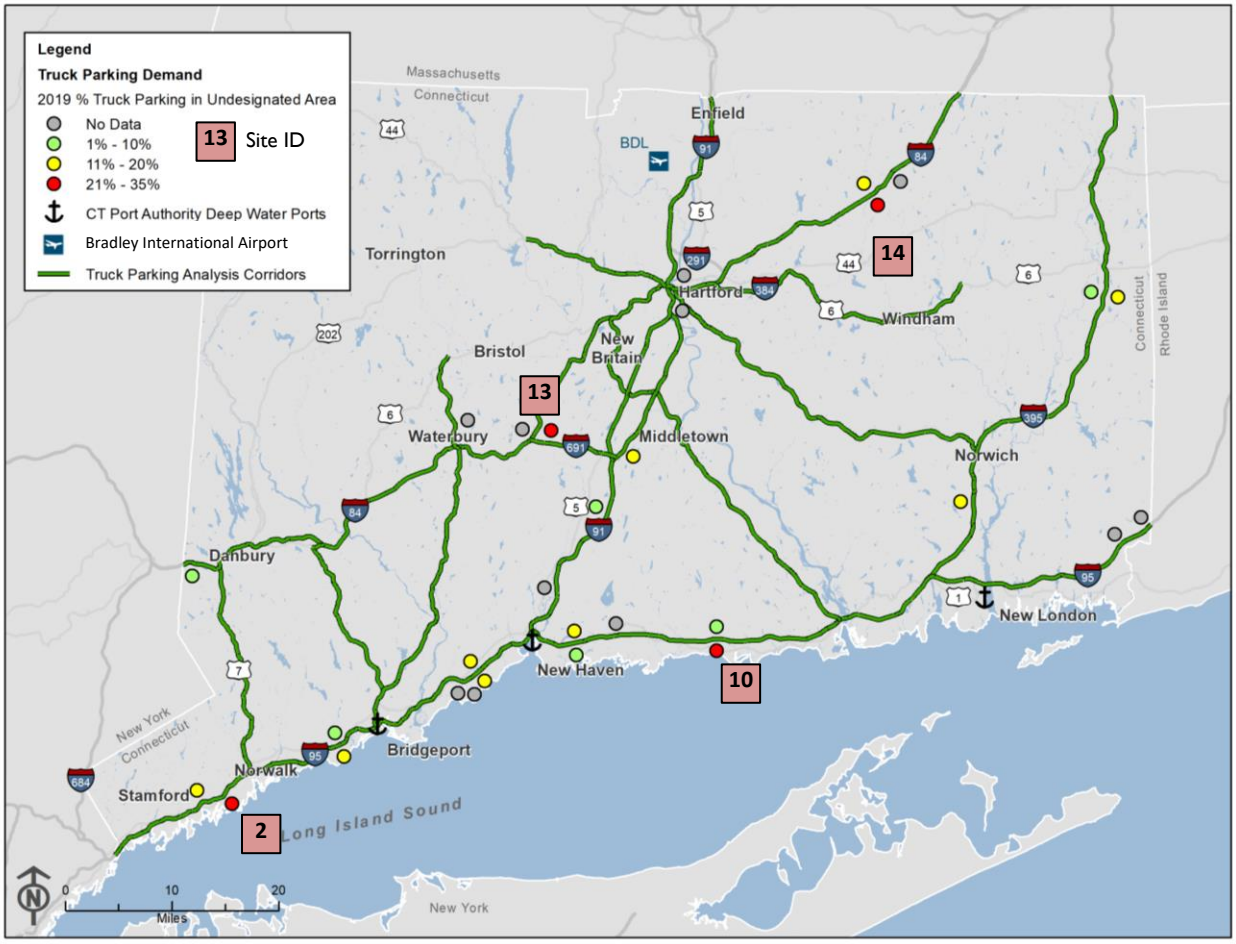
7.3 ASSESSMENT OF UNDESIGNATED LOCATIONS

Two types of inputs were used to identify locations of undesignated truck parking. The first one is based on ATRI data (this section), and the second type of summary is based on the online truck driver surveys (**Section 7.5**). ATRI data determined the percentage of undesignated parking only at the public sites that are on-freeway and accessed through off- and on-ramps and areas not designated for trucks (shoulders to approach roads to site and passenger vehicle parking area). The truck parking in undesignated areas were attributable to a parking spillover effect from the public on-freeway truck parking site. Private off-freeway sites were not analyzed for undesignated parking in the same way because the trucks parking on undesignated areas (such as the local street network) adjacent to a truck parking site could not be clearly attributed to a parking spillover effect just from the private off-freeway truck parking site.

Undesignated parking is likely a major issue at the following locations where the percentage of undesignated parking exceeds 20 percent (**Figure 7.8**):

- Site #2 I-95 NB Darien Service Plaza between Stamford and Norwalk (close to NY/CT border)
- Site #10 I-95 NB Madison Service Plaza along I-95 east of New Haven
- Site #13 I-84 EB Southington Rest Area north of I-84/I-691 interchange
- Site #14 I-84 EB West Willington Rest Area along I-84 south of Connecticut / Massachusetts (CT/MA) border

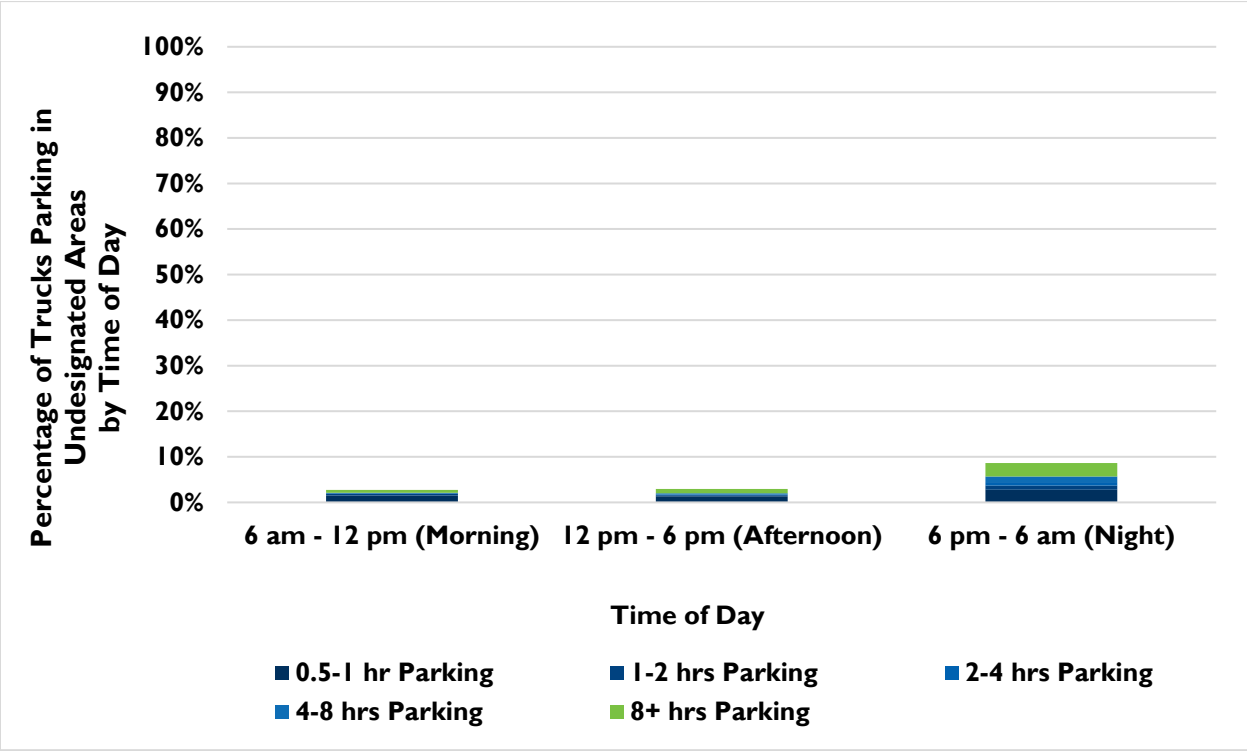
Figure 7.8: Percentage of Undesignated Truck Parking by Truck Parking Site



Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample based Truck Flows; CTDOT 2019 HPMS Bidirectional Combined Unit Truck AADTs

Combining all truck parking sites, the assessment also analyzed the percentage of undesignated truck parking by time of day (**Figure 7.9**). There is a higher volume of truck parking at night and a higher percentage of undesignated truck parking. Undesignated truck parking at night presents a bigger safety issue because visibility is lower.

Figure 7.9: Percentage of Undesignated Truck Parking by Time of Day

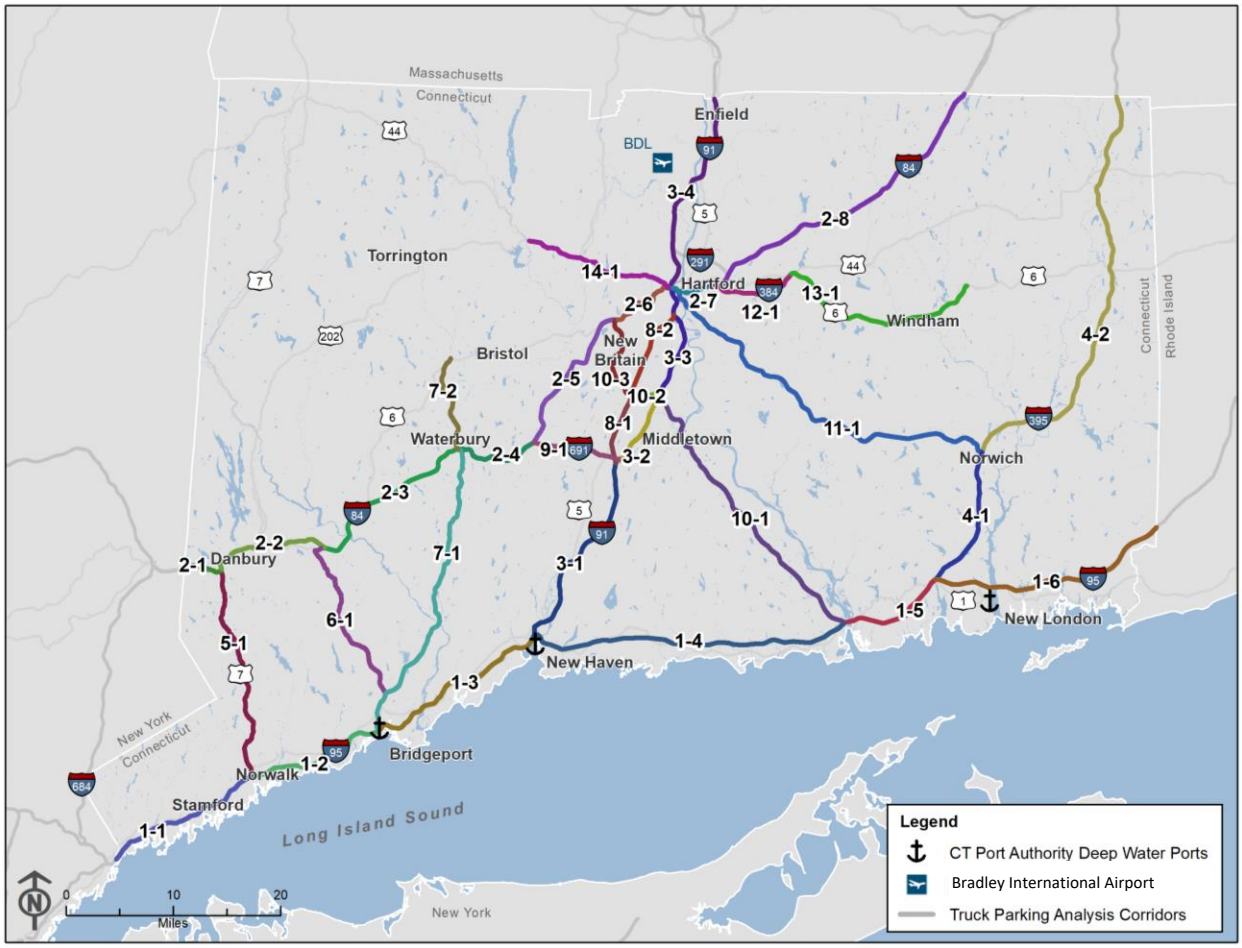


Source: Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample based Truck Flows; CTDOT 2019 HPMS Bidirectional Combined Unit Truck AADTs

7.4 TRUCK PARKING DEMAND FORECAST

This assessment forecasts truck parking demand by the Year 2040 using bidirectional truck data from the Year 2019. The corridor segments for this analysis are located on state routes with a minimum truck AADT of 1,000 trucks per day (including both directions) with existing truck parking sites available. Thirty-four corridors were analyzed, as shown in **Figure 7.10** and listed in **Table 7.3**.

Figure 7.10: Truck Parking Analysis Corridors for Demand Forecasting



Source: CTDOT Highways GIS Data; CTDOT 2019 HPMS Bidirectional Combined Unit Truck AADTs

Table 7.3: Truck Parking Analysis Corridors for Demand Forecasting

Seg. #	Segment Name	Seg. #	Segment Name	Seg. #	Segment Name
1-1	I-95 between NY/CT Border and US 7	2-7	I-84 between I-91 / US 44 and I-384	8-1	US 5 between I-691 and SR 9
1-2	I-95 between US 7 and SR 8	2-8	I-84 between I-384 and CT/MA Border	8-2	US 5 between SR 9 and I-91
1-3	I-95 between SR 8 and I-91	3-1	I-91 between I-95 and I-691	9-1	I-691 EB between I-84 and I-91
1-4	I-95 between I-91 and SR 9	3-2	I-91 between I-691 and SR 9	10-1	SR 9 between I-95 and I-91
1-5	I-95 between SR 9 and I-395	3-3	I-91 between SR 9 and US 5 / I-84	10-2	SR 9 between I-91 and US 5
1-6	I-95 between I-395 and CT/RI Border	3-4	I-91 between US 5 / I-84 and CT/MA Border	10-3	SR 9 between US 5 and I-84
2-1	I-84 between NY/CT Border and US 7	4-1	I-395 between I-95 and SR 2	11-1	SR 2 between I-395 and I-84
2-2	I-84 between US 7 and SR 25	4-2	I-395 between SR 2 and CT/MA Border	12-1	I-384 between I-84 and US 6
2-3	I-84 between SR 25 and SR 8	5-1	US 7 between I-95 and I-84	13-1	US 6 east of I-384
2-4	I-84 between SR 8 and I-691	6-1	SR 25 between SR 8 and I-84	14-1	US 44 WB between I-84 / I-91 and US 202
2-5	I-84 between I-691 and SR 9	7-1	SR 8 between I-95 and I-84		
2-6	I-84 between SR 9 and I-91 / US 4	7-2	SR 8 north of I-84		

Source: CTDOT Highways GIS Data; CTDOT 2019 HPMS Bi-directional Combined Unit Truck AADTs

In 2019, the supply of truck parking spaces was 1,224 spaces and bi-directional truck AADT estimated a demand of 700 truck parking spaces in the peak hour along the study corridor segments. By 2040, the demand for truck parking is estimated to increase to 829 spaces in the peak hour, representing an 18-percent increase in demand. Just over 70 percent of the existing (2019) statewide truck parking demand is overnight parking and about 30 percent is short-term parking. These shares are expected to remain similar through 2040. Comparing this to the supply of 1,226 spaces, the state seems to have reserve parking capacity, although utilization or availability of supply may vary by corridor.

Figure 7.11 and **Figure 7.12** show normalized truck parking demand estimates by corridor segment for peak hour in 2019 and 2040. Normalization is dividing the corridor segment demand by its length (in miles), this was done so that demand for corridor segments of varying lengths are comparable. Major 2019 truck parking demand corridor segments are:

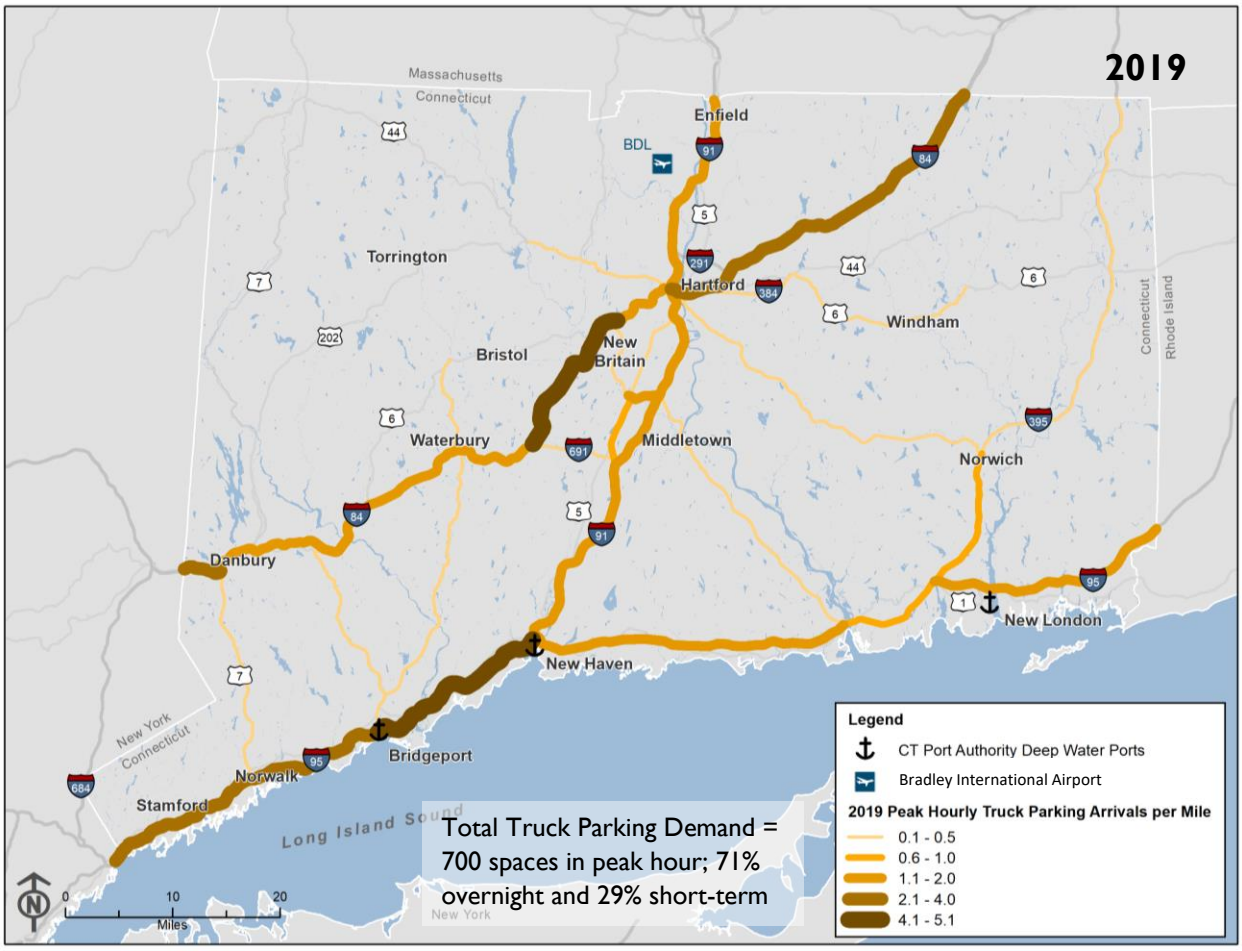
- I-95 between CT/NY border and New Haven
- I-84 west of Danbury, from I-691 to SR 9
- I-84 east of Hartford to CT/MA border

The percentage change in demand mostly follows the base year demand pattern. The corridor segments with the highest 2019–2040 percentage demand growth are also the corridor segments with the highest 2019 demand, which are listed above.

Corridor segments with noticeable truck parking demand increase from 2019 to 2040 are:

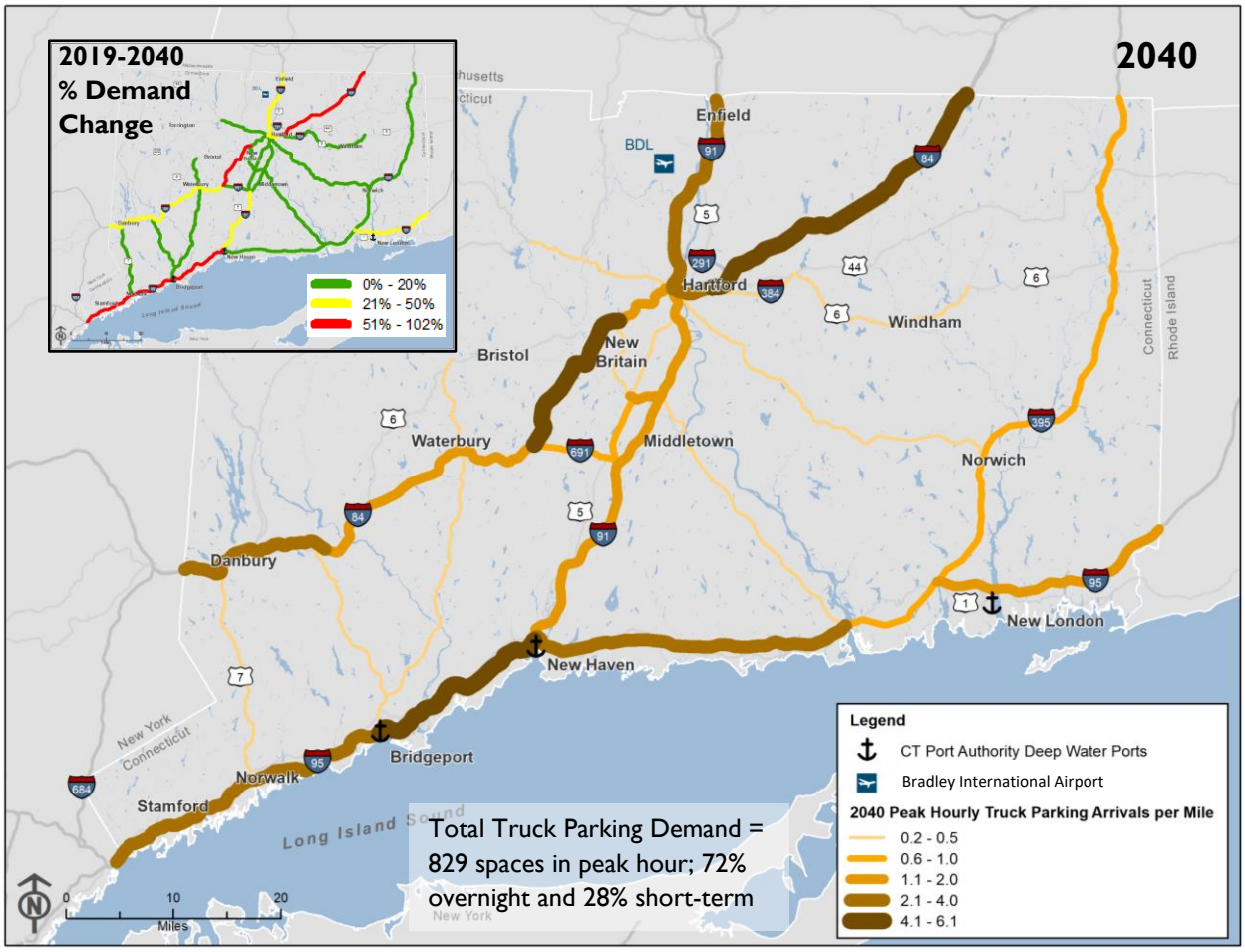
- I-95 between New Haven and SR 9
- I-84 east of Danbury
- I-91 north of Hartford

Figure 7.11: 2019 Truck Parking Demand on Analysis Corridors



Source: CTDOT Highways GIS Data; CTDOT 2019 HPMS Bi-directional Combined Unit Truck AADTs; CTDOT Travel Demand Model (TDM): base year (2016); CTDOT TRANSEARCH truck-based commodity flows origin-destination database; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample-Based Truck Flows.

Figure 7.12: 2040 Truck Parking Demand on Analysis Corridors



Source: CTDOT Highways GIS Data; CTDOT 2019 HPMS Bidirectional Combined Unit Truck AADTs; CTDOT Travel Demand Model (TDM): base year (2016) and forecast year (2040); CTDOT TRANSEARCH truck-based commodity flows origin-destination database; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample based Truck Flows. Note: The inset in 2040 map is showing the percent change in 2019–2040 truck parking demand growth. Red = more than 50-percent change in demand; Yellow = 21- to 50-percent change in demand; and Green = less than 20-percent change in demand.

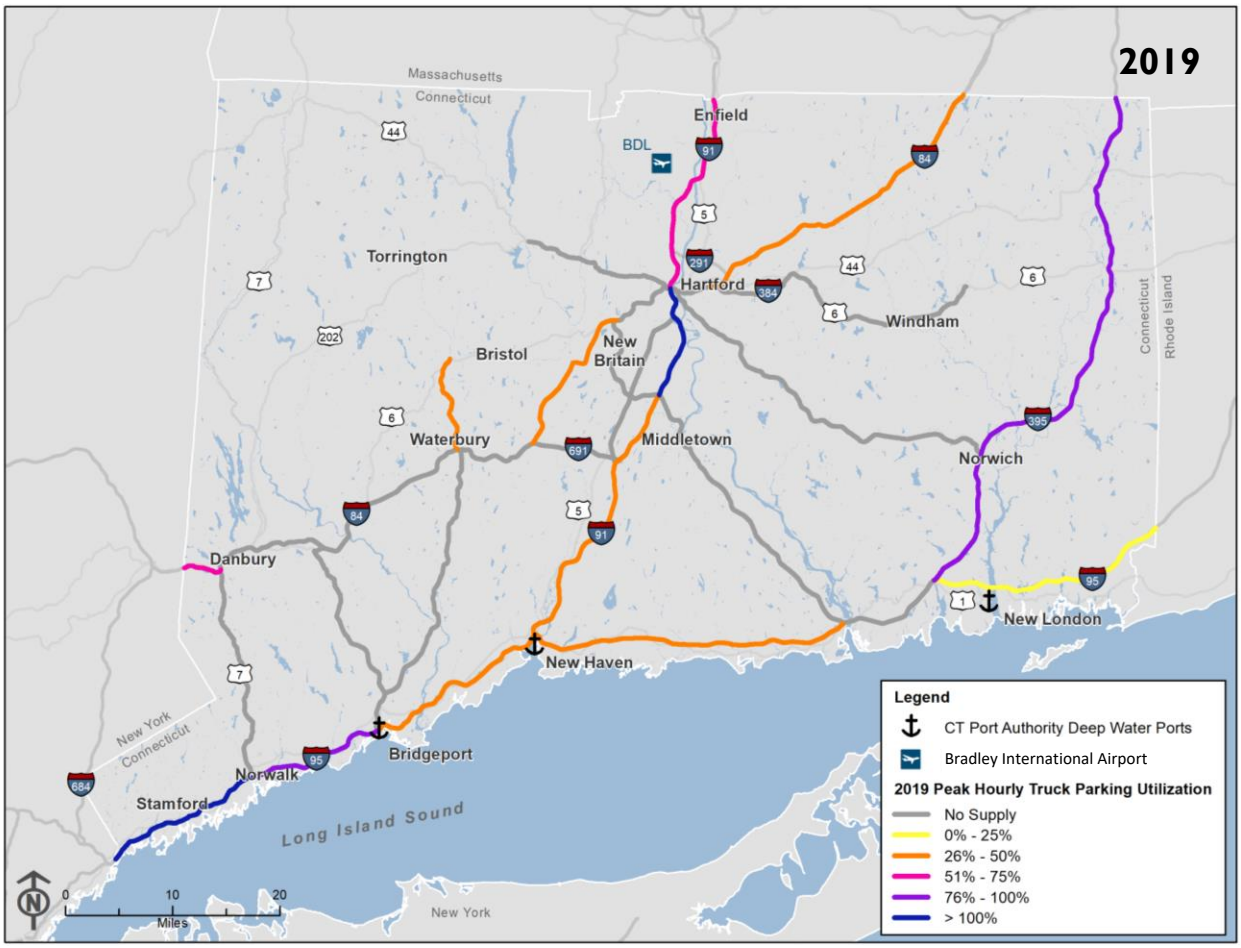
The assessment also analyzed truck parking utilization for 2019 and 2040 (**Figure 7.13** and **Figure** 7.14 respectively). For 2019, corridor segments with a high truck parking utilization are:

- I-95 west of Bridgeport to CT/NY border
- I-91 north of SR 9 (Middletown) to south of I-84 (Hartford)
- I-395 north of I-95

Corridors that are forecasted to have a larger increase in truck parking utilization from 2019 to 2040 are:

- I-95 east of New Haven to SR 9
- I-91 north of New Haven to SR 9 (Middletown)
- I-84 from I-691 to SR 9 and east of Hartford to CT/MA border

Figure 7.13: 2019 Truck Parking Utilization on Analysis Corridors



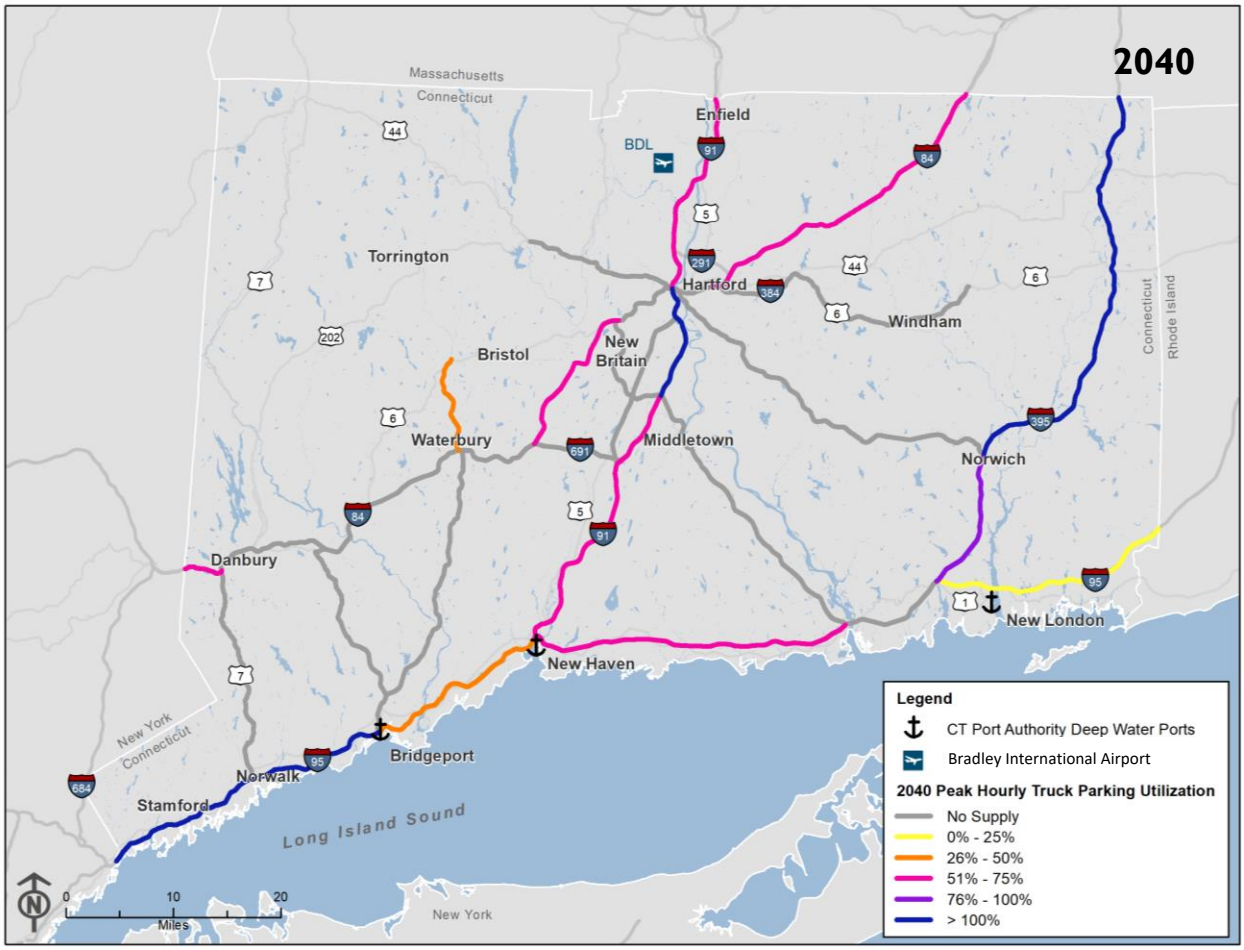
Source: CTDOT Highways GIS Data; CTDOT 2019 HPMS Bidirectional Combined Unit Truck AADTs; CTDOT Travel Demand Model (TDM): base year (2016); CTDOT TRANSEARCH truck-based commodity flows origin-destination database; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample-Based Truck Flows

Along some corridor segments forecasted to have high truck parking demand in 2040 (**Figure 7.12**), there is presently no truck parking available (**Figure 7.14**). These include:

- I-84 from Danbury to I-691
- SR 9 to Hartford
- I-691 from I-84 to I-91
- SR 9 from US 5 to I-91
- US 5 from I-691 to SR 9

The lack of truck parking supply on portions of I-84 between Danbury and I-691 likely increases the truck parking demand near Danbury and I-84/I-691 interchange and may result in undesignated parking along I-84. This could be exacerbated by 2040.

Figure 7.14: 2040 Truck Parking Utilization on Analysis Corridors

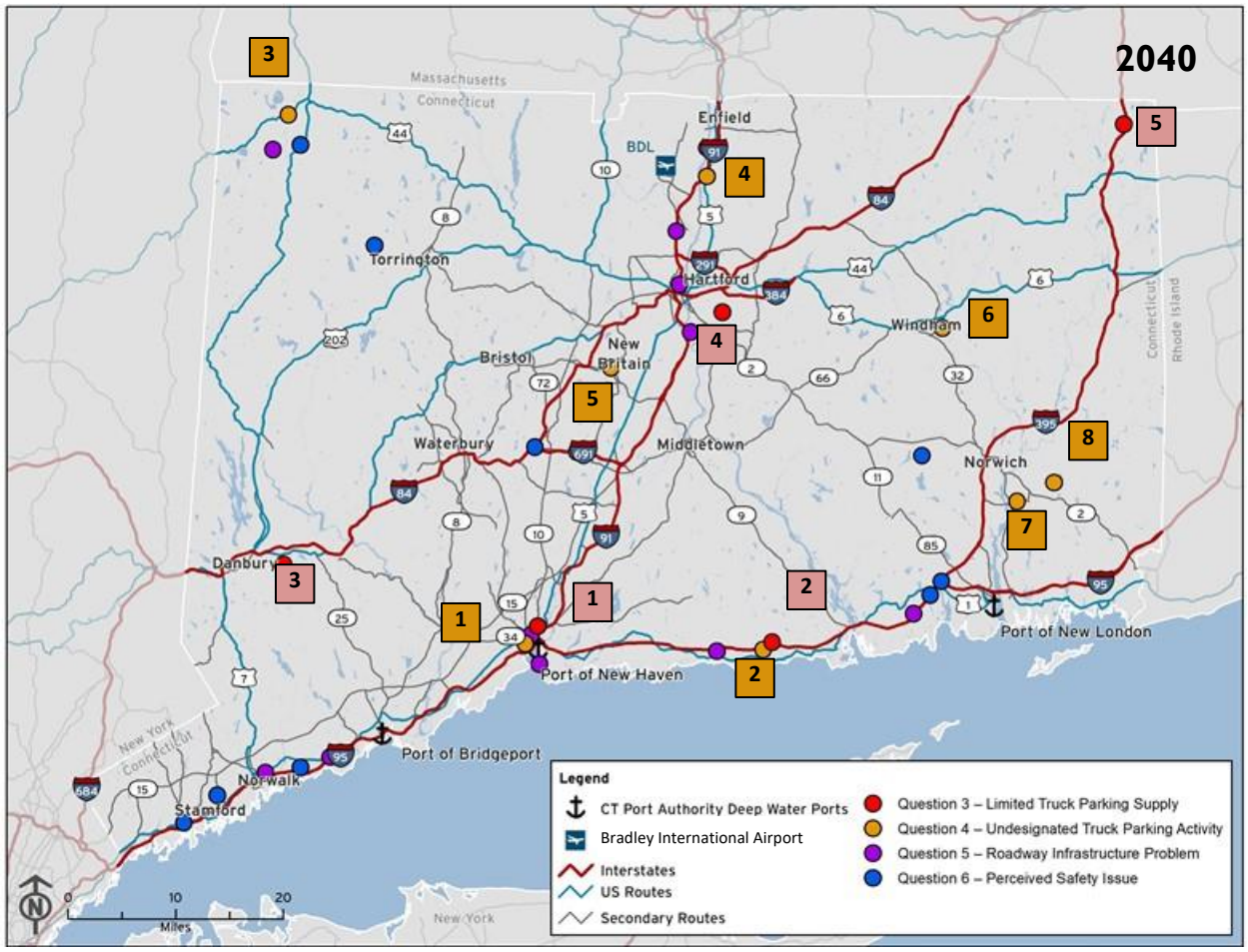


Source: CTDOT Highways GIS Data; CTDOT 2019 HPMS Bidirectional Combined Unit Truck AADTs; CTDOT Travel Demand Model (TDM): base year (2016) and forecast year (2040); CTDOT TRANSEARCH truck-based commodity flows origin-destination database; ATRI 2019 Truck Parking Events Sample; ATRI 2019 Truck GPS Sample-Based Truck Flows

7.5 STAKEHOLDER (TRUCK DRIVER) INPUTS

CTDOT conducted an online truck driver survey via the Connecticut Motor Transport Association. This survey requested feedback on freight issues related to enforcement, truck parking, and truck movement constraints. Truck drivers provided input on locations of limited truck parking supply and undesignated truck parking activity (locations identified in **Chapter 9** on **Figure 9.2**). The survey respondents used an online mapping feature to provide input, shown in **Figure 7.15**. The locations marked on the map are approximate.

Figure 7.15: Truck Driver Inputs on Freight Issues (including Truck Parking)



Source: CTDOT's 2021 Online Truck Driver Survey

Based on the survey, the truck drivers perceived two types of truck parking issues and identified a limited number of locations for each of the issues as follows:

- Type A: Limited truck parking supply (red circles in the map):
  - Location #1: near to and north of I-91/I-95 interchange
  - Location #2: west of I-95/SR 9 interchange
  - Location #3: on I-84 near Danbury
  - Location #4: southwest of Hartford
  - Location #5: on I-395 close to CT/MA border

- Type B: Undesignated truck parking activity (orange circles in the map):
  - Location #1: near to and west of I-95/I-91 interchange
  - Location #2: west of I-95/SR 9 interchange
  - Location #3: on US 44 near CT/MA border
  - Location #4: on I-91 between Hartford and Enfield
  - Location #5: along I-84 and in the vicinity of New Britain
  - Location #6: along US 6 and in the vicinity of Windham
  - Locations #7 and #8: along SR 2 southeast of Norwich

The findings of the truck driver survey were compared with the findings of the truck parking demand and utilization analysis. When comparing the truck driver's responses for 'Type A' issues with the truck parking supply and demand assessment, truck driver responses validate the gaps found in the corridor-based assessment. 'Type A' issue locations #1, #2 and #3 have nearby existing truck supply locations. There is the possibility to expand nearby existing sites to overcome the limited supply. 'Type A' issue locations #4 and #5, on the other hand, do not have nearby existing truck supply locations, so the possibility to provide new sites should be explored.

'Type B' issue (the undesignated truck parking activity) is seen at locations mostly beyond the analysis corridor segments used in the truck parking supply and demand assessment. Hence, this complements the supply and demand assessment by identifying the locations of on-street truck parking violations or the presence of informal truck parking lots. Because of the fluidity with such demand, a formal demand analysis may not be useful. However, we are documenting this unmet need for truck parking.

While some of these locations identified by the survey respondents are consistent with the truck parking and utilization analysis, there are additional locations identified in the survey both on and off of the study corridor segments:[53]

- I-91 north of Hartford
- Near southeast Hartford, New Britain, Norwich and Windham
- US 44 in northwestern part of the State

Locations that are consistent between the survey data and the truck parking demand and utilization analysis are:

- I-95/I-91 junction near New Haven – although there are no supply sites at this exact location, demand on corridors approaching this location are high and utilization is growing
- I-95 NB and SB Madison Service Plazas
- US 395 between SR 2 and CT/MA Border – corridor level utilization analysis showed a high utilization (due to low supply) and increasing utilization into the future

7.6 EXISTING AND FUTURE NEEDS

The truck parking supply and demand assessment identified different aspects of truck parking needs for Connecticut, as shown in **Table 7.4**:

[53] Further study is needed to confirm locations identified during the truck driver survey

Table 7.4: Truck Parking Needs for Connecticut

Need Category	Description	Identification Method	Locations
Non-uniform and/or non-existent supply	HOS regulations require all trucks on the national transportation network to take breaks at regular time intervals. This generally implies the need for a uniform distribution of truck parking supply, and, in special cases, concentrated supply at discrete distances from major freight generators. In meeting the HOS regulations, long road segments of no truck parking supply (that is, large spacing between consecutive truck parking supply locations on a corridor) imply either operational inefficiencies for truckers who park in designated places ahead of the 'no supply' segment and their time limit or safety issues for truckers who park in undesignated places (ramps, cross-streets, etc.) along the 'no supply' segment. In Connecticut, both issues are seen and further confirmed by truck driver inputs.	Visual evidence and supply statistics by corridor and stakeholder (truck driver) inputs were used to identify this need.	**Non-uniform supply corridors:** I-84, I-91 and I-395 **No supply corridors (with demand ≥ 10 peak arrivals on average day):** ▪ Segment 2-2: I-84 between US 7 and SR 25 ▪ Segment 2-3: I-84 between SR 25 and SR 8 ▪ Segment 2-4: I-84 between SR 8 and I-691 ▪ Segment 2-6: I-84 between SR 9 and I-91 / US 44 **Truck driver identified limited truck parking supply ('Type A') issue locations with nearby existing supply:** ▪ Location #1: near to and north of I-91/I-95 Interchange ▪ Location #2: Location west of I-95/SR 9 interchange ▪ Location #3: on I-84 near Danbury **Truck driver identified limited truck parking supply ('Type A') issue locations without nearby existing supply:** ▪ Location #4: southwest of Hartford ▪ Location #5: on I-395 close to CT/MA border
Current supply shortfall at supply locations	When peak hourly truck arrivals to parking supply locations approach or exceed the supply in spaces, some of the arriving trucks are denied parking. This is due to any residual trucks parked in the hour prior to the peak hour, or the lack of information on the turnover and availability of a space, or the competition from other truckers who may approach the same empty space. A truck supply location facing a shortfall thus has reached an operational capacity. Some of the truck parking sites in the State are facing a supply shortfall.	Truck parking supply locations with high truck parking utilization in a peak hour (more than 75 percent) or high undesignated truck parking (more than 20 percent) were used to identify this need.	**High-utilization and high-undesignated parking sites:** ▪ Site #2: I-95 NB Darien Service Plaza between Stamford and Norwalk (close to NY/CT border) ▪ Site #13: I-84 EB Southington Rest Area near I-84/I-691 interchange ▪ Site #14: I-84 EB West Willington Rest Area **High-utilization and low-undesignated parking sites:** ▪ Site #1: I-95 SB Darien Service Plaza between Stamford and Norwalk (close to NY/CT border) **Low-utilization and high-undesignated parking sites:** ▪ Site #10: I-95 NB Madison Service Plaza along I-95 east of New Haven

Need Category	Description	Identification Method	Locations
Underutilized supply locations	The cost of developing a new truck parking is high. Urban areas hold a majority of freight generators but competing land uses make new developments for truck parking here difficult to implement. Given this, there is a need to maximize utilization of existing large truck parking sites and truck parking supply locations in urban areas. This is not being achieved at some supply locations in the state.	Truck parking supply locations with underutilization (below 25%) was used to identify this need.	**Less utilized truck parking sites:** ▪ Site #11: I-95 SB North Stonington Welcome Center ▪ Site #22: Pilot Travel Center #882 (On I-95 close to CT/RI border) ▪ Site #27: Pride Hartford Truck Stop (On I-91 in Hartford urban area)
Future supply shortfall on corridor basis	On a corridor basis, future high utilization on some corridors is seen in the State, which is indicative that the existing designated truck parking supply in these corridors is likely to be overrun by projected demand. This may also result in a spillover truck parking demand to nearby corridors.	Truck parking analysis corridors with high utilization (more than 75 percent) and major growth in utilization (currently less than 50 percent to future above 50 percent) was used to identify this need.	**High-future-utilization corridors:** ▪ Segment 1-1: I-95 between NY/CT Border and US 7 ▪ Segment 1-2: I-95 between US 7 and SR 8 ▪ Segment 3-3: I-91 between SR 9 and US 5 / I-84 ▪ Segment 4-1: I-395 between I-95 and SR 2 ▪ Segment 4-2: I-395 between SR 2 and CT/MA Border **Major growth in utilization corridors:** ▪ Segment 1-4: I-95 between I-91 and SR 9 ▪ Segment 2-5: I-84 between I-691 and SR 9 ▪ Segment 2-8: I-84 between I-384 and CT/MA Border ▪ Segment 3-1: I-91 between I-95 and I-691

Need Category	Description	Identification Method	Locations
Inadequate amenities supporting overnight parking truck drivers[1]	While overnight parking appears to be present at all supply locations in the state, only few of them have services essential to truck drivers performing overnight parking, which include showers and laundry. Truck wash sites are also limited in the State.	Availability of showers, laundry and truck wash amenities by corridor was used to identify this need.	**Showers – present only on the following segments, absent on others:** ▪ Segment 1-3: I-95 between SR 8 and I-91 ▪ Segment 1-6: I-95 between I-395 and CT/RI Border **Laundry – present only on the following segments, absent on others:** ▪ Segment 1-3: I-95 between SR 8 and I-91 ▪ Segment 1-4: I-95 between I-91 and SR 9 ▪ Segment 1-6: I-95 between I-395 and CT/RI Border ▪ Segment 2-5: I-84 between I-691 and SR 9 ▪ Segment 2-8: I-84 between I-384 and CT/MA Border ▪ Segment 3-4: I-91 between US 5 / I-84 and CT/MA Border **Truck Wash – present only on the following segments, absent on others:** ▪ Segment 1-3: I-95 between SR 8 and I-91 ▪ Segment 1-6: I-95 between I-395 and CT/RI Border
Undesignated truck parking activities away from supply locations	Truck drivers have identified locations where undesignated truck parking activities are seen to occur in the state. These may represent on-street truck parking violations or informal truck parking lots.	Stakeholder (truck driver) inputs were used to identify this need.	**Truck driver identified undesignated truck parking activities ('Type B') issue locations:** ▪ Location #1: near to and west of I-95/I-91 Interchange ▪ Location #2: west of I-95/SR 9 interchange ▪ Location #3 on US 44 near CT/MA border ▪ Location #4: on I-91 between Hartford and Enfield ▪ Location #5: along I-84 and in the vicinity of New Britain ▪ Location #6: along US 6 and in the vicinity of Windham ▪ Locations #7 & #8: along SR 2 southeast of Norwich

Note: In the truck parking supply and demand assessment, utilization is defined as the ratio of the demand in peak hourly parking arrivals to supply in parking spaces and undesignated truck parking identification is limited to public on-freeway facilities. Truck driver inputs are not limited to the truck parking supply locations or the analysis corridors used in the truck parking supply and demand assessment.

[1]Base (2019) and updated (2021) Jason's Law databases; Connecticut Statewide Rest Area and Service Plaza website; AllStays.com Pro Account trucker information website. Note: Starred (*): For 2 supply locations, the overnight parking amenity was verified based on the source, and for the remaining 26 supply locations, this amenity was verified based on overnight use seen in 2019 ATRI Truck Parking Events data.

7.7 NEXT STEPS

The Connecticut Statewide Truck Parking Study is anticipated to be completed in Spring 2023. The study will include the information presented in this chapter as well as the following additional analyses:

- Compile truck parking need locations based on supply-demand assessment.
- Conduct CTDOT right-of-way analysis to identify opportunities to expand existing truck parking sites or develop new truck parking sites.
- Develop conceptual designs for some truck parking sites.

7.8 RECOMMENDATIONS

The following are identified as potential recommendations beyond the performance period of the truck parking study, some of which may be covered through the upcoming truck parking information system for real time dissemination pilot study by University of Connecticut and the Department of Motor Vehicles.

- CTDOT will continue to coordinate with the private sector to provide adequate and safe truck parking facilities and rest facilities for commercial motor vehicles in Connecticut.
- CTDOT will continue to coordinate with the University of Connecticut in the development of the truck parking ITS study.
- Use already collected ATRI data to develop information for use in designing truck parking facilities, e.g., 85th percentile peak demand in terms of occupancy. This can be done by analyzing all days of ATRI data and selecting the day with 85th percentile value of daily total truck arrivals. On this day, build temporal patterns for occupancy (net of arrivals minus departure) starting from a near-empty occupancy hour. Estimate departures from truck parking sites by superimposing the truck parking arrivals and dwell time patterns by arrival hour, and derive the occupancy by hour.
- Expand undesignated truck parking analysis to understand related issues and identify strategies to address those issues, especially, if there are safety, pollution or other community concerns.
- Develop truck parking related safety analysis by developing statewide crash information that isolates crashes from all truck-involved crashes with the following two characteristics: (a) crashes with parked trucks, and (b) crashes due to truck driver fatigue.
- Monitor growth in state truck parking demand and compare to the growth projected by CTDOT TRANSEARCH truck-based freight projections and FHWA truck parking demand methodology.

8. Condition and Performance of Connecticut's Freight System

Evaluating freight network condition and performance is an important step in any freight planning process. Aging infrastructure affects all freight modes and funding for maintenance and improvements will continue to be a concern. Assessing the freight system's condition and performance helps inform and focus future investment strategies. This chapter summarizes the condition and performance for the freight modes in Connecticut.

8.1 Highway System

8.1.1 Pavement Condition

CTDOT collects and reports on pavement condition primarily via the International Roughness Index (IRI) metric. IRI is an established indicator of pavement condition as experienced by road users. IRI describes how much vertical movement (in inches) a standard passenger vehicle would experience over 1 mile of pavement at 50 miles per hour. CTDOT has adopted the following qualitative ratings for IRI:

- Good condition – Less than 95 inches per mile
- Acceptable condition – 95 to 170 inches per mile
- Poor condition – More than 170 inches per mile

The condition of roads maintained by CTDOT has steadily improved since 2011 (**Figure 8.1**). As of 2020, the ride quality on 90 percent of Connecticut's National Highway System (NHS) routes was in acceptable or better condition, up from 77 percent in 2011. For all state-maintained routes, acceptable ride quality rose from 69 percent of the network in 2011 to 83 percent in 2020.

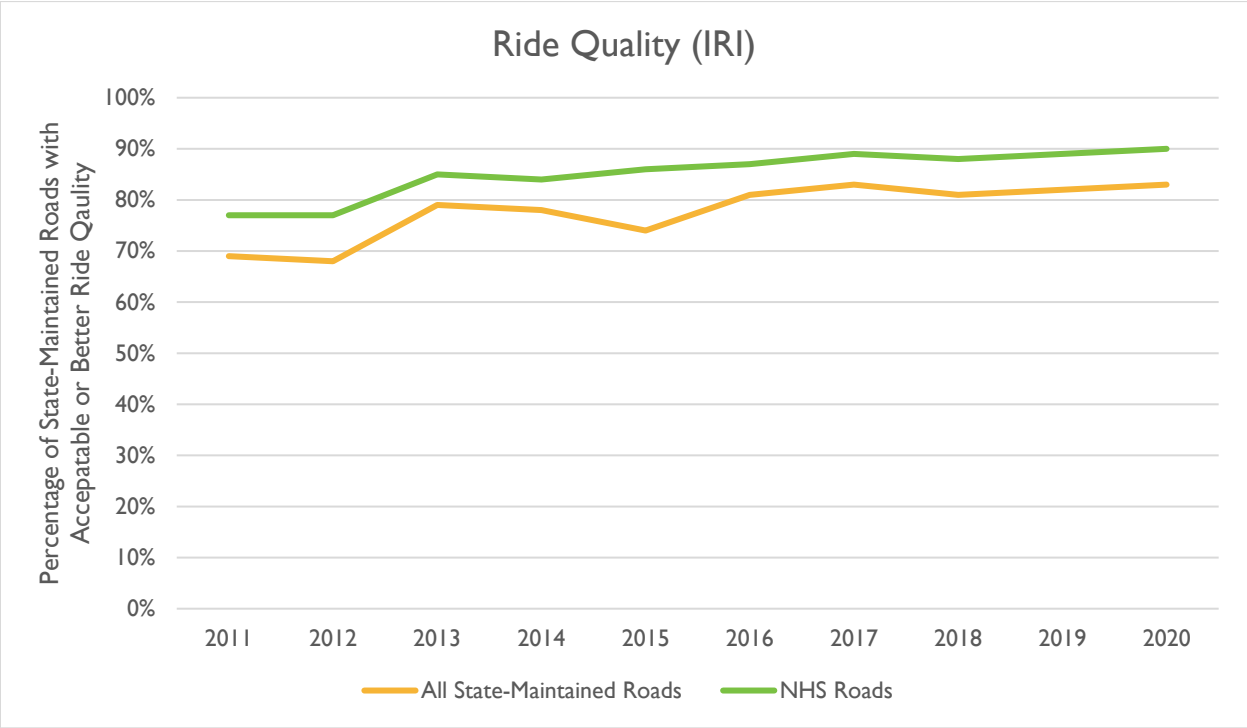
Ride Quality

Ride quality measures the roughness of the pavement asyou drive over it. In the future,CTDOT will report additional measures that address factors like structural integrity.

NHS routes have been identified by USDOT as critical to the nation's economy, defense, and mobility.[54] Hence, they typically carry more traffic and are prioritized for maintenance funding. **Figure 8.2** shows 2020 IRI ratings on all NHS routes in Connecticut. Poor condition pavement is concentrated in Connecticut's metro areas (e.g., Hartford, Bridgeport, Stamford, Waterbury) and along the I-95 corridor from the New York line to New Haven.

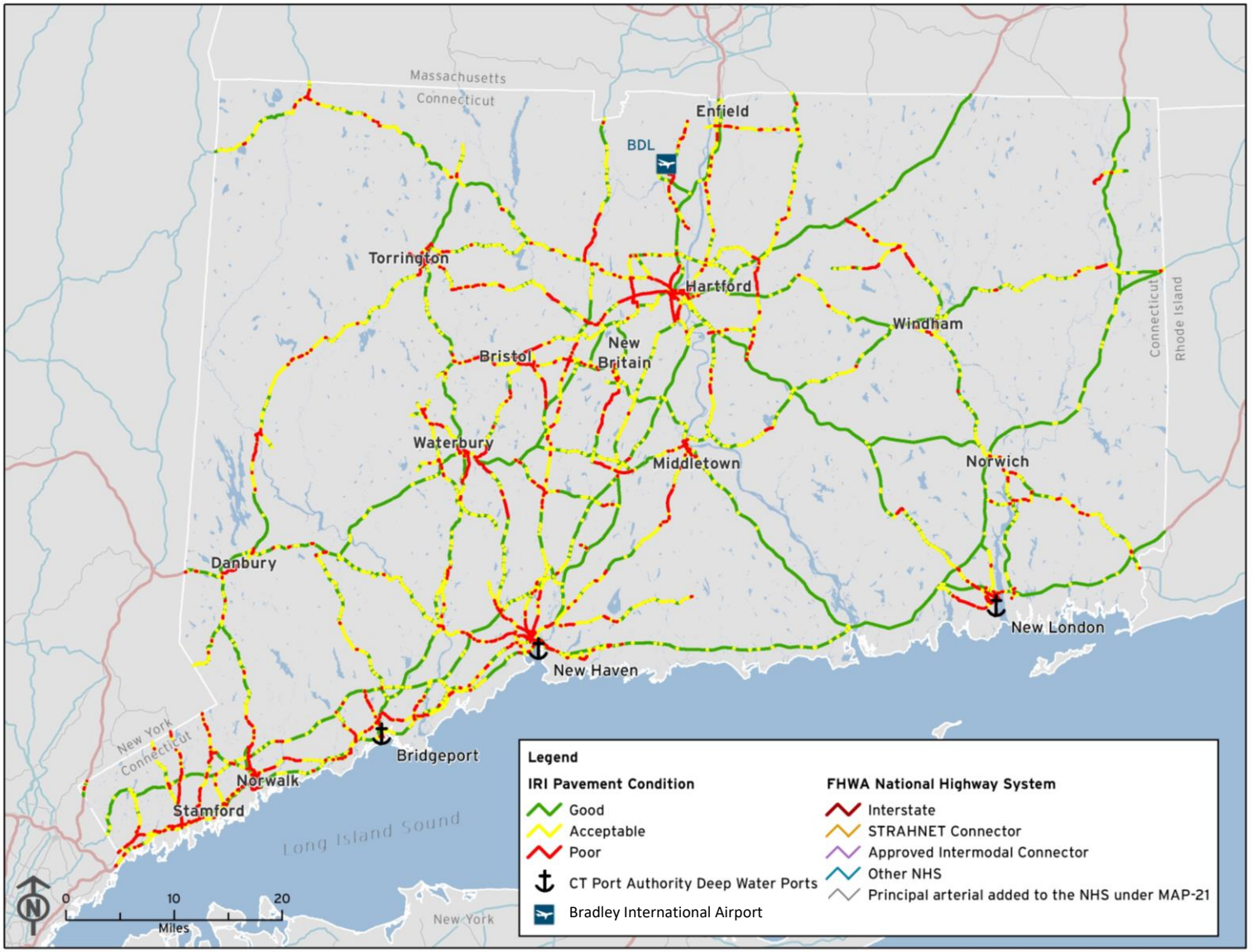
[54] https://www.fhwa.dot.gov/planning/national_highway_system/.

Figure 8.1: Ride Quality of CTDOT-Maintained Roads (2011–2020)



Source: Connecticut Department of Transportation

Figure 8.2: Connecticut National Highway System Pavement Condition (2020)



Source: CTDOT Open Data Portal, accessed March 2022

Table 8.1 provides NHS miles in poor condition by county and functional classification. Hartford, New Haven, and Fairfield counties account for 76 percent of total NHS mileage in poor condition, statewide. Poor pavement condition on higher classification routes (i.e., Interstates or other freeways/expressways) may be of particular concern given the commerce such routes facilitate. Only 10 percent of poor condition NHS mileage is on those higher classification routes (38 miles of a total 383 miles).

Table 8.1: Connecticut National Highway System Miles in Poor Condition by County (2020)

County	Functional Classification	NHS Miles in Poor Condition
Fairfield	Interstate	7.89
	Other Freeway and Expressway	3.39
	Other Principal Arterial	71.30
Fairfield Total		*82.58*
Hartford	Interstate	6.05
	Other Freeway and Expressway	6.71
	Other Principal Arterial	107.34
Hartford Total		*120.11*
Litchfield	Other Freeway and Expressway	0.99
	Other Principal Arterial	34.88
Litchfield Total		*35.87*
Middlesex	Other Freeway and Expressway	1.14
	Other Principal Arterial	14.70
Middlesex Total		*15.84*
New Haven	Interstate	4.32
	Other Freeway and Expressway	5.08
	Other Principal Arterial	78.00
New Haven Total		*87.39*
New London	Interstate	1.17
	Other Freeway and Expressway	1.05
	Other Principal Arterial	20.57
New London Total		*22.79*
Tolland	Interstate	0.40
	Other Freeway and Expressway	0.21
	Other Principal Arterial	11.70
Tolland Total		*12.31*
Windham	Other Principal Arterial	6.55
Windham Total		*6.55*
Grand Total		**383.45**

** Route miles are bidirectional. Source: CTDOT Open Data Portal, accessed March 2022*

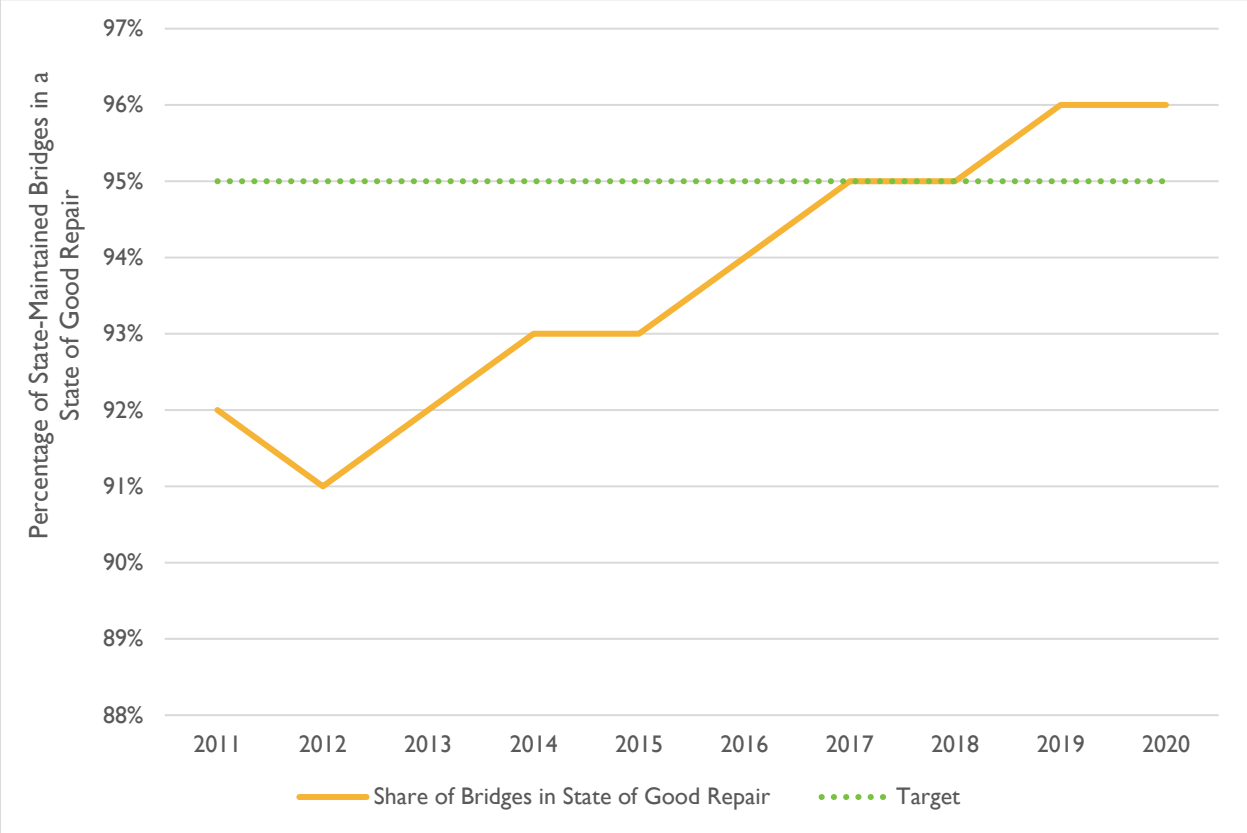
8.1.2 Bridge Condition

CTDOT periodically inspects its bridges and assigns condition ratings for each major bridge component (deck, substructure, and superstructure). According to the CTDOT Performance Measures dashboard, the lowest rated component becomes the overall rating for the structure.[55] A rating of 5 or better is considered a state of good repair. The condition of Connecticut's bridges is on an upward-moving trend (**Figure 8.3**). Since 2011, the percentage of bridges in a state of good repair has increased from 92 percent to 96 percent, against a system wide goal of 95 percent. Connecticut achieved the 95 percent target benchmark in 2017.

Bridge Condition

CTDOT inspects its bridges thoroughly on a regular basis. These inspections produce ratings(National Bridge Inventory Condition Ratings) of many bridgecomponents, such as the deck andsubstructure. The lowest rating among the main components becomes the bridge's overall rating.

Figure 8.3: Percent of State Maintained Bridges in a State of Good Repair (2011–2020)



Source: CTDOT Open Data Portal, accessed February 2022

[55] CTDOT, Condition of CTDOT Roadway Bridges, retrieved February 8, 2022, from https://portal.ct.gov/DOT/Performance-Measures/Performance-Measures.

Figure 8.4 shows state-maintained bridges on the National Highway System in Connecticut that are in poor condition. Bridges with condition ratings of 4 or less are considered to be in poor condition.[56] This is an indicator that the bridge requires maintenance to continue operating at its present level of service. For freight, such bridges may deteriorate to the point where they must be posted for load, thus preventing trucks from using them. Poor condition bridges on Connecticut's Interstate highways may be of particular concern, given the volume of trucks such roads carry.

These bridges are listed in **Figure 8.4** and **Table 8.2**. Note, bridges on Route 15 from the New York line to Meriden are excluded from the map and table because trucks are prohibited on that road.

The Gold Star Memorial Bridge links I-95 over the Thames River between New London and Groton. According to a recent study, this section of I-95 accommodated 123,611 vehicles per day in 2019.[57] CTDOT has pursued discretionary grant funding for the bridge. The northbound span is slated for a rehabilitation project that will begin in the Spring of 2022.

8.1.3 Online Trucker Survey Results

An online survey was sent to truck industry and law enforcement agencies in Connecticut to solicit input on safety, truck parking, and congestion issue locations. Some areas of concern identified by respondents include the I-91 corridor near Hartford, the I-84 corridor near Plainville, and the I-95 corridor from Norwalk to Bridgeport.

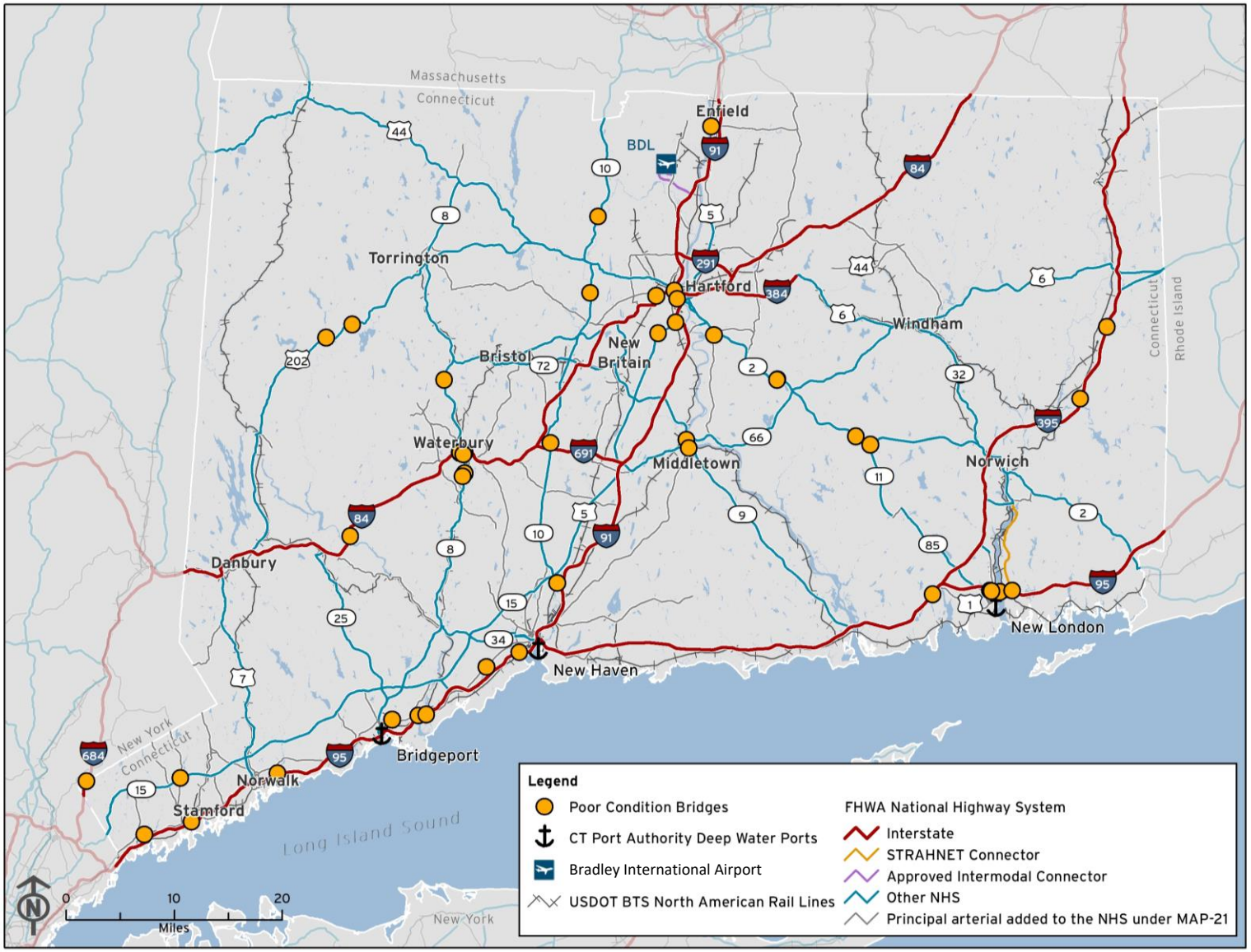
8.1.4 Truck Volume Analysis

It is important to assess truck volume trends since most freight is carried by trucks and the highway system is CTDOT's primary concern. This task used tabular Highway Performance Monitoring System (HPMS) data combined with geospatial data (CTDOT traffic counts and U.S. Census County Boundary Line files) to assess and visualize truck volumes. Truck traffic data are provided for 2015 to 2019 to get the most recent available data while excluding COVID-19 impacts. Trends are reported at state, county, and route levels, including growth and change in truck traffic relative to all traffic. Maps of 2019 truck volumes are also provided. Finally, CTDOT biannual weigh station reports are summarized to assess trends in the number of vehicles weighed, citations issued, and total fines for Connecticut's five weigh stations. Methodological details are provided in the **Appendix C – Truck Volume Analysis**.

[56] A poor condition rating does not necessarily mean a bridge is in danger of structural failure. CTDOT will not permit traffic to use an unsafe bridge.

[57] CTDOT, *Gold Star Memorial Bridge Groton-New London, Connecticut Northbound Bridge Multi-Use Path Draft Engineering Feasibility Study*, March 2021. Retrieved February 10, 2022, from https://portal.ct.gov/-/media/DOT/PLNG_STUDIES/Multi-Use-Lane-Study-With-Summary-Cover.

Figure 8.4: Connecticut National Highway System Poor Condition Bridges



Note: Bridges on Route 15 from New York line to Meriden are excluded. Source: CTDOT Open Data Portal, accessed February 2022

Table 8.2: Poor Condition Bridges on the National Highway System, by County

County	Town	Structure Number	Bridge Name	Facility Carried	Feature Crossed	Condition Ratings		
						Deck	Superstructure	Substructure
Fairfield	Stamford	00032		I-95 & I-95 Ramps	Metro North Railroad & Local Roads	Poor	Poor	Poor
Fairfield	Westport	00062		I-95	Route 33	Poor	Fair	Fair
New Haven	West Haven	00162		I-95	Metro North Railroad	Fair	Poor	Fair
New London	East Lyme	00250		I-95	Route 161	Poor	Fair	Satisfactory
New London	Griswold	00293		I-395	Bishop Crossing Road	Satisfactory	Poor	Satisfactory
Windham	Plainfield	00302		I-395	Moosup River & Route 14	Poor	Fair	Satisfactory
Fairfield	Bridgeport	00325		US Route 1	Yellow Mill Channel	Not Applicable	Serious	Serious
Fairfield	Stratford	00326		US Route 1	Metro North Railroad	Poor	Satisfactory	Fair
New Haven	Milford	00327	Devon Bridge	US Route 1	Housatonic River	Poor	Poor	Fair
Hartford	Glastonbury	00388		Route 17 Northbound	Route 17 Southbound Ramp 007	Poor	Good	Good
Hartford	Wethersfield	00448		Route 15 Southbound	Route 314 - Berlin Turnpike	Good	Poor	Satisfactory
Hartford	Southington	00518		Route 10	Route 322	Good	Poor	Satisfactory
Middlesex	Middletown	00524	Arrigoni Bridge	Route 66	P&W Railroad, Routh 9, Conn River	Poor	Poor	Poor
Middlesex	Middletown	00638		Route 9	P&W Railroad & Union Street	Good	Poor	Good
Hartford	Simsbury	00653		Route 10	Hop Brook	Poor	Serious	Fair
Hartford	Wethersfield	00811		Route 15 & US 5	P&W Railroad & Hartford Avenue	Satisfactory	Poor	Satisfactory
Litchfield	Washington	00906		US Route 202	Shepaug River	Poor	Fair	Satisfactory
New London	Franklin	00935		Route 32	New England Central Railroad	Satisfactory	Poor	Satisfactory
Fairfield	Newtown	01218	Rochambeau Bridge	I-84 Eastbound & Westbound	Houstanic River	Fair	Poor	Satisfactory
Fairfield	Stamford	01350		Route 137	Rippowam River	Satisfactory	Poor	Fair
Hartford	Marlborough	01708		Route 2 Eastbound	West Road	Satisfactory	Poor	Satisfactory

County	Town	Structure Number	Bridge Name	Facility Carried	Feature Crossed	Condition Ratings		
						Deck	Superstructure	Substructure
Litchfield	Thomaston	01729		Route 8 Southbound	Reynolds Bridge Road	Poor	Satisfactory	Satisfactory
New London	Groton	01771		I-95 SB	Route 12	Satisfactory	Poor	Satisfactory
Fairfield	Greenwich	01872		US Route 1	Greenwich Creek	Fair	Serious	Satisfactory
New Haven	Orange	01882		US Route 1	Silver Brook	Fair	Serious	Poor
Hartford	Avon	02112		Route 10	Brook	Fair	Fair	Poor
Litchfield	Litchfield	02231		US Route 202	Still Brook	Satisfactory	Poor	Fair
New London	New London	02572		US Route 1 Northbound	I-95 Ramp 310, SR 641 Southbound	Satisfactory	Poor	Good
New London	New London	02833		Route 32 Northbound	I-95, US 1 NB, SR 623 & 641	Fair	Poor	Satisfactory
New Haven	Waterbury	03176		Route 8 Southbound	Naugatuck River-Local Roads	Satisfactory	Poor	Satisfactory
New Haven	Waterbury	03179		Route 8 Northbound	Metro North Railroad	Fair	Poor	Fair
Hartford	Suffield	03295	Enfield-Suffield Veteran's Bridge	Route 190	Conn River & Amtrak Railroad	Satisfactory	Poor	Satisfactory
Hartford	Marlborough	03374		Route 2 Westbound	West Road	Satisfactory	Serious	Satisfactory
New London	Colchester	03390		Route 2 Eastbound	Wall Street	Satisfactory	Poor	Satisfactory
New London	Colchester	03396		Route 2 Eastbound	Route 85	Satisfactory	Poor	Fair
New Haven	North Haven	03410		Route 40 Southbound	Amtrak Railroad	Poor	Fair	Satisfactory
Fairfield	Greenwich	03514		I-684 Northbound	Byram River	Poor	Poor	Fair
New London	New London	03819	Gold Star Memorial Bridge	I-95 Northbound	Thames River, Railroad, Local Roads	Poor	Poor	Fair
Hartford	Hartford	01469B	Dutch Point Viaduct	I-91 Southbound	CSO Railroad, SR 598 Westbound & TR803	Poor	Fair	Fair

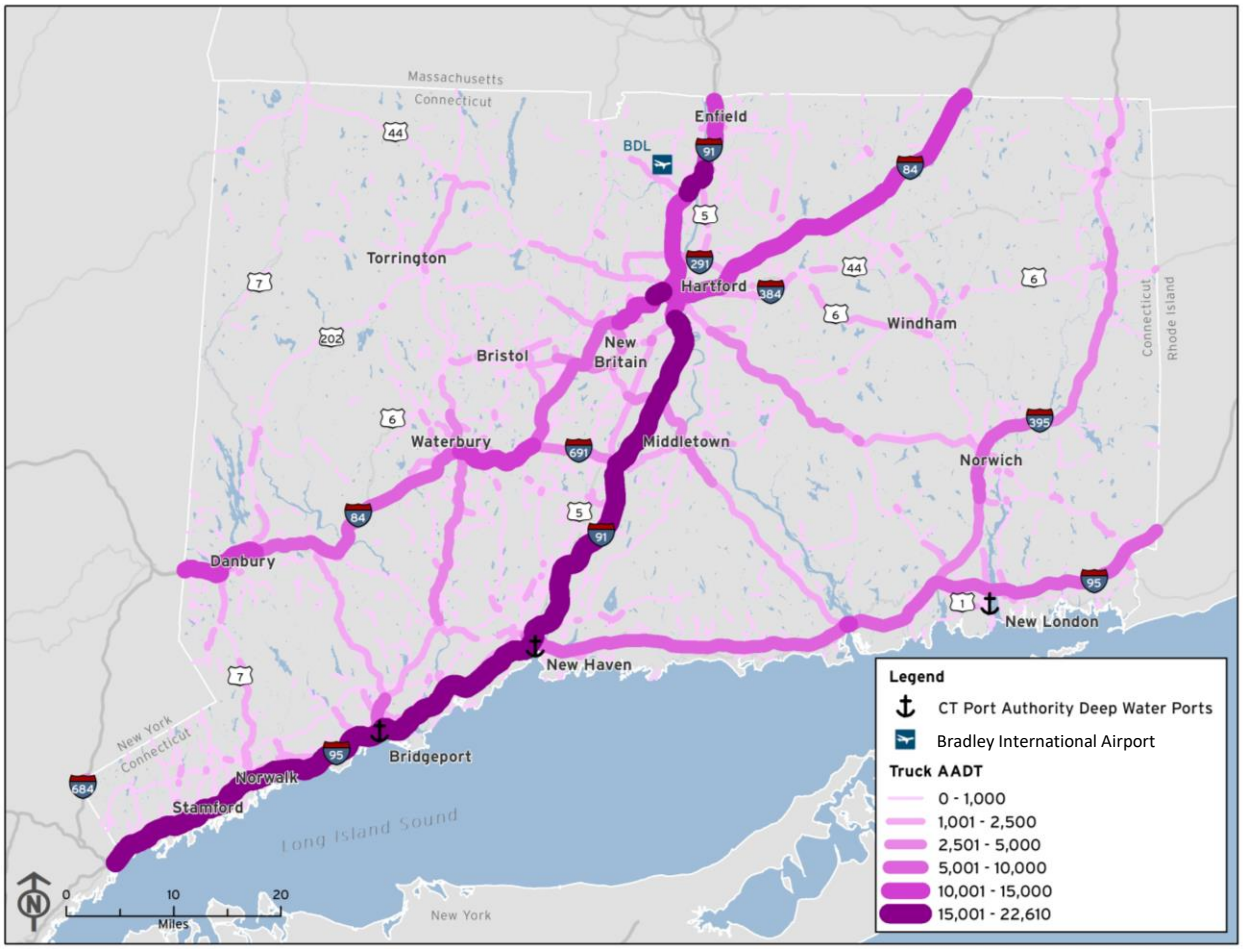
County	Town	Structure Number	Bridge Name	Facility Carried	Feature Crossed	Condition Ratings		
						Deck	Superstructure	Substructure
Hartford	Hartford	01686B		I-84 TR 825	US Route 44 Eastbound & Columbus BD	Poor	Fair	Poor
New Haven	Waterbury	03190A	Waterbury Stacks Bridge	Route 8 Northbound	Route 8 Southbound & Local Roads	Poor	Poor	Poor
New Haven	Waterbury	03190B	Waterbury Stacks Bridge	Route 8 Southbound	Riverside Street - Sunnyside	Poor	Poor	Fair
New Haven	Waterbury	03190F		I-84 TR 808	Route 8 Southbound & Ramp 129	Fair	Poor	Poor
New Haven	Waterbury	03191A	Waterbury Stacks Bridge	I-84 Eastbound	I-84 WB, Route 8, Naugatuck River	Poor	Poor	Poor
New Haven	Waterbury	03191B	Waterbury Stacks Bridge	I-84 Westbound	Route 8, Naugatuck River, Metro North Railroad	Poor	Poor	Poor
New Haven	Waterbury	03191D		I-84 TR 809	Route 8 Northbound, Riverside Street	Poor	Poor	Poor
New Haven	Waterbury	03191E		I-84 TR 810	Route 8 Northbound & Ramp 128	Satisfactory	Poor	Fair
New Haven	Waterbury	03191F		I-84 Ramp 197	Ramp 202 Meadow Street	Poor	Fair	Satisfactory
Hartford	Hartford	03400D		I-84 TR 823	Parking Lot	Poor	Fair	Fair

Note: Bridges on Route 15 from New York line to Meriden are excluded. Source: CTDOT Open Data Portal, accessed March 2022

Statewide Truck Volume Trends

As shown in **Figure 8.5**, I-95 from the New York/Connecticut border to New Haven and I-91 between New Haven and Hartford carry the heaviest truck volumes, generally over 15,000 trucks per day and up to 22,000 trucks per day (near Bridgeport). North of Hartford, the truck traffic splits into I-91 and I-84 corridors, and averages more than 10,000 trucks per day up to the Connecticut/Massachusetts border. Routes in Danbury, Waterbury, and the Raymond E. Baldwin Bridge also carry more than 10,000 trucks per day.

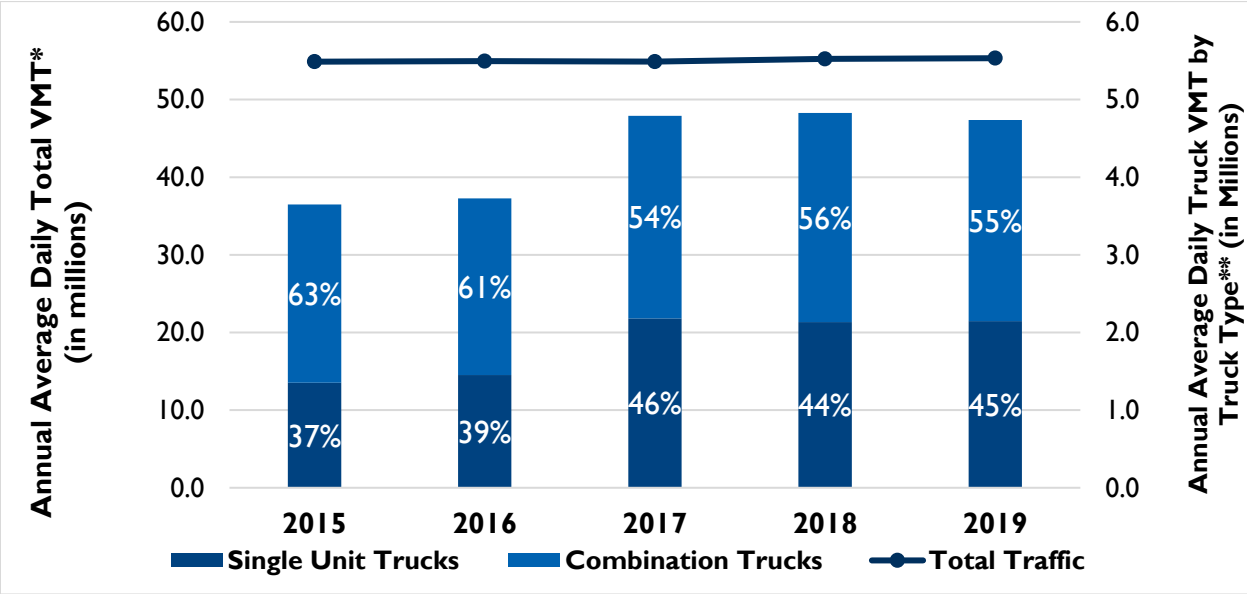
Figure 8.5: Statewide Annual Average Daily Truck Volumes (2019)



Sources: CT DOT 2015-2019 Truck AADT Data for FHWA Highway Performance Monitoring System (HPMS) Reporting; CT DOT 2019 Total AADT GIS Data

Average year-over-year vehicle miles traveled (VMT) growth for all vehicles was 0.2 percent from 2015 to 2019, but for trucks it was 7.4 percent (**Figure 8.6**). While truck VMT growth slowed down from 2017 to 2019, it has clearly outpaced total traffic during this time, implying that freight trucks are becoming a larger share of the traffic mix in Connecticut.

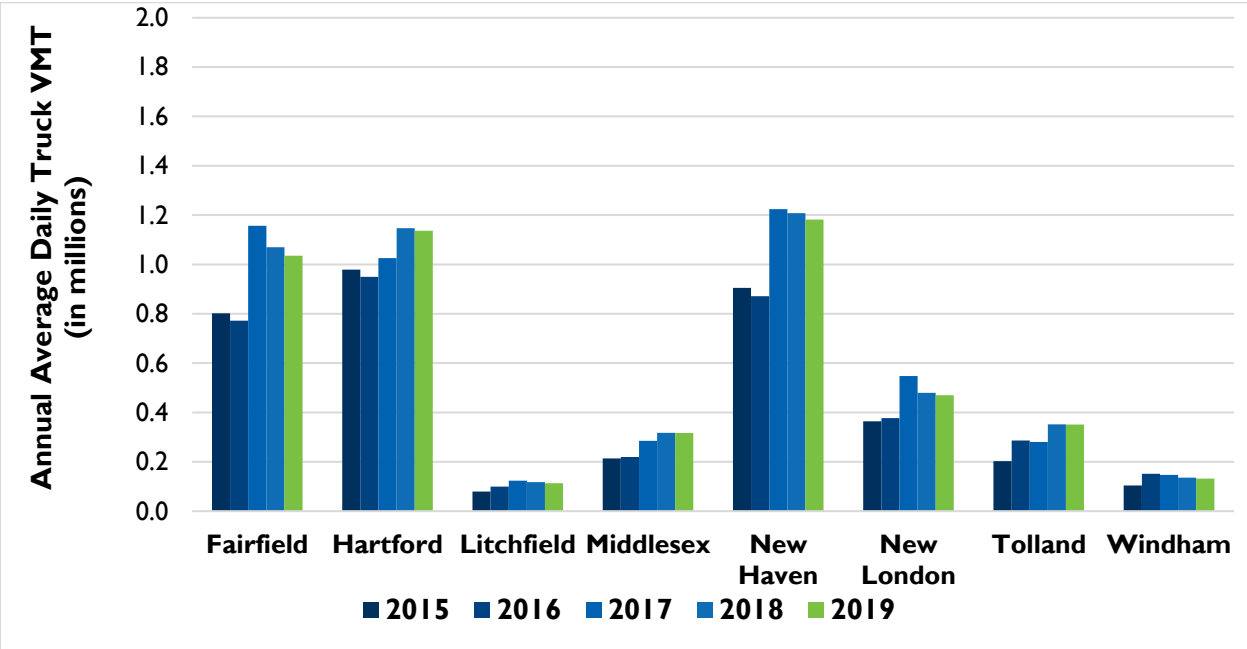
Figure 8.6: Statewide Annual Average Daily Truck VMT Trends (2015–2019)



**All Traffic Annual Average Daily Total Traffic VMT is shown as Line with Markers*
***All Traffic Annual Average Daily Truck VMT by Truck Type is shown as Stacked Column Chart*
Source: CT DOT 2015-2019 Truck AADT Data for FHWA Highway Performance Monitoring System (HPMS) Reporting

Truck VMT has grown in all Connecticut counties during this time (**Figure 8.7**:). Rural areas, such as Litchfield and Windham counties, sometimes saw larger percentage increases, albeit from a smaller base. Clearly, the more populous counties (Fairfield, Hartford, and New Haven) have the largest share of truck VMT. These three counties accounted for 71 percent of total statewide truck VMT in 2019.

Figure 8.7: County Level Annual Average Daily Truck VMT Trends (2015–2019)

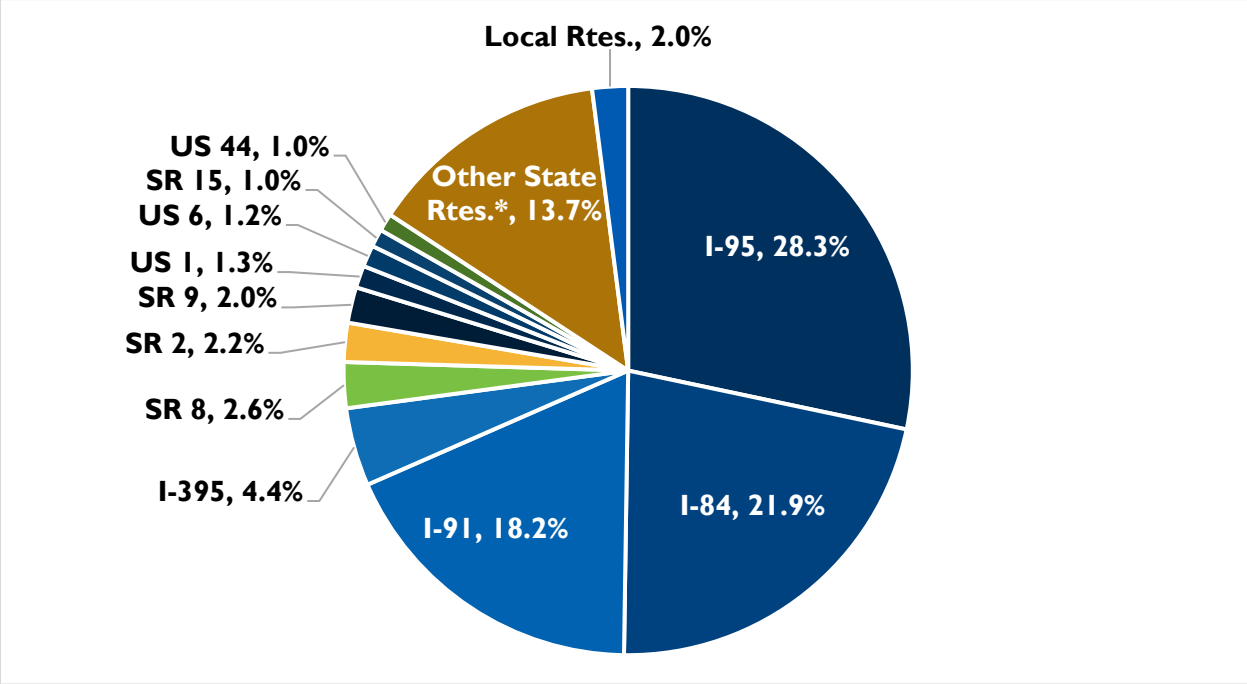


Sources: CT DOT 2015-2019 Truck AADT Data for FHWA Highway Performance Monitoring System (HPMS) Reporting

Trends by Route

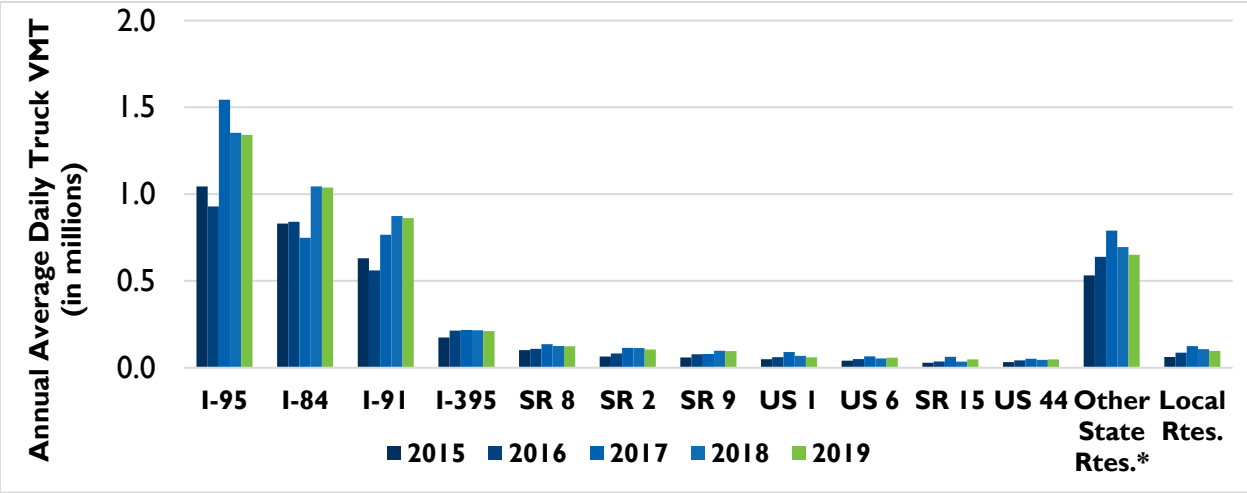
When viewed by individual routes, I-95, I-84, and I-91 jointly carried 68 percent of statewide annual average daily truck vehicle-miles traveled in 2019 (**Figure 8.8**:). As shown in **Figure 8.9**:, truck VMT growth varied by route, but I-95 and I-91 experienced significant increases in 2017. I-84 saw a large increase in 2018. Most truck traffic is clearly traveling on Connecticut's state highway network, and more specifically on its Interstates.

Figure 8.8: Route Level Annual Average Daily Truck VMT Shares (2019)



*Other state routes are estimated to carry less than 1 percent of Statewide total daily truck vehicle-miles in 2019.
Sources: CT DOT 2015-2019 Truck AADT Data for FHWA Highway Performance Monitoring System (HPMS) Reporting

Figure 8.9: Route Level Annual Average Daily Truck VMT Trends (2015–2019)

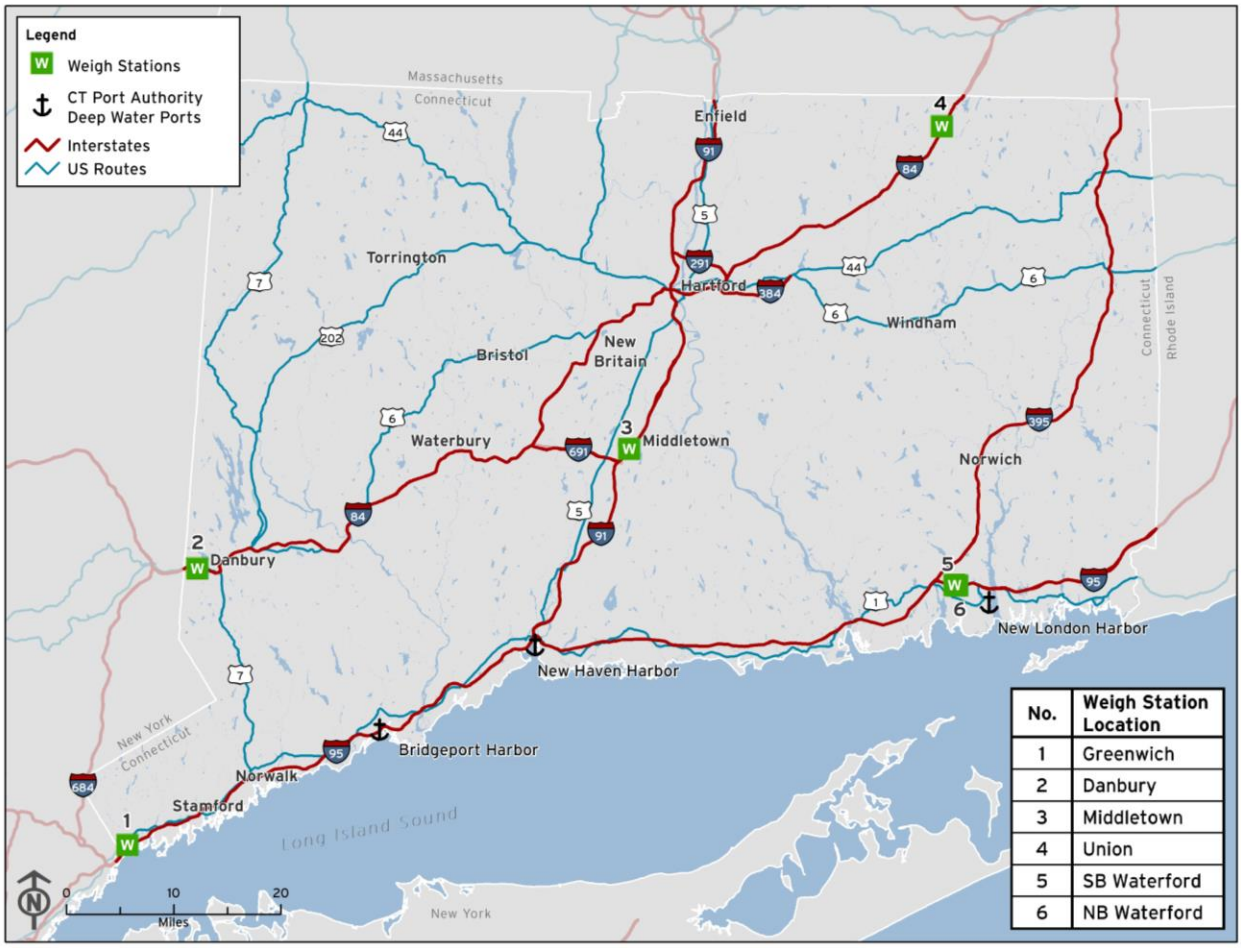


*Other state routes are estimated to carry less than 1 percent of statewide total daily truck vehicle-miles in 2019.
Sources: CT DOT 2015-2019 Truck AADT Data for FHWA Highway Performance Monitoring System (HPMS) Reporting

Weigh Station Trends

There are five weigh stations in Connecticut located on the interstate highways in Danbury, Greenwich, Middletown, Union, and Waterford (**Figure 8.10**:).[58] The weigh stations promote highway safety and preserve the infrastructure by weighing and inspecting trucks traveling in the state. Trucks that are overweight, lack the proper permits, or have safety violations like underinflated tires can be cited or put out of service by enforcement staff.

Figure 8.10: Weigh Station Locations Map



Source: All Stays Pro Account – Truck Dashboard

[58] A vehicle crashed into the Waterford southbound weigh station in 2018 and demolished the building. This weigh station has since closed and CTDOT is converting it to a Virtual Weigh Station.

Table 8.3 summarizes 2015 to 2019 weigh station weighing, inspection, and citation trends. Overall, there is a declining trend in number of vehicles weighed and number of inspections although truck VMT is increasing. As a result, citations are also declining. Partly, this trend may be attributed to bypasses or pre-clearances enabled by ITS for commercial vehicle operations (CVO). Connecticut is a PrePass state, and as of September 2020 the Union westbound weigh station was equipped with PrePass weigh station bypass technology.[59] Overall from 2015 to 2019, about 0.6 percent of the trucks weighed statewide led to a violation.

Table 8.3: Weigh Station Data Trends (2015-2019)

Weigh Station	Metric	2015	2016	2017	2018	2019
Danbury	# of Vehicle Weighed	91,124	87,718	60,659	44,136	60,375
	# of Vehicle Inspections	1,755	1,366	1,054	663	664
	Total # of Citations	3,814	2,214	1,610	1,005	744
	# of Citations relating to Overweight Violations	1,008	648	606	340	155
	# of Citations relating to Oversize Violations	596	400	155	69	30
Greenwich	# of Vehicle Weighed	144,600	190,949	199,121	119,296	105,941
	# of Vehicle Inspections	1,687	2,478	2,028	1,795	1,400
	Total # of Citations	3,374	4,499	3,652	3,873	2,870
	# of Citations relating to Overweight Violations	1,109	1,882	1,403	1,336	927
	# of Citations relating to Oversize Violations	378	221	164	104	57
Middletown	# of Vehicle Weighed	75,468	63,463	48,878	76,759	54,559
	# of Vehicle Inspections	1,781	1,536	1,186	1,334	976
	Total # of Citations	1,868	2,007	1,360	946	1,493
	# of Citations relating to Overweight Violations	797	781	551	294	355
	# of Citations relating to Oversize Violations	69	76	44	38	37
Union	# of Vehicle Weighed	203,884	152,244	195,668	205,878	199,998
	# of Vehicle Inspections	1,381	1,448	1,422	1,386	1,209
	Total # of Citations	402	641	743	1,489	2,625
	# of Citations relating to Overweight Violations	38	189	271	553	887
	# of Citations relating to Oversize Violations	31	32	30	82	257
Waterford N/B	# of Vehicle Weighed	34,660	50,143	49,421	33,226	40,920
	# of Vehicle Inspections	622	652	715	468	677
	Total # of Citations	962	976	880	510	868
	# of Citations relating to Overweight Violations	191	239	372	174	301
	# of Citations relating to Oversize Violations	18	22	21	8	16

[59] PrePass is a nonprofit founded in 1993 by trucking industry officials, state DOTs, and enforcement agencies to provide weigh station bypass and toll payment services.

Weigh Station	Metric	2015	2016	2017	2018	2019
Waterford S/B*	# of Vehicle Weighed	20,339	5,945	3,647	223	0
	# of Vehicle Inspections	431	190	153	185	0
	Total # of Citations	1,304	875	666	575	0
	# of Citations relating to Overweight Violations	222	194	207	187	0
	# of Citations relating to Oversize Violations	20	9	8	6	0
State Total	**# of Vehicle Weighed**	**570,075**	**550,462**	**557,394**	**479,518**	**461,793**
	# of Vehicle Inspections	**7,657**	**7,670**	**6,558**	**5,831**	**4,926**
	Total # of Citations	**11,724**	**11,212**	**8,911**	**8,398**	**8,600**
	# of Citations relating to Overweight Violations	**3,365**	**3,933**	**3,410**	**2,884**	**2,625**
	# of Citations relating to Oversize Violations	**1,112**	**760**	**422**	**307**	**397**

Source: Connecticut Department of Motor Vehicles – Weigh Station Reports, Available at: https://portal.ct.gov/DMV/Commercial-Vehicle-Safety/Weigh-Station-Reports/Weigh-Station-Reports (last accessed on November 22, 2021)
**Not operational since September 2018, this affects numerical values for Waterford S/B and State Total metrics.*

The Connecticut DMV and CTDOT is working to design, build, operate, and maintain a pilot Virtual Weigh Station (VWS) on I-95 east of Whippoorwill Road in Old Lyme. The intent of the pilot project is to identify new technologies and applicability to design, build, and maintain one or more VWS sites in the future.

8.1.5 Truck Freight Bottlenecks

In 2019, 9.7 million trucks[60] moved cargo on Connecticut's roadways, primarily on the National Highway System, including Interstate highways. In completing their shipments, motor carriers must travel through the same corridors as passenger vehicles, often during the same peak travel periods.

Federal regulations require states to identify, track, and address truck freight bottlenecks via regular performance reporting to FHWA.[61] States are also required to inventory freight mobility issues including bottlenecks when developing state freight plans.[62]

A bottleneck for truck freight is "a segment of roadway identified by the State DOT as having constraints that cause a

Truck Bottleneck Analysis

To identify bottlenecks, the team analyzed more than 42 million speed observations and thousands of truck volume counts on the National Highway System collected throughout Connecticut in 2019, to estimate cumulative truck delay. This volume of data assures that identified high-congestion locations accurately reflect conditions experienced by truck drivers.

[60] 2019 IHS Markit TRANSEARCH data, expressed as truck units.
[61] 23 CFR 490.107
[62] 49 USC 70202

significant impact on freight mobility and reliability."[63] CTDOT followed FHWA recommended best practices to evaluate truck bottlenecks in Connecticut.[64] The assessment considered congestion-based bottlenecks resulting from recurring congestion, typically caused by traffic volumes exceeding a road segment's capacity on a routine basis or by geometric limitations that affect trucks (for example, steep grades). Bottlenecks caused by non-recurring events (e.g., weather or crashes) or by truck restrictions (e.g., route restrictions or truck operating times) were excluded. **Appendix D – Truck Bottleneck Analysis** documents the process used to evaluate truck bottlenecks.

Two performance measures were used to identify the recurring congestion truck bottlenecks:

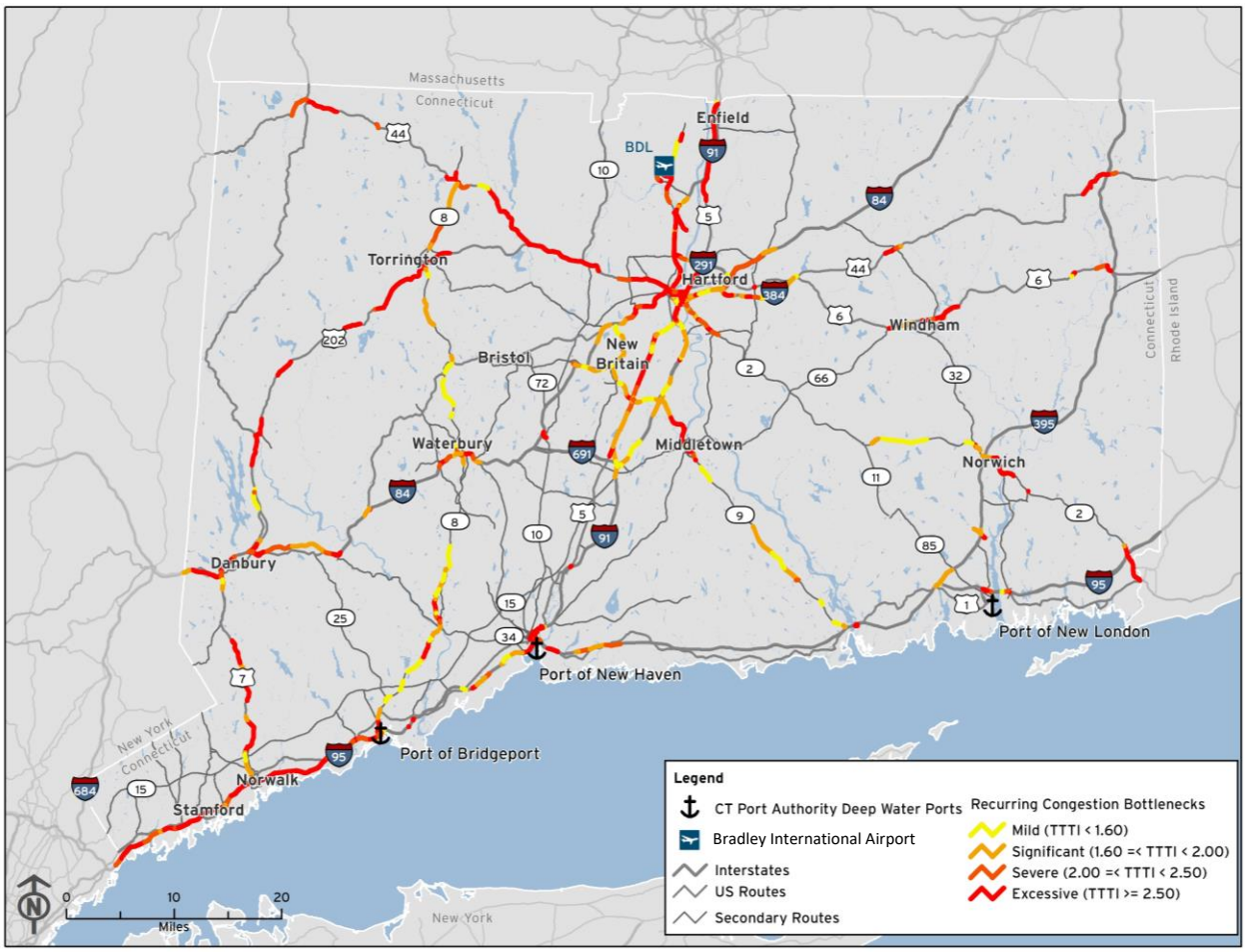
- Truck Travel Time Index (TTTI) – The ratio of observed truck travel time to free flow travel time
- Truck Speed Standard Normal Deviation (TSSND) – The index of variation of the speed from the average speed in terms of standard deviation

The results of the recurring congestion analysis (calculated from the TSSND) based on the recurring TTTI for the studied routes is shown in **Figure 8.11**. The routes analyzed include the Interstates, NHS, CURFN, and a few additional routes identified by CTDOT.

[63] 23 CFR 490.101

[64] Federal Highway Administration, *Truck Freight Bottleneck Reporting Guidebook*, July 2018, FHWA-HOP-18-070.

Figure 8.11: Recurring Congestion Truck Bottlenecks, 2019



Source: CTDOT, National Performance Management Research Data Set, and CDM Smith analysis

The identified truck bottlenecks shown above were further prioritized to help focus freight planning efforts on the highest and best use of limited resources. Developing a prioritized list of freight bottlenecks can also help in measuring progress toward addressing bottlenecks in performance reporting. For this update to the Freight Plan, the bottlenecks were ranked based on the estimates of 'Total Delay.' Delay was calculated in seconds by subtracting the free flow travel time from the congested travel time for those routes, which are most likely to have recurring congestion. **Table 8.4** summarizes truck delay (converted to hours) in 2019 by bottleneck cause and route type. A majority of the truck delay occurs on Connecticut's Interstate highways for the routes analyzed.

Almost half of the delay could not be diagnosed owing to data limitations. The 'unknown' bottleneck delay category could be caused by elements such as deficient pavement type, poor access control, narrow shoulder width, presence of high-occupancy vehicles (HOV) lanes, presence of auxiliary lanes, and media and shoulder type.

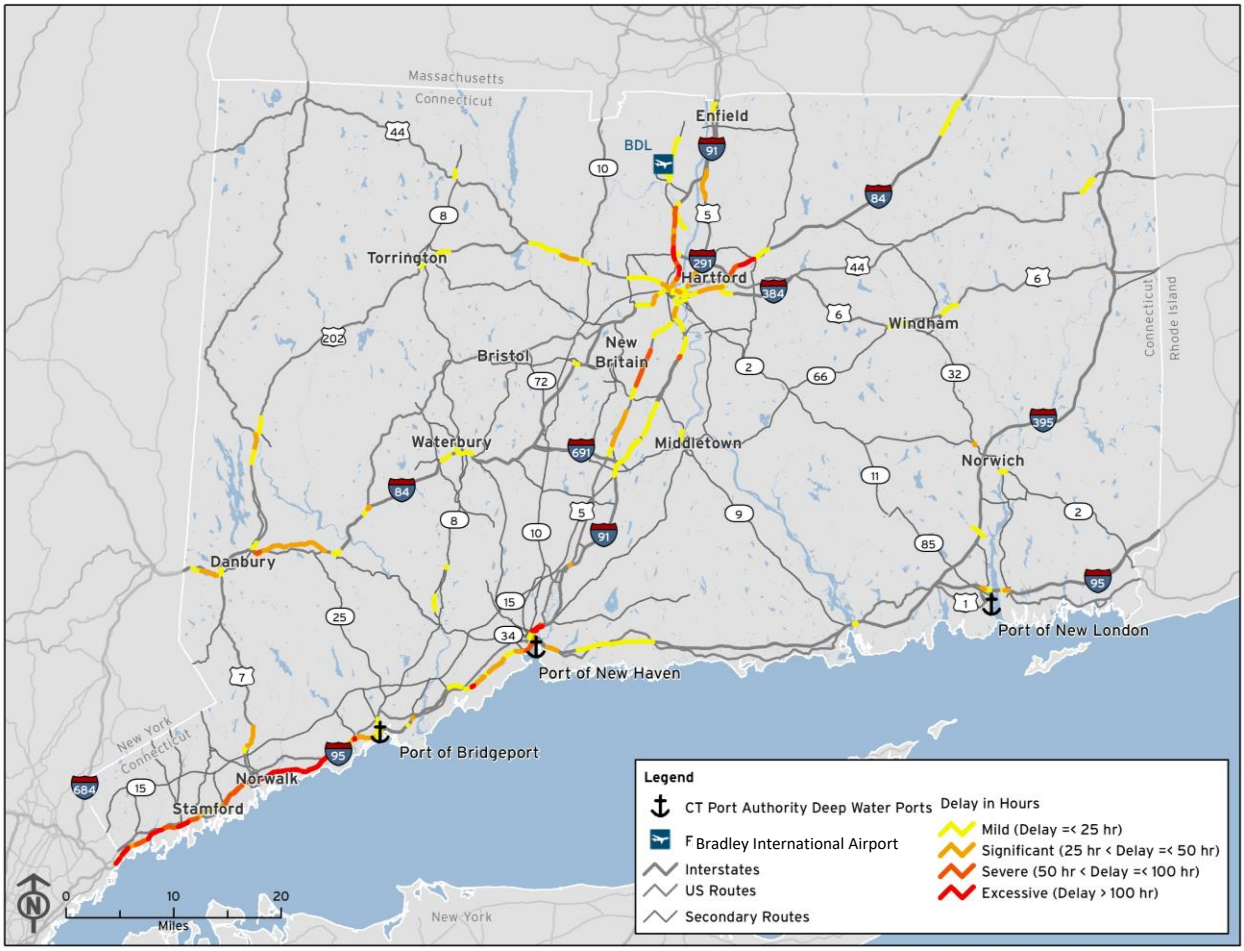
Table 8.4: Total Delay by Cause and Route Type (2019, in Hours)

Bottleneck Cause	Interstate System	NHS Routes	CURFN	CTDOT Selected Routes
Traffic Control	2,684	218	1,493	27
Demand	2,987	16	-	-
Grades	54	26	1	-
Curvature	16	33	1	-
Combination of Causes*	466	21	82	-
Unknown	6,737	797	442	8
Total	**12,945**	**1,112**	**2,018**	**35**

Source: CTDOT, National Performance Management Research Data Set, and CDM Smith analysis
**Combination of any two or more causes from traffic control, demand, grades, and curvature causes*

Figure 8.12 shows the route segments with various levels of delay. Based on **Figure 8.12**, the top 10 segments with high delay are listed in **Table 8.5** and shown in **Figure 8.13**.

Figure 8.12: Route Segments with Various Levels of Truck Delay



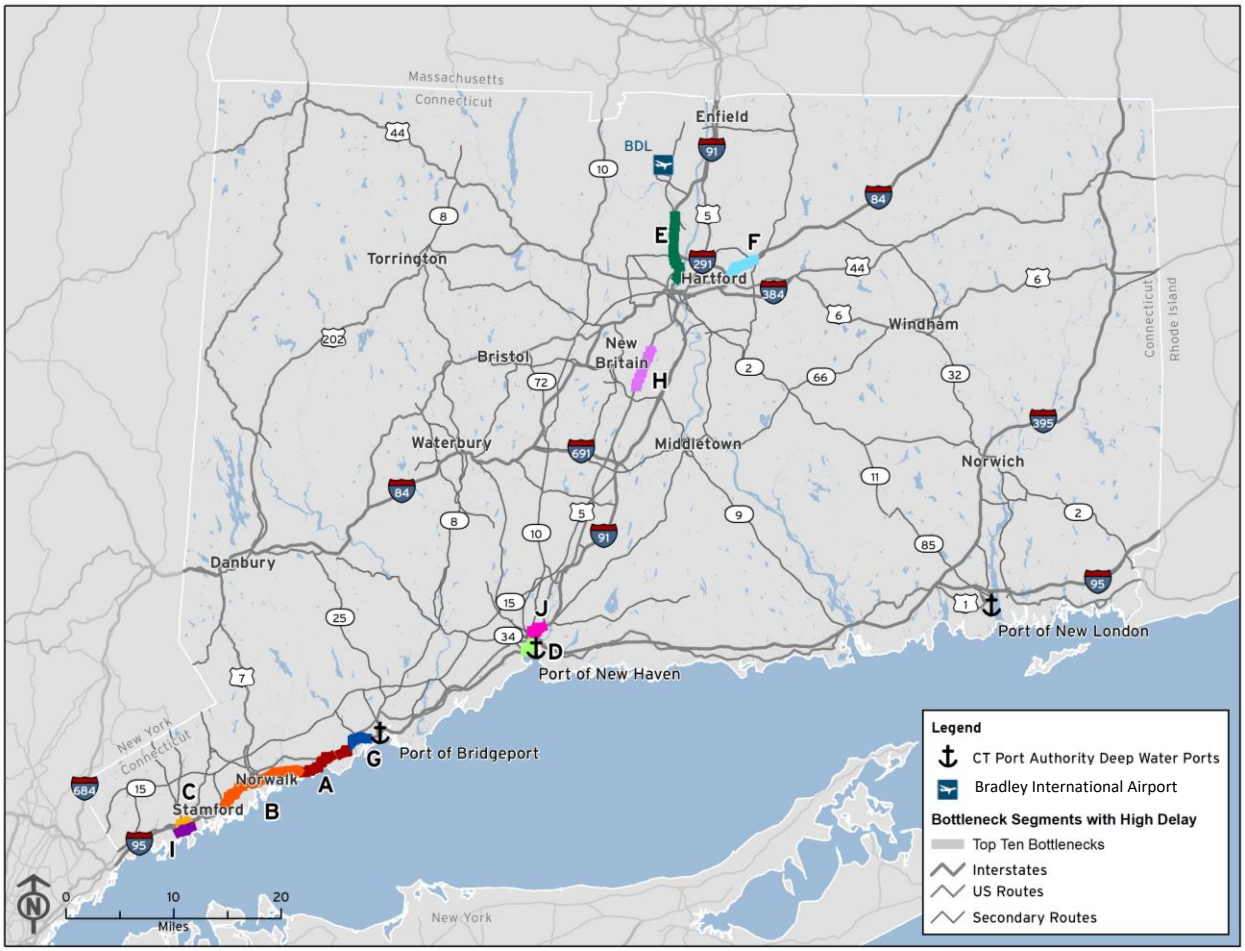
Source: CTDOT, National Performance Management Research Data Set, and CDM Smith analysis

Table 8.5: Top Ten Segments with High Delay

Map ID	Segment	From	To	Cause of Delay
A	I-95 (Fairfield)	Mill Hill Rd	Sherwood Island Connector	Demand
B	I-95 (Norwalk)	Sherwood Island Connector	Exit 13	Demand
C	I-95 (Stamford)	Lafayette St	Sachem Rd	Demand, Traffic Control
D	I-91 (New Haven)	Orange St	East St	Demand
E	I-91 (Hartford)	Day Hill Rd	Jennings Rd	Unknown
F	I-84 (East Hartford)	I-291	Deming St	Unknown
G	US-1 (I-95 intersection at Fairfield)	Stephens Ln	Johnson Dr	Demand, Traffic Control
H	CT-15/CT-5 (B/W Newington and Berlin)	Deming Rd	Prospect St	Traffic Control
I	South State Street, Stamford	Exit 7	Elm St	Demand, Traffic Control
J	State Street (Route 5), New Haven	Bradley St	Willow St	Traffic Control

Source: CTDOT, NPMRDS, and CDM Smith analysis

Figure 8.13: Top 10 Segments with High Delay



Source: CTDOT, National Performance Management Research Data Set, and CDM Smith analysis

8.1.6 Truck Crashes

Truck-involved crashes are typically less frequent than those involving other road users but can be more serious owing to the size and weight of the vehicles. The following sections summarize commercial vehicle crashes in Connecticut.

Crash Frequency

Between 2015 and 2019, commercial vehicle crashes represented 10.8 percent (57,352) of all motor vehicle (530,103) crashes in Connecticut (**Table 8.6**). Total crashes increased by an annual average rate of 0.8 percent during that time, while commercial vehicle crashes increased by an annual average rate of 0.9 percent.

Table 8.6: Commercial Vehicle and All Motor Vehicle Crashes by Year (2015–2019)

Year	Truck Crashes	All Motor Vehicle Crashes	CMV/All Vehicle Crashes
2015	11,435	102,262	11.18%
2016	11,476	107,755	10.7%
2017	11,061	107,799	10.3%
2018	11,546	106,659	10.8%
2019	11,834	105,628	11.2%
Total	**57,352**	**530,103**	**10.8%**

Source: CTDOT, Hosted by University of Connecticut's (UConn) Connecticut Crash Data Repository

Crash Severity

Effective January 1, 2015, CTDOT updated the Uniform Police Crash Report Form to be based on the Model Minimum Uniform Crash Criteria Guideline (MMUCC) Version 4. The purpose of MMUCC is to provide a dataset for describing crashes of motor vehicles in operation that will generate information necessary to improve highway safety and provide the same uniform criteria for categorizing crashes nationally. According to MMUCC Version 4, crashes are reported as either a fatality, suspected serious injury, suspected minor injury, possible injury, or property damage only (PDO).

Of the 57,352 truck-involved crashes, 168 (0.3 percent) were fatal crashes and another 394 (0.7 percent) were serious injury crashes (**Table 8.7**). The remaining truck-involved crashes were either minor injuries (16.5 percent) or property damage only (82.5 percent).

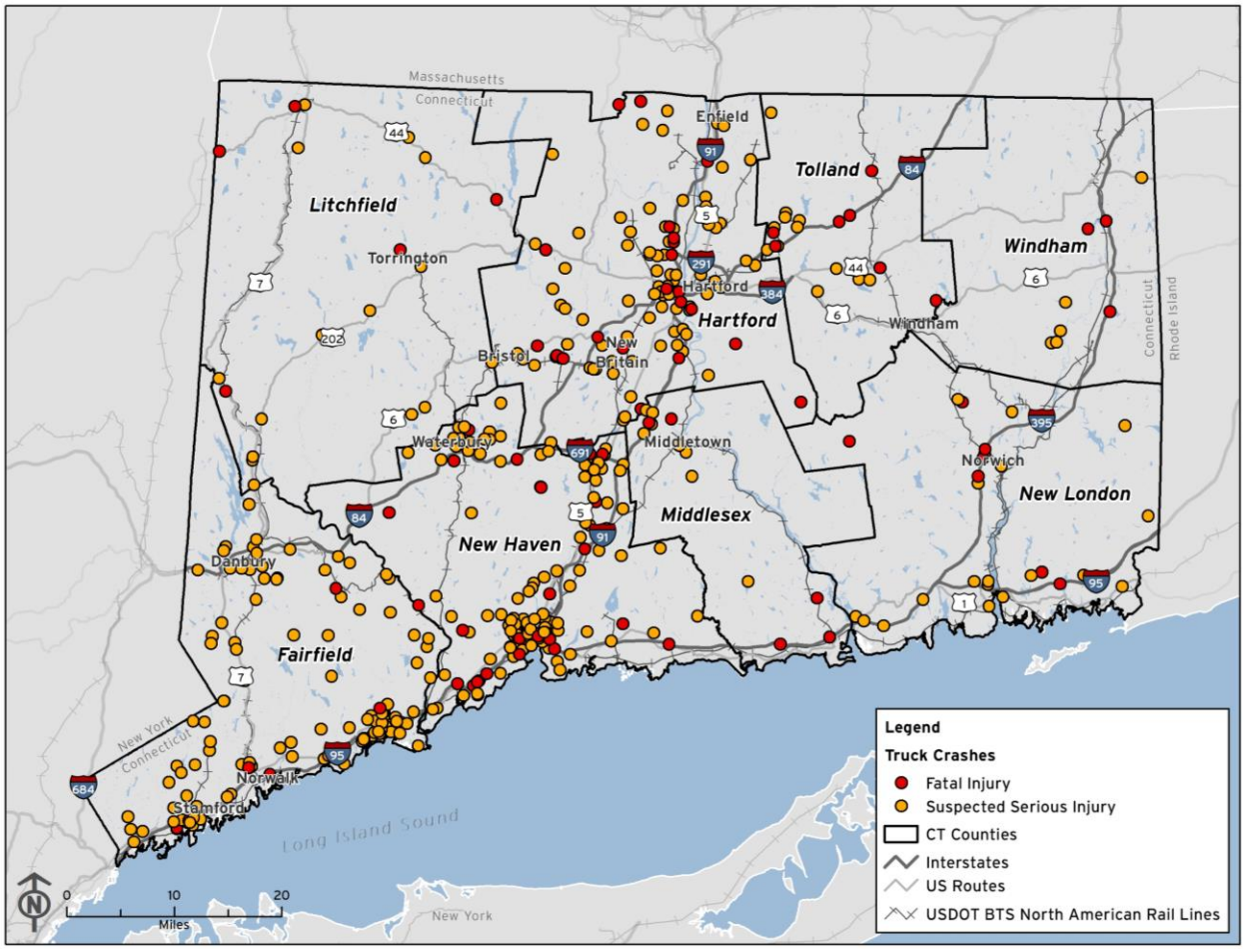
Figure 8.14 shows the locations of fatal and serious injury crashes throughout the state. These types of crashes tend to cluster along major Interstate highway trade corridors (e.g., I-95 and I-91) and around the state's largest metro areas such as Hartford, New Haven, Bridgeport, and Stamford.

Table 8.7: Fatal, Serious Injury and Property Damage Only (PDO) Commercial Vehicle Crashes (2015 – 2019)

Year	Fatality	Serious Injury	Minor Injury	PDO	Total
2015	37	75	1,848	9,475	11,435
2016	38	85	1,983	9,370	11,476
2017	27	84	1,821	9,129	11,061
2018	39	77	1,922	9,508	11,546
2019	27	73	1,924	9,810	11,834
Total	**168**	**394**	**9,498**	**47,292**	**57,352**

Source: CTDOT, Hosted by University of Connecticut's (UConn) Connecticut CrashData Repository

Figure 8.14: Fatal, Serious Injury and Property Damage Only (PDO) Commercial Vehicle Crashes (2015–2019)



Source: CTDOT, Hosted by University of Connecticut's (UConn) Connecticut Crash Data Repository

Table 8.8 breaks down the number of truck-involved fatal and injury crashes by county. Clearly, most of these crashes happen in the state's most populous counties—Fairfield, Hartford, and New Haven. Those three counties accounted for 84 percent of all injury and fatal crashes statewide from 2015 to 2019. Nonetheless, rural locations may have safety issues disproportionate to their population or vehicle miles traveled, since rural crashes may involve higher speeds.

Table 8.8: Count of all Fatal and Injury Commercial Vehicle Crashes by County (2015–2019)

		2015	2016	2017	2018	2019
Fairfield	Fatal Crashes	7	12	5	3	1
	Injury Crashes	545	538	576	586	569
	Total:	**552**	**550**	**581**	**589**	**570**
Hartford	Fatal Crashes	7	6	8	10	7
	Injury Crashes	505	541	469	529	525
	Total:	**512**	**547**	**477**	**539**	**532**
Litchfield	Fatal Crashes	3	2	2	3	2
	Injury Crashes	46	70	53	65	56
	Total:	**49**	**72**	**55**	**68**	**58**
Middlesex	Fatal Crashes	2	0	2	2	5
	Injury Crashes	71	77	63	76	76
	Total:	**73**	**77**	**65**	**78**	**81**
New Haven	Fatal Crashes	6	11	6	12	6
	Injury Crashes	556	648	579	588	598
	Total:	**562**	**659**	**585**	**600**	**604**
New London	Fatal Crashes	1	4	2	3	3
	Injury Crashes	127	99	95	78	84
	Total:	**128**	**103**	**97**	**81**	**87**
Tolland	Fatal Crashes	6	1	1	5	2
	Injury Crashes	36	57	36	53	45
	Total:	**42**	**58**	**37**	**58**	**47**
Windham	Fatal Crashes	5	2	1	1	1
	Injury Crashes	37	38	34	24	44
	Total:	**42**	**40**	**35**	**25**	**45**

Source: CTDOT, Hosted by University of Connecticut's (UConn) Connecticut Crash Data Repository

8.1.7 Non-Highway Freight Safety

In an interview for the Connecticut Rail Plan update, the Connecticut Rail Association noted that grade crossings are an issue for the state's freight railroads. There are 353 public highway grade crossings in Connecticut, 257 of which are owned by freight railroads.[65] The remainder are owned by Amtrak, commuter rail services, and one tourist railroad, although freight trains frequently operate over these

[65] Federal Railroad Administration Crossing Inventory Lookup, Query by Location. Retrieved January 25, 2022, from https://railroads.dot.gov/safety-data/crossing-and-inventory-data/crossing-inventory-lookup.

crossings as well. From 2017 through 2021, there were 12 crashes between trains and highway users at these 353 grade crossings.[66] These crashes produced three injuries but no fatalities (**Table 8.9**).

Table 8.9: Connecticut Grade Crossing Crashes (2017 to 2021)

Year	County	Railroad Name	Type of Equipment	Injuries	Fatalities
2017	Fairfield	Metro North Commuter Railroad Company	Commuter Train	0	0
2017	Tolland	New England Central Railroad	Freight Train	0	0
2018	Fairfield	Metro North Commuter Railroad Company	Maint./inspect Car	2	0
2018	Windham	Providence & Worcester Railroad Company	Freight Train	0	0
2019	Hartford	CTRail Hartford Line	Passenger Train	0	0
2019	Litchfield	Housatonic Railroad Company, Inc.	Freight Train	0	0
2019	New Haven	Providence & Worcester Railroad Company	Freight Train	0	0
2019	New Haven	Amtrak	Maint./inspect Car	1	0
2019	Windham	Providence & Worcester Railroad Company	Freight Train	0	0
2019	Windham	Providence & Worcester Railroad Company	Freight Train	0	0
2020	Fairfield	Metro North Commuter Railroad Company	Commuter Train	0	0
2021	Hartford	Connecticut Southern Railroad Inc.	Freight Train	0	0
Total				**3**	**0**

Source: Federal Railroad Administration

Many of these crossings need replacement or repair of crossing surfaces on the approach as well as repair or replacement of signs, signals, crossing gates and other warning or protective devices. The Bipartisan Infrastructure Law extended the existing Railway-Highway Crossings program and authorized funding at $245 million per year from FY 2022 through FY 2026.[67] This program funds projects that reduce fatalities and injuries from trespassing at grade crossings. The funds are a set aside from the Highway Safety Improvement Program with funds apportioned to states by formula per 23 USC 130(f).

The Buckeye Pipeline (which runs for three miles between New Haven and Hamden) reports issues with safety and security since three quarters of the line is above ground, parallel to a railroad.

None of the seaport operators contacted for this freight plan update reported issues or needs specific to safety, nor did Bradley International Airport representatives.

[66] Federal Railroad Administration Highway/Rail Grade Crossing Incident Dashboards, Incidents by State, retrieved January 25, 2022, from https://railroads.dot.gov/accident-and-incident-reporting/highwayrail-grade-crossing-incidents/incidents-state.

[67] Federal Highway Administration, 'Highway Authorizations under the Bipartisan Infrastructure Law,' retrieved January 25, 2022, from https://www.fhwa.dot.gov/bipartisan-infrastructure-law/funding.cfm.

8.2 FREIGHT RAIL

8.2.1 Rail Asset Condition

Connecticut relies on its rail network not only for goods movement but also for passenger transportation. Many freight rail lines rely on infrastructure owned by the State of Connecticut, making the condition of such assets critical for both freight and passenger mobility. According to the Connecticut Rail Association, maintenance of existing assets is the single greatest challenge for the state's rail operators.

Most modern freight rail lines in the United States use the industry standard 286k lb rail, but many smaller railroads and branch lines have not been upgraded. This effectively limits freight capacity on such lines. The Central New England Railroad, which operates on rails owned by CTDOT, reports that much of its 22-mile line consists of undersized rails that are not 286k lb compatible. Similarly, the Housatonic Railroad, of which 50 percent of the rail lines are owned by CTDOT, states that their network is more than 100 years old, with several obsolete sections of track that are becoming difficult to maintain. The rail industry is increasingly moving towards a newer 315k lb standard which will make such networks even more obsolete.

According to the Central New England Railroad, the Broad Brook Bridge also needs a new deck.

The State Rail Plan update has also identified routine maintenance needs around the state, including tie and ballast replacement, bridge upkeep, continuously welded rail upgrades, and grade crossing rehabilitation.

8.2.2 Freight Rail Bottlenecks

Capacity and operations issues on key rail lines can lead to freight rail bottlenecks:

- According to the Connecticut Rail Association (CRA), the Hartford line is very congested with the addition of new CT*rail* and Amtrak service. Growth in passenger service can crowd out freight rail operations. The Connecticut Southern Railroad is already limited to nighttime operations, but Amtrak maintenance work (which occurs at night) interferes with freight service.
- CRA also noted potential delays associated with the Walk Bridge.
- Housatonic Railroad has secured new business creating a need for additional siding capacity in the Canaan area. They have filed a funding application with the Rail Freight Infrastructure Program.
- Shoreline passenger rail line catenary wire and overhead platforms limit vertical clearance for rail freight and are an impediment to freight rail growth in Connecticut.

Rail Bottlenecks

To understand bottlenecks and asset condition issues on the Connecticut freight rail system, the team interviewed rail operators in person and coordinated with the recent update to the Connecticut Rail Plan.

- Hartford Viaduct is a series of highway and railbridge structures on I-84, located in and around Hartford. The structures are well past their useful life and are a chokepoint for freight traffic as well as for passenger vehicles and trucks. One of the options under study for the viaduct is to move the railroad to the west and to upgrade the structures to accommodate 286k lb rail cars.
- Connecticut River Bridge, located near Windsor north of Hartford, is a major constraint to freight operations between Hartford and Springfield, Massachusetts. Rail operators that use the bridge experience issues scheduling shipments during the time windows that are available. The Central New England Railroad also reports capacity constraints in accessing an auxiliary branch line in East Long Meadow, Massachusetts. Continued growth in passenger volumes on the New Haven-Hartford-Springfield line could exacerbate these issues. The cost of a double-track, 286k replacement bridge is estimated at $50 million.

8.3 MARINE FREIGHT

Connecticut's port system faces dredging and access issues that are explained in **Chapter 11**.

8.4 AIR CARGO

Connecticut has taken steps to ensure that Bradley International Airport remains accessible and that it has adequate capacity to handle cargo freight for the immediate future. **Chapter 11** provides more information about potential air cargo needs.

8.5 PIPELINES

No asset condition or bottleneck issues were identified for pipelines.

9. STAKEHOLDER ENGAGEMENT

Moving goods to, in, and through the state's compact and heavily utilized transportation network efficiently, safely, and at a reasonable cost, is key to the state's economic well-being and to the state's competitiveness in the decades to come. One of the principal objectives of the Freight Plan is to identify and prioritize investments in the state's multi-modal freight transportation system (truck, rail, marine, and air). This is best achieved through a cooperative and collaborative process where the public and freight stakeholders are involved in the plan's development.

Public and stakeholder involvement is critical to ensuring that the plan addresses current and future needs and challenges unique to the movement of goods and commodities. As part of this update, CTDOT engaged both private and public freight transportation stakeholders. These stakeholders, across all modes, collectively serve as the ad hoc State Freight Advisory Committee. The goals of this outreach were to:

- Understand the relationship between the movement of freight and the state's economy, as identified by stakeholders
- Establish, and build on existing, private sector relationships in an ongoing dialogue about freight system needs, and opportunities to create efficiencies in freight movements
- Collect stakeholder input on the condition, deficiencies, and needs of the freight network
- Identify ways that CTDOT can make businesses and communities more competitive – whether through capital improvement projects or policy changes
- Allow stakeholders and the public to weigh in on what freight projects are of highest priority for the State

Stakeholder outreach was conducted in various ways to engage freight-related organizations and private enterprises. These outreach efforts included stakeholder interviews with representatives of freight network users such as trucking, port, and railroad associations; logistics directors; shipping managers; economic development professionals; environmental interest groups; local, state and regional planners, and business leaders. Additional outreach was conducted using an online survey to enforcement stakeholders. In addition, an Internal Freight Working Group representing state agencies met quarterly during the update of the Freight Plan. A summary of each engagement activity is included in this chapter. The stakeholder input guided the identification of freight transportation needs and issues, as well as the updated prioritized project list and policy recommendations.

9.1 FREIGHT TRANSPORTATION STAKEHOLDER INTERVIEWS

CTDOT conducted interviews with leaders in freight-related services including public agencies, manufacturing, retail and wholesale sales, logistics, and local, regional, national and international freight carriers. Discussions centered on the strengths and weaknesses of the current freight network, current

and future demands on the network, and investments needed to improve the network and meet future demands. A list of stakeholders interviewed is provided in **Table 9.1**.

Table 9.1: Freight Stakeholder Interviews

Stakeholder	Date
Tilcon Connecticut	10-12-21
Connecticut Construction Industries Association (CCIA)	10-14-21
Motor Transport Association of Connecticut, DATTCO, Inc., UPS, and The Anastasio Group	10-21-21
O & G Industries, Inc., Rawson Industries	11-04-21
Pratt & Whitney	11-05-21
Santa Energy	11-08-21
Central New England Railroad	11-09-21
Housatonic Railroad	11-18-21
Connecticut Port Authority	11-23-21
Connecticut Business & Industry Association (CBIA) and Northeast Express Transportation	11-29-21
New Haven Port Authority	12-16-21
Connecticut Rail Association, Housatonic Railroad, Genesee & Wyoming Railroad	12-16-21
Gateway Terminal	1-06-22
Connecticut Airport Authority	1-20-22
New Haven Harbor Cooperative	1-12-22
Bridgeport Port Authority	1-14-22
Buckeye Pipeline	1-24-22
Schneider National	1-31-22

The various freight stakeholder interviews provided extensive feedback on industry concerns as well as modal strengths and opportunities; challenges, issues, and obstacles; location-specification issues; and recommendations. A summary of the input received throughout the stakeholder outreach effort is summarized below by mode.

"Minutes matter" – Don Shubert, President of Connecticut Construction Industries Association

Truck Freight

Strengths and Opportunities

- Technological advances and opportunities
  - Information and communications technologies can be used to enhance communication of congestion, accidents, detours, and conditions that alter traffic.
  - New data centers will help the industry in the future regarding the collection, analysis, and use of data.
- Opportunities to reduce emissions
  - There are opportunities to add more anti-idling technologies.
  - Some trucking companies are using hybrid haulers that emit less emissions.
  - Cleaner engines are becoming more readily available.
- Waterbury congestion is improving
- Retired state-owned spaces can be used for truck parking needs

Challenges, Issues, and Obstacles

- Unreliable congestion in:
  - Hartford, I-95 from New Haven to NY State line
  - Danbury congestion is becoming problematic
  - More truck only lanes or separate truck routes are needed
- Weight and vertical clearance restrictions on bridges:
  - Gold Star Memorial Bridge has weight restrictions
- Connecticut weight limits are lower than surrounding states:
  - Results in more trips to haul same amount of freight (uses more fuel, more emissions)
  - Other states with higher weight limits were grandfathered in
  - Innovate ways to allow for higher loads is needed
- Oversize-overweight permits:
  - Need separate permits for each state
  - Industry needs one oversize-overweight vehicle system for through movements across state lines
- DMV Credentials/Licensing Procedures:
  - Multiple submission of the same list of credentials are required for different licenses, certifications and renewals
  - There is no clearinghouse of the required information to reduce duplication and replication in the process
  - CT truck permit process and the NY truck permit process are different. Trucks are required to be across the NY state border before sunset which is difficult during early sunsets in winter
- Enforcement
  - Only the Department of Environmental Protection can issue tickets for idling infractions and enforce the law. Other agencies should be empowered to issue tickets
  - CT is one of the few states that has language in state law to suspend the operating authority for a company if they have an unpaid parking ticket
  - Ability to look up open citations online in CT is not available
- Truck parking:
  - Parking on highway off-ramps is a safety problem (e.g., I-84 near exit 70 trucks are parked all over the place, and I-95)
  - Rest areas have more frequent closures which reduces truck parking
  - Queuing is happening near ports because of lack of truck parking
- Freight electric vehicle technology:
  - There is no standard for electric vehicles (EV) (rates, charging stations, power cords)
  - Power grid may not be able to handle mass transition to EV vehicles
  - There is a lack of designated space for EVs to charge
- Other Issues:
  - Local restrictions limit through traffic on local streets and through neighborhoods
  - There is a driver shortage. It is unclear if autonomous vehicles help alleviate the problem
  - There is confusion on how the new highway user fee on trucks will be enforced and what it applies to
  - Construction needs to be better coordinated and advertised. Advance notification is needed
  - There is a lack of accessible fuel stations
  - Drivers' hours of service limitations inhibit freight movement

  - There are inconsistent state regulations for driving during adverse weather and decreased visibility
  - Roadway and bridge conditions are deteriorating
  - CT has particularly high fuel taxes which increases costs

Location-Specific Issues

- Congestion is an issue for:
  - Hartford, I-95 from New Haven to NY State Line
  - I-95 corridor in Fairfield County
  - I-84 corridor (Greater Hartford area, Greater Hartford interchange, Danbury)
  - Southbound of I-91 near Meriden
  - Between off ramp for I-684 onto I-84 at Exit 17
- Gold Star Memorial Bridge and Moses Wheeler Bridge have weight restrictions
- There is a parking shortage at I-95 Greenwich area
- There is a lack of truck stops in Danbury and Norwich
- There is a lack of rest area options along I-84
- Parking on the highway ramps is a safety problem

Recommendations

- Adjust hours of service for certain types of truck shipments such as trucks carrying pre-prepared or pre-mixed materials with limited timeframes for use
- Allow oversize-overweight permits for certain types of loads
- Address bridge weight limitations
- Streamline the permit applications for moving truck loads through neighboring states (separate permits are required for each state)
- Improve truck parking availability
- Encourage and/or incentivize the use of recycled products in construction of transportation infrastructure (update CTDOT engineering standards)
- Improve fuel station access
- Establish truck only corridors
- Perform a power grid study to determine needs for mass transition to EVs
- Determine designated parking for charging EVs
- Increase resilience to weather and natural impacts
- Improve redundancy and efficiency of the supply chain
- Co-locate warehouses with distribution centers

Freight Rail

Strengths and Opportunities

- Rail freight has become more efficient, and it is very important to the construction industry and others
- Connecticut rail system is safe and efficient, but has infrastructure problems
- Rail is more reliable than barge and more efficient per ton than trucks. It is important to keep rail system resilient and redundant
- Rail congestion due to passenger rail has improved
- Electric hybrid batteries for locomotives have potential to reduce emissions

- Rail connectivity at the Port of New Haven and Port of New London facilitates movement of goods
- New standard weight capacity for rail cars will become 315k lbs. New rail cars are being built to accommodate the weight, but are limited to loading only 286k lbs based on policy/regulations
- There is expected growth in rail shipments to NY markets. Companies receive tax benefits from diversifying their modes-moving by rail instead of trucks
- Rail functions well, even under adverse conditions
  - There was a concern with declining freight traffic during the pandemic. In fact, there was a small increase in rail traffic during 2020
- Battery generating electric vehicles may be a possibility for passenger rail cars, but it may be a bit further out for freight rail cars

Challenges, Issues, and Obstacles

- Insufficient Infrastructure
  - Old infrastructure is obsolete and difficult to maintain
  - Some rail yards need expansion
  - Additional siding capacity is needed to accommodate/access new businesses
  - Rail bridges need repair and to be upgraded to new standard weight capacity
- Need to ensure adequate window to move daily. There should be more room for moving freight at night and during the day.
- Rail expansion is limited due to land use policies, we need to change the assumption that freight rail has a negative impact on the environment and communities.
- There is a lack of regular funding, funding should be made available for freight rail similar to moving highway freight. The amount of funding for freight by rail is substantially less.
- Trucking industry requesting to increase weights for trucks could reduce rail competitiveness.

Location-Specific Issues

- No rail is available at the Port of Bridgeport
- Siding capacity is limited in the Canaan area
- Reconfiguration of Housatonic track is needed in Danbury/Brookfield area
- Shoreline rail overhead wire and high-level platforms impede freight rail growth

Recommendations

- Expand rail yards to allow more rail cars and add more rail sidings
- Extend rail to Windsor Sanitation facility
- Upgrade aging rail infrastructure
- Secure consistent funding mechanisms
- Encourage and promote mode shifts
- Consider rail connectivity at the Port of Bridgeport

Maritime

Strengths and Opportunities

- There is currently improvement being made to the terminal in New London to accommodate the offshore wind industry.
- Use of small private docks at industrial facilities on waterways move a lot of material by barge, keeping trucks off the interstates.

- Use of dredged sediments for habitat restoration and creation has environmental and ecological benefits.
- Electrification of terminal equipment reduces emissions.
- New Haven Port Authority would like additional rail into the port district to expand capacity.
- New Haven Channel is in the design phase for deepening the channel. This would allow ships to carry additional cargo and larger ships to use the channel.

Challenges, Issues, and Obstacles

- Ports are state assets, but local municipalities write zoning laws about land use which can cause conflict.
- Local port authorities do not fall under the Connecticut Port Authority.
- Contaminated material disposal is expensive.
- Limited channel widths and depths:
  - Regular dredging is needed for freight to come in and out of the ports efficiently
  - New Haven terminal has limited depth and width that impedes a ship's ability to carry cargo
  - Commercial traffic has decreased owing to lack of dredging
- Bridgeport lacks rail connectivity.
- Expansion of marine terminals is constrained by adjacent land use.
- Salt operations out of the New Haven port had some issues last winter. Trucks queue on surrounding streets and the highway off-ramps.
- There is a shortage of truck idling locations while waiting to gain access to the terminal.

Location-Specific Issues

- Port of New Haven has a shortage of truck idling locations.
- Bridgeport harbor is in need of dredging.
- There are inadequate parking facilities on the eastern seaboard of Bridgeport.
- Rail around Bridgeport Port is commuter rail only.
- Black Rock Harbor has less than 1 foot of space/shoulders in some areas.
- There is a lack of available land for expansion around the Port of New Haven. The Port is trying to identify surplus land to acquire.

Recommendations

- Add an additional mooring for barges in Long Island Sound near Stamford, CT.
- Unify the freight network across modes between ports, rail, and trucks.
- Create dedicated freight corridors to move maritime goods from ports.
- Develop transload facilities in Connecticut like M64 at the Port of Virginia.
- Provide commercial rail access at ports.

Maritime – Small Privately Owned Docks

Some of the stakeholders that were interviewed are privately owned freight-related businesses located along rivers in Connecticut that have small docks used for moving product by barges.

Strengths and Opportunities

- Construction industry moves a lot of material by barges
- Barge business has substantially increased in the past 4 years.
- Moving material by barge helps to lighten the load on I-95, and reduce emissions.

- It is the cheapest and most efficient way to deal with the growth in redevelopment and transportation projects in Southwestern CT.

Challenges, Issues, and Obstacles

- Redevelopment has occurred around the facility with lots of infrastructure development.
- There is constant community pressure surrounding these yards.
- Permits are becoming more difficult to obtain for maintenance dredging around the docks.
- There is a need for streamlined permitting process for dredging, and improvements in channel maintenance policies and funding.

Recommendations

- Improve and streamline channel maintenance process for permitting and funding.

Air Cargo

Strengths and Opportunities

- Recent improvements in Pinnacle warehouses improved freight storage space and eases the transportation of goods.
- Bradley Airport has plenty of capacity for landing, thus there is no airfield congestion.
- Freight operators change times of arrival to reduce congestion.
- Currently able to move full aircraft engines from CT to John F. Kennedy International Airport (JFK) for export.

Challenges, Issues, and Obstacles

- Bradley Airport traffic creates congestion surrounding highways.
- Route 20 distribution centers increase traffic and congestion on International Drive.
- Scheduling flights and obtaining providers that can handle large shipments is beneficial.
- Aircraft engine parts are more susceptible to damage if not moved promptly, they need to be moved quickly and cannot be stored.

Location-Specific Issues

- Limited cargo capacity at Bradley Airport

Recommendations

- Look into the feasibility of adding cargo capacity at Bradley Airport to support the large freighters aircrafts. There are only a handful of airports that can support these aircrafts and they are all over capacity.
- Additional airfield space at Bradley Airport would be beneficial.
- Increase use of EVs and solar panels for sustainability.

Pipeline

Strengths and Opportunities

- The Buckeye terminal serves as major facility for movement of petroleum fuel
  - Operates more than 7,000 miles of pipeline and 120 terminals nationwide.
  - Operates pipelines from the Port of New Haven to WestoverAir Force Base in Massachusetts and two terminals in Connecticut and one in Springfield, Massachusetts.

- Pipeline is a very efficient method to ship petroleum fuels, and can help decrease the number of delivery trucks needed on the highway system.

Challenges, Issues, and Obstacles

- Aboveground pipes result in safety and security issues.

9.2 Environmental Advocacy Organizations

During the update of the Freight Plan, CTDOT met with representatives of various environmental advocacy organizations, as shown in **Table 9.2**, to overview the process of updating the Freight Plan.

Table 9.2: Environmental Advocacy Meetings

Organization	Date
Sierra Club Connecticut, Save the Sound, Connecticut Coalition for Environmental Justice, Conservation Law Foundation, Acadia Center, Live Green Connecticut, and Transport Hartford	10-26-21 12-02-21 2-16-22[1]

Notes:

[1] Meeting on 2-16-22 included a presentation and discussion of the plan to the DEEP Environmental Justice group, additional organizations were present during this meeting.

During these discussions, the following suggestions were provided to CTDOT:

- Communication and collaboration
  - Increase coordination between COGs, the Port Authority, and the CT Airport Authority
  - Increase interagency coordination between CTDOT, DEEP, DPH, and other relevant agencies related to the Governor's Council on Climate Change (GC3) and the Global Warming Solutions Act

- Reduce emissions
  - Add GHG emission reduction as a stated goal in freight plan
  - Make reducing emissions in environmental justice (EJ) communities a stated goal
  - Recommend adoption of the California Advanced Clean Trucks (ACT) rule – emissions reduction from medium- and heavy-duty vehicles
  - Continue to participate on the Multi-State ZEV Task Force in developing a multi-state action plan to identify barriers and propose solutions to support widespread electrification of medium- and heavy-duty vehicle

- Support electrification
  - Suggest DEEP consider exploring a pilot program for assisting freight truck operators with fleet conversion to electric or hybrid
  - Consider mitigating the impact of Road Use fee on electric trucks
  - Identify opportunities for freight rail and port modal shifts

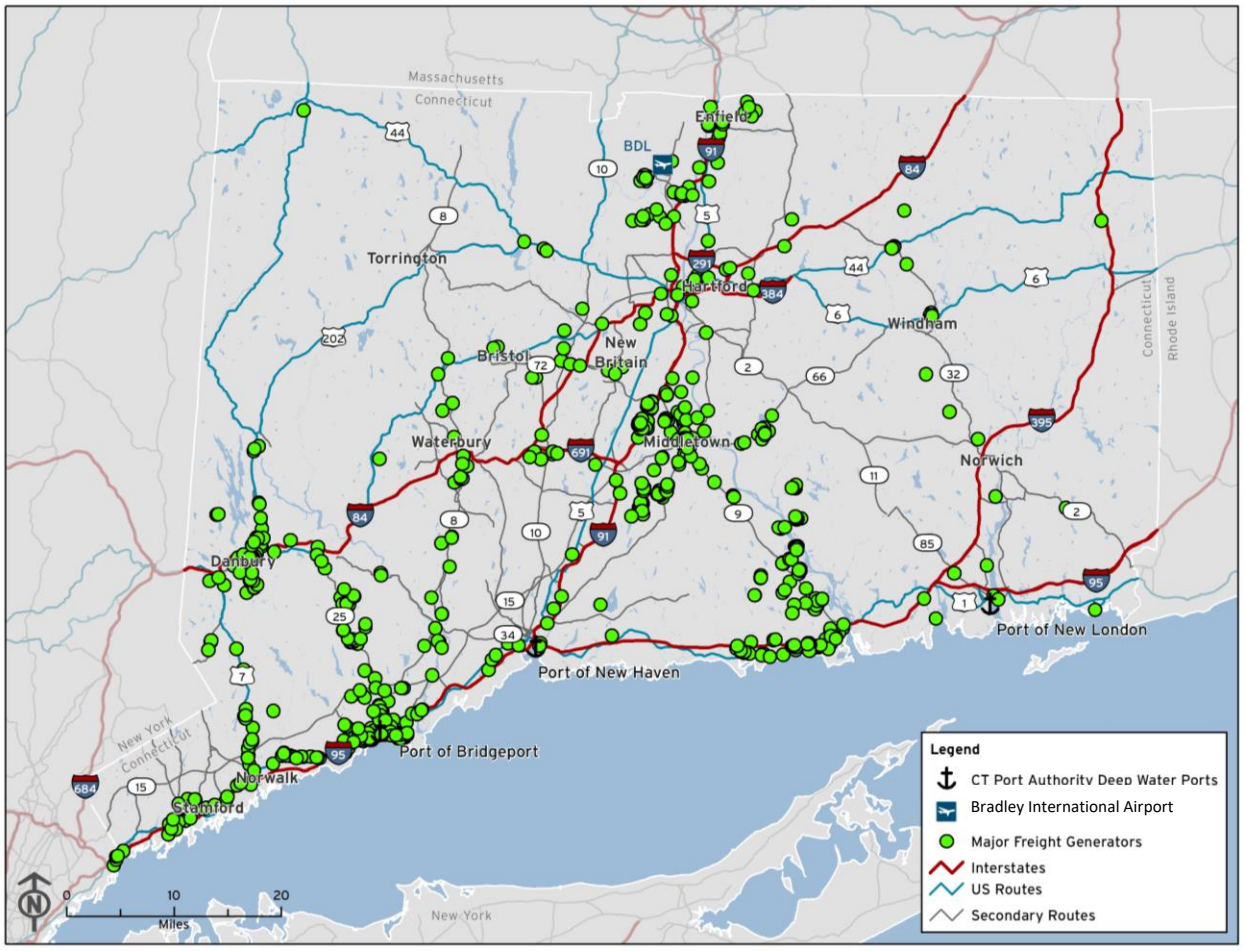
- Consider co-benefit of expansion of waste reduction and recycling programs that will also reduce waste-stream freight

- Encourage the use of information and communications technologies that use real-time tracking of logistics and transportation assets

9.3 METROPOLITAN PLANNING ORGANIZATIONS

Representatives from each of the MPOs in Connecticut were asked to provide information for the update of the Freight Plan, including updated freight plans and/or freight initiatives, a list of major freight generators in their region, and any locations that may provide an opportunity for adding truck parking. MPOs were also invited to participate in key stakeholder interviews specific to their region. A summary of the MPO freight planning efforts provided to CTDOT is included in **Chapter 3** and the major freight generators identified by the MPOs are shown in **Figure 9.1**. A TRANSEARCH data-generated freight generators map is also provided in **Chapter 6**.

Figure 9.1: Major Freight Generators Identified by MPOs



Source: Connecticut MPOs.

9.4 TRUCK DRIVERS/ASSOCIATION SURVEY

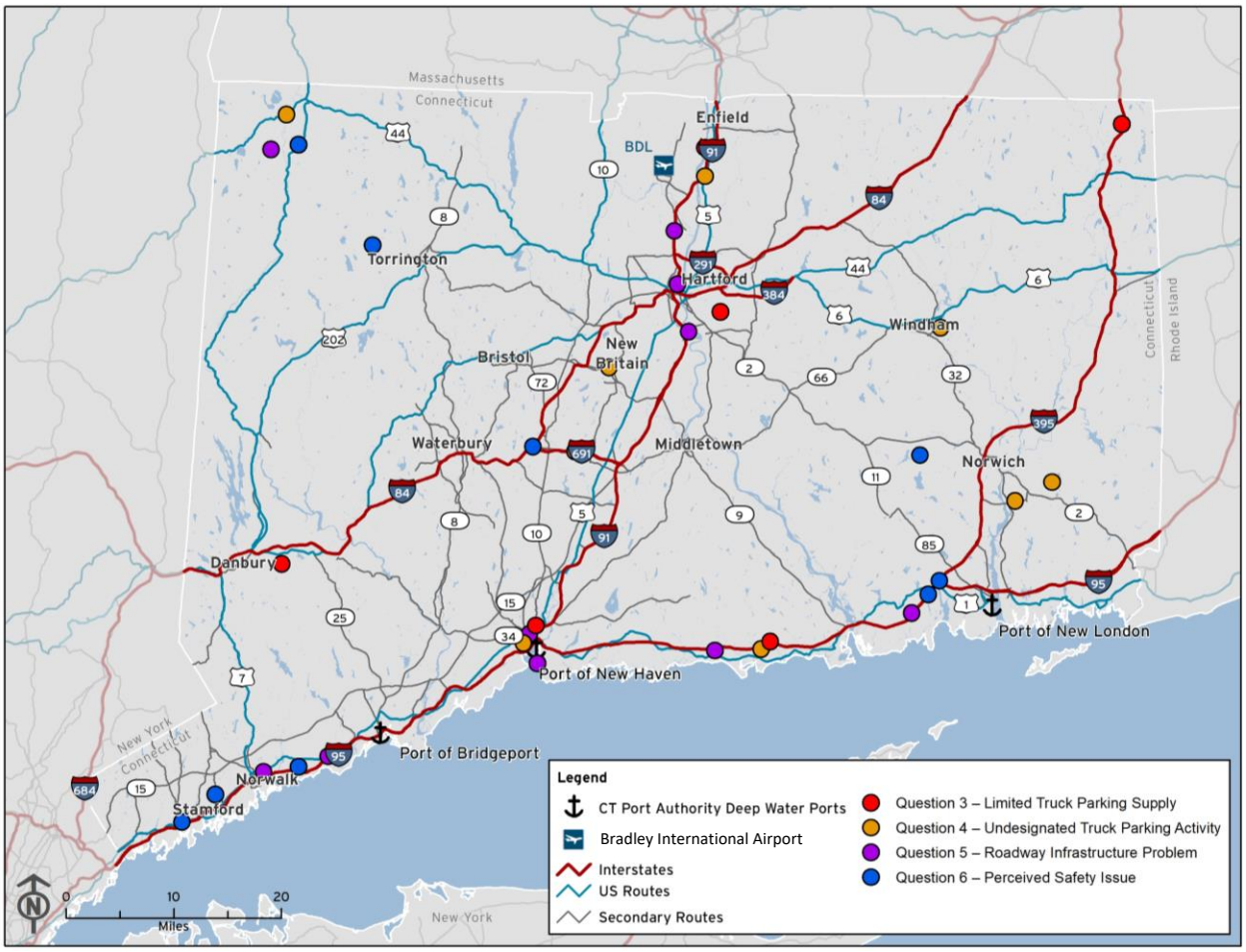
CTDOT reached out to the Connecticut Motor Transport Association to distribute a truck driver survey to its members. The survey requested feedback on freight issues related to enforcement, truck parking, and truck movement constraints within the state using an online survey format. Respondents were asked to answer a few questions as well as use the online mapping feature to provide input on specific locations. Respondents identified congestion of bottlenecks, weight-distance tax, lack of truck

parking, and driver shortage/working conditions as top issues facing the trucking industry. Additional comments include:

- Strengths of the trucking industry are established companies, but overall communication needs to be emphasized
- Lack of consideration of trucking industry needs, lack of parking areas and truck stops
- Road construction takes too long, not enough people per job
- Too many taxes and ways to be taxed as a business, we will be out of business, roads are good
- Congestion and anti-truck philosophy in the state
- Companies are being taxed, which will have to be passed on to the customer
- Companies that I work with communicate well regarding delays in loading and unloading
- I-95 needs better fuel stops for trucks in rest areas. New York State does a much better job on the interstates.

Figure 9.2 illustrates input received from respondents about problem areas such as locations of limited truck parking supply, undesignated truck parking activity, roadway infrastructure issues, and perceived safety issues.

Figure 9.2: Truck Drivers Survey Input on Problem Areas



Source: Trucker Stakeholders Online Survey.

9.5 ENFORCEMENT SURVEY

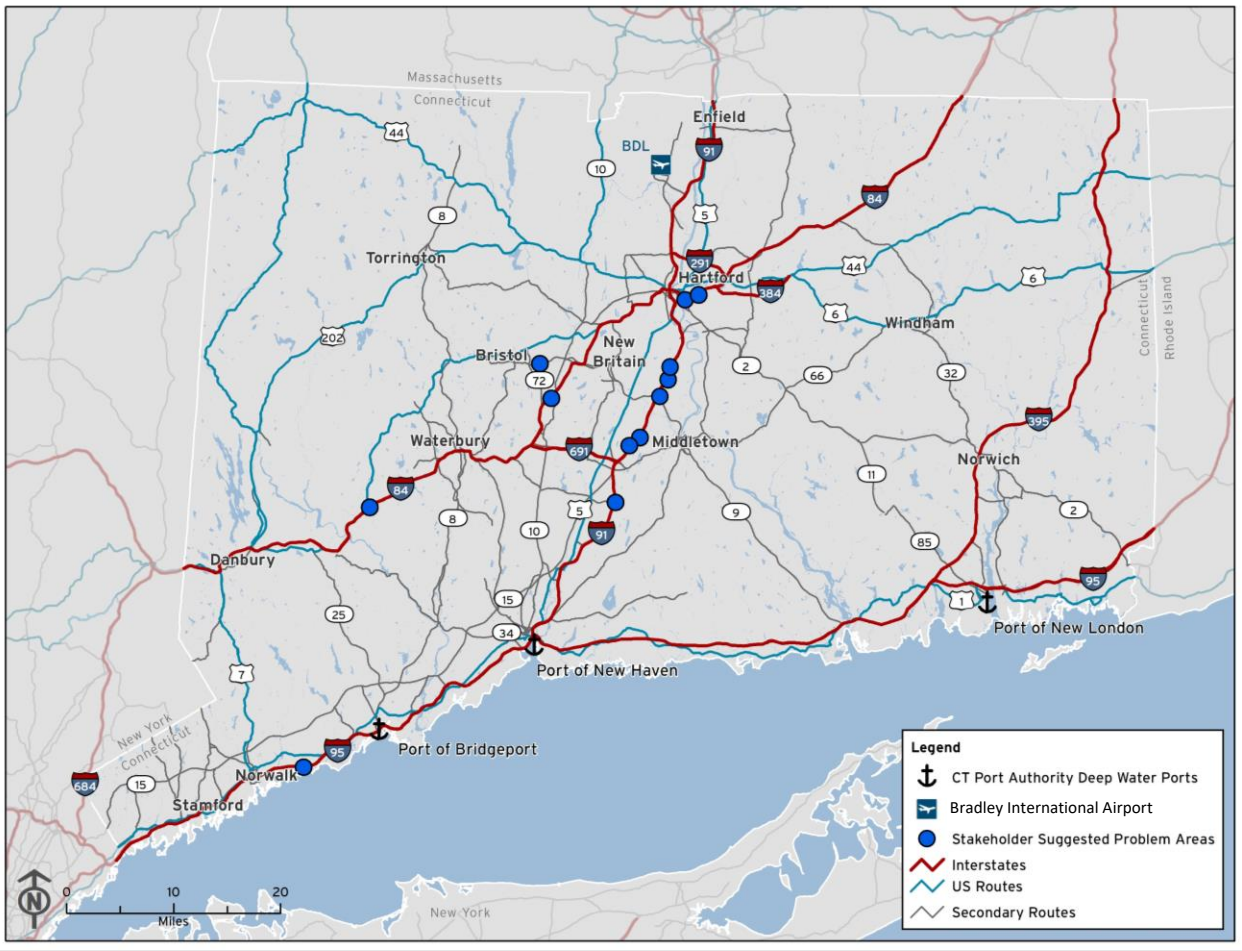
CTDOT also reached out to law enforcement and the CT DMV to identify and describe freight issues related to enforcement, truck parking, and truck movement constraints within the state using an online survey format. Respondents were asked to answer a few questions as well as use the online mapping feature to provide input on specific locations. Respondents identified lack of truck parking and decreased safety as top concerns. Additional comments include:

- There is a lack of large truck parking areas/truck stops in areas of greatest need
- Too many sharp curves, generally near urban areas
- Lack of Hartford bypass (I-295 should have extended west toward West Hartford/Farmington)
- Interstates where there are four lanes in a single direction should exclude trucks in the two left lanes
- There are too many left-hand exits off the highway system that create risky lane changes for trucks to enter and exit the roadway

Figure 9.3 illustrates problem areas identified by the respondents where trucks are observed in undesignated parking locations. Additionally, respondents noted problem areas for trucks near the following locations:

- I-95 and US 7 in Norwalk
- I-95 in Bridgeport
- I-84 Mixmaster, Waterbury
- I-84 and Route 72 interchange
- I-84 near exit 70 in Willington
- Route 72 and Route 177 intersection
- I-91 north of Meriden
- I-91 and Charter Oak Bridge interchange
- US 5 and Route 9 intersection

Figure 9.3: Enforcement Survey Input Regarding Observed Undesignated Truck Parking Locations



Source: Enforcement Stakeholders Online Survey.

9.6 Internal Freight Working Group

CTDOT has continued engagement on freight modal issues through an Internal Freight Working Group. The Internal Freight Working Group meets quarterly and includes representatives from FHWA, several divisions within the CTDOT, CT Airport Authority, and CT Port Authority. This ongoing engagement across CTDOT and its partners ensures collaboration and coordination on freight issues within the state transportation agencies. The Internal Freight Working Group served as intermediate reviewers of the Freight Plan Update. During the development of this Freight Plan Update, the Internal Freight Working Group met four times. It is anticipated that the Internal Freight Working Group will continue to meet quarterly after the completion of the Freight Plan Update to collaborate and coordinate on its implementation.

9.7 Freight Advisory Committee

Freight planning is greatly enhanced by private sector and industry expert engagement. One mechanism of achieving this is through ongoing dialogue with operators, shippers, and users of the freight system. CTDOT conducted extensive outreach in developing this plan and will continue to do so through regular meetings with modal stakeholders. It is anticipated that CTDOT will lead ongoing meetings, annually, or more frequently as needed with the private sector including firms related to trucking, rail, waterway transportation, and aviation, as well as public sector partners. This ongoing engagement will improve freight operations and provide the state with a more detailed understanding of freight issues that the CTDOT and private industry will face in the coming years. Maintaining a Freight Advisory Committee after the completion of the Plan can be mutually beneficial. The public sector can stay abreast of how the evolution of technology and business models may change freight needs in Connecticut and enhance the state's competitiveness from a transportation standpoint. With open lines of communication, the private sector can work with the CTDOT to meet transportation needs that is in the public interest to address. CTDOT is examining the establishment of a State Freight Advisory Committee.

9.8 Public Comment

The Draft Connecticut Statewide Freight Plan Update was made available for public review and comment.

10. FREIGHT TRENDS

Economic, demographic, social, and technological change all influence the way freight moves. While Connecticut exists in a fixed location, the state's consumer demands, its economic drivers and the way freight moves are not fixed at all. This chapter summarizes the trends related to goods movement on Connecticut's statewide freight transportation network. It also assesses how those trends might impact the state's freight flow patterns in the future.

10.1 TECHNOLOGY TRENDS

Technological advancement is rapidly changing the nature of the freight industry. Technology can help gather data and to understand the transportation system, its operation, and opportunities for efficiencies. It can also improve operations, allowing for better movement of freight across a transportation network. Technology is perhaps the category with the greatest potential to change the transportation system in terms of freight mobility and delivery. Advances in vehicle technology and logistics operations move faster than regulatory bodies can adjust to them, so close coordination with the private sector is essential to ensure that the private sector interest in flexibility and the public-sector interest in safety and environmental protection are in balance.

10.1.1 Connected Vehicles

The USDOT defines connected vehicles (CV) as cars, trucks, buses, and other vehicles that use advanced technology to 'talk' to each other and to the infrastructure via wireless devices. These devices continuously share safety and mobility information, thus enabling crash prevention, environmental benefits, and continuous real-time data sharing and performance monitoring.[68] **Figure 10.1** provides a conceptual view of such wireless connectivity.

Information can be exchanged between different types of vehicles, the infrastructure, and across networks and devices. Applications include:

- Safety alerts – For example, spot weather impact warnings, forward collision warnings, and work zone information
- Traffic and traveler information – Such as weather alerts, road conditions, incidents, and speed restrictions
- Signal priority – Permits certain types of vehicles like trucks or transit buses to receive priority green lights when traffic conditions warrant
- Distress notifications – Allows a connected vehicle to broadcast a distress signal when systems detect a situation that may require assistance from others

[68] https://www.its.dot.gov/cv_basics/cv_basics_what.htm

Figure 10.1: Connected Vehicles Concept

Source: USDOT

Recent freight-focused CV deployments include Freight Signal Priority on key freight arterials in Miami, Florida and a Wyoming project that tested several safety applications designed to improve safety on I-80, where severe winter weather often leads to crashes.

A key uncertainty in planning for CV technologies revolves around communications standards. The two leading standards are Dedicated Short-Range Communications (DSRC) and Cellular Vehicle-to-Everything (C-V2X). DSRC relies on a version of the 802.11p Wi-Fi standard, while C-V2X is based on the Long-Term Evolution (LTE) cellular standard. Hence, although both standards use the same message sets for CV applications, DSRC and C-V2X devices cannot interoperate. In 2020, the Federal Communications Commission voted to reallocate the 5.9 GHz band previously reserved for DSRC safety applications to unlicensed uses and C-V2X.[69] As a result, many industry observers expect C-V2X to emerge as the preferred choice. But in the absence of a federal mandate to install C-V2X radios in new vehicles, market adoption could take time.

Nonetheless, CV technologies will continue to evolve, including applications that may benefit freight movement in Connecticut. Planning for statewide V2X deployment is likely premature but installing Intelligent Transportation Systems (ITS) devices at spot locations or along individual corridors may encourage adoption of emerging technology while benefiting all road users. Co-locating future CV

[69] https://www.fcc.gov/document/fcc-modernizes-59-ghz-band-improve-wi-fi-and-automotive-safety-0

equipment with existing ITS infrastructure can also generate cost savings because the equipment can share the same power, cabinet, and communications infrastructure.

10.1.2 Autonomous Trucks and Truck Platooning

Autonomous vehicles use internal sensors, cameras, radar, light detection and ranging (lidar), GPS, and advanced software to operate some or all functions of a vehicle without driver assistance. Fully autonomous trucks are either under development or have been deployed by several private firms including TuSimple, Waymo, and Aurora. Field deployments have been successful within well-defined use cases. TuSimple recently completed the world's first 'driver out' test on public roads, running a specially equipped tractor trailer for 80 miles on surface streets and highways in Arizona without anyone in the cab.[70] These deployments have demonstrated potential long term and larger industry deployments and use. Many observers now expect autonomous trucks to reach market before passenger vehicles owing to market pressures in the trucking industry, most notably a persistent driver shortage.


Source: USDOT

Fully autonomous trucks are typically focused on limited access highways, such as Interstate highways, where automation is simpler owing to relatively stable speeds, long travel distances, and the absence of traffic signals, non-motorized users, and other variables encountered on surface streets. They can also work well on fixed routes, such as from a production site to a distribution center. (The TuSimple test was from a rail yard in Tucson to a distribution center in Phoenix.) Autonomous trucks can be deployed on any trade corridor within the operational design domain of autonomous systems available today.

Truck platooning is a wireless technology that links two tractor-trailer trucks together such that the following truck mirrors the lead truck's braking, acceleration, and sometimes steering, allowing for shorter following distances and reduced fuel use and emissions. Truck platooning has been tested in multiple states including Michigan, Pennsylvania, and Ohio.[71] Platooning typically requires an engaged driver in both tractors. The technology works best on Interstate highway corridors with many trucks traveling between the same or at least similar origin-destination pairs. Pairing trucks may be easier if they come from the same fleet. This minimizes potential concerns about liability and competition. One potential hurdle to truck platooning is operations in mixed traffic, since motorists may have difficulty entering or exiting the freeway through a 'wall' of platooning trucks.

Autonomous trucks and platooning systems are being developed to operate within existing infrastructure constraints and without the need for communication with roadside equipment, offering somewhat limited scope for government involvement. Nonetheless, deployments require coordination

[70] https://ir.tusimple.com/news-releases/news-release-details/tusimple-becomes-first-successfully-operate-driver-out-fully

[71] https://aashtojournal.org/2020/10/30/multi-state-coalition-conducts-highway-testing-of-truck-platooning/

between state DOTs, law enforcement, and local agencies. CTDOT can therefore act as a facilitator and enabler for developing and testing such technologies. Given the long-distance nature of most truck freight on such corridors, CTDOT could coordinate with neighboring state DOTs, law enforcement, the USDOT, the Eastern Transportation Coalition, local agencies, and industry partners to facilitate tests and deployments as appropriate. It is important to consider appropriate operating conditions with respect to technological capabilities in such tests, since Connecticut's weather and topography may pose challenges to autonomous systems. In addition, routine maintenance of pavement markings and signage could improve autonomous vehicle operations, including trucks.

10.1.3 Intelligent Transportation Systems for Freight

As technology advances, real-time data on parking availability, congestion, and road and weather conditions can be transmitted between vehicles, roadside units, and traffic management centers. As truck freight volumes increase, advances in ITS have the potential to optimize and improve the transportation network. An example of a freight-oriented application is the Drayage Freight and Logistics Exchange (DrayFLEX) deployment in Southern California. DrayFLEX shares information between terminal operators, truck dispatchers, and agencies including real-time and predicted port terminal queue times; real-time routing, navigation, traffic, work zone, and incident data; and drayage truck arrival times. The goal is to improve container movement planning between terminals and distribution centers while mitigating safety concerns associated with high truck traffic and vehicular congestion.

In addition, applications can include advanced emergency management that aims to reduce congestion on major roadways through monitoring traffic incidents with closed-circuit television cameras, dispatching vehicles to remove debris or hazardous materials, communicating the most direct routes to emergency vehicles to help them arrive more quickly at accident scenes, and displaying information on dynamic message signs to alert travelers of any issues.

Connecticut does not have a major seaport generating container movements as in Southern California, but the state highway network facilitates long-distance cargo generated at the Port of New York and New Jersey and elsewhere. Moreover, Connecticut's highway infrastructure must accommodate significant local and regional passenger traffic in a densely developed area where large-scale highway expansion can be difficult for cost and environmental reasons. Therefore, ITS applications can focus on sharing information to better manage existing capacity for all users including freight.

10.1.4 E-Commerce and Last-Mile Delivery

Electronic commerce, or e-commerce, is the use of electronic devices and technologies to buy and sell goods, services, or for the transmittal of funds or data, primarily over the internet. E-commerce has grown substantially over the past two decades with widespread use of online retailers such as eBay and Amazon. According to the U.S. Census Bureau, e-commerce sales accounted for 13 percent of total retail sales in the third quarter of 2021, up nearly 7 percent from the third quarter of 2020. Moreover, online sales have been growing as a share of total retail sales, from 5 percent of the total in 2011 to

almost 14 percent in 2020. Web sales totaled $759 billion in 2020, up from $199 billion in 2011.[72] The COVID-19 pandemic accelerated this trend. One estimate based on Adobe Digital Insights data found that COVID-19 accelerated e-commerce growth by 4 to 6 years in just a few months as lockdowns forced consumers to purchase more goods online.[73] Even more than before the pandemic, consumers will expect to be able to shop from home with free delivery to their doorstep.

As e-commerce has grown, consumer demand for faster delivery has also grown. This rapid growth in e-commerce has changed shipping patterns and freight movements in particular, at the regional and local level, as residences replace retail locations as freight destinations. Growth in e-commerce retail sales has decentralized retail distribution and fulfillment networks.

Decentralized retail distribution has resulted in increased regional distribution of goods and regional distribution warehouse and trucking needs.[74] For example, Amazon began locating facilities in Connecticut in 2010; since then, more than a dozen warehouses and distribution centers are located across the state.[75] More recently in 2022, Amazon acquired a 150-acre facility spanning across Waterbury and Naugatuck with easy access to Route 8, I-84, and rail service.[76]

Growth in e-commerce retail sales has resulted in the growth of home deliveries. The growth in home deliveries, particularly in heavily populated area, has increased the need for last-mile direct to consumer truck trip solutions and research into new delivery technologies such as drones. As such, last-mile delivery is becoming a critical differentiator and a strategic priority. According to a survey by Accenture in 2016, two-thirds of online consumers now choose a retailer based on the number of delivery options while three-quarters look at a retailer's return policy before completing an order.[77]

More recently, e-retailers have implemented centralized distribution centers, customer pick-up lockers and private fleets of delivery vehicles to supplement other postal services. Rapid e-commerce requires fast, on-time delivery which is sensitive to both distance and congestion. One result of this trend is a higher number of delivery vehicles entering residential neighborhoods and more frequent deliveries to businesses, causing increased congestion and wear and tear to the local road network. Additionally, online commerce introduces the need for reverse logistics to handle returns or recycling of goods that were formerly brought to a retail location, further increasing the strain on the freight network.

E-commerce in Connecticut relies heavily on the trucking industry with long-haul transport into the state, then regional and urban transfers, and then the last mile, usually completed with postal services, private fleet delivery vehicles, and app-based delivery services. This increase in road freight carriers leads to increased traffic congestion and delays in the delivery of goods to both residential consumers and businesses.

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[72] U.S. Census Bureau, "Estimated Quarterly US Retail Sales (Adjusted): Total and E-commerce," retrieved January 7, 2022, from https://www.census.gov/retail/index.html.

[73] Koetsier, John, "COVID-19 Accelerated E-Commerce Growth 4 to 6 Years," *Forbes*, June 12, 2020.

[74] https://truckingresearch.org/wp-content/uploads/2019/02/ATRI-Impacts-of-E-Commerce-on-Trucking-02-2019.pdf

[75] https://www.journalinquirer.com/business/state-is-hub-for-amazon/article_575618be-149c-11ec-98c3-e764ea1feb3e.html

[76] https://www.ctinsider.com/business/article/Planned-Amazon-distribution-center-in-Naugatuck-16803416.php

[77] Accenture, "Shipping Options and Delivery Partners Essential to Winning the eCommerce Battle, Accenture Study Shows," retrieved January 7, 2022 from https://newsroom.accenture.com/news/shipping-options-and-delivery-partners-essential-to-winning-the-ecommerce-battle-accenture-study-shows.htm.

Rapid advances in digital technology and automation is expected to continue to influence e-commerce logistics. Retailers are expected to continue to look for opportunities to increase same-day delivery options and forcing a growing need for shortening the last-mile delivery distance. As demand for e-commerce continues to increase, intermodal solutions, such as a combination of two or more different shipping modes such as trucks, trains, ships, and aircraft, is needed to accommodate the increasing complexity of supply chains, to reduce costs, and to reduce the time frame of e-commerce deliveries into Connecticut. Additionally, regional intermodal facilities that can transfer goods from one mode to another may also help to reduce the complexities of transporting goods across modes.

Major delivery companies such as Amazon, Google, DHL, and UPS are now working on meeting the demand for faster, cheaper package deliveries by looking for efficient, time saving methods for home delivery. Emerging strategies include:

- **Setting up smaller consolidation centers –** Some retailers are placing smaller consolidation centers, or microhubs, in dense urban communities. Goods get delivered from warehouses and distribution centers via truck to a microhub facility where a package can be picked up by a customer or delivered by cargo bike, bicycle, robot, or drone to its destination.[78]
- **Setting up a network of regional carriers –** Rather than relying on one or two large national carriers, some retailers are experimenting with several regional carriers to quickly deliver parcels to customers.
- **Using gig and platform services –** Technology platforms like Instacart and Shoprunner can permit same-day fulfillment. Although this is a high-cost approach, the benefits of converting more online shoppers may outweigh the fees for using the platforms.
- **Drone delivery –** Companies including Amazon and Google subsidiary Wing have received Federal Aviation Administration approval to operate drone delivery services. Such services may allow drivers to make more deliveries per hour without driving additional miles, or customers could receive drone parcel shipments directly from nearby warehouses.

Weather restrictions, regulations, and public acceptance obstacles may make drones a longer-term solution, but wide adoption of drone delivery could disrupt the local parcel and trucking industry in Connecticut. Platform services could reduce the number of parcel trucks on the road but would presumably increase conventional vehicle traffic since gig workers would be using their personal vehicles to make deliveries.

10.2 Truck Electrification and Alternative Fuels

Most of the truck fleet used for freight movement remains diesel powered. However, fully electric, hybrid, and alternative fuel trucks have been making inroads into the market, which may help reduce the environmental impacts of goods movement in Connecticut.

[78] https://www.portlandoregon.gov/transportation/article/751002

10.2.1 Electric and Hybrid Trucks

Electric trucks use only electric motors with no diesel or gasoline power. Hybrid trucks use a conventional engine during long-haul highway trips while shorter trips in stop-and-go traffic rely more on an electric powertrain. Truck manufacturers and fleets have been experimenting with hybrids for more than a decade, while some startups have more recently begun offering fully electric trucks. Electric and hybrid trucks may also have some level of automation; Tesla's Semi, for instance, includes the company's Autopilot driver assistance feature.

According to IHS Markit research, about 80 percent of heavy- and medium-duty trucks in the United States are powered by diesel fuel. The sheer size of the diesel-powered trucking market, the lack of large-scale charging infrastructure, and improvements in diesel engine fuel economy suggest that diesel will remain the dominant truck power source at least through 2040, according to the firm. However, the firm predicts that electric truck sales will grow by 15 percent annually over the next few decades, growing to 34 percent of the market by 2040.[79]

Electric and hybrid truck market adoption will be driven by ownership costs and fitness for use in key applications. Diesel trucks continue to enjoy advantages for long-haul trucking, notably longer range between fueling. Hybrid and electric trucks will likely achieve the greatest penetration in the medium-duty market, particularly urban trucking firms making short deliveries, many of which are driven by e-commerce sales. These use cases are better suited to electrification since range is less important in such operations. However, uncertain variables like the cost of diesel fuel and the regulatory environment may change this outlook.

It is also possible that fully electric trucks could become preferred over hybrids given the simplicity of fully electric powertrains and ongoing improvements in battery technology. Some manufacturers and fleets have been rethinking hybrid technology due to high capital and maintenance costs.[80]

In any event, there are use cases in Connecticut where electric or hybrid trucks may make sense. For example, Tilcon (a construction material supplier) uses some hybrid trucks that emit less exhaust than diesel trucks. Connecticut port terminals could also convert their on-site vehicle fleets (e.g., yard hostlers) to electric power. As battery and hybrid technology continues to improve, more fleets will likely adopt these technologies. CTDOT and/or its partner agencies can also consider grant programs aimed at replacing diesel trucks with electric and hybrid trucks.

10.2.2 Vehicle-to-Grid Technology

As electric vehicle technology improves, the emergence of vehicle-to-grid (V2G) technology is also anticipated. V2G technology allows plug-in electric vehicles to interact with power grids and supply the grids with excess energy in batteries. Recent developments in V2G include:[81]

- Development of smart grids for electricity and load management
- Development of batteries and charging systems with bidirectional operation

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[79] Cassidy, W.B., "Electric truck use accelerates, but diesel to keep dominance." *The Journal of Commerce*, September 24, 2018.

[80] Stinson, J., "Why hybrid diesel trucks never quite caught on." *Transport Dive*, March 23, 2021.

[81] Corbellini, G., "The Future of V2G Technology – What to Expect in the Next Ten Years." *Hive Power,* July 12, 2021, from https://hivepower.tech/the-future-of-v2g-technology-what-to-expect-in-the-next-ten-years/

10.2.3 Compressed Natural Gas / Liquefied Natural Gas

According to the Energy Information Administration (EIA), transportation use in 2020 accounted for 3 percent of natural gas consumed in the United States.[82] Natural gas was roughly 30 percent less expensive than diesel on a dollars per million British thermal units (Btu) basis in 2020, and the EIA expects this gap to widen in coming years.[83] Consequently, some commercial trucking fleets have begun converting to compressed natural gas (CNG) and liquefied natural gas (LNG) in certain use cases. Companies with large fleets that have made commitments to CNG/LNG include United Parcel Service (UPS), Waste Management and AT&T, to name a few. Natural gas consumption in the transportation sector is therefore expected to grow from 90 trillion Btu to 450 trillion Btu through 2050, or 5.6 percent annually on average.[84]

Currently, the key obstacles to faster conversion from diesel and gasoline are the higher cost of natural gas-powered trucks and the lack of refueling stations for long-haul trips. Further adoption of natural gas for transportation use will therefore require more filling stations and widespread awareness by policy makers. Currently, most filling stations (like those being built by UPS) are paid for and used privately. However, if demand for CNG and/or LNG fueling stations continues to grow, state or local governments may need to consider policies to attract or allow for fueling stations so more businesses can access this fuel. CTDOT and/or its agency partners can also consider grant programs aimed at replacing diesel trucks with alternate fuels including LNG and CNG.

10.3 Air Quality and Regulation

The U.S. Clean Air Act regulates areas that do not meet the standards for criteria pollutants under the National Ambient Air Quality Standards (NAAQS). In nonattainment areas, federal law requires state and local governments to develop and implement plans for bringing these areas back into compliance. These areas operate under 'maintenance' state implementation plans (SIPs), which often have provisions affecting the transportation network. Project delays related to these regulations can prolong bottlenecks for truckers (who carry goods to otherparts of the system), and restrictions on traffic in general can also affect trucks.

The U.S. Environmental Protection Agency (EPA) is developing regulations to further reduce GHG emissions from heavy duty trucks. The new Phase 2 regulations, which build on prior Phase 1 standards, will apply to semi-trucks produced in the 2021 to 2027 model years. These regulations are expected to reduce carbon dioxide emissions by 1.1 billion metric tons, save fleets approximately $170 billion in fuel expenses, and reduce oil consumption by up to 2 million barrels over the useful life of vehicles sold under the program (**Figure 10.2**).[85]

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[82] U.S. Energy Information Administration, "Natural gas explained." Retrieved January 11, 2022, from https://www.eia.gov/energyexplained/natural-gas/use-of-natural-gas.php.

[83] U.S. Energy Information Administration, *Annual Energy Outlook 2021*, Table 3. Energy Prices by Sector and Source. Retrieved January 12, 2022, from https://www.eia.gov/outlooks/aeo/excel/aeotab_3.xlsx.

[84] U.S. Energy Information Administration, *Annual Energy* Outlook *2021*, Table 2. Energy Consumption by Sector and Source. Retrieved January 11, 2022, from https://www.eia.gov/outlooks/aeo/excel/aeotab_2.xlsx.

[85] U.S. Environmental Protection Agency, "Regulations for Greenhouse Gas Emissions from Commercial Trucks and Buses," retrieved January 12, 2022 from https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-commercial-trucks.

Within Connecticut, Governor Ned Lamont recently issued an executive order re-establishing the Governor's Council on Climate Change and charging it with monitoring implementation of the state's greenhouse gas reduction strategies. As noted in **Chapter 3**, some of these strategies are freight-related, including encouraging adoption of zero-emission trucks.

In the future, Connecticut trucking companies and fleet owners may be required to retrofit existing trucks or purchase new ones to meet more stringent requirements. The associated costs may mean higher operating expenses for shippers, which in turn will lead to higher costs to transport goods.

10.4 Climate Volatility

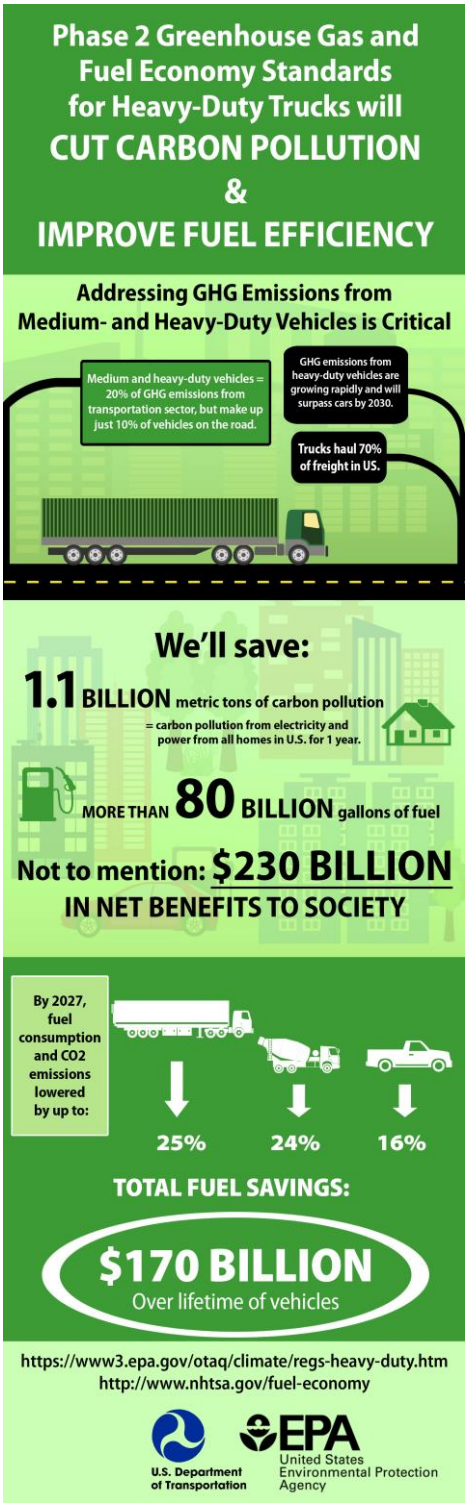
Climate volatility is likely to have more impact on the future of surface transportation than any other issue. Anticipated sea level rise, more extreme weather events, and an increase in very hot days/heat waves have the potential to severely impact the freight transportation network. State DOTs may face future challenges and implications for surface transportation such as meeting changing public expectations, adapting vulnerable transportation infrastructure, and addressing GHG reductions.

Environmental advocates interviewed for the freight plan update made several suggestions related to climate and emissions including improving agency coordination to better implement strategies identified by the Governor's Council on Climate Change; adding GHG reduction as a stated goal in the freight plan; adopting the California Advanced Clean Trucks rule; and encouraging technology use (e.g., load matching and logistics software) aimed at improving freight efficiency. While some of these initiatives are beyond the scope of a state freight plan, Connecticut's participation and support of such policies can improve the environmental footprint of goods movement in the state.

10.5 Regulatory and Funding Trends

The new BIL includes several new and revised programs that may help Connecticut and other states achieve their climate and emissions goals through investment in freight transportation networks and technology. Key new and

Figure 10.2: Benefits of Phase 2 Greenhouse Gas and Fuel Economy Standards for Trucks



Source: Environmental Protection Agency

updated programs and their potential impact on Connecticut are listed in **Table 10.1**. More information about these programs and other BIL provisions can be found in **Chapter 4**.

In addition to these USDOT programs, CTDOT and its partners can access grants administered by other agencies, such as EPA-managed Diesel Emissions Reduction Act funding. One avenue for regional coordination is the Northeast Diesel Collaborative, which collaborates with the public and private sectors to reduce diesel emissions, improve public health, and promote clean diesel technology.

Table 10.1: BIL Programs for Freight Emissions Reduction

Program	Summary	Impacts on Connecticut
Reduction of Truck Emissions at Port Facilities	Competitive grants to reduce emissions from idling trucks at ports	Could be used to fund on-port electrification projects
Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT)	Formula funding program to improve infrastructure resilience	Increased federal funding share for states that develop a resilience improvement plan
Formula Carbon Reduction Program	Grants aimed at reducing emissions including from freight sources	Applicable to truck stop electrification, ITS applications, and CV applications with emissions benefits
Grants for Charging and Fueling Infrastructure	Allocates funds to deploy publicly accessible charging infrastructure	Could be used for electric truck charging or alternative fueling stations
EV Charging Program	Formula funding for states to deploy charging facilities	CTDOT can develop a plan or funds will be reallocated to MPOs and local agencies
Strengthening Mobility and Revolutionizing Transportation (SMART) Grant Program	Competitive grants for innovative technology demonstrations	Could be used for connected/ autonomous freight deployments or ITS projects
Congestion Mitigation and Air Quality Improvement Program	Grants for projects that reduce emissions from transportation	BIL provides additional flexibility for states to use CMAQ dollars on multimodal freight projects

Source: Infrastructure Investment and Jobs Act (IIJA), Public Law 117-58

11. Freight Needs and Issues

Understanding the current and future issues and needs of the freight transportation system is critical to maintaining and improving Connecticut's freight transportation network. This chapter identifies the significant issues and needs of Connecticut's freight transportation system and provides more detailed discussion of freight needs by mode.

11.1 Freight System Needs and Issues Identification

Table 11.1 identifies the need types by goal area into which these needs are categorized and lists the data sources used to analyze them. Truck bottlenecks, safety hot spots, 'poor'/'fair' pavement condition locations, and bridge locations needing improvements were identified primarily based on CTDOT datasets. Similarly, highway/rail at-grade crossing safety issues were identified primarily based on FRA datasets. Other needs were identified through stakeholder input.

Table 11.1: Freight Need Type Definitions and Data Sources

Goal Area/Need Type	Definition	Data Sources
Safety and Security	Locations with high numbers of truck-involved crashes and rail grade crossing safety hotspots	▪ UCONN Connecticut Crash Data Repository ▪ Federal Railroad Administration grade crossing safety data ▪ Stakeholder input
Economic Competitiveness and Efficiency	Needs related to freight regulations or policies that impact goods movement competitiveness and efficiency; areas of shoaling and sedimentation affecting navigation	▪ Stakeholder input ▪ Online research
Optimized Operations, Performance, and Resiliency	Locations with inadequate capacity, congestion hotspot locations, operation deficiency, freight traveler needs, aging infrastructure, flood-prone areas, and other resiliency issues	▪ Truck bottleneck analysis ▪ Stakeholder input
State of Good Repair	Locations with pavement in poor or fair condition or bridges in need of improvements	▪ CTDOT pavement and bridge condition data
Equity, Environmental Protection, and Livability	Areas where trucks or rail move through incompatible land uses; opportunities for reducing GHG emissions	▪ Stakeholder input
Program and Service Delivery	Opportunities for continued or new partnerships with agencies, neighboring states, and private-sector companies	▪ Stakeholder input

11.2 Significant Freight System Needs and Issues

Freight transportation system needs cover a wide range of issues, from increasing capacity to exploring additional transportation funding mechanisms. They provide the rationale for necessary solutions and are an integral part of the development of Connecticut's freight mobility improvement strategy. Eight significant freight transportation needs were identified and are categorized as follows:

- **System Capacity**: Issues related to system capacity include congestion and bottlenecks on key freight corridors, rail capacity constraints, marine freight constraints, and air cargo constraints.
- **Safety**: Addressing safety issues consists of adequate truck parking, including overnight/rest stops; reducing the number of at-grade highway/rail crossings; improving and updating roadway geometrics; addressing vertical clearance issues; and increasing education/awareness of the public about commercial vehicle needs.
- **System Operations**: Efficient system operations require investing in transportation infrastructure, investing in emerging transportation technologies, developing comprehensive incident management systems, addressing oversize/overweight/over-dimensional trucks, reducing permitting and credentialing barriers, and updating and maintaining aging infrastructure.
- **Modal Connectivity**: Improving intermodal connections to increase the speed at which goods move throughout the state, reduce transportation costs, and increase efficiency for freight-reliant businesses.
- **Freight Asset Preservation and Maintenance**: Maintaining Connecticut's existing freight system infrastructure to preserve capital investments including rail track and grade crossing maintenance, waterway dredging, and pavement and bridge repair.
- **Funding and Financing**: Transportation needs far outweigh the resources available and historically, freight needs have not received separate attention in transportation funding programs. There is a freight-specific need for additional transportation funding mechanisms, particularly for highway maintenance and construction. In addition, funding programs are often prescribed for specific types of projects or modes, limiting the ability to fund some high priority freight-specific projects.
- **Energy and Environmental**: Supporting and implementing policies and activities that reduce the cost of alternative fuels and understanding how growing industry and freight tonnage impact infrastructure are important energy/environmental issues that need to be reviewed.
- **Continued Coordination and Collaboration**: More informal exchanges that lead to better coordination between public agencies. For any exchanges to succeed, there must be a mutual recognition of the value in communicating and a way to institutionalize agreements into concrete actions.

11.3 TRUCKING NEEDS AND ISSUES

Because nearly every freight shipment travels by truck at some point in its delivery, challenges on the highway system can cause ripples through the state's freight transportation system and the economy. Delay, safety, and access issues raise costs for shippers, carriers, manufacturers, and consumers alike.

Truck and heavy vehicle needs are centered around infrastructure that is inadequate for or quickly deteriorated by truck use, congestion, and safety concerns including lack of adequate parking. Additional non-infrastructure concerns include driver shortage/retention, restrictive policy applications, such as conflicting weight limitation with neighboring states and addressing climate change through fleet conversion away from fossil fuels. There is also need for public agencies to exchange information and harmonize how trucks are managed in an operational sense. Regional and national coordinating bodies such as the American Association of State Highway Transportation Officials (AASHTO), the Metropolitan Area Planning (MAP) Forum, and the I-95 Corridor Coalition offer forums for exchanging such information.

11.3.1 Pavement and Bridge Maintenance

Substandard Bridges and Pavement – Substandard bridges and pavement may cause cargo damage and truck detours that increase distances and delivery times. Heavy-use truck routes often experience rough pavement, tight turning radii, narrow lane width, short ramps, inadequate merging lanes, lane restrictions and overall capacity issues. Last mile connections on the local road systems can be particularly prone to these issues. Needs can range from small scale intersection improvements to rebuilding and expanding long stretches of highway links. Approximately 383 miles of the NHS are in 'poor' pavement condition as of 2020 and 49 bridges are in 'poor' condition. **Section 8.1** summarizes the pavement and bridge condition.

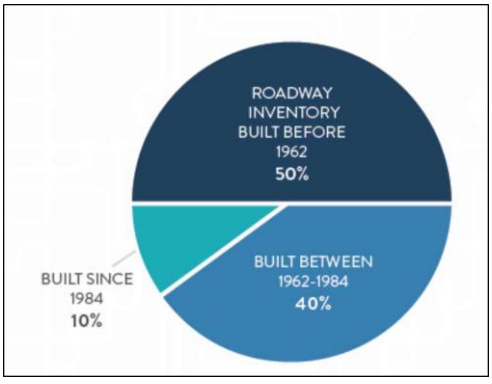
Oversize and Overweight Vehicles – In addition to the ever-increasing number of trucks on our roadways, there is the concern with overweight vehicles. The damage caused by these vehicles can lead to premature pavement failure and is not easily quantified. Continued enforcement of maximum weight restrictions is critical to the long-term performance of highway systems (pavements and bridges).

The state's roadway system is relatively well equipped to handle current truck configurations, in terms of size and weight, particularly in urban areas. Town and city roads are not built to the same standards however and can suffer from the repeated stress of heavy truck loads. In rural areas, some infrastructure that was built decades ago may struggle to handle heavy farm loads.

Climate Variability – New England's extreme variability in weather is also a factor beyond traffic loading that contributes to pavement deterioration.

Age of the Highway System – The majority of Connecticut's most vital highways, the Interstate System, was constructed in the 1950s and 1960s, and substantial portions were constructed earlier (**Figure 11.1**). Many roadways are continuously subject to greater traffic and

Figure 11.1: Age of the System



Source: Connecticut Department of Transportation

loads than they were designed to handle. The increasing traffic volumes and heavier loads have accelerated the deterioration of the underlying layers of the pavement structure. This situation has made the subsequent rehabilitation of pavements increasingly more extensive and costly.

11.3.2 Congestion and Safety

Truck Volumes – I-95 from the New York/Connecticut border to New Haven and I-91 between New Haven and Hartford carry the largest truck volumes. Freight trucks are forecast to become a larger share of the traffic mix in Connecticut. When traffic volumes on roadway facilities exceed capacity, it can contribute to congestion. Congestion can result in long idle times for trucks and slows down the movement of goods. Truck volumes are further discussed in **Chapter 8.** Areas of highest truck volumes (10,001 to 22,610 trucks per day in 2019) include:

- I-95 (New York/Connecticut border to New Haven)
- I-91 (New Haven to Massachusetts border)
- I-84 (New York/Connecticut border to Massachusetts border)

Truck Bottlenecks – Truck bottlenecks cause a significant impact on freight mobility. In 2019, trucks on the Interstate system in Connecticut experienced almost 13,000 hours of delay due to bottlenecks. Causes of bottlenecks may include traffic control, high traffic demand, issues with vertical grades, roadway geometry (curves) as well as a combination of these issues and other causes. Truck bottlenecks from recurring congestion are discussed in **Chapter 8**. The top 10 segments of high delay include:

- I-95 (Fairfield) – From Mill Hill Road to Sherwood Island Connector
- I-95 (Norwalk) – From Sherwood Island Connector to Exit 13
- I-95 (Stamford) – From Lafayette Street to Sachem Road
- I-91 (New Haven) – From Orange Street to East Street
- I-91 (Hartford) – From Day Hill Road to Jennings Road
- I-84 (East Hartford) – From I-291 to Deming Street
- US-1 (I-95 intersection at Fairfield) – From Stephens Lane to Johnson Drive
- CT-15/CT-5 (B/W Newington and Berlin) – From Deming Road to Prospect Street
- South State Street, Stamford – From Exit 7 to Elm Street
- State Street, New Haven – From Bradley Street to Willow Street

Truck Parking Availability – Congestion and a lack of parking availability have led to the creation of informal parking areas, in locations such as along interstate ramps. Unsanctioned parking locations, especially on interstate ramps, present safety and operational concerns and are a significant issue for both law enforcement and CTDOT. The limited availability of parking may occasionally result in trucks parked on ramps and shoulders, which may present a safety risk. **Chapter 7** summarizes the truck parking supply in Connecticut. There are 1,226 commercial truck parking spaces in Connecticut that are being accommodated by 20 public facilities and 10 private facilities. The location of truck parking facilities is critical especially in high demand urban locations where the current supply may not be adequate.

Truck-Involved Crashes – Truck-involved crashes occur less frequently than many other types of crashes but can be more sever due to the size and weight of the vehicles. **Section 8.1.6** summarizes the truck-involved crashes from 2015 to 2019. Fatal and serious injury crashes occur throughout the

state but tend to cluster along major Interstate corridors (including I-95, I-91, I-84, and I-395) and around the state's largest metro areas (including Hartford, New Haven, Bridgeport, and Stamford) (**Figure 8.14**).

Incident Management – Incident management describes the coordinated activities of transportation, emergency and law enforcement agencies to respond to accidents, highway construction, incidents, natural disasters such as hurricanes, as well as winter weather, storms, road maintenance and closures. Proper planning and investment in incident management can decrease the response times to emergencies and can help restore a corridor to pre-incident flow rates more quickly. Statewide and regional transportation planning for disasters, emergencies, and significant events provide a framework for comprehensive, multi-jurisdictional, multidisciplinary preparedness, response, and management for a wide range of incidents that affect freight transportation systems in the state. Providing solutions that address all hazards will support transportation system management, congestion management, and emergency response preparedness. Barriers to better incident management exist within the state such as manpower, funding limitations, lack of best practices knowledge, and bureaucracy/coordination issues.

Truck and Passenger Vehicle Conflicts – Freight vehicles and passenger vehicles often share lanes, requiring merging and lane changes that can result in passenger vehicle drivers to speed or change lanes quickly to avoid freight traffic. Dedicated truck lanes could improve the movement of freight vehicles and reduce interactions with passenger vehicles.

11.3.3 Standardization in Policy Application

Truck use is governed by policies including overweight and oversize vehicles restrictions and permitting. Truck drivers are also subject to regulations such as licensing and obtaining credentials, abiding by 'Hours of Service' regulations, and driving restrictions during adverse weather and decreased visibility. These policies serve important value in increasing the longevity of infrastructure and increasing the safety of truck driving but can inhibit truck movements, particularly when regulations vary widely from state to state. Overweight restrictions on certain roadways and bridges can also require trucks to use designated truck routes which may increase travel distances, increasing costs and impacts on infrastructure.

11.3.4 Addressing Climate Change

Burning fossil fuels, including gasoline and diesel, releases greenhouse gas emissions into the atmosphere and contributes to climate change. There is widespread interest and need in reducing the emissions from trucks and heavy vehicles. Alongside the transition to electric vehicles (EV) which reduces emissions, truck only driving lanes has been viewed as a potential alternative to reduce congestion delay, fuel consumption, and emissions. Moving truck traffic into dedicated lanes can enhance vehicle operations and thereby reducing total fuel consumption, emissions, and pollutant concentrations.

Interagency Coordination/Continued Partnerships – Interagency coordination between CTDOT, CT Department of Energy and Environmental Protection (DEEP), CT Department of Public Health (DPH), CT DMV, CT State Police, and other relevant agencies is needed on existing initiatives and legislations such as the Governor's Council on Climate Change (GC3) and the Global Warming Solutions Act. Continued partnerships are necessary to develop and implement climate and resilience strategies, to coordinate across modes of transportation, and to coordinate freight needs across local, state, and national jurisdictions.

Medium and Heavy-Duty EV Charging Infrastructure – Continued participation on the Multi-State Zero emission vehicle (ZEV) Task Force is needed to develop a multi-state action plan to identify barriers and propose solutions to support widespread electrification of medium- and heavy-duty vehicles (Zero Emission Medium- and Heavy-Duty Vehicle Action Plan). Barriers may include:

- Inadequate power grid to support increased EV charging
- Lack of charging locations and staging for charging vehicles
- Lack of standard and clearly defined charging rates
- Variations in charging adapters and plugs

Information Systems – Information and communications technologies that use real-time tracking of logistics and transportation assets are needed for the trucking industry. Logistical software systems and services can help: Reduce empty miles, cube optimization, co-loading, tractor-trailer pairing, truck-to-rail mode shift, electrification, and connected and autonomous vehicle (CAV) technologies. These strategies are anticipated to help reduce freight GHG emissions by (1) increasing truck load factor (in tons per-mile), (2) reducing truck per-mile emissions rates, or (3) reducing GHG emissions per ton-mile by shifting from truck to rail.

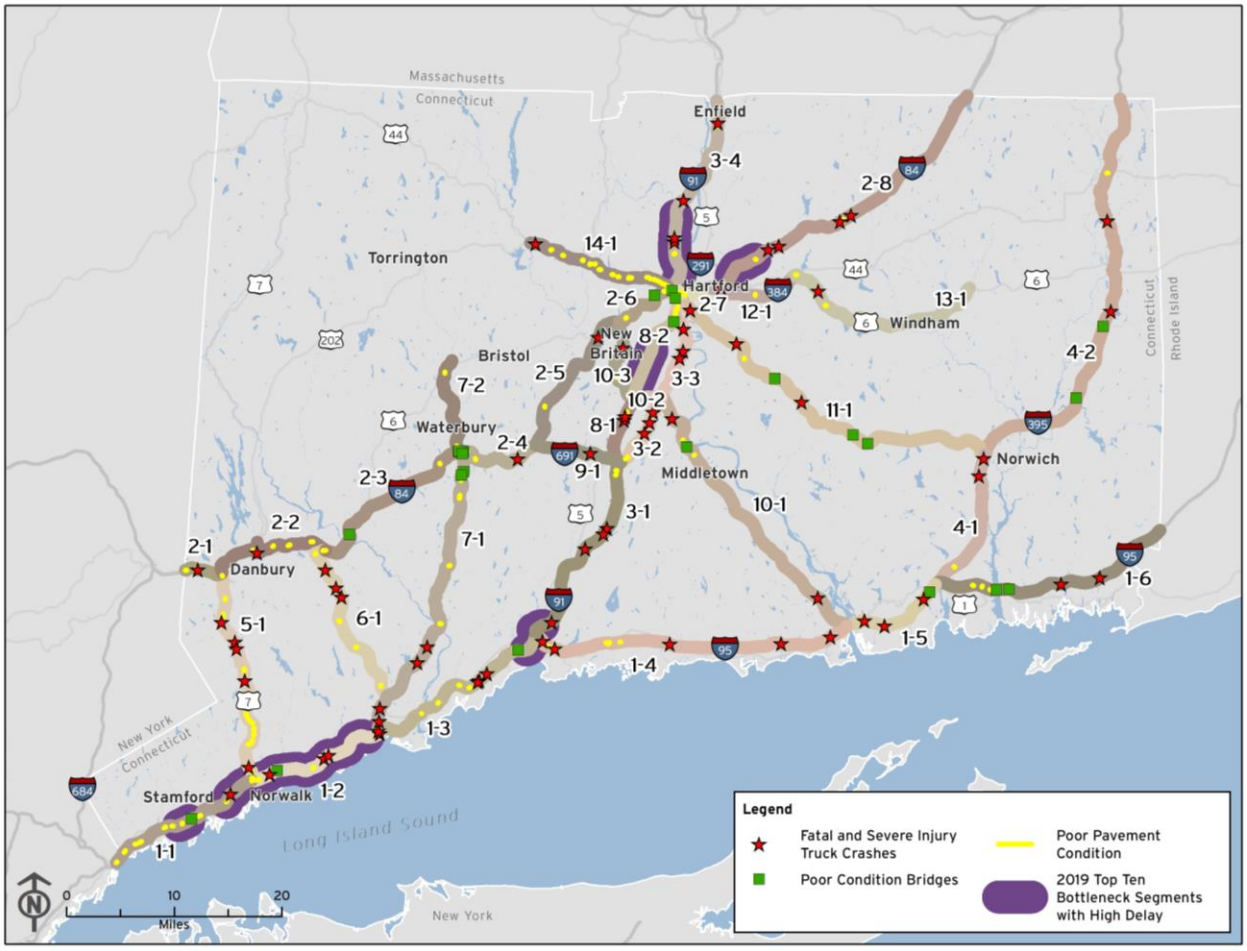
11.4 HIGHWAY SYSTEM INFRASTRUCTURE NEEDS SUMMARY

Highway system infrastructure needs are mapped in **Figure 11.2** and summarized in **Table 11.2.**[86] The infrastructure needs are identified by corridor segment based on the presence of the top 10 truck bottlenecks, fatal and severe injury crashes, poor bridge condition, and poor pavement condition.

There are other needs that are more universal across the highway network and are not depicted in the referenced figure and table. These needs include safe truck parking locations (Chapter 7) and the need for EV charging stations.

[86] The corridor segments for this analysis are located on state routes with a minimum truck AADT of 1,000 trucks per day (including both directions)

Figure 11.2: Highway System Infrastructure Needs by Corridor



Source: CTDOT, CTDOT Open Data Portal, National Performance Management Research Data Set, University of Connecticut's (UConn) Connecticut Crash Data Repository, and CDM Smith analysis

Table 11.2: Highway System Infrastructure Needs by Corridor

Segment Name	Need	Project Relevance to Freight	Goal Area	Corridor Segment #
I-95 between NY/CT Border and US 7	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair ▪ Optimized Operations, Performance, and Resiliency	1-1
I-95 between US 7 and SR 8	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair ▪ Optimized Operations, Performance, and Resiliency	1-2
I-95 between SR 8 and I-91	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair ▪ Optimized Operations, Performance, and Resiliency	1-3
I-95 between I-91 and SR 9	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	1-4
I-95 between SR 9 and I-395	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	1-5
I-95 between I-395 and CT/RI Border	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	1-6
I-84 between NY/CT Border and US 7	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	2-1
I-84 between US 7 and SR 25	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	2-2
I-84 between SR 25 and SR 8	▪ Improve infrastructure condition	On the NHS	▪ State of Good Repair	2-3
I-84 between SR 8 and I-691	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	2-4
I-84 between I-691 and SR 9	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	2-5
I-84 between SR 9 and I-91 / US 44	▪ Improve infrastructure condition	On the NHS	▪ State of Good Repair	2-6
I-84 between I-91 / US 44 and I-384	▪ Improve infrastructure condition	On the NHS	▪ State of Good Repair	2-7

Segment Name	Need	Project Relevance to Freight	Goal Area	Corridor Segment #
I-84 between I-384 and CT/MA Border	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair ▪ Optimized Operations, Performance, and Resiliency	2-8
I-91 between I-95 and I-691	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair ▪ Optimized Operations, Performance, and Resiliency	3-1
I-91 between I-691 and SR 9	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	3-2
I-91 between SR 9 and US 5 / I-84	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	3-3
I-91 between US 5 / I-84 and CT/MA Border	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair ▪ Optimized Operations, Performance, and Resiliency	3-4
I-395 between I-95 and SR 2	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	4-1
I-395 between SR 2 and CT/MA Border	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	4-2
US 7 between I-95 and I-84	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	5-1
SR 25 between SR 8 and I-84	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	6-1
SR 8 between I-95 and I-84	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	7-1
SR 8 north of I-84	▪ Improve infrastructure condition	On the NHS	▪ State of Good Repair	7-2
US 5 between I-691 and SR 9	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	8-1
US 5 between SR 9 and I-91	▪ Improve congestion ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair ▪ Optimized Operations, Performance, and Resiliency	8-2

Segment Name	Need	Project Relevance to Freight	Goal Area	Corridor Segment #
I-691 EB between I-84 and I-91	▪ Improve safety	On the NHS	▪ Safety and Security ▪ State of Good Repair	9-1
SR 9 between I-95 and I-91	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	10-1
SR 9 between I-91 and US 5	▪ None	On the NHS	▪ N/A	10-2
SR 9 between US 5 and I-84	▪ Improve infrastructure condition	On the NHS	▪ State of Good Repair	10-3
SR 2 between I-395 and I-84	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	11-1
I-384 between I-84 and US 6	▪ Improve safety ▪ Improve infrastructure condition	On the NHS	▪ Safety and Security ▪ State of Good Repair	12-1
US 6 east of I-384	▪ Improve safety ▪ Improve infrastructure condition	On the NHS On the CURFC	▪ Safety and Security ▪ State of Good Repair	13-1
US 44 WB between I-84 / I-91 and US 202	▪ Improve safety ▪ Improve infrastructure condition	On the NHS On the CURFC	▪ Safety and Security ▪ State of Good Repair	14-1

Source: CTDOT, CTDOT Open Data Portal, National Performance Management Research Data Set, University of Connecticut's (UConn) Connecticut Crash Data Repository, and CDM Smith analysis

11.5 Highway System Freight Infrastructure Gap Analysis

The highway system freight infrastructure gap analysis builds upon the mapped freight needs identified by corridor segment in **Section 11.4**. The identified needs were compared with planned, programmed, and funded projects along each corridor to determine if existing projects address the needs or if further work is required (i.e., the gaps). Planned, programmed, and funded projects were identified using the Connecticut DOT Active Projects Dashboard and the I-95 West Strategic Implementation Plan.[87] In addition to planned and programmed projects, numerous studies are occurring that could provide location specific recommendations to address freight-related needs along the study corridors. Ongoing or recently completed studies are noted in **Table 11.3** and include:

- I-84 Danbury Planning and Environmental Linkages (PEL) Study (I-84 from NY state line and Interchange 8, and US Route 7 from interchanges 7 and 9, and US Route 7 from I-84 and Interchange 11)
- Greater Hartford Mobility Study (I-84/I-91 interchange and surrounding area)

[87] https://ctdot.maps.arcgis.com/apps/MapSeries/index.html?appid=497d9f93de1247378faceff72434b8a6, https://portal.ct.gov/-/media/DOT/documents/dconsultantselection/2400/Strategic_Implementation_Plan_I-95_West_Corridor_NY_to_New_Haven.pdf

- Interstate 84 / Route 8 interchange 'New Mix' in Waterbury PEL Study
- I-95 Stamford PEL Study (Exit 7 to Exit 9)
- I-95 Eastern CT PEL Study (Branford to Rhode Island State Line)
- I-95 Greenwich PEL Study (NY State line to Greenwich)
- I-95 Fairfield to Bridgeport PEL Study

Planned and programmed projects include state of good repair projects like pavement and bridge rehabilitation, capacity improving projects like widening a roadway, and safety improvement such as traffic signal safety improvements. Pavement rehabilitation or resurfacing, bridge rehabilitations, or reconstruction can help improve infrastructure conditions but tend to be location specific, rather than occur along an entire corridor segment. Such programmed projects do not address congestion or safety needs which can require corridor-wide improvements such as roadway widening or traffic signal alignment. Ongoing studies along the corridor segments, such as PEL studies and NEPA studies, should further define the freight-related needs of the corridor and identify project alternatives to address those needs. However, these studies will require additional project development steps prior to being implemented.

Table 11.3 identifies the corridor segments with associated needs on that corridor that also has a planned project, programmed project, or ongoing study.[88] Corridor segments are shown in **Figure 11.2**.

[88] Numbers identified in this table correspond to an inventory of structures used by CTDOT employees.

Table 11.3: Corridor Segments with Programmed Projects and Ongoing Studies

Segment Name (ID #)	Need	Programmed and Planned Projects on Corridor Segments	Current Studies on Corridor Segment
I-95 between NY/CT Border and US 7 (#1-1)	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	▪ Pavement Preservation from NY State Line to Exit 6 ▪ I-95 between Stamford to Bridgeport ▪ National Highway System - Median Barrier/Resurfacing ▪ I-95 Improvements from New York State Line to Exit 7 ▪ I-95 Greenwich Exit 3 Southbound Off Ramp to Arch Street ▪ I-95 Southbound Exit 6-7 ▪ Greenwich I-95 Southbound Exit 7 to New York State Line ▪ Stamford I-95 Exits 7-9 & Bridge 00032, I-95 over Metro North ▪ RBC Improvements between Exits 6-7 & Auxiliary Lane SB ▪ *Greenwich: Rehab Bridge #00001* ▪ *I-95 Bridges Concrete Sealing*	▪ I-95 Stamford PEL Study ▪ I-95 Greenwich PEL Study
I-95 between US 7 and SR 8 (#1-2)	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	▪ I-95 between Stamford to Bridgeport ▪ National Highway System - Median Barrier/Resurfacing ▪ I-95 Northbound Exit 27A (I-95/Route 8/Route 25 Interchange)I-95 Northbound Exits 19-27A Bridgeport ▪ Norwalk I-95 Exits 13-16 ▪ *Rehab Bridge #00059*	
I-95 between SR 8 and I-91 (#1-3)	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	▪ Full interchange at Interchange 33 with new southbound off-ramp & new northbound on-ramp ▪ Rehab Bridge #00163A West River ▪ New Haven Area Variable Messaging Signs (VMS) Upgrades ▪ I-95 Southbound Exit 38 Ramps ▪ I-95 Exit 38 Milford Connector, Milford ▪ I-95 & Boston Post Road/ Route 1 to Exit 39 and Woodmont Road Exit 40, Milford ▪ NHS - Replace Br 00162 o/ MNRR & 00161 o/ SR 745 & Widen to Extend Decel. Lane ▪ *I-95 Bridges Concrete Sealing*	
I-95 between I-91 and SR 9 (#1-4)	▪ Improve safety ▪ Improve infrastructure condition	▪ Rehab Bridge #00163A West River ▪ New Haven Area VMS Upgrades ▪ *I-95 Bridges Concrete Sealing*	▪ I-95 Eastern CT PEL Study
I-95 between SR 9 and I-395 (#1-5)	▪ Improve safety ▪ Improve infrastructure condition	▪ Improvement of I-95 Interchange 74 at CT 161	▪ I-95 Eastern CT PEL Study

Segment Name (ID #)	Need	Programmed and Planned Projects on Corridor Segments	Current Studies on Corridor Segment
I-95 between I-395 and CT/RI Border (#1-6)	▪ Improve safety ▪ Improve infrastructure condition	▪ NHS-Rehab Br 03819-NB Gold Star (Phs 1A) ▪ *I-95 NB Improvements B/O of 58-307* ▪ *2021 D2 Pavement Preservation - Ultra-Thin*	▪ I-95 Eastern CT PEL Study ▪ Grant Application submitted for Gold Star Memorial Bridge improvements
I-84 between NY/CT Border and US 7 (#2-1)	▪ Improve safety ▪ Improve infrastructure condition	▪ *Reconstruction between Exits 3 & 8 (PE)*	▪ I-84 Danbury PEL Study
I-84 between US 7 and SR 25 (#2-2)	▪ Improve safety ▪ Improve infrastructure condition	▪ Climbing Lane Extension & Exit 9 On-Ramp Reconfiguration (FD) ▪ NHS - Rehab Br 01218 & 04180 o/ Housatonic River ▪ *Reconstruction between Exits 3 & 8 (PE)* ▪ *Newtown: Intersection Improvements*	▪ I-84 Danbury PEL Study
I-84 between SR 25 and SR 8 (#2-3)	▪ Improve infrastructure condition	▪ Upgrade Expressway - Phase 3 ▪ National Highway System - Rehab Bridge 03191A o/ I-84 WB, CT 8 & Naugatuck River ▪ National Highway System - Rehab Bridge 03191B o/ I-84 WB, CT 8 & Naugatuck River ▪ National Highway System - Rehab 8 Bridges, 03190 A, B, C, D, E, F & 03191 D, E ▪ I-84/Rt 8 Interchange (PE) ▪ *Newtown: Intersection Improvements*	▪ Interstate 84 / Route 8 interchange 'New Mix' in Waterbury PEL Study
I-84 between SR 8 and I-691 (#2-4)	▪ Improve safety ▪ Improve infrastructure condition	▪ Upgrade Expressway - Phase 3 ▪ National Highway System - Rehab Bridge 03191A o/ I-84 westbound, CT 8 & Naugatuck River ▪ National Highway System - Rehab Bridge 03191B o/ I-84 westbound, CT 8 & Naugatuck River ▪ National Highway System - Rehab 8 Bridges, 03190 A, B, C, D, E, F and 03191 D, E ▪ National Highway System - Rehab Bridge 03191F Ramp 197 over Ramp 202 Meadow Street ▪ I-84/Rt 8 Interchange (PE) ▪ *I-84 Improvements at Exit 14* ▪ *Rehabilitate Bridge #01160* ▪ *2022 D4 Pavement Preservation - Ultra-Thin*	▪ Interstate 84 / Route 8 interchange 'New Mix' in Waterbury PEL Study

Segment Name (ID #)	Need	Programmed and Planned Projects on Corridor Segments	Current Studies on Corridor Segment
I-84 between SR 9 and I-91 / US 44 (#2-6)	▪ Improve infrastructure condition	▪ Construct Operational Lanes Eastbound & Westbound (CN)	▪ Greater Hartford Mobility Study
I-84 between I-384 and CT/MA Border (#2-8)	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	▪ National Highway System - Rehab Bridge 01686B o/ US 44 & Columbus Blvd ▪ National Highway System - Rehab Bridge 01428D o/ US 44, RR & CT River ▪ I-84 Viaduct Replacement (PE) ▪ NHS - Rehab Br 05844A o/ CT 15	
I-91 between I-95 and I-691 (#3-1)	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	▪ I-91/I-691 Interchange Improvements ▪ New Haven Area VMS Upgrades ▪ National Highway System - Rehab Bridge 03094 o/Amtrak	
I-91 between SR 9 and US 5 / I-84 (#3-3)	▪ Improve safety ▪ Improve infrastructure condition	▪ Relocation & Reconfiguration of Interchange 29 (CN) ▪ *I-91 Wethersfield Hartford RBC*	
I-91 between US 5 / I-84 and CT/MA Border (#3-4)	▪ Improve congestion ▪ Improve safety ▪ Improve infrastructure condition	▪ NHS - Rehab Br 01469B o/ CSRR, SR 598 & TR803	
I-395 between I-95 and SR 2 (#4-1)	▪ Improve safety ▪ Improve infrastructure condition	▪ *Norwich: Replace Bridge #00279* ▪ *Rehab I-395 Culverts - Norwich*	
I-395 between SR 2 and CT/MA Border (#4-2)	▪ Improve safety ▪ Improve infrastructure condition	▪ *Rehab Bridge #00302* ▪ *Replace Bridge #06706 (Culvert)* ▪ *Rehab Bridge #06793 and #06794*	
US 7 between I-95 and I-84 (#5-1)	▪ Improve safety ▪ Improve infrastructure condition	▪ *D3 Illumination Replacement*	▪ I-84 Danbury PEL Study
SR 25 between SR 8 and I-84 (#6-1)	▪ Improve safety ▪ Improve infrastructure condition	▪ *Traffic Signal Safety Improvements (Proj #1)* ▪ *Traffic Signal Safety Improvements (Proj #2)* ▪ *Replace Highway Illumination System* ▪ *Rehab Bridge (Culvert) 06750*	

Segment Name (ID #)	Need	Programmed and Planned Projects on Corridor Segments	Current Studies on Corridor Segment
SR 8 between I-95 and I-84 (#7-1)	▪ Improve safety ▪ Improve infrastructure condition	▪ I-84/Rt 8 Interchange (PE) ▪ *CT Route 8 Resurfacing Bridge Rehabilitation and Safety Improvements Design-Build* ▪ *Rehab Bridge #03176 & #03177* ▪ *Rehab Bridges #03178 & #03179* ▪ *Bridge Rehab Route 8/84 Interchange*	
SR 8 north of I-84 (#7-2)	▪ Improve infrastructure condition	▪ I-84/Rt 8 Interchange (PE) ▪ *Rehab Bridge #01729* ▪ *ED - Repair Failed Embankment at MP 39.4*	
US 5 between SR 9 and I-91 (#8-2)	▪ Improve congestion ▪ Improve infrastructure condition	▪ *Wethersfield: Rehab Bridge #00811*	▪ Greater Hartford Mobility Study
I-691 EB between I-84 and I-91 (#9-1)	▪ Improve safety	▪ I-91/I-691 Interchange Improvements ▪ *Resurfacing, Bridge Rehab & Safety Improvements - RFQ (Design-Build)* ▪ *Improve I-91 Southbound/I-691 Eastbound/15 SB*	
SR 9 between I-95 and I-91 (#10-1)	▪ Improve safety ▪ Improve infrastructure condition	▪ *District 1 Ultra High Performance Concrete Beam End Repairs*	
SR 2 between I-395 and I-84 (#11-1)	▪ Improve safety ▪ Improve infrastructure condition	▪ *2021 District 2 Pavement Preservation - Ultra-Thin* ▪ *RBC Program - Resurfacing, Bridge Rehab & Safety Improvements* ▪ *Rehab Bridge 00384/6 & Route 2 Eastbound Mod* ▪ *Route 2 Resurfacing & Safety Improvements*	
US 44 WB between I-84 / I-91 and US 202 (#14-1)	▪ Improve safety ▪ Improve infrastructure condition	▪ *Intersection Improvements – Bishop's Corner*	

Source: CTDOT Open Data Portal, CTDOT Studies, and CDM Smith analysis. Italicized projects are previous project recommendations identified in the 2017 Connecticut Statewide Freight Plan.

Table 11.4 identifies corridor segments that do not have any existing programmed project or ongoing study and the associated needs identified on each corridor. Corridor segments are shown in **Figure 11.2**. This table represents the 'gaps,' where there is a need to be addressed, but no existing project that would address that need. Future studies on these corridor segments should evaluate improvements to address the freight needs.

Table 11.4: Needs Gap – Corridor Segments Without Programmed Projects or Ongoing/Recent Studies

Segment Name (ID #)	Need
I-84 between I-691 and SR 9 (#2-5)	▪ Improve safety ▪ Improve infrastructure condition
I-84 between I-91 / US 44 and I-384 (#2-7)	▪ Improve infrastructure condition
I-91 between I-691 and SR 9 (#3-2)	▪ Improve safety ▪ Improve infrastructure condition
US 5 between I-691 and SR 9 (#8-1)	▪ Improve safety ▪ Improve infrastructure condition
SR 9 between US 5 and I-84 (#10-3)	▪ Improve infrastructure condition
I-384 between I-84 and US 6 (#12-1)	▪ Improve safety ▪ Improve infrastructure condition
US 6 east of I-384 (#13-1)	▪ Improve safety ▪ Improve infrastructure condition

11.6 FREIGHT RAIL NEEDS AND ISSUES

Freight rail is more reliable than barges and more efficient per ton than trucks; however, track infrastructure is often old and in need of consistent repairs. Track may not extend to port facilities and transfer facilities between rail and truck are limited. Railroad bridges are also in need of repair and weight capacity upgrades. Furthermore, the expansion of freight rail is limited by land use policies and lack of regular funding. Passenger rail and freight rail with overlapping track can lead to chokepoints and congestion.

11.6.1 Rail Infrastructure Condition

Rail Car Weight Standards – The Federal Railroad Administration (FRA) has encouraged the railroad industry to increase the standard maximum car weight from 263,000 lbs to 286,000 lbs; and, according to freight rail stakeholders, the new standard weight capacity for rail cars is anticipated to become 315,000 lbs. New rail cars are being built to accommodate the 315,000 lb. weight, but are currently limited to loading only 286,000 lbs. A more robust track structure is required to handle these heavier cars and many short line railroads do not have track and bridges capable of handling the heavier loads. Significant portions of Connecticut's rail lines cannot support 286,000 lb freight loads. These limitations result in a higher cost per ton, resulting in a disadvantage to shippers, which undermines the efficiencies of rail versus truck freight.

Aging Infrastructure – The I-84 and rail structures in Hartford are well past their useful life and are a chokepoint for freight traffic as well as for passenger vehicles and trucks. One of the options under study for the viaduct is to move the railroad to the west and to upgrade the structures to accommodate 286k lb rail cars.

Vertical and Horizontal Clearance – Vertical and horizontal clearance issues can restrict the railroad's ability to increase services or capture additional markets. For example, the state's rail lines cannot accommodate double-stackrail cars. The Shoreline passenger rail line catenary wire and overhead platforms limit vertical clearance for rail freight and are an impediment to freight rail growth in Connecticut.

Track Reconfiguration – Reconfiguration of the Housatonic track is needed in Danbury/Brookfield area.

11.6.2 Rail Expansion

Rail expansion in some locations is limited because of local land use policies. The Housatonic Railroad has secured new business creating a need for additional siding capacity in the Canaan area. They have filed a funding application with the Freight Rail Improvement Program. Rail connectivity to the Port of Bridgeport is also needed.

11.6.3 Freight Bottlenecks

According to the Connecticut Rail Association (CRA), the Hartford line is very congested with the addition of new CTRail and Amtrak service. Growth in passenger service can crowd out freight rail operations. The Connecticut Southern Railroad is already limited to nighttime operations, but Amtrak maintenance work (which occurs at night) interferes with freight service. The CRA also noted potential delays associated with the Walk Bridge in Norwalk.

The Connecticut River Bridge, located near Windsor north of Hartford, is a major constraint to freight operations between Hartford and Springfield, Massachusetts. Rail operators that use the bridge experience issues scheduling shipments during the time windows that are available. The Central New England Railroad also reports capacity constraints in accessing an auxiliary branch line in East Longmeadow, Massachusetts. Continued growth in passenger volumes on the New Haven-Hartford-Springfield line could exacerbate these issues.

11.6.4 Railway-Highway Grade Crossings

Railway-highway grade crossing needs include improved signing and pavements markings, upgraded track circuitry, upgraded traffic control signals with railroad pre-emption, increased sight distance, and modified horizontal and vertical alignments. According to the *Connecticut State Rail Plan 2022–2026*, CTDOT typically spends approximately $1.4 million in federal funds received through the Railway-Highway Grade Crossing Program (Section 130) on railway-highway grade crossing projects. Typical improvements include installing new active warning devices and upgrading existing devices at public crossings. The CTDOT maintains a priority list to determine future projects including public railway-highway grade crossings that may require separation, relocation, or protective devices. More information on freight rail needs can be found in the *Connecticut State Rail Plan 2022–2026*.

11.7 Maritime Needs and Issues

The maritime industry has deep roots in Connecticut, having played a central role in the state and national economy. Connecticut's three deep-water ports as well as our coastal harbors and rivers, all make important contributions to the state's jobs, economic activity and tax revenue. The CPA's 2018

Maritime Strategy identifies the following eight strategic objectives that provide a roadmap for investment decisions and resource allocations over a 5-year period:

1. Manage the State Pier in New London to Increase Utilization and Profitability
2. Build More Volume in Our Commercial Ports
3. Support Dredging of Connecticut's Ports and Waterways
4. Support Small Harbor Improvement Projects Program (SHIPP)
5. Create Intermodal Options
6. Leverage Emerging Opportunities
7. Enhance Ferry Systems and Cruise Coordination Activities
8. Ensure the Future Support of the Connecticut Port Authority (CPA)

In 2019, the Authority commissioned a report[89] that found that the maritime industry in Connecticut generates an estimated $11.2 billion dollars annually and supports an estimated 59,800 jobs across the state. The Authority is committed to supporting a thriving maritime economy that can drive steady economic growth and create new jobs across Connecticut.

11.7.1 Maintenance Dredging

Similar to several port facilities in the United States, the ports in Connecticut are Congressionally Authorized Federal Navigation Channels. The maintenance responsibility is on USACE. Regular maintenance dredging is needed for general cargo ships to transit in and out of the ports efficiently and safely. Infrequent dredging results in shoaling that limits the size of vessels able to enter the port safely. Funding for dredging in Connecticut ports and harbors is not sufficient to maintain a regular maintenance dredging cycle (5 to 10 years).

USACE manages over 28 navigation projects in Connecticut. These sites include rivers, bays, coves, and harbors that are used by commercial interest, fishermen, and the many recreational boaters that enjoy the intricate and fascinating Connecticut coastline. Initial work on many of the projects dates back to the 19th century. Much of the navigational work in today's waterways has been constructed by USACE within the past 50 years, costing an aggregate total of $20 million.

The three deep-draft commercial ports (New London, New Haven, and Bridgeport) waterways are authorized to 35-foot depths or more, and a diverse array of channels and harbors which support the navigation needs of national defense, petroleum, breakbulk and offshore wind components.

The priority issue for Connecticut ports and harbors has been disposal of dredged sediments. Specifically, open water disposal at the three approved sites in Long Island Sound (Eastern, Central, and Western). The Connecticut legislature in the 2022 session approved an authorization in the amount of $3 million to go towards a study to identify dredge sediment disposal options. The Connecticut Port

[89] Connecticut Economic Resource Center, Inc., "Impacts of the Connecticut Maritime Industry 2019," retrieved https://ctportauthority.com/reports/, accessed July 2022.

Authority has requested to the USACE Planning Assistance to States (PAS) program for investigation of alternatives to open water disposal of dredge material in Long Island Sound. The results of this study will support long-term safe and efficient commercial and recreational navigation for the state's ports and harbors. The comprehensive plan would build upon the recommendations made in the December 2015 Regional Dredge Material Management Plan (DMMP) for Long Island Sound.

Initial study tasks would include updating the DMMP's dredging needs assessment for the state including federal and non-federal waterways and marine facilities; review and updating of existing and proposed dredged material placement facilities; review and update beneficial use opportunities for dredged material; and perform initial screening of alternatives for facility siting. The evaluation of coastal dredged material placement facilities will identify current non-federal conditions, capacities, and placement needs of each site. This information will be essential for the state to determine future dredge material capacity needs, capacity at current sites, as well as to determine what new placement sites must be developed or acquired.

Port of Bridgeport & Black Rock Harbors

Bridgeport harbor has not been maintenance dredged since the 1960s. In early 2012, the Port of Bridgeport submitted a Dredged Material Management Plan to the USACE for review, this document has been revised several times and is expected to get finalized late 2022. An optimistic date for maintenance dredging of the harbors could take place FY2025/26 subject to availability of funds.

Dredge depths have been a critical part of the project discussions. Federal Engineering Regulation 1110-2-100, Part E-15 requires that DMMP's include an economic assessment to determine whether continuing operation and maintenance of the overall project and separable increments appears wanted. Considering current usage of the projects yields a preliminary recommendation that the Bridgeport Inner Harbor main channel be dredged to 33 feet instead of the authorized 35-foot depth, and all of the Black rock Harbor channels be dredged to 14-foot depth instead of the authorized 18-foot depth. Cost of dredging to full authorized depth is estimated to be approximately $57 million. Cost of dredging to reduced depths is estimated to be approximately $40 million.

The dredge volumes:	1,000,000 CY – Bridgeport Harbor (reduced dredge depths) 122,700 CY – Black Rock Harbor (reduced dredge depths)
Dredge Material:	All inner harbor maintenance material is unsuitable for open water disposal. Only the Bridgeport outer harbor channel material is suitable.
Disposal Alternative:	Disposal of unsuitable material requires the construction of confined aquatic disposal (CAD) cells, in Bridgeport and Black Rock Harbor.

Additional CAD capacity have started with EPA Region 1, USACE and the Connecticut Port Authority to pursue construction of additional CAD capacity to accommodate privately dredged unsuitable material.

Port of New Haven

USACE New England District, along with the non-federal sponsor, the New Haven Port Authority, and Connecticut Port Authority undertook the New Haven Harbor Navigational Improvement Feasibility Study (2015) to examine navigation improvements to the existing New Haven Harbor federal navigation

project. The study reexamined prior proposals to deepen the main channels and associated features. The navigational safety and efficiency, channel widening and provisions of deeper turning and maneuvering areas were examined. Beneficial uses of dredge material disposal were studied and found consistent with recommendations of the Long Island Sound Dredge Material Management Plan.

The completed study determined a deeper navigation channel up from a 35-foot depth to a 38-foot depth along with widening the entrance channel approach.

The project has received its full funding under the recently passed bipartisan Infrastructure Investment and Jobs Act under President Biden. The next steps are for USACE to initiate movement of the Cross Sound Cable out of the channel and to establish a baseline schedule for early scoping for geotechnical borings. A partnership agreement was initiated with the non-federal partner for design and construction.

The Connecticut Port Authority has secured the non-federal cost share through a legislative authorization.

State Pier New London

The State Pier facility will conduct dredging of the basin between the Northeast and East berths and dispose of the dredged material to a site located in New Jersey for beneficial use. The additional cost to dispose of the sediment outside of Connecticut remains a concern of this project and other commercial port facilities. As noted in the Maintenance Dredging section, the Connecticut Port Authority and USACE's study will find solutions to this issue of dredged material disposal.

11.7.2 Port Expansion and Intermodal Access

Expansion of marine terminals is constrained by adjacent land uses. An additional mooring for barges is needed in the Long Island Sound near Stamford, CT.

Port of Bridgeport needs:

- Port of Bridgeport is hampered as a cargo port by the lack of conveniently accessible freight rail. Existing rail at the port is passenger rail only.
- Nearby Black Rock Harbor was last dredged in 1983 and has less than 1 foot of space/shoulders in some areas.
- Lack of truck freight and rail connections between the Bradley airport and Port of Bridgeport limits connectivity between modes.
- There are inadequate parking facilities on the eastern seaboard of the Port of Bridgeport.

Port of New Haven needs:

- Port of New Haven has limited land availability and surrounding land uses are incompatible for expansion. The Port is trying to identify surplus land to acquire.
- Site known as the North Yard, north of the I-95 corridor and Forbes Avenue, was identified in the Port Authority's Strategic Land Use Plan as a key site for further development to expand maritime use in the port district.

- New Haven Port Authority would like additional rail into the port district to expand capacity.
- Port of New Haven has a shortage of truck idling locations for trucks awaiting access to the terminal.

Ferry operations issues:

- Limited parking and queuing facilities at Bridgeport and New London port facilities.
- Need for expansion and relocation of Bridgeport Ferry to Barnum Landing.

11.8 Air Cargo Needs and Issues

Air cargo is seeing an upward trend that is forecasted to continue over the next 10 to 15 years. A new on-airport cargo facility at Bradley International Airport is a priority and will position the airport to meet future air cargo demand including supporting the large freighter aircrafts. Additional needs include adding additional airfield space to facilitate air cargo access or staging areas for air cargo-truck deliveries.

12. FREIGHT RECOMMENDATIONS

This chapter presents recommendations for freight infrastructure investments, policies, and programs that Connecticut should implement to ensure the state's freight transportation system serves the current and future freight transportation needs of business, industry and consumers.

These recommendations are also aligned with national freight policy goals established under the MAP-21, FAST Act, and BIL in addition to Connecticut's Statewide LRTP. They were carefully crafted by CTDOT and freight stakeholders to address current needs and support the major goals and objectives of this plan (as articulated in **Chapter 2** of this report):

- **Goal 1: Safety and Security** – Enhance the safety and security of the freight transportation system in all modes.
- **Goal 2: Economic Competitiveness and Efficiency** – Support economic competitiveness, efficiency, and development through investment in the freight transportation system. Enhance goods movement efficiency into, out of, and through the State. Work with the private sector to identify needs and deficiencies.
- **Goal 3: Optimized Operations, Performance, and Resiliency** – Attain and maintain adequate capacity and operational efficiency in the Connecticut freight system. Support the use of Intelligent Transportation Systems and technologies. Improve freight system resiliency and redundancy to extreme weather and natural disaster events or change in travel demand. Improve intermodal connections.
- **Goal 4: State of Good Repair** – Proactively maintain freight system infrastructure to preserve CTDOT's capital investments.
- **Goal 5: Equity, Environmental Protection, and Livability** – Mitigate freight movement impacts on communities located near freight facilities or freight corridors. Reduce freight transportation-related greenhouse gas (GHG) emissions. Increase electric vehicle charging and alternative fuel infrastructure. Reduce impacts of freight movement on flooding and stormwater runoff. Reduce impacts of freight movement on wildlife habitat loss.
- **Goal 6: Program and Service Delivery** – Deliver projects and services faster, cost-effectively, and with greater customer satisfaction. Create strong partnerships with state agencies, local governments, neighboring states and the private sector to foster collaboration, improve program delivery and facilitate public-private partnerships.

Recommendations are organized under five categories including a general freight category and four modal categories that recognize the principal modes that the state relies upon for goods and commodities movement: trucking, freight rail, marine freight, and air cargo. Within each category, recommendations are further organized under subcategories: infrastructure recommendations, policy and strategy recommendations, technology recommendations, and study recommendations where appropriate.

12.1 Recommended Freight Policies, Programs, and Studies

In addition to the infrastructure projects identified, this freight plan also provides policies, programs and study recommendations to support freight activity in Connecticut that will advance the goals identified in this Freight Plan Update. These recommendations were identified through a combination of CTDOT staff, stakeholder interviews, surveys, and needs identification. Some definitions are included as follows:

- Policies and strategies include over-arching recommendations to help advance the goals and objectives of this freight plan.
- Programs are initiatives that can be undertaken to achieve policies and strategies.
- Studies are identified where additional information is needed to develop a policy, program, or project.

12.2 Recommendations to Address Significant Freight System Needs

As identified in **Chapter 11**, there are eight significant freight transportation needs that identified. Recommendations to address each of the eight significant freight needs are addressed below and are further detailed in **Table 12.1**.

- **System Capacity**. Issues related to system capacity include congestion and bottlenecks on key freight corridors, rail capacity constraints, marine freight constraints, and air cargo constraints.
  - **Recommendations to Address:**
    - Continue to prioritize studies and existing planned and programmed projects, as identified in **Table 11.3** and **Table 12.2,** designed to improve freight mobility and eliminate freight bottlenecks.
    - Continue to monitor progress to achieving the target set for the performance measure for truck congestion and reliability.
- **Safety**. Addressing safety issues consists of adequate truck parking, including overnight/rest stops; reducing the number of at-grade highway/rail crossings; improving and updating roadway geometrics; addressing vertical clearance issues; and increasing education/awareness of the public about commercial vehicle needs.
  - **Recommendations to Address:**
    - Continue to address safety and geometric issues on highways during the project development process.
    - Continue to monitor progress to achieving the target set for the performance measure related to safety.
    - Continue to reduce the number of at-grade highway rail crossings where feasible.

- **System Operations**. Efficient system operations require investing in transportation infrastructure, investing in emerging transportation technologies, developing comprehensive incident management systems, addressing oversize/overweight/over-dimensional trucks, reducing permitting and credentialing barriers, and updating and maintaining aging infrastructure.

  - **Recommendations to Address:**
    - Continue to implement the freight highway system recommendations identified in this chapter.
    - Expand the use of ITS, technology, and innovation to improve the flow of freight as identified in **Table 12.2**.

- **Modal Connectivity**. Improving intermodal connections to increase the speed at which goods move throughout the state, reduce transportation costs, and increase efficiency for freight-reliant businesses.

  - **Recommendations to Address:**
    - Continue to invest in intermodal connection projects. See **Sections 12.4 to 12.6** for specific modal recommendations.
    - Continue to identify and close any first/last mile gaps.

- **Freight Asset Preservation and Maintenance**. Maintaining Connecticut's existing freight system infrastructure to preserve capital investments including rail track and grade crossing maintenance, waterway dredging, and pavement and bridge repair.

  - **Recommendations to Address:**
    - Continue to invest in the pavement and bridge preservation programs.
    - Continue to monitor progress to achieving the target set for the performance measures related to state of good repair.

- **Funding and Financing**. Transportation needs far outweigh the resources available and historically, freight needs have not received separate attention in transportation funding programs. There is a freight-specific need for additional transportation funding mechanisms, particularly for highway maintenance and construction. In addition, funding programs are often prescribed for specific types of projects or modes, limiting the ability to fund some high priority freight-specific projects.

  - **Recommendations to Address:**
    - Continue to identify opportunities to invest in freight infrastructure projects using federal and state funding sources. Monitor federal discretionary grant opportunities and identify potential freight projects that may be eligible.
    - Leverage public-private partnerships for funding non-highway improvements.

- **Energy and Environmental**. Supporting and implementing policies and activities that reduce the cost of alternative fuels and understanding how growing industry and freight tonnage impact infrastructure are important energy/environmental issues that need to be reviewed.

  - **Recommendations to Address:**
    - Develop a strategic risk-based asset management approach.
    - Coordinate the freight plan implementation with the state's future Carbon Reduction Strategy and Resiliency Plan.
    - Minimize and reduce impacts of habitat loss.
    - Coordinate the implementation of Connecticut's NEVI Plan.

- **Coordination and Collaboration**. More informal exchanges that lead to better coordination between public agencies. For any exchanges to succeed, there must be a mutual recognition of the value in communicating and a way to institutionalize agreements into concrete actions.

  - **Recommendations to Address:**
    - Continue to engage public and private sector freight stakeholders.
    - Continue to coordinate regional freight planning and freight-supportive land uses with MPOs and COGs.
    - Continue to coordinate transportation planning and investments among New England states.
    - Continue to participate on the Multi-State Zero Emission Vehicles Task Force.
    - Increase interagency coordination within CTDOT.

Table 12.1 lists the recommendations to address significant freight system needs organized by type and goal area.

Table 12.1: General Freight Recommendations by Goal Area

Significant Freight Need	Recommendation	Goal Area
System Capacity	Continue to prioritize new studies and existing programmed projects designed to **improve freight mobility and eliminate freight bottlenecks**.	#1 Safety and Security #3 Optimized Operations, Performance, and Resiliency
System Capacity	Continue to **monitor progress to achieving the target set** for the performance measure for **truck congestion and reliability**.	#3 Optimized Operations, Performance, and Resiliency
Safety	Continue to **address safety and geometric issues** on highways during the project development process.	#1 Safety and Security
Safety	Continue to **monitor progress to achieving the target set** for the performance measure related to **safety**.	#1 Safety and Security
Safety	Continue to **reduce the number of at-grade highway rail crossings** where feasible.	#1 Safety and Security
System Operations	Continue to **implement the freight highway system recommendations** identified in this chapter.	#3 Optimized Operations, Performance, and Resiliency
System Operations	**Expand the use of ITS, technology, and innovation** to improve the flow of freight as identified in **Table 12.2** such as: surveillance systems to identify congestion or traffic disruptions, variable message signing, electronic tolling, ramp control/metering during peak traffic hours.	#3 Optimized Operations, Performance, and Resiliency

Significant Freight Need	Recommendation	Goal Area
Modal Connectivity	Continue to **invest in intermodal connection projects**, as these projects are often the most conducive to reducing overall supply chain costs. See **Sections 12.4 to 12.6** for specific modal recommendations.	#2 Economic Competitiveness and Efficiency
Modal Connectivity	Continue to **identify and close any first/last mile gaps** near major intermodal centers and manufacturing hubs.	#2 Economic Competitiveness and Efficiency
Freight Asset Preservation and Maintenance	Continue to **invest in the pavement and bridge preservation programs**.	#4 State of Good Repair
Freight Asset Preservation and Maintenance	Continue to **monitor progress to achieving the target set** for the performance measures related to **state of good repair**.	#4 State of Good Repair
Funding and Financing	Continue to **identify opportunities to invest in freight infrastructure projects** using federal and state funding sources. Monitor federal discretionary grant opportunities and identify potential freight projects that may be eligible.	#2 Economic Competitiveness and Efficiency
Funding and Financing	**Leverage public-private partnerships** for funding non-highway improvements.	#2 Economic Competitiveness and Efficiency
Energy and Environmental	**Develop a strategic risk-based asset management approach** to identify freight system vulnerabilities and areas that are most prone to weather events and natural disasters and prioritize for improvements.	#3 Optimized Operations, Performance, and Resiliency #5 Equity, Environmental Protection, and Livability
Energy and Environmental	**Coordinate the freight plan implementation** with the state's future **Carbon Reduction Strategy and Resiliency Plan**.	#3 Optimized Operations, Performance, and Resiliency #5 Equity, Environmental Protection, and Livability
Energy and Environmental	**Minimize and reduce impacts of habitat loss** from new freight-related infrastructure projects through the environmental review process.	#3 Optimized Operations, Performance, and Resiliency #5 Equity, Environmental Protection, and Livability
Energy and Environmental	Coordinate the **implementation of Connecticut's NEVI Plan** and the implementation of the freight plan on a regional basis to identify future charging infrastructure to support ZEV M/HD.	#3 Optimized Operations, Performance, and Resiliency #5 Equity, Environmental Protection, and Livability
Coordination and Collaboration	Continue to **engage public and private sector freight stakeholders** to inform stakeholders of the status of freight projects and activities, solicit feedback, and work cooperatively to advance new policies.	#6 Program and Service Delivery
Coordination and Collaboration	Continue to **coordinate regional freight planning and freight-support land uses with MPOs and COGs** to prioritize, fund and implement freight capital improvements and institute new freight related programs and policies.	#6 Program and Service Delivery

Significant Freight Need	Recommendation	Goal Area
Coordination and Collaboration	Continue to **coordinate transportation planning and investments among New England states** to ensure issues that impact regional trade are identified and addressed strategically. Continued involvement in multi-state regional organizations will allow the region's state DOT officials to collaborate on a regional vision for freight and to prioritize mutually beneficial investments.	#6 Program and Service Delivery
Coordination and Collaboration	Continue to **participate on the Multi-State Zero Emission Vehicles Task Force** in developing a multi-state action plan to identify barriers and propose solutions to support widespread electrification of medium- and heavy-duty vehicles (Zero Emission Medium- and Heavy-Duty Vehicle Action Plan).	#5 Equity, Environmental Protection, and Livability #6 Program and Service Delivery
Coordination and Collaboration	**Increase interagency coordination** between CTDOT, DEEP, DMV, DPH, CT Office of Policy and Management (OPM), and other relevant agencies related to the Governor's Council on Climate Change (GC3) and the Global Warming Solutions Act.	#5 Equity, Environmental Protection, and Livability #6 Program and Service Delivery

12.3 FREIGHT HIGHWAY SYSTEM AND TRUCKING RECOMMENDATIONS

Freight highway system and trucking recommendations are summarized in **Table 12.2**.

Table 12.2: Freight Highway System and Trucking Recommendations

Recommendation	Type	Goal Area
Evaluate implementation opportunities for the Truck Parking Study recommendations by identifying locations for adding additional truck parking.	Infrastructure	#1 Safety and Security #3 Optimized Operations, Performance, and Resiliency
Evaluate implementation opportunities for the ongoing, planned, and programmed highway projects and studies to address freight needs.	Infrastructure	#1 Safety and Security #3 Optimized Operations, Performance, and Resiliency
Truck Inspection Safety – Construct wider breakdown lanes to allow for safer inspection of trucks.	Infrastructure	#1 Safety and Security
Evaluate implementation opportunities for Truck Parking Availability Services (TPAS), an intelligent transportation system designed to gather, fuse, and disseminate real-time information on truck parking availability and reservation of spaces at connected sites.	Technology/ Program	#3 Optimized Operations, Performance, and Resiliency
Evaluate implementation opportunities for Truck Alternate Routing Services (TARS), a truck-specific GPS navigation solution that accounts for truck-restricted and prohibited roads. The service would provide safe and reliable navigation around congestion and accidents on roads that are safe for the truck to maneuver.	Technology/ Program	#3 Optimized Operations, Performance, and Resiliency

Recommendation	Type	Goal Area
Evaluate implementation opportunities for Truck Road Weather Travel Services (TRWTS), an application that pushes roadway link-specific information on road weather to users' in-vehicle equipment or personal wireless devices. Users would receive road weather alerts and warnings when adverse conditions are detected by mobile data sources.	Technology	#3 Optimized Operations, Performance, and Resiliency
Evaluate implementation opportunities for Truck Smart Roadside (TSR) solutions include technology sharing capabilities for sharing of data associated with the operation of commercial vehicles between customer business systems, roadside facilities, weigh-in-motion scales systems, truck parking systems, and government systems. The data is seamlessly collected at roadsides to improve motor carrier safety, security, operational efficiency, and freight mobility.	Technology	#3 Optimized Operations, Performance, and Resiliency
Retrofit or retire aging heavy-duty vehicles. Support the accelerated retirement of state-owned older model year heavy duty vehicles focusing on idle reduction and low emissions technology.	Policy/Strategy	#5 Equity, Environmental Protection, and Livability
Implement **a pilot program** for assisting freight truck operators with fleet conversion to electric or hybrid.	Program	#5 Equity, Environmental Protection, and Livability
Real-time information targeted to truckers should be made available on variable message signs along strategic routes and via privately operated phone-based or web-based applications.	Technology	#3 Optimized Operations, Performance, and Resiliency
Corridor study on I-84 between I-691 and SR 9 (#2-5) to address safety and infrastructure condition needs.	Study	#1 Safety and Security #4 State of Good Repair
Corridor study on I-84 between I-91 / US 44 and I-384 (#2-7) to address infrastructure condition needs.	Study	#1 Safety and Security #4 State of Good Repair
Corridor study on I-91 between I-691 and SR 9 (#3-2) to address safety and infrastructure condition needs.	Study	#1 Safety and Security #4 State of Good Repair
Corridor study on US 5 between I-691 and SR 9 (#8-1) to address safety and infrastructure condition needs.	Study	#1 Safety and Security #4 State of Good Repair
Corridor study on SR 9 between US 5 and I-84 (#10-3) to address infrastructure condition needs.	Study	#1 Safety and Security #4 State of Good Repair
Corridor study on I-384 between I-84 and US 6 (#12-1) to address safety and infrastructure condition needs.	Study	#1 Safety and Security #4 State of Good Repair
Corridor study on US 6 east of I-384 (#13-1) to address safety and infrastructure condition needs.	Study	#1 Safety and Security #4 State of Good Repair
Freight Resilience and Emissions Reduction Study to integrate strategies and recommendations identified in the state's future Carbon Reduction Strategy, Resiliency Plan, and applicable federal BIL requirements with freight implementation.	Study	#3 Optimized Operations, Performance, and Resiliency #5 Equity, Environmental Protection, and Livability
Conduct a freight technology application study to prioritize freight technology opportunities in Connecticut.	Study	#3 Optimized Operations, Performance, and Resiliency

12.4 FREIGHT RAIL RECOMMENDATIONS

The freight rail-related recommendations are summarized below. Freight rail infrastructure recommendations are from the Connecticut State Rail Plan 2022-2026. Proposed freight rail infrastructure recommendations include track repairs, intermodal connections, and rail facilities. **Table 12.3** lists the broad planned freight railroad improvements by railroad. Additional detail on the freight rail recommendations can be found in the Connecticut State Rail Plan 2022–2026 under separate cover.

Table 12.3: Freight Rail Infrastructure Recommendations by Railroad

Railroad	Recommendation/Improvement
Branford Steam	Track maintenance and expansion, as well as rolling stock investments to address service gaps by improving reliability.
Central New England Railroad (CNZR)	▪ Purchase two 'green' low-emission locomotives. ▪ Acquire right-of-way to Bradley Field. ▪ Support Federal grant applications with CTDOT to FRA and FTA, as needed. ▪ Rail Track Program – Stabilize the roadbed between mileposts (MP) 3.6 and 5.7, install sidings, road, rail, and ties, and rebuild switches. ▪ Bridges Program – Replace bridge deck at Scantic and Broad Brook, and repair three other bridges based on current bridge inspection reports. ▪ Communications and Signals Program – Add a communications repeater on the Griffin Line. ▪ Crossings Program – Install crossing signals at 13 crossings, add flashers and gates at Route 190 and Route 220, and renew the grade crossing at Troy Road. ▪ Facilities/Yard Program – Design and construct a locomotive repair facility with offices in East Windsor. ▪ Security Program – Add fencing, security cameras, and improved communications systemwide. ▪ Studies Program – CNZR to partner with the Connecticut Department of Economic Community Development (CT DECD) to conduct a feasibility study to attract new rail freight shippers systemwide.
CSX/Pan Am	Safety project on the Waterbury to Berlin corridor that will maintain the safety and integrity of crossing warning signals and signs, which is essential for public safety at all at-grade rail/highway crossings.
Connecticut Southern	▪ System-wide improvements including track, bridge, and switch upgrades. These improvements span Priority 3, 4, 6 and 9 lists and allow the railroad to increase reliability due to new equipment and improved safety at crossings. ▪ Priority 3 Rail Track Program – Includes the replacement of approximately 13,500 ties, 13,640 tons of new ballast, 27.5 miles of surfacing, installation of 10 lb relay rail (replacing 80 lb and smaller rail), a bolt tightening program, and rebuilding six switches. ▪ Priority 4 Switch Tie Program – Restore switches to maintenance level on the Bradley/Suffield and Manchester subdivisions. ▪ Priority 6 Yard – Install new switch timbers and repair or replace switch points at north and south ends of the yard. ▪ Priority 9 Crossings – Rebuild seven at-grade road crossings, including the rehabilitation of two grade crossings on the Bradley-Suffield subdivision.
Housatonic Railroad Company	Projects are divided into Priority 1 and Priority 2 lists. The Priority 1 Program includes rail track projects. The Priority 2 Program includes Rail Track and Facilities/Yards. Collectively, these will address safety, improve reliability, resiliency, and capacity: ▪ Priority 1 Rail Track Program

Railroad	Recommendation/Improvement
	– Repairs on approximately 44 miles of track between Canaan and Brookfield, installation of approximately 65,000 new ties, some switch improvements, some ballast and associated work. – Berkshire Line – Canaan ▪ Rebuild the main track between the Massachusetts State Line and Orchard Street, Canaan to connect the upgrade under construction in Massachusetts from the State Line North with the grade crossing and other work in Canaan. ▪ Construct a new customer lead track and crossing surface at North Elm Street for a length of 745 feet. ▪ Reconstruct the CTDOT maintenance facility grade crossing, replacing the bridge deck on the Blackberry River Bridge, and adding a pedestrian walkway for safety. ▪ Canaan Yard/Millers Siding, rebuild the parallel passing siding, storage track, public delivery track and additional storage tracks. ▪ Reconfigure the Berkshire Junction, remove a switch, install crossovers, replace one mile of jointed rail with welded rail, and install approximately 22,500 ties. ▪ Priority 2 Program – Full rehabilitation and replacement of approximately 32.5 miles of rail between Canaan and New Milford, renewal of three railroad crossings in Canaan, installation of approximately 80,000 new ties, switches and ballast and associated work. – Rehabilitation and replacement of 13.65 miles of rail between New Milford and Berkshire Junction to include renewal of railroad crossings as needed, installation of approximately 30,000 new ties, switches and ballast and associated work. – Modernize or relocate and improve the dispatching and operations center in Canaan.
Naugatuck Railroad	▪ Bridge Program – Replace deteriorated wood timber deck and perform any needed masonry and steel repairs on the Jericho Bridge over the Naugatuck River between Watertown and Thomaston (top priority project). – Replace the deteriorated wood timber deck and perform any needed masonry and steel repairs on the Chase Bridge over the Naugatuck River between Waterbury and Watertown (second priority project). ▪ Track Program – Replacement of 25,000 ties. ▪ Rail Replacement Program – Replace the 100-year-old rail with new heavy rail between Mile Posts 0-2.4 and 9-15.6.
New England Central Railroad	▪ Rail Track Program – Replace an estimated 30,000 ties, 23,000 tons of new ballast, 55.7 miles of surfacing, bridge work, and rebuilding 10 switches. – Conduct annual capital needs to sustain track conditions including tie replacement, ballast, surfacing, switch ties, and bridge work. ▪ Rail Bridges Program – Address annual capital needs to sustain existing bridge conditions at three bridges. Needs include piles, abutments, stringers, and decks. ▪ Culverts/Drainage Program – Drainage project that will clean out ditches and repair culverts.
Providence & Worcester	Track Program – Install 10,000 linear feet of 136 lb rail on the Norwich Branch and install 1,200 ties per mile on the Middletown Branch to improve service and reliability.
Valley Railroad	Improvements to advance safety and improve gaps in service through reducing opportunities for track failures.

Source: Connecticut State Rail Plan 2022–2026. Note: Private railroads are under no obligation to provide information on their capital improvement plans, thus the information in table is limited to broad project descriptions.

Additional freight rail recommendations listed in **Table 12.4** were identified through a combination of previous recommendations identified in the 2017 Freight Plan, CTDOT staff, stakeholder interviews, and needs identification.

Table 12.4: Freight Rail Recommendations

Recommendation	Type	Goal Area
Quiet zone designations. Encourage counties, MPOs, and COGs to assess areas disproportionately impacted by train horn noise for potential quiet zone designations.	Policy	#5 Equity, Environmental Protection, and Livability
Encourage counties to **coordinate land use policies** with rail expansion needs.	Policy	#3 Optimized Operations, Performance, and Resiliency
Leverage economic development opportunities with transportation investments and improvements. CTDOT will optimize its rail system assets by continuing to work collaboratively with state, regional and local economic development agencies to attract new freight rail dependent industries and develop new approaches to capture the public and private benefits of locating at new or redeveloped rail-served sites.	Policy/ Strategy	#2 Economic Competitiveness and Efficiency
Develop **steady funding sources for freight rail** projects	Strategy	#6 Program and Service Delivery
Develop a plan for the New Haven-Hartford-Springfield Line to accommodate both **passenger and freight rail** needs.	Strategy	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency
Public–Private Partnerships. Institute Public–Private Partnerships (P3) between CTDOT and private freight railroad owners and operators in Connecticut covering railroad planning, operations, capital improvements, matching grant programs and economic development to: ▪ Effect fair and transparent governance of rail lines to improve safety, reduce trucks on state roads, and mitigate highway congestion. ▪ Reduce barriers to funding for rail operators that do not own tracks. ▪ Provide tax incentives or credits for non-highway freight transport. Facilitate the conversion of brownfields adjacent to freight rail lines to productive industrial development sites that could support rail freight customers.	Strategy	#1 Safety and Security #2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency Equity, Environmental Protection, and Livability
Prioritize where full, double stack clearances are warranted and implement a **capital investment program for bridge or catenary reconstruction** to provide those clearances.	Program/ Strategy	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency
Preserve rail siding access to existing industrial sites. CTDOT to work cooperatively with regional partners, such as MPOs and COGs, to implement a program that identifies rail siding access to industrial sites where rail customers currently exist or where rail shippers may develop new facilities.	Program	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency
Upgrade all feasible lines to 286k lb weight-bearing capability. Industry is moving to 315k lb capability.	Infrastructure	#2 Economic Competitiveness and Efficiency
Explore upgrading feasible lines to 315k weight-bearing capability.	Infrastructure	#2 Economic Competitiveness and Efficiency
Improve access to CSX Class I terminals in New Haven and West Springfield.	Infrastructure	#3 Optimized Operations, Performance, and Resiliency
Reestablish operation of the Maybrook Line (Derby, CT to Maybrook, NY via Danbury, CT).	Infrastructure	#3 Optimized Operations, Performance, and Resiliency

Recommendation	Type	Goal Area
Maintain Pan Am line to the same class as the Springfield Line that feeds into it.	Infrastructure	#3 Optimized Operations, Performance, and Resiliency
Upgrade the New England Central Railway (NECR) including replacing and increasing vertical clearances to accommodate the heights of Phase II double-stack containers between Willimantic and New London.	Infrastructure	#3 Optimized Operations, Performance, and Resiliency #4 State of Good Repair
Improve Intermodal Connections Between Maritime Freight and Freight Rail. Coordinate with the Statewide Port Authority to facilitate improvements to maritime-to-rail connections and maritime to highway connections at Connecticut's Deepwater ports.	Infrastructure / Strategy	#3 Optimized Operations, Performance, and Resiliency #4 State of Good Repair
Modernize At-Grade Crossings. Continue to upgrade at-grade crossing signals with full protection including gates and modern lights.	Infrastructure	#4 State of Good Repair

12.5 MARITIME FREIGHT RECOMMENDATIONS

Table 12.5 presents freight recommendations that would improve maritime freight movement in Connecticut.

Table 12.5: Maritime Freight Recommendations

Recommendations	Type	Goal Area
Reduce local zoning laws conflict with local Port Authority and state Port Authority Needs	Policy/Strategy	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency
Increase dry bulk and break-bulk cargoes ▪ Extend the service areas of ports into competitive regional markets. ▪ Explore cost sharing opportunities with the private sector to expand port operations.	Policy/Strategy	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency
Intermodal Connectivity. Prioritize and construct identified intermodal connectivity improvements between freight rail and ports (e.g., new sidings and improved tracks) and between truck freight and ports (e.g., truck staging areas/lay down areas and improved connections between ports and the Interstate System) in the ports of New London, New Haven, and Bridgeport.	Strategy	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency
Improve and streamline channel maintenance process for permitting and funding to ensure the small privately owned docks can continue to increase freight movement by barge.	Infrastructure	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency
Port of New London/State Pier Repairs – State Pier repairs and minor improvements such as dock levelers, LED lighting, etc.	Infrastructure	#1 Safety and Security #4 State of Good Repair
Port of New London Ferry Improvements – Rehab and replacement of existing vessels, tugs/barges, docks, piles, etc.	Infrastructure	#1 Safety and Security #4 State of Good Repair

Recommendations	Type	Goal Area
Port of New Haven Improvements – Includes completion of rail link to terminals, additional trackage and sidings, and deepening of channel.	Infrastructure	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency
New London Thames River Dredging – Authorized depth of Thames River Federal Navigation Project (FNP) is 35 feet though United States Navy (USN) maintains most of channel at 40 feet. Project will provide consistent depth leading into State Pier Facility of 40+ feet.	Infrastructure	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency #4 State of Good Repair
Port of Bridgeport Dredging – Project would remove shoaling thus return the authorized depth of the FNP to 35 feet.	Infrastructure	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency #4 State of Good Repair
Harbor Maintenance – **Maintenance dredging** of small to midsize ports and harbors at $5 million per year for 25 years. This investment will ensure the on-going economic viability and allow for safe passage of vessels.	Infrastructure	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency #4 State of Good Repair

12.6 Air Cargo Recommendations

Table 12.6 lists the air cargo recommendations.

Table 12.6: Air Cargo Recommendations

Recommendation	Type	Goal Area
Improve Truck-to-Air Connections at BDL. Work with the CT Airport Authority to facilitate improvements to truck-to-air connections at BDL. Identify freight supportive land near BDL that might require road improvements to facilitate air cargo access or staging areas for air cargo-truck deliveries.	Infrastructure/ Strategy	#2 Economic Competitiveness and Efficiency #3 Optimized Operations, Performance, and Resiliency

13. FREIGHT INVESTMENT PLAN

The Freight Investment Plan is used to identify and constrain freight projects for utilizing Connecticut's National Highway Freight Program (NHFP) funds. The FAST Act and BIL Act directs FHWA to apportion NHFP funding for each state to support the implementation of the National Highway Freight Program. Generally, NHFP funds must contribute to the efficient movement of freight on the National Highway Freight Network and be identified in the Freight Investment Plan within the state's Freight Plan.

Connecticut's Freight Investment Plan approach is to apply NHFP funding for federal fiscal years (FFY) 2022 to 2027 to existing projects addressing congestion, maintaining a state of good repair, efficient operations, and safety on the Primary Highway Freight System. Two projects were chosen for use of NHFP funds and are listed in **Table 13.1**. The first project is a pavement preservation project on I-95 from the New York State Line to Exit 6. As noted in **Chapter 8**, **Figure 8.2**, the pavement condition in this section of I-95 is poor. Also, in **Chapter 11**, **Table 11.2** shows this segment as needing to improve infrastructure condition. This segment of I-95 is a critical truck freight connection to the New Jersey/New York Port region.

The second project is an interchange improvement project at the I-91/I-691 interchange. In **Table 11.2**, Segment 3-1 identifies I-91 between I-95 and I-691 needs in terms of improving congestion, safety, improve infrastructure condition. The area surrounding this interchange is critical for trucks and I-691 is a connector between I-91 and I-84. This interchange improvement will improve freight mobility in a critical freight corridor.

Table 13.1: Freight Projects Chosen for NHFP Funds

Project Info	Total Project Cost	Funds Programmed	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	Total
Project No. 0056-0316CN I-95 (Greenwich/ Stamford) Pavement Preservation from NY State Line to Exit 6	$57,000,000	NHFP Funds	$0	$17,000,000	$0	$0	$0	$0	$17,000,000
		Other Federal Funds - NHPP	$34,300,000	$0	$0	$0	$0	$0	$34,300,000
		Other Federal Funds - STPA	$0	$0	$0	$0	$0	$0	$0
		Other Federal Funds - EBS	$0	$0	$0	$0	$0	$0	$0
		Other Federal Funds - EBE	$0	$0	$0	$0	$0	$0	$0
		Other Federal Funds - REPF	$0	$0	$0	$0	$0	$0	$0
		Other Federal Funds - REPS	$0	$0	$0	$0	$0	$0	$0
		Other Federal Funds - NHPP-Exempt	$0	$0	$0	$0	$0	$0	$0
		State Funds - 41404	$5,700,000	$0	$0	$0	$0	$0	$5,700,000
		Total	$40,000,000	$17,000,000	$0	$0	$0	$0	$57,000,000
Project No. 0079-0246 I-91/I-691 (Meriden) I-91/I-691 Interchange Improvements	$215,000,000	NHFP Funds			$17,070,316	$17,070,316	$17,070,316	$17,070,316	$68,281,264
		Other Federal Funds - NHPP			$0	$30,000,000	$30,000,000	$14,788,128	$74,788,128
		State Funds – Let'sGoCT! & 41404			$71,930,608	$0	$0	$0	$71,930,608
		Total			$89,000,924	$47,070,316	$47,070,316	$31,858,444	$215,000,000

**The sources and amounts of funds programmed represent a snapshot in time (as of June 2022) and may be revised at any point based on funding availability, project deliverability, changes in priorities, etc.*

Appendices

Appendix A – Modal Commodities by Direction

Table A.1: TRANSEARCH Truck, All Directions 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	6,337,558	4.0%	359,972	3.7%	$4,126	1.8%	$651
8	Forest Products	51,956	0.0%	2,235	0.0%	$117	0.1%	$2,250
9	Fresh Fish or Marine Products	184,625	0.1%	7,962	0.1%	$2,019	0.9%	$10,933
10	Metallic Ores	27,020	0.0%	1,065	0.0%	$86	0.0%	$3,194
11	Coal	3,020	0.0%	122	0.0%	$0	0.0%	$82
13	Crude Petroleum or Natural Gas	20	0.0%	1	0.0%	$0	0.0%	$471
14	Nonmetallic Minerals	38,926,025	24.6%	1,601,213	16.5%	$529	0.2%	$14
19	Ordnance or Accessories	36,076	0.0%	1,610	0.0%	$1,069	0.5%	$29,636
20	Food or Kindred Products	17,632,732	11.1%	768,244	7.9%	$26,823	11.5%	$1,521
21	Tobacco Products	141,839	0.1%	6,413	0.1%	$3,307	1.4%	$23,317
22	Textile Mill Products	447,187	0.3%	20,937	0.2%	$2,447	1.0%	$5,472
23	Apparel or Related Products	293,371	0.2%	17,876	0.2%	$3,049	1.3%	$10,392
24	Lumber or Wood Products	3,942,208	2.5%	153,509	1.6%	$2,579	1.1%	$654
25	Furniture or Fixtures	494,386	0.3%	32,729	0.3%	$2,090	0.9%	$4,227
26	Pulp, Paper, or Allied Products	4,853,565	3.1%	201,057	2.1%	$7,208	3.1%	$1,485
27	Printed Matter	1,090,690	0.7%	61,179	0.6%	$3,381	1.4%	$3,100
28	Chemicals or Allied Products	8,886,000	5.6%	432,562	4.4%	$26,664	11.4%	$3,001
29	Petroleum or Coal Products	18,595,544	11.8%	776,447	8.0%	$8,031	3.4%	$432
30	Rubber or Miscellaneous Plastics	2,610,933	1.7%	220,462	2.3%	$10,035	4.3%	$3,843
31	Leather or Leather Products	81,227	0.1%	5,521	0.1%	$1,244	0.5%	$15,318
32	Clay, Concrete, Glass, or Stone	9,649,054	6.1%	596,904	6.1%	$2,601	1.1%	$270
33	Primary Metal Products	3,961,226	2.5%	158,521	1.6%	$8,710	3.7%	$2,199
34	Fabricated Metal Products	3,076,509	1.9%	171,381	1.8%	$11,633	5.0%	$3,781
35	Machinery	1,477,730	0.9%	110,224	1.1%	$15,152	6.5%	$10,254
36	Electrical Equipment	1,441,767	0.9%	86,654	0.9%	$19,193	8.2%	$13,312
37	Transportation Equipment	2,326,444	1.5%	165,878	1.7%	$34,309	14.7%	$14,747
38	Instrument, Photo, and Optical Equip.	267,958	0.2%	21,213	0.2%	$5,568	2.4%	$20,780
39	Miscellaneous Manufacturing Products	436,361	0.3%	22,576	0.2%	$3,264	1.4%	$7,479
40	Waste or Scrap Materials	14,491,113	9.2%	597,953	6.1%	$3,640	1.6%	$251
41	Miscellaneous Freight Shipments	181	0.0%	9	0.0%	$1	0.0%	$8,256
42	Shipping Containers	0	0.0%	2,306,520	23.7%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	263,186	0.2%	12,802	0.1%	$456	0.2%	$1,732
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	16,175,393	10.2%	804,278	8.3%	$24,327	10.4%	$1,504
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	158,202,902	100.0%	9,726,031	100.0%	$233,657	100.0%	$1,477

*Top five movement types (tons, units, value) shaded blue

Table A.2: TRANSEARCH Truck, Outbound 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	690,818	2.5%	44,049	2.1%	$165	0.6%	$239
8	Forest Products	963	0.0%	41	0.0%	$2	0.0%	$1,578
9	Fresh Fish or Marine Products	3,766	0.0%	162	0.0%	$47	0.2%	$12,497
10	Metallic Ores	0	0.0%	0	0.0%	$0	0.0%	$0
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	9,787,259	36.1%	402,597	19.6%	$116	0.4%	$12
19	Ordnance or Accessories	3,175	0.0%	142	0.0%	$139	0.5%	$43,764
20	Food or Kindred Products	804,804	3.0%	35,107	1.7%	$1,134	4.1%	$1,409
21	Tobacco Products	7,546	0.0%	343	0.0%	$147	0.5%	$19,544
22	Textile Mill Products	12,252	0.0%	575	0.0%	$79	0.3%	$6,471
23	Apparel or Related Products	7,642	0.0%	466	0.0%	$48	0.2%	$6,250
24	Lumber or Wood Products	306,180	1.1%	12,102	0.6%	$142	0.5%	$463
25	Furniture or Fixtures	14,792	0.1%	980	0.0%	$85	0.3%	$5,772
26	Pulp, Paper, or Allied Products	484,445	1.8%	20,065	1.0%	$842	3.1%	$1,739
27	Printed Matter	235,537	0.9%	13,212	0.6%	$721	2.6%	$3,059
28	Chemicals or Allied Products	2,691,822	9.9%	131,068	6.4%	$6,307	22.8%	$2,343
29	Petroleum or Coal Products	4,785,206	17.6%	199,664	9.7%	$2,197	8.0%	$459
30	Rubber or Miscellaneous Plastics	159,368	0.6%	13,511	0.7%	$614	2.2%	$3,854
31	Leather or Leather Products	625	0.0%	41	0.0%	$7	0.0%	$11,059
32	Clay, Concrete, Glass, or Stone	1,055,027	3.9%	66,690	3.2%	$182	0.7%	$172
33	Primary Metal Products	392,027	1.4%	15,608	0.8%	$795	2.9%	$2,029
34	Fabricated Metal Products	574,954	2.1%	31,974	1.6%	$2,296	8.3%	$3,994
35	Machinery	176,737	0.7%	13,409	0.7%	$1,776	6.4%	$10,051
36	Electrical Equipment	192,393	0.7%	11,552	0.6%	$2,648	9.6%	$13,763
37	Transportation Equipment	111,489	0.4%	8,043	0.4%	$3,016	10.9%	$27,049
38	Instrument, Photo, and Optical Equip.	31,080	0.1%	2,456	0.1%	$761	2.8%	$24,496
39	Miscellaneous Manufacturing Products	25,050	0.1%	1,296	0.1%	$153	0.6%	$6,108
40	Waste or Scrap Materials	3,677,275	13.5%	151,263	7.4%	$997	3.6%	$271
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	836,135	40.6%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	913,070	3.4%	45,330	2.2%	$2,193	7.9%	$2,401
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	27,145,302	100.0%	2,057,882	100.0%	$27,609	100.0%	$1,017

*Top five movement types (tons, units, value) shaded blue

Table A.3: TRANSEARCH Truck, Inbound 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	1,811,037	3.9%	102,319	3.8%	$1,188	1.8%	$656
8	Forest Products	9,544	0.0%	411	0.0%	$24	0.0%	$2,535
9	Fresh Fish or Marine Products	40,932	0.1%	1,765	0.1%	$444	0.7%	$10,860
10	Metallic Ores	13,501	0.0%	532	0.0%	$53	0.1%	$3,919
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	14,525,364	31.0%	597,498	22.0%	$195	0.3%	$13
19	Ordnance or Accessories	9,485	0.0%	423	0.0%	$243	0.4%	$25,602
20	Food or Kindred Products	5,440,000	11.6%	236,843	8.7%	$8,593	12.8%	$1,580
21	Tobacco Products	43,280	0.1%	1,956	0.1%	$1,029	1.5%	$23,766
22	Textile Mill Products	86,153	0.2%	4,038	0.1%	$429	0.6%	$4,976
23	Apparel or Related Products	120,718	0.3%	7,358	0.3%	$1,359	2.0%	$11,254
24	Lumber or Wood Products	956,916	2.0%	37,150	1.4%	$683	1.0%	$714
25	Furniture or Fixtures	188,824	0.4%	12,503	0.5%	$732	1.1%	$3,879
26	Pulp, Paper, or Allied Products	957,771	2.0%	39,703	1.5%	$1,668	2.5%	$1,741
27	Printed Matter	201,826	0.4%	11,320	0.4%	$636	0.9%	$3,149
28	Chemicals or Allied Products	2,089,967	4.5%	101,718	3.8%	$6,562	9.8%	$3,140
29	Petroleum or Coal Products	5,030,931	10.7%	209,046	7.7%	$2,409	3.6%	$479
30	Rubber or Miscellaneous Plastics	660,414	1.4%	55,851	2.1%	$2,567	3.8%	$3,887
31	Leather or Leather Products	32,211	0.1%	2,190	0.1%	$521	0.8%	$16,171
32	Clay, Concrete, Glass, or Stone	3,601,036	7.7%	222,760	8.2%	$868	1.3%	$241
33	Primary Metal Products	1,622,070	3.5%	65,098	2.4%	$3,968	5.9%	$2,446
34	Fabricated Metal Products	815,830	1.7%	45,484	1.7%	$3,076	4.6%	$3,771
35	Machinery	491,752	1.0%	36,585	1.3%	$5,459	8.1%	$11,102
36	Electrical Equipment	436,428	0.9%	26,262	1.0%	$4,742	7.1%	$10,866
37	Transportation Equipment	787,245	1.7%	56,049	2.1%	$10,732	16.0%	$13,632
38	Instrument, Photo, and Optical Equip.	59,203	0.1%	4,692	0.2%	$1,297	1.9%	$21,912
39	Miscellaneous Manufacturing Products	137,022	0.3%	7,088	0.3%	$1,100	1.6%	$8,028
40	Waste or Scrap Materials	2,936,211	6.3%	126,044	4.6%	$622	0.9%	$212
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	512,548	18.9%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	132,044	0.3%	6,423	0.2%	$242	0.4%	$1,836
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	3,664,463	7.8%	180,229	6.6%	$5,623	8.4%	$1,535
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	46,902,176	100.0%	2,711,886	100.0%	$67,065	100.0%	$1,430

*Top five movement types (tons, units, value) shaded blue

Table A.4: TRANSEARCH Truck, Intra-Regional 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	89,532	0.5%	4,843	0.4%	$18	0.1%	$197
8	Forest Products	372	0.0%	16	0.0%	$0	0.0%	$1,150
9	Fresh Fish or Marine Products	830	0.0%	36	0.0%	$10	0.0%	$12,461
10	Metallic Ores	0	0.0%	0	0.0%	$0	0.0%	$0
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	4,073,034	23.6%	167,543	13.0%	$45	0.2%	$11
19	Ordnance or Accessories	1,842	0.0%	82	0.0%	$79	0.3%	$43,078
20	Food or Kindred Products	338,587	2.0%	14,764	1.1%	$501	2.1%	$1,479
21	Tobacco Products	17,753	0.1%	801	0.1%	$444	1.8%	$25,019
22	Textile Mill Products	4,089	0.0%	192	0.0%	$25	0.1%	$6,183
23	Apparel or Related Products	3,934	0.0%	241	0.0%	$24	0.1%	$6,031
24	Lumber or Wood Products	45,850	0.3%	1,782	0.1%	$45	0.2%	$972
25	Furniture or Fixtures	8,811	0.1%	584	0.0%	$45	0.2%	$5,113
26	Pulp, Paper, or Allied Products	96,705	0.6%	4,020	0.3%	$191	0.8%	$1,974
27	Printed Matter	115,758	0.7%	6,493	0.5%	$353	1.5%	$3,049
28	Chemicals or Allied Products	963,038	5.6%	47,246	3.7%	$2,073	8.5%	$2,152
29	Petroleum or Coal Products	3,975,581	23.0%	163,851	12.7%	$2,369	9.8%	$596
30	Rubber or Miscellaneous Plastics	44,603	0.3%	3,783	0.3%	$171	0.7%	$3,842
31	Leather or Leather Products	297	0.0%	20	0.0%	$3	0.0%	$8,607
32	Clay, Concrete, Glass, or Stone	660,572	3.8%	41,677	3.2%	$105	0.4%	$158
33	Primary Metal Products	156,944	0.9%	6,284	0.5%	$254	1.0%	$1,617
34	Fabricated Metal Products	282,600	1.6%	15,693	1.2%	$1,180	4.9%	$4,177
35	Machinery	112,248	0.7%	8,488	0.7%	$1,086	4.5%	$9,678
36	Electrical Equipment	99,158	0.6%	5,962	0.5%	$1,221	5.0%	$12,318
37	Transportation Equipment	95,868	0.6%	7,001	0.5%	$6,593	27.2%	$68,767
38	Instrument, Photo, and Optical Equip.	14,467	0.1%	1,148	0.1%	$425	1.8%	$29,404
39	Miscellaneous Manufacturing Products	9,232	0.1%	477	0.0%	$57	0.2%	$6,132
40	Waste or Scrap Materials	1,245,671	7.2%	53,324	4.1%	$237	1.0%	$190
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	499,460	38.7%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	4,794,414	27.8%	233,381	18.1%	$6,708	27.6%	$1,399
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	17,251,790	100.0%	1,289,191	100.0%	$24,262	100.0%	$1,406

*Top five movement types (tons, units, value) shaded blue

Table A.5: TRANSEARCH Truck, Through 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	3,746,170	5.6%	208,760	5.7%	$2,754	2.4%	$735
8	Forest Products	41,076	0.1%	1,767	0.0%	$91	0.1%	$2,209
9	Fresh Fish or Marine Products	139,097	0.2%	5,999	0.2%	$1,517	1.3%	$10,903
10	Metallic Ores	13,519	0.0%	533	0.0%	$33	0.0%	$2,470
11	Coal	3,020	0.0%	122	0.0%	$0	0.0%	$82
13	Crude Petroleum or Natural Gas	20	0.0%	1	0.0%	$0	0.0%	$471
14	Nonmetallic Minerals	10,540,367	15.8%	433,576	11.8%	$173	0.2%	$16
19	Ordnance or Accessories	21,574	0.0%	963	0.0%	$608	0.5%	$28,182
20	Food or Kindred Products	11,049,341	16.5%	481,531	13.1%	$16,596	14.5%	$1,502
21	Tobacco Products	73,260	0.1%	3,314	0.1%	$1,687	1.5%	$23,028
22	Textile Mill Products	344,694	0.5%	16,132	0.4%	$1,914	1.7%	$5,552
23	Apparel or Related Products	161,076	0.2%	9,811	0.3%	$1,619	1.4%	$10,048
24	Lumber or Wood Products	2,633,263	3.9%	102,476	2.8%	$1,709	1.5%	$649
25	Furniture or Fixtures	281,959	0.4%	18,662	0.5%	$1,227	1.1%	$4,350
26	Pulp, Paper, or Allied Products	3,314,644	5.0%	137,269	3.7%	$4,508	3.9%	$1,360
27	Printed Matter	537,570	0.8%	30,155	0.8%	$1,672	1.5%	$3,110
28	Chemicals or Allied Products	3,141,173	4.7%	152,530	4.2%	$11,722	10.2%	$3,732
29	Petroleum or Coal Products	4,803,825	7.2%	203,887	5.6%	$1,055	0.9%	$220
30	Rubber or Miscellaneous Plastics	1,746,549	2.6%	147,316	4.0%	$6,682	5.8%	$3,826
31	Leather or Leather Products	48,094	0.1%	3,270	0.1%	$714	0.6%	$14,844
32	Clay, Concrete, Glass, or Stone	4,332,419	6.5%	265,777	7.2%	$1,447	1.3%	$334
33	Primary Metal Products	1,790,185	2.7%	71,532	2.0%	$3,693	3.2%	$2,063
34	Fabricated Metal Products	1,403,125	2.1%	78,230	2.1%	$5,081	4.4%	$3,621
35	Machinery	696,992	1.0%	51,742	1.4%	$6,830	6.0%	$9,800
36	Electrical Equipment	713,788	1.1%	42,878	1.2%	$10,582	9.2%	$14,825
37	Transportation Equipment	1,331,842	2.0%	94,786	2.6%	$13,969	12.2%	$10,488
38	Instrument, Photo, and Optical Equip.	163,208	0.2%	12,916	0.4%	$3,084	2.7%	$18,897
39	Miscellaneous Manufacturing Products	265,056	0.4%	13,714	0.4%	$1,954	1.7%	$7,372
40	Waste or Scrap Materials	6,631,956	9.9%	267,322	7.3%	$1,784	1.6%	$269
41	Miscellaneous Freight Shipments	181	0.0%	9	0.0%	$1	0.0%	$8,256
42	Shipping Containers	0	0.0%	458,377	12.5%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	131,143	0.2%	6,379	0.2%	$213	0.2%	$1,628
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	6,803,446	10.2%	345,338	9.4%	$9,803	8.5%	$1,441
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	66,903,634	100.0%	3,667,072	100.0%	$114,721	100.0%	$1,715

*Top five movement types (tons, units, value) shaded blue

Table A.6: TRANSEARCH Truck, All Directions 2040

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	7,754,752	4.1%	438,487	3.7%	$5,299	1.6%	$683
8	Forest Products	73,027	0.0%	3,142	0.0%	$150	0.0%	$2,049
9	Fresh Fish or Marine Products	230,945	0.1%	9,960	0.1%	$2,450	0.8%	$10,608
10	Metallic Ores	18,946	0.0%	747	0.0%	$55	0.0%	$2,908
11	Coal	1,424	0.0%	57	0.0%	$0	0.0%	$100
13	Crude Petroleum or Natural Gas	32	0.0%	1	0.0%	$0	0.0%	$471
14	Nonmetallic Minerals	40,616,657	21.5%	1,670,757	14.2%	$614	0.2%	$15
19	Ordnance or Accessories	38,094	0.0%	1,700	0.0%	$1,186	0.4%	$31,137
20	Food or Kindred Products	25,720,426	13.6%	1,120,569	9.5%	$39,054	12.0%	$1,518
21	Tobacco Products	53,666	0.0%	2,427	0.0%	$1,243	0.4%	$23,171
22	Textile Mill Products	459,768	0.2%	21,531	0.2%	$2,336	0.7%	$5,080
23	Apparel or Related Products	291,350	0.2%	17,761	0.2%	$2,995	0.9%	$10,281
24	Lumber or Wood Products	3,596,902	1.9%	140,025	1.2%	$2,389	0.7%	$664
25	Furniture or Fixtures	732,570	0.4%	48,494	0.4%	$2,920	0.9%	$3,986
26	Pulp, Paper, or Allied Products	5,114,897	2.7%	211,957	1.8%	$7,850	2.4%	$1,535
27	Printed Matter	785,170	0.4%	43,874	0.4%	$2,846	0.9%	$3,624
28	Chemicals or Allied Products	11,938,074	6.3%	578,608	4.9%	$49,211	15.2%	$4,122
29	Petroleum or Coal Products	15,413,577	8.2%	639,505	5.4%	$7,822	2.4%	$508
30	Rubber or Miscellaneous Plastics	3,411,033	1.8%	287,991	2.4%	$13,183	4.1%	$3,865
31	Leather or Leather Products	134,195	0.1%	9,157	0.1%	$2,167	0.7%	$16,149
32	Clay, Concrete, Glass, or Stone	13,512,841	7.1%	838,574	7.1%	$3,496	1.1%	$259
33	Primary Metal Products	5,139,825	2.7%	205,969	1.7%	$11,906	3.7%	$2,316
34	Fabricated Metal Products	3,593,552	1.9%	200,030	1.7%	$13,689	4.2%	$3,809
35	Machinery	2,049,036	1.1%	152,759	1.3%	$22,021	6.8%	$10,747
36	Electrical Equipment	1,952,620	1.0%	117,516	1.0%	$27,432	8.4%	$14,049
37	Transportation Equipment	2,942,198	1.6%	209,680	1.8%	$47,273	14.6%	$16,067
38	Instrument, Photo, and Optical Equip.	473,678	0.3%	37,523	0.3%	$9,456	2.9%	$19,963
39	Miscellaneous Manufacturing Products	658,884	0.3%	34,085	0.3%	$4,850	1.5%	$7,360
40	Waste or Scrap Materials	17,384,426	9.2%	709,057	6.0%	$4,727	1.5%	$272
41	Miscellaneous Freight Shipments	368	0.0%	18	0.0%	$3	0.0%	$7,091
42	Shipping Containers	0	0.0%	2,790,665	23.7%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	367,212	0.2%	17,862	0.2%	$636	0.2%	$1,732
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	24,549,243	13.0%	1,224,836	10.4%	$35,440	10.9%	$1,444
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	189,009,391	100.0%	11,785,325	100.0%	$324,700	100.0%	$1,718

*Top five movement types (tons, units, value) shaded blue

Table A.7: TRANSEARCH Truck 2019–40 Ton Growth

STCC2	Commodity	2019		2040		Abs.	Percent	
		Amount	%	Amount	%	Growth	Total	CAGR
1	Farm Products	6,337,558	4.0%	7,754,752	4.1%	1,417,195	22.4%	1.0%
8	Forest Products	51,956	0.0%	73,027	0.0%	21,071	40.6%	1.6%
9	Fresh Fish or Marine Products	184,625	0.1%	230,945	0.1%	46,320	25.1%	1.1%
10	Metallic Ores	27,020	0.0%	18,946	0.0%	-8,074	-29.9%	-1.7%
11	Coal	3,020	0.0%	1,424	0.0%	-1,596	-52.8%	-3.5%
13	Crude Petroleum or Natural Gas	20	0.0%	32	0.0%	12	57.9%	2.2%
14	Nonmetallic Minerals	38,926,025	24.6%	40,616,657	21.5%	1,690,632	4.3%	0.2%
19	Ordnance or Accessories	36,076	0.0%	38,094	0.0%	2,018	5.6%	0.3%
20	Food or Kindred Products	17,632,732	11.1%	25,720,426	13.6%	8,087,694	45.9%	1.8%
21	Tobacco Products	141,839	0.1%	53,666	0.0%	-88,173	-62.2%	-4.5%
22	Textile Mill Products	447,187	0.3%	459,768	0.2%	12,581	2.8%	0.1%
23	Apparel or Related Products	293,371	0.2%	291,350	0.2%	-2,020	-0.7%	0.0%
24	Lumber or Wood Products	3,942,208	2.5%	3,596,902	1.9%	-345,306	-8.8%	-0.4%
25	Furniture or Fixtures	494,386	0.3%	732,570	0.4%	238,184	48.2%	1.9%
26	Pulp, Paper, or Allied Products	4,853,565	3.1%	5,114,897	2.7%	261,332	5.4%	0.3%
27	Printed Matter	1,090,690	0.7%	785,170	0.4%	-305,520	-28.0%	-1.6%
28	Chemicals or Allied Products	8,886,000	5.6%	11,938,074	6.3%	3,052,074	34.3%	1.4%
29	Petroleum or Coal Products	18,595,544	11.8%	15,413,577	8.2%	-3,181,967	-17.1%	-0.9%
30	Rubber or Miscellaneous Plastics	2,610,933	1.7%	3,411,033	1.8%	800,100	30.6%	1.3%
31	Leather or Leather Products	81,227	0.1%	134,195	0.1%	52,968	65.2%	2.4%
32	Clay, Concrete, Glass, or Stone	9,649,054	6.1%	13,512,841	7.1%	3,863,787	40.0%	1.6%
33	Primary Metal Products	3,961,226	2.5%	5,139,825	2.7%	1,178,599	29.8%	1.2%
34	Fabricated Metal Products	3,076,509	1.9%	3,593,552	1.9%	517,043	16.8%	0.7%
35	Machinery	1,477,730	0.9%	2,049,036	1.1%	571,306	38.7%	1.6%
36	Electrical Equipment	1,441,767	0.9%	1,952,620	1.0%	510,854	35.4%	1.5%
37	Transportation Equipment	2,326,444	1.5%	2,942,198	1.6%	615,754	26.5%	1.1%
38	Instrument, Photo, and Optical Equip.	267,958	0.2%	473,678	0.3%	205,720	76.8%	2.7%
39	Miscellaneous Manufacturing Products	436,361	0.3%	658,884	0.3%	222,524	51.0%	2.0%
40	Waste or Scrap Materials	14,491,113	9.2%	17,384,426	9.2%	2,893,313	20.0%	0.9%
41	Miscellaneous Freight Shipments	181	0.0%	368	0.0%	187	103.7%	3.4%
42	Shipping Containers	0	0.0%	0	0.0%	0	0.0%	0.0%
43	Mail or Contract Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
45	Shipper Association Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
46	Miscellaneous Mixed Shipments	263,186	0.2%	367,212	0.2%	104,025	39.5%	1.6%
47	Small Packaged Shipments	0	0.0%	0	0.0%	0	0.0%	0.0%
48	Waste	0	0.0%	0	0.0%	0	0.0%	0.0%
49	Hazardous Materials	0	0.0%	0	0.0%	0	0.0%	0.0%
50	Secondary Traffic	16,175,393	10.2%	24,549,243	13.0%	8,373,849	51.8%	2.0%
60	Unclassified	0	0.0%	0	0.0%	0	0.0%	0.0%
	Total	158,202,902	100.0%	189,009,391	100.0%	30,806,489	19.5%	0.9%

*Top five movement types (tons, units, value) shaded blue

Table A.8: TRANSEARCH Truck 2019–40 Unit Growth

STCC2	Commodity	2019		2040		Abs.	Percent	
		Amount	%	Amount	%	Growth	Total	CAGR
1	Farm Products	359,972	3.7%	438,487	3.7%	78,516	21.8%	0.9%
8	Forest Products	2,235	0.0%	3,142	0.0%	907	40.6%	1.6%
9	Fresh Fish or Marine Products	7,962	0.1%	9,960	0.1%	1,998	25.1%	1.1%
10	Metallic Ores	1,065	0.0%	747	0.0%	-318	-29.9%	-1.7%
11	Coal	122	0.0%	57	0.0%	-64	-52.8%	-3.5%
13	Crude Petroleum or Natural Gas	1	0.0%	1	0.0%	0	57.9%	2.2%
14	Nonmetallic Minerals	1,601,213	16.5%	1,670,757	14.2%	69,544	4.3%	0.2%
19	Ordnance or Accessories	1,610	0.0%	1,700	0.0%	90	5.6%	0.3%
20	Food or Kindred Products	768,244	7.9%	1,120,569	9.5%	352,325	45.9%	1.8%
21	Tobacco Products	6,413	0.1%	2,427	0.0%	-3,986	-62.2%	-4.5%
22	Textile Mill Products	20,937	0.2%	21,531	0.2%	594	2.8%	0.1%
23	Apparel or Related Products	17,876	0.2%	17,761	0.2%	-115	-0.6%	0.0%
24	Lumber or Wood Products	153,509	1.6%	140,025	1.2%	-13,484	-8.8%	-0.4%
25	Furniture or Fixtures	32,729	0.3%	48,494	0.4%	15,765	48.2%	1.9%
26	Pulp, Paper, or Allied Products	201,057	2.1%	211,957	1.8%	10,900	5.4%	0.3%
27	Printed Matter	61,179	0.6%	43,874	0.4%	-17,306	-28.3%	-1.6%
28	Chemicals or Allied Products	432,562	4.4%	578,608	4.9%	146,046	33.8%	1.4%
29	Petroleum or Coal Products	776,447	8.0%	639,505	5.4%	-136,943	-17.6%	-0.9%
30	Rubber or Miscellaneous Plastics	220,462	2.3%	287,991	2.4%	67,529	30.6%	1.3%
31	Leather or Leather Products	5,521	0.1%	9,157	0.1%	3,636	65.8%	2.4%
32	Clay, Concrete, Glass, or Stone	596,904	6.1%	838,574	7.1%	241,669	40.5%	1.6%
33	Primary Metal Products	158,521	1.6%	205,969	1.7%	47,448	29.9%	1.3%
34	Fabricated Metal Products	171,381	1.8%	200,030	1.7%	28,649	16.7%	0.7%
35	Machinery	110,224	1.1%	152,759	1.3%	42,536	38.6%	1.6%
36	Electrical Equipment	86,654	0.9%	117,516	1.0%	30,862	35.6%	1.5%
37	Transportation Equipment	165,878	1.7%	209,680	1.8%	43,802	26.4%	1.1%
38	Instrument, Photo, and Optical Equip.	21,213	0.2%	37,523	0.3%	16,309	76.9%	2.8%
39	Miscellaneous Manufacturing Products	22,576	0.2%	34,085	0.3%	11,509	51.0%	2.0%
40	Waste or Scrap Materials	597,953	6.1%	709,057	6.0%	111,104	18.6%	0.8%
41	Miscellaneous Freight Shipments	9	0.0%	18	0.0%	9	103.8%	3.4%
42	Shipping Containers	2306519.898	23.7%	2790665.42	23.7%	484,146	21.0%	0.9%
43	Mail or Contract Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
45	Shipper Association Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
46	Miscellaneous Mixed Shipments	12,802	0.1%	17,862	0.2%	5,060	39.5%	1.6%
47	Small Packaged Shipments	0	0.0%	0	0.0%	0	0.0%	0.0%
48	Waste	0	0.0%	0	0.0%	0	0.0%	0.0%
49	Hazardous Materials	0	0.0%	0	0.0%	0	0.0%	0.0%
50	Secondary Traffic	804,278	8.3%	1,224,836	10.4%	420,559	52.3%	2.0%
60	Unclassified	0	0.0%	0	0.0%	0	0.0%	0.0%
	Total	9,726,031	100.0%	11,785,325	100.0%	2,059,294	21.2%	0.9%

*Top five movement types (tons, units, value) shaded blue

Table A.9: TRANSEARCH Truck 2019–40 Value Growth ($millions)

STCC2	Commodity	2019		2040		Abs.	Percent	
		Amount	%	Amount	%	Growth	Total	CAGR
1	Farm Products	$4,126	1.8%	$5,299	1.6%	$1,173	28.4%	1.2%
8	Forest Products	$117	0.1%	$150	0.0%	$33	28.0%	1.2%
9	Fresh Fish or Marine Products	$2,019	0.9%	$2,450	0.8%	$431	21.4%	0.9%
10	Metallic Ores	$86	0.0%	$55	0.0%	-$31	-36.2%	-2.1%
11	Coal	$0	0.0%	$0	0.0%	$0	-42.2%	-2.6%
13	Crude Petroleum or Natural Gas	$0	0.0%	$0	0.0%	$0	57.9%	2.2%
14	Nonmetallic Minerals	$529	0.2%	$614	0.2%	$85	16.1%	0.7%
19	Ordnance or Accessories	$1,069	0.5%	$1,186	0.4%	$117	10.9%	0.5%
20	Food or Kindred Products	$26,823	11.5%	$39,054	12.0%	$12,231	45.6%	1.8%
21	Tobacco Products	$3,307	1.4%	$1,243	0.4%	-$2,064	-62.4%	-4.6%
22	Textile Mill Products	$2,447	1.0%	$2,336	0.7%	-$111	-4.5%	-0.2%
23	Apparel or Related Products	$3,049	1.3%	$2,995	0.9%	-$53	-1.7%	-0.1%
24	Lumber or Wood Products	$2,579	1.1%	$2,389	0.7%	-$189	-7.3%	-0.4%
25	Furniture or Fixtures	$2,090	0.9%	$2,920	0.9%	$831	39.7%	1.6%
26	Pulp, Paper, or Allied Products	$7,208	3.1%	$7,850	2.4%	$642	8.9%	0.4%
27	Printed Matter	$3,381	1.4%	$2,846	0.9%	-$536	-15.8%	-0.8%
28	Chemicals or Allied Products	$26,664	11.4%	$49,211	15.2%	$22,548	84.6%	3.0%
29	Petroleum or Coal Products	$8,031	3.4%	$7,822	2.4%	-$208	-2.6%	-0.1%
30	Rubber or Miscellaneous Plastics	$10,035	4.3%	$13,183	4.1%	$3,148	31.4%	1.3%
31	Leather or Leather Products	$1,244	0.5%	$2,167	0.7%	$923	74.2%	2.7%
32	Clay, Concrete, Glass, or Stone	$2,601	1.1%	$3,496	1.1%	$895	34.4%	1.4%
33	Primary Metal Products	$8,710	3.7%	$11,906	3.7%	$3,196	36.7%	1.5%
34	Fabricated Metal Products	$11,633	5.0%	$13,689	4.2%	$2,055	17.7%	0.8%
35	Machinery	$15,152	6.5%	$22,021	6.8%	$6,869	45.3%	1.8%
36	Electrical Equipment	$19,193	8.2%	$27,432	8.4%	$8,239	42.9%	1.7%
37	Transportation Equipment	$34,309	14.7%	$47,273	14.6%	$12,964	37.8%	1.5%
38	Instrument, Photo, and Optical Equip.	$5,568	2.4%	$9,456	2.9%	$3,888	69.8%	2.6%
39	Miscellaneous Manufacturing Products	$3,264	1.4%	$4,850	1.5%	$1,586	48.6%	1.9%
40	Waste or Scrap Materials	$3,640	1.6%	$4,727	1.5%	$1,087	29.9%	1.3%
41	Miscellaneous Freight Shipments	$1	0.0%	$3	0.0%	$1	75.0%	2.7%
42	Shipping Containers	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
43	Mail or Contract Traffic	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
44	Freight Forwarder Traffic	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
45	Shipper Association Traffic	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
46	Miscellaneous Mixed Shipments	$456	0.2%	$636	0.2%	$180	39.5%	1.6%
47	Small Packaged Shipments	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
48	Waste	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
49	Hazardous Materials	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
50	Secondary Traffic	$24,327	10.4%	$35,440	10.9%	$11,113	45.7%	1.8%
60	Unclassified	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
	Total	$233,657	100.0%	$324,700	100.0%	$91,043	39.0%	1.6%

*Top five movement types (tons, units, value) shaded blue

Table A.10: TRANSEARCH Rail, All Directions 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	268,304	4.0%	2,720	4.0%	$27	0.9%	$101
8	Forest Products	0	0.0%	0	0.0%	$0	0.0%	$0
9	Fresh Fish or Marine Products	0	0.0%	0	0.0%	$0	0.0%	$0
10	Metallic Ores	0	0.0%	0	0.0%	$0	0.0%	$0
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	2,334,960	35.0%	22,128	32.3%	$27	0.9%	$12
19	Ordnance or Accessories	0	0.0%	0	0.0%	$0	0.0%	$0
20	Food or Kindred Products	233,536	3.5%	2,520	3.7%	$158	5.3%	$678
21	Tobacco Products	0	0.0%	0	0.0%	$0	0.0%	$0
22	Textile Mill Products	0	0.0%	0	0.0%	$0	0.0%	$0
23	Apparel or Related Products	0	0.0%	0	0.0%	$0	0.0%	$0
24	Lumber or Wood Products	109,840	1.6%	1,240	1.8%	$84	2.8%	$762
25	Furniture or Fixtures	0	0.0%	0	0.0%	$0	0.0%	$0
26	Pulp, Paper, or Allied Products	93,840	1.4%	1,360	2.0%	$83	2.8%	$888
27	Printed Matter	0	0.0%	0	0.0%	$0	0.0%	$0
28	Chemicals or Allied Products	223,280	3.4%	2,480	3.6%	$429	14.4%	$1,922
29	Petroleum or Coal Products	99,040	1.5%	1,360	2.0%	$36	1.2%	$362
30	Rubber or Miscellaneous Plastics	0	0.0%	0	0.0%	$0	0.0%	$0
31	Leather or Leather Products	0	0.0%	0	0.0%	$0	0.0%	$0
32	Clay, Concrete, Glass, or Stone	717,040	10.8%	6,880	10.0%	$675	22.6%	$941
33	Primary Metal Products	560,584	8.4%	6,360	9.3%	$940	31.5%	$1,677
34	Fabricated Metal Products	0	0.0%	0	0.0%	$0	0.0%	$0
35	Machinery	0	0.0%	0	0.0%	$0	0.0%	$0
36	Electrical Equipment	0	0.0%	0	0.0%	$0	0.0%	$0
37	Transportation Equipment	21,152	0.3%	760	1.1%	$22	0.7%	$1,018
38	Instrument, Photo, and Optical Equip.	0	0.0%	0	0.0%	$0	0.0%	$0
39	Miscellaneous Manufacturing Products	0	0.0%	0	0.0%	$0	0.0%	$0
40	Waste or Scrap Materials	2,000,424	30.0%	20,800	30.3%	$505	16.9%	$252
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	0	0.0%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	6,662,000	100.0%	68,608	100.0%	$2,986	100.0%	$448

*Top five movement types (tons, units, value) shaded blue

Table A.11: TRANSEARCH Rail, Outbound 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	0	0.0%	0	0.0%	$0	0.0%	$0
8	Forest Products	0	0.0%	0	0.0%	$0	0.0%	$0
9	Fresh Fish or Marine Products	0	0.0%	0	0.0%	$0	0.0%	$0
10	Metallic Ores	0	0.0%	0	0.0%	$0	0.0%	$0
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	1,728,536	39.7%	16,104	36.8%	$20	1.3%	$11
19	Ordnance or Accessories	0	0.0%	0	0.0%	$0	0.0%	$0
20	Food or Kindred Products	0	0.0%	0	0.0%	$0	0.0%	$0
21	Tobacco Products	0	0.0%	0	0.0%	$0	0.0%	$0
22	Textile Mill Products	0	0.0%	0	0.0%	$0	0.0%	$0
23	Apparel or Related Products	0	0.0%	0	0.0%	$0	0.0%	$0
24	Lumber or Wood Products	2,320	0.1%	80	0.2%	$1	0.1%	$624
25	Furniture or Fixtures	0	0.0%	0	0.0%	$0	0.0%	$0
26	Pulp, Paper, or Allied Products	5,040	0.1%	80	0.2%	$11	0.7%	$2,099
27	Printed Matter	0	0.0%	0	0.0%	$0	0.0%	$0
28	Chemicals or Allied Products	109,920	2.5%	1,200	2.7%	$255	17.4%	$2,321
29	Petroleum or Coal Products	0	0.0%	0	0.0%	$0	0.0%	$0
30	Rubber or Miscellaneous Plastics	0	0.0%	0	0.0%	$0	0.0%	$0
31	Leather or Leather Products	0	0.0%	0	0.0%	$0	0.0%	$0
32	Clay, Concrete, Glass, or Stone	474,160	10.9%	4,640	10.6%	$643	43.8%	$1,356
33	Primary Metal Products	12,904	0.3%	280	0.6%	$17	1.2%	$1,354
34	Fabricated Metal Products	0	0.0%	0	0.0%	$0	0.0%	$0
35	Machinery	0	0.0%	0	0.0%	$0	0.0%	$0
36	Electrical Equipment	0	0.0%	0	0.0%	$0	0.0%	$0
37	Transportation Equipment	17,152	0.4%	560	1.3%	$17	1.2%	$1,018
38	Instrument, Photo, and Optical Equip.	0	0.0%	0	0.0%	$0	0.0%	$0
39	Miscellaneous Manufacturing Products	0	0.0%	0	0.0%	$0	0.0%	$0
40	Waste or Scrap Materials	2,000,424	46.0%	20,800	47.5%	$505	34.3%	$252
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	0	0.0%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	4,350,456	100.0%	43,744	100.0%	$1,469	100.0%	$338

*Top five movement types (tons, units, value) shaded blue

Table A.12: TRANSEARCH Rail, Inbound 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	268,304	15.4%	2,720	14.1%	$27	1.8%	$101
8	Forest Products	0	0.0%	0	0.0%	$0	0.0%	$0
9	Fresh Fish or Marine Products	0	0.0%	0	0.0%	$0	0.0%	$0
10	Metallic Ores	0	0.0%	0	0.0%	$0	0.0%	$0
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	46,096	2.6%	440	2.3%	$1	0.1%	$21
19	Ordnance or Accessories	0	0.0%	0	0.0%	$0	0.0%	$0
20	Food or Kindred Products	233,536	13.4%	2,520	13.1%	$158	10.5%	$678
21	Tobacco Products	0	0.0%	0	0.0%	$0	0.0%	$0
22	Textile Mill Products	0	0.0%	0	0.0%	$0	0.0%	$0
23	Apparel or Related Products	0	0.0%	0	0.0%	$0	0.0%	$0
24	Lumber or Wood Products	103,600	5.9%	1,120	5.8%	$82	5.4%	$789
25	Furniture or Fixtures	0	0.0%	0	0.0%	$0	0.0%	$0
26	Pulp, Paper, or Allied Products	88,800	5.1%	1,280	6.7%	$73	4.8%	$819
27	Printed Matter	0	0.0%	0	0.0%	$0	0.0%	$0
28	Chemicals or Allied Products	113,360	6.5%	1,280	6.7%	$174	11.5%	$1,536
29	Petroleum or Coal Products	99,040	5.7%	1,360	7.1%	$36	2.4%	$362
30	Rubber or Miscellaneous Plastics	0	0.0%	0	0.0%	$0	0.0%	$0
31	Leather or Leather Products	0	0.0%	0	0.0%	$0	0.0%	$0
32	Clay, Concrete, Glass, or Stone	242,880	13.9%	2,240	11.6%	$32	2.1%	$131
33	Primary Metal Products	547,680	31.3%	6,080	31.6%	$923	61.1%	$1,685
34	Fabricated Metal Products	0	0.0%	0	0.0%	$0	0.0%	$0
35	Machinery	0	0.0%	0	0.0%	$0	0.0%	$0
36	Electrical Equipment	0	0.0%	0	0.0%	$0	0.0%	$0
37	Transportation Equipment	4,000	0.2%	200	1.0%	$4	0.3%	$1,018
38	Instrument, Photo, and Optical Equip.	0	0.0%	0	0.0%	$0	0.0%	$0
39	Miscellaneous Manufacturing Products	0	0.0%	0	0.0%	$0	0.0%	$0
40	Waste or Scrap Materials	0	0.0%	0	0.0%	$0	0.0%	$0
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	0	0.0%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	1,747,296	100.0%	19,240	100.0%	$1,509	100.0%	$864

*Top five movement types (tons, units, value) shaded blue

Table A.13: TRANSEARCH Rail, Intra-Regional 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	0	0.0%	0	0.0%	$0	0.0%	$0
8	Forest Products	0	0.0%	0	0.0%	$0	0.0%	$0
9	Fresh Fish or Marine Products	0	0.0%	0	0.0%	$0	0.0%	$0
10	Metallic Ores	0	0.0%	0	0.0%	$0	0.0%	$0
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	560,328	100.0%	5,584	100.0%	$6	100.0%	$11
19	Ordnance or Accessories	0	0.0%	0	0.0%	$0	0.0%	$0
20	Food or Kindred Products	0	0.0%	0	0.0%	$0	0.0%	$0
21	Tobacco Products	0	0.0%	0	0.0%	$0	0.0%	$0
22	Textile Mill Products	0	0.0%	0	0.0%	$0	0.0%	$0
23	Apparel or Related Products	0	0.0%	0	0.0%	$0	0.0%	$0
24	Lumber or Wood Products	0	0.0%	0	0.0%	$0	0.0%	$0
25	Furniture or Fixtures	0	0.0%	0	0.0%	$0	0.0%	$0
26	Pulp, Paper, or Allied Products	0	0.0%	0	0.0%	$0	0.0%	$0
27	Printed Matter	0	0.0%	0	0.0%	$0	0.0%	$0
28	Chemicals or Allied Products	0	0.0%	0	0.0%	$0	0.0%	$0
29	Petroleum or Coal Products	0	0.0%	0	0.0%	$0	0.0%	$0
30	Rubber or Miscellaneous Plastics	0	0.0%	0	0.0%	$0	0.0%	$0
31	Leather or Leather Products	0	0.0%	0	0.0%	$0	0.0%	$0
32	Clay, Concrete, Glass, or Stone	0	0.0%	0	0.0%	$0	0.0%	$0
33	Primary Metal Products	0	0.0%	0	0.0%	$0	0.0%	$0
34	Fabricated Metal Products	0	0.0%	0	0.0%	$0	0.0%	$0
35	Machinery	0	0.0%	0	0.0%	$0	0.0%	$0
36	Electrical Equipment	0	0.0%	0	0.0%	$0	0.0%	$0
37	Transportation Equipment	0	0.0%	0	0.0%	$0	0.0%	$0
38	Instrument, Photo, and Optical Equip.	0	0.0%	0	0.0%	$0	0.0%	$0
39	Miscellaneous Manufacturing Products	0	0.0%	0	0.0%	$0	0.0%	$0
40	Waste or Scrap Materials	0	0.0%	0	0.0%	$0	0.0%	$0
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	0	0.0%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	560,328	100.0%	5,584	100.0%	$6	100.0%	$11

*Top movement types (tons, units, value) shaded blue

Table A.14: TRANSEARCH Rail, Through 2019

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	0	0.0%	0	0.0%	$0	0.0%	$0
8	Forest Products	0	0.0%	0	0.0%	$0	0.0%	$0
9	Fresh Fish or Marine Products	0	0.0%	0	0.0%	$0	0.0%	$0
10	Metallic Ores	0	0.0%	0	0.0%	$0	0.0%	$0
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	0	0.0%	0	0.0%	$0	0.0%	$0
19	Ordnance or Accessories	0	0.0%	0	0.0%	$0	0.0%	$0
20	Food or Kindred Products	0	0.0%	0	0.0%	$0	0.0%	$0
21	Tobacco Products	0	0.0%	0	0.0%	$0	0.0%	$0
22	Textile Mill Products	0	0.0%	0	0.0%	$0	0.0%	$0
23	Apparel or Related Products	0	0.0%	0	0.0%	$0	0.0%	$0
24	Lumber or Wood Products	3,920	100.0%	40	100.0%	$1	100.0%	$150
25	Furniture or Fixtures	0	0.0%	0	0.0%	$0	0.0%	$0
26	Pulp, Paper, or Allied Products	0	0.0%	0	0.0%	$0	0.0%	$0
27	Printed Matter	0	0.0%	0	0.0%	$0	0.0%	$0
28	Chemicals or Allied Products	0	0.0%	0	0.0%	$0	0.0%	$0
29	Petroleum or Coal Products	0	0.0%	0	0.0%	$0	0.0%	$0
30	Rubber or Miscellaneous Plastics	0	0.0%	0	0.0%	$0	0.0%	$0
31	Leather or Leather Products	0	0.0%	0	0.0%	$0	0.0%	$0
32	Clay, Concrete, Glass, or Stone	0	0.0%	0	0.0%	$0	0.0%	$0
33	Primary Metal Products	0	0.0%	0	0.0%	$0	0.0%	$0
34	Fabricated Metal Products	0	0.0%	0	0.0%	$0	0.0%	$0
35	Machinery	0	0.0%	0	0.0%	$0	0.0%	$0
36	Electrical Equipment	0	0.0%	0	0.0%	$0	0.0%	$0
37	Transportation Equipment	0	0.0%	0	0.0%	$0	0.0%	$0
38	Instrument, Photo, and Optical Equip.	0	0.0%	0	0.0%	$0	0.0%	$0
39	Miscellaneous Manufacturing Products	0	0.0%	0	0.0%	$0	0.0%	$0
40	Waste or Scrap Materials	0	0.0%	0	0.0%	$0	0.0%	$0
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	0	0.0%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	3,920	100.0%	40	100.0%	$1	100.0%	$150

*Top movement types (tons, units, value) shaded blue

Table A.15: TRANSEARCH Rail, All Directions 2040

STCC2	Commodity	Tons		Units		Value (in millions)		Average
		Amount	%	Amount	%	Amount	%	Value/Ton
1	Farm Products	343,958	4.0%	3,487	3.9%	$35	1.0%	$101
8	Forest Products	0	0.0%	0	0.0%	$0	0.0%	$0
9	Fresh Fish or Marine Products	0	0.0%	0	0.0%	$0	0.0%	$0
10	Metallic Ores	0	0.0%	0	0.0%	$0	0.0%	$0
11	Coal	0	0.0%	0	0.0%	$0	0.0%	$0
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	$0	0.0%	$0
14	Nonmetallic Minerals	2,712,954	31.4%	25,708	28.8%	$32	0.9%	$12
19	Ordnance or Accessories	0	0.0%	0	0.0%	$0	0.0%	$0
20	Food or Kindred Products	621,964	7.2%	6,573	7.4%	$368	10.5%	$592
21	Tobacco Products	0	0.0%	0	0.0%	$0	0.0%	$0
22	Textile Mill Products	0	0.0%	0	0.0%	$0	0.0%	$0
23	Apparel or Related Products	0	0.0%	0	0.0%	$0	0.0%	$0
24	Lumber or Wood Products	97,292	1.1%	1,109	1.2%	$68	1.9%	$696
25	Furniture or Fixtures	0	0.0%	0	0.0%	$0	0.0%	$0
26	Pulp, Paper, or Allied Products	89,486	1.0%	1,295	1.5%	$77	2.2%	$866
27	Printed Matter	0	0.0%	0	0.0%	$0	0.0%	$0
28	Chemicals or Allied Products	347,798	4.0%	3,977	4.5%	$624	17.8%	$1,793
29	Petroleum or Coal Products	60,248	0.7%	822	0.9%	$22	0.6%	$362
30	Rubber or Miscellaneous Plastics	0	0.0%	0	0.0%	$0	0.0%	$0
31	Leather or Leather Products	0	0.0%	0	0.0%	$0	0.0%	$0
32	Clay, Concrete, Glass, or Stone	1,076,393	12.4%	10,261	11.5%	$405	11.5%	$376
33	Primary Metal Products	819,456	9.5%	9,249	10.4%	$1,230	35.0%	$1,501
34	Fabricated Metal Products	0	0.0%	0	0.0%	$0	0.0%	$0
35	Machinery	0	0.0%	0	0.0%	$0	0.0%	$0
36	Electrical Equipment	0	0.0%	0	0.0%	$0	0.0%	$0
37	Transportation Equipment	34,543	0.4%	1,241	1.4%	$35	1.0%	$1,018
38	Instrument, Photo, and Optical Equip.	0	0.0%	0	0.0%	$0	0.0%	$0
39	Miscellaneous Manufacturing Products	0	0.0%	0	0.0%	$0	0.0%	$0
40	Waste or Scrap Materials	2,445,207	28.3%	25,429	28.5%	$617	17.6%	$252
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
42	Shipping Containers	0	0.0%	0	0.0%	$0	0.0%	$0
43	Mail or Contract Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
45	Shipper Association Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
47	Small Packaged Shipments	0	0.0%	0	0.0%	$0	0.0%	$0
48	Waste	0	0.0%	0	0.0%	$0	0.0%	$0
49	Hazardous Materials	0	0.0%	0	0.0%	$0	0.0%	$0
50	Secondary Traffic	0	0.0%	0	0.0%	$0	0.0%	$0
60	Unclassified	0	0.0%	0	0.0%	$0	0.0%	$0
	Total	8,649,298	100.0%	89,150	100.0%	$3,513	100.0%	$406

*Top five movement types (tons, units, value) shaded blue

Table A.16: TRANSEARCH Rail 2019–40 Ton Growth

STCC2	Commodity	2019		2040		Abs.	Percent	
		Amount	%	Amount	%	Growth	Total	CAGR
1	Farm Products	268,304	4.0%	343,958	4.0%	75,654	28.2%	1.2%
8	Forest Products	0	0.0%	0	0.0%	0	0.0%	0.0%
9	Fresh Fish or Marine Products	0	0.0%	0	0.0%	0	0.0%	0.0%
10	Metallic Ores	0	0.0%	0	0.0%	0	0.0%	0.0%
11	Coal	0	0.0%	0	0.0%	0	0.0%	0.0%
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	0	0.0%	0.0%
14	Nonmetallic Minerals	2,334,960	35.0%	2,712,954	31.4%	377,994	16.2%	0.7%
19	Ordnance or Accessories	0	0.0%	0	0.0%	0	0.0%	0.0%
20	Food or Kindred Products	233,536	3.5%	621,964	7.2%	388,428	166.3%	4.8%
21	Tobacco Products	0	0.0%	0	0.0%	0	0.0%	0.0%
22	Textile Mill Products	0	0.0%	0	0.0%	0	0.0%	0.0%
23	Apparel or Related Products	0	0.0%	0	0.0%	0	0.0%	0.0%
24	Lumber or Wood Products	109,840	1.6%	97,292	1.1%	-12,548	-11.4%	-0.6%
25	Furniture or Fixtures	0	0.0%	0	0.0%	0	0.0%	0.0%
26	Pulp, Paper, or Allied Products	93,840	1.4%	89,486	1.0%	-4,354	-4.6%	-0.2%
27	Printed Matter	0	0.0%	0	0.0%	0	0.0%	0.0%
28	Chemicals or Allied Products	223,280	3.4%	347,798	4.0%	124,518	55.8%	2.1%
29	Petroleum or Coal Products	99,040	1.5%	60,248	0.7%	-38,792	-39.2%	-2.3%
30	Rubber or Miscellaneous Plastics	0	0.0%	0	0.0%	0	0.0%	0.0%
31	Leather or Leather Products	0	0.0%	0	0.0%	0	0.0%	0.0%
32	Clay, Concrete, Glass, or Stone	717,040	10.8%	1,076,393	12.4%	359,353	50.1%	2.0%
33	Primary Metal Products	560,584	8.4%	819,456	9.5%	258,872	46.2%	1.8%
34	Fabricated Metal Products	0	0.0%	0	0.0%	0	0.0%	0.0%
35	Machinery	0	0.0%	0	0.0%	0	0.0%	0.0%
36	Electrical Equipment	0	0.0%	0	0.0%	0	0.0%	0.0%
37	Transportation Equipment	21,152	0.3%	34,543	0.4%	13,391	63.3%	2.4%
38	Instrument, Photo, and Optical Equip.	0	0.0%	0	0.0%	0	0.0%	0.0%
39	Miscellaneous Manufacturing Products	0	0.0%	0	0.0%	0	0.0%	0.0%
40	Waste or Scrap Materials	2,000,424	30.0%	2,445,207	28.3%	444,783	22.2%	1.0%
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	0	0.0%	0.0%
42	Shipping Containers	0	0.0%	0	0.0%	0	0.0%	0.0%
43	Mail or Contract Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
45	Shipper Association Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	0	0.0%	0.0%
47	Small Packaged Shipments	0	0.0%	0	0.0%	0	0.0%	0.0%
48	Waste	0	0.0%	0	0.0%	0	0.0%	0.0%
49	Hazardous Materials	0	0.0%	0	0.0%	0	0.0%	0.0%
50	Secondary Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
60	Unclassified	0	0.0%	0	0.0%	0	0.0%	0.0%
	Total	6,662,000	100.0%	8,649,298	100.0%	1,987,298	29.8%	1.3%

*Top five movement types (tons, units, value) shaded blue

Table A.17: TRANSEARCH Rail 2019–40 Unit Growth

STCC2	Commodity	2019		2040		Abs.	Percent	
		Amount	%	Amount	%	Growth	Total	CAGR
1	Farm Products	2,720	4.0%	3,487	3.9%	767	28.2%	1.2%
8	Forest Products	0	0.0%	0	0.0%	0	0.0%	0.0%
9	Fresh Fish or Marine Products	0	0.0%	0	0.0%	0	0.0%	0.0%
10	Metallic Ores	0	0.0%	0	0.0%	0	0.0%	0.0%
11	Coal	0	0.0%	0	0.0%	0	0.0%	0.0%
13	Crude Petroleum or Natural Gas	0	0.0%	0	0.0%	0	0.0%	0.0%
14	Nonmetallic Minerals	22,128	32.3%	25,708	28.8%	3,580	16.2%	0.7%
19	Ordnance or Accessories	0	0.0%	0	0.0%	0	0.0%	0.0%
20	Food or Kindred Products	2,520	3.7%	6,573	7.4%	4,053	160.8%	4.7%
21	Tobacco Products	0	0.0%	0	0.0%	0	0.0%	0.0%
22	Textile Mill Products	0	0.0%	0	0.0%	0	0.0%	0.0%
23	Apparel or Related Products	0	0.0%	0	0.0%	0	0.0%	0.0%
24	Lumber or Wood Products	1,240	1.8%	1,109	1.2%	-131	-10.6%	-0.5%
25	Furniture or Fixtures	0	0.0%	0	0.0%	0	0.0%	0.0%
26	Pulp, Paper, or Allied Products	1,360	2.0%	1,295	1.5%	-65	-4.8%	-0.2%
27	Printed Matter	0	0.0%	0	0.0%	0	0.0%	0.0%
28	Chemicals or Allied Products	2,480	3.6%	3,977	4.5%	1,497	60.4%	2.3%
29	Petroleum or Coal Products	1,360	2.0%	822	0.9%	-538	-39.6%	-2.4%
30	Rubber or Miscellaneous Plastics	0	0.0%	0	0.0%	0	0.0%	0.0%
31	Leather or Leather Products	0	0.0%	0	0.0%	0	0.0%	0.0%
32	Clay, Concrete, Glass, or Stone	6,880	10.0%	10,261	11.5%	3,381	49.1%	1.9%
33	Primary Metal Products	6,360	9.3%	9,249	10.4%	2,889	45.4%	1.8%
34	Fabricated Metal Products	0	0.0%	0	0.0%	0	0.0%	0.0%
35	Machinery	0	0.0%	0	0.0%	0	0.0%	0.0%
36	Electrical Equipment	0	0.0%	0	0.0%	0	0.0%	0.0%
37	Transportation Equipment	760	1.1%	1,241	1.4%	481	63.3%	2.4%
38	Instrument, Photo, and Optical Equip.	0	0.0%	0	0.0%	0	0.0%	0.0%
39	Miscellaneous Manufacturing Products	0	0.0%	0	0.0%	0	0.0%	0.0%
40	Waste or Scrap Materials	20,800	30.3%	25,429	28.5%	4,629	22.3%	1.0%
41	Miscellaneous Freight Shipments	0	0.0%	0	0.0%	0	0.0%	0.0%
42	Shipping Containers	0	0.0%	0	0.0%	0	0.0%	0.0%
43	Mail or Contract Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
44	Freight Forwarder Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
45	Shipper Association Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
46	Miscellaneous Mixed Shipments	0	0.0%	0	0.0%	0	0.0%	0.0%
47	Small Packaged Shipments	0	0.0%	0	0.0%	0	0.0%	0.0%
48	Waste	0	0.0%	0	0.0%	0	0.0%	0.0%
49	Hazardous Materials	0	0.0%	0	0.0%	0	0.0%	0.0%
50	Secondary Traffic	0	0.0%	0	0.0%	0	0.0%	0.0%
60	Unclassified	0	0.0%	0	0.0%	0	0.0%	0.0%
	Total	68,608	100.0%	89,150	100.0%	20,542	29.9%	1.3%

*Top five movement types (tons, units, value) shaded blue

Table A.18: TRANSEARCH Rail 2019–40 Value Growth ($millions)

STCC2	Commodity	2019		2040		Abs.	Percent	
		Amount	%	Amount	%	Growth	Total	CAGR
1	Farm Products	$27	0.9%	$35	1.0%	$8	28.2%	1.2%
8	Forest Products	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
9	Fresh Fish or Marine Products	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
10	Metallic Ores	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
11	Coal	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
13	Crude Petroleum or Natural Gas	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
14	Nonmetallic Minerals	$27	0.9%	$32	0.9%	$5	17.5%	0.8%
19	Ordnance or Accessories	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
20	Food or Kindred Products	$158	5.3%	$368	10.5%	$210	132.8%	4.1%
21	Tobacco Products	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
22	Textile Mill Products	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
23	Apparel or Related Products	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
24	Lumber or Wood Products	$84	2.8%	$68	1.9%	-$16	-19.2%	-1.0%
25	Furniture or Fixtures	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
26	Pulp, Paper, or Allied Products	$83	2.8%	$77	2.2%	-$6	-7.0%	-0.3%
27	Printed Matter	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
28	Chemicals or Allied Products	$429	14.4%	$624	17.8%	$194	45.3%	1.8%
29	Petroleum or Coal Products	$36	1.2%	$22	0.6%	-$14	-39.2%	-2.3%
30	Rubber or Miscellaneous Plastics	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
31	Leather or Leather Products	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
32	Clay, Concrete, Glass, or Stone	$675	22.6%	$405	11.5%	-$270	-40.0%	-2.4%
33	Primary Metal Products	$940	31.5%	$1,230	35.0%	$290	30.8%	1.3%
34	Fabricated Metal Products	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
35	Machinery	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
36	Electrical Equipment	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
37	Transportation Equipment	$22	0.7%	$35	1.0%	$14	63.3%	2.4%
38	Instrument, Photo, and Optical Equip.	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
39	Miscellaneous Manufacturing Products	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
40	Waste or Scrap Materials	$505	16.9%	$617	17.6%	$112	22.3%	1.0%
41	Miscellaneous Freight Shipments	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
42	Shipping Containers	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
43	Mail or Contract Traffic	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
44	Freight Forwarder Traffic	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
45	Shipper Association Traffic	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
46	Miscellaneous Mixed Shipments	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
47	Small Packaged Shipments	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
48	Waste	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
49	Hazardous Materials	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
50	Secondary Traffic	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
60	Unclassified	$0	0.0%	$0	0.0%	$0	0.0%	0.0%
	Total	$2,986	100.0%	$3,513	100.0%	$527	17.7%	0.8%

*Top five movement types (tons, units, value) shaded blue

Appendix B – Truck Parking Sites Inventory

Site ID	Site Name	Ownership Type	Coordinates	Address	Place	Truck Parking Spaces	Restroom	Truck Wash	Shower	Laundry	Fuel	Food	Overnight Parking
1	I-95 SB Darien Service Plaza	Public	41.068212, -73.501397	I-95 SB Exit 10	Darien	20	Y	N	N	N	Y	Y	Y
2	I-95 NB Darien Service Plaza	Public	41.078322, -73.463741	I-95 NB Exit 12	Darien	20	Y	N	N	N	Y	Y	Y
3	I-95 SB Fairfield Service Plaza	Public	41.1478803, -73.255076	I-95 SB Exit 22	Fairfield	20	Y	N	N	N	Y	Y	Y
4	I-95 NB Fairfield Service Plaza	Public	41.1463534, -73.258037	I-95 NB Exit 21	Fairfield	20	Y	N	N	N	Y	Y	Y
5	I-95 SB Milford Service Plaza	Public	41.248064, -73.006918	I-95 SB Exit 41	Milford	25	Y	N	N	N	Y	Y	Y
6	I-95 NB Milford Service Plaza	Public	41.244731, -73.011533	I-95 NB Exit 40	Milford	25	Y	N	N	N	Y	Y	Y
7	I-95 SB Branford Service Plaza	Public	41.286741, -72.830359	I-95 SB Exit 54	Branford	10	Y	N	N	N	Y	Y	Y
8	I-95 NB Branford Service Plaza	Public	41.285399, -72.837374	I-95 NB Exit 53	Branford	10	Y	N	N	N	Y	Y	Y
9	I-95 SB Madison Service Plaza	Public	41.29103, -72.576786	I-95 SB Exit 62	Madison	20	Y	N	N	N	Y	Y	Y
10	I-95 NB Madison Service Plaza	Public	41.291008, -72.583511	I-95 NB Exit 61	Madison	10	Y	N	N	N	Y	Y	Y
11	I-95 SB North Stonington Welcome Center	Public	41.418473, -71.848234	I-95 SB Exit 93	North Stonington	30	Y	N	N	N	N	N	Y
12	I-84 EB Danbury Welcome Center	Public	41.392579, -73.527994	I-84 EB Exit 2	Danbury	20	Y	N	N	N	N	N	Y
13	I-84 EB Southington Rest Area	Public	41.573695, -72.905541	I-84 EB Exit 28	Plantsville / Southington	20	Y	N	N	N	N	N	Y
14	I-84 EB West Willington Rest Area	Public	41.891268, -72.300444	I-84 EB Exit 69	West Willington	6	Y	N	N	N	N	N	Y
15	I-84 WB West Willington Rest Area	Public	41.894671, -72.293977	I-84 WB Exit 70	West Willington	12	Y	N	N	N	N	N	Y
16	I-91 SB Wallingford Rest Area	Public	41.464619, -72.776372	1-91 SB Exit 15	Wallingford	40	Y	N	N	N	N	N	Y

Site ID	Site Name	Ownership Type	Coordinates	Address	Place	Truck Parking Spaces	Restroom	Truck Wash	Shower	Laundry	Fuel	Food	Overnight Parking
17	I-91 NB Middletown Rest Area	Public	41.550665, -72.745329	I-91 NB Exit 23	Middletown	25	Y	N	N	N	N	N	Y
18	I-395 SB Montville Service Plaza	Public	41.475224, -72.116578	I-395 SB Exit 79A	Uncasville / Montville	10	Y	N	N	N	Y	Y	Y
19	I-395 NB Plainfield Service Plaza	Public	41.752172, -71.878517	I-395 NB Exit 90	Moosup / Plainfield	10	Y	N	N	N	N (for Diesel)	Y	Y
20	I-395 SB Plainfield Service Plaza	Public	41.756033, -71.876759	I-395 SB Exit 89	Moosup / Plainfield	10	Y	N	N	N	N (for Diesel)	Y	Y
21	Pilot Travel Center #255 / TA Milford	Private	41.2368815, -73.0222282	433 Old Gate Lane, Milford, CT 06460	Milford	150	Y	Y	Y	Y	Y	Y	Y
22	Pilot Travel Center #882	Private	41.4419112, -71.8002626	273 Clarks Falls Road, North Stonington, CT 06359	North Stonington	120	Y	Y	Y	Y	Y	Y	Y
23	Wheels Citgo #365 / Secondi Truck Stop	Private	41.236203, -73.025543	365 Old Gate Ln, Milford, CT, 06460	Milford	50	Y	Y	N	Y	Y	Y	Y
24	TA Express New Haven #171	Private	41.296984, -72.759431	3 East Industrial Road, Branford, CT, 06405	New Haven	75	Y	N	N	Y	Y	Y	Y
25	TA Southington #154	Private	41.564427, -72.909937	1875 Meriden-Waterbury Turnpike, Milldale, CT, 06467	Southington	145	Y	N	N	Y	Y	Y	Y
26	TA Willington #022	Private	41.917700, -72.261363	327 Ruby Road, Willington, CT, 06279	Willington	240	Y	N	N	Y	Y	Y	Y
27	Pride Hartford Truck Stop I-91	Private	41.787547, -72.655526	10 Jennings Road, Hartford, CT 06120	Hartford	60	Y	N	N	Y	Y	Y	Y
28	Waterbury Valley Truck Stop LLC	Private	41.584202, -73.052286	990 Huntingdon Ave, Waterbury CT 06704	Waterbury	10	Y	N	N	N	Y	Y	Y
29	Gulf Truck Stop	Private	41.350416, -72.868566	11 Universal Dr, North Haven CT 06473	North Haven	3	Y	N	N	N	Y	Y	Y
30	Mercury Mobil	Private	41.737400, -72.659406	110 Brainard Rd, Hartford CT 06114	Hartford	10	Y	N	N	N	Y	Y	Y

Connecticut Statewide Freight Plan Update

Appendix C – Truck Volumes Analysis

Prepared by:

CDM Smith

August 2022

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1. Truck Analysis Data and Methodology

This technical memorandum documents the 2015-2019 truck volume trends analysis. The trends information, including growth and change in truck traffic relative to all traffic, are reported at state, county, and route levels. Based on the period of available data, the trends information do not report impacts of the COVID-19 pandemic.

1.1 Data

The following data were used in this analysis:

- **Connecticut Department of Transportation's (CTDOT's) Highway Performance Monitoring System (HPMS) 2015-2019 Data**: The HPMS data is annually reported by CTDOT to the Federal Highway Administration (FHWA). It contains tabulated average annual daily traffic (AADT) estimates for trucks (classified into single unit truck[1] and combination truck[2]) and total for all vehicle types by highway segment. This data supports truck and total traffic comparisons and trends analysis. The volume information is available only as bi-directional totals.
- **CTDOT's 2019 AADT Geographic Information System (GIS) Data:** This is a geospatial database developed by CTDOT that identifies AADT estimate and year of the count data by highway segment. This data enables visualization of segment level attributes both on a single direction and bi-directional basis. This analysis only uses the bi-directional segment features.
- **United States (U.S.) Census 2018 TIGER U.S. County Boundary Line GIS Data:** This is a geospatial dataset developed by the U.S. Census that identifies the boundaries of U.S. counties, including those in Connecticut.
- **Connecticut Department of Motor Vehicles' (DMV's) Bi-annual Weigh Station Reports**: These reports are prepared for the five weigh stations in the State located on interstate highways in Danbury, Greenwich, Middletown, Union and Waterford. The reports contain information on the total number of vehicles weighed, total number and type of vehicle inspections, total number and type of citations issued, and total potential fines for the weigh stations.

1.2 Methodology

The HPMS data and GIS data do not have a common segment identifier or route labeling system. The two types of data differ in the segment extents, that is, the beginning and ending postmiles. There are also extent differences within the different years of HPMS data. The HPMS data included all state routes and some local routes, while the GIS data includes all routes. The local routes that are missing in the

[1] A single unit truck is a single unit vehicle capable of carrying cargo.
[2] A combination truck is a combination vehicle made by articulating a truck tractor unit with one or more trailers containing cargo.

HPMS data are those where classification counts are not required. As a result, the analysis and visualization of the HPMS data using the GIS data required large data processing to identify matching routes and locations and repeating the processing steps for the different years of HPMS data.

HPMS and GIS data were matched via database queries (for state and local routes separately) in Microsoft (MS) Access software followed by post-processing in MS Excel to select the best match, and a small percentage of manual matching based adjustments. The result was many-to-many relationships between the HPMS and GIS data. For multiple HPMS data segments matched to the same GIS data segment, a distance weighted average was used to compute the average truck volume. For a single HPMS data segment matched to multiple GIS data segments, the truck volume data was kept the same. The visualization of truck volumes was done using the GIS data segments. There are GIS data segments with no HPMS data.

For the trends analysis, the Federal Information Processing Standard (FIPS) code and name for the county in which the GIS data segments are located were identified. Based on the established match between the HPMS data and GIS data, the county FIPS code and name were assigned to all HPMS data segments. The HPMS data for 2015-2019 was then summarized at route and county level, and trend charts and tables were developed.

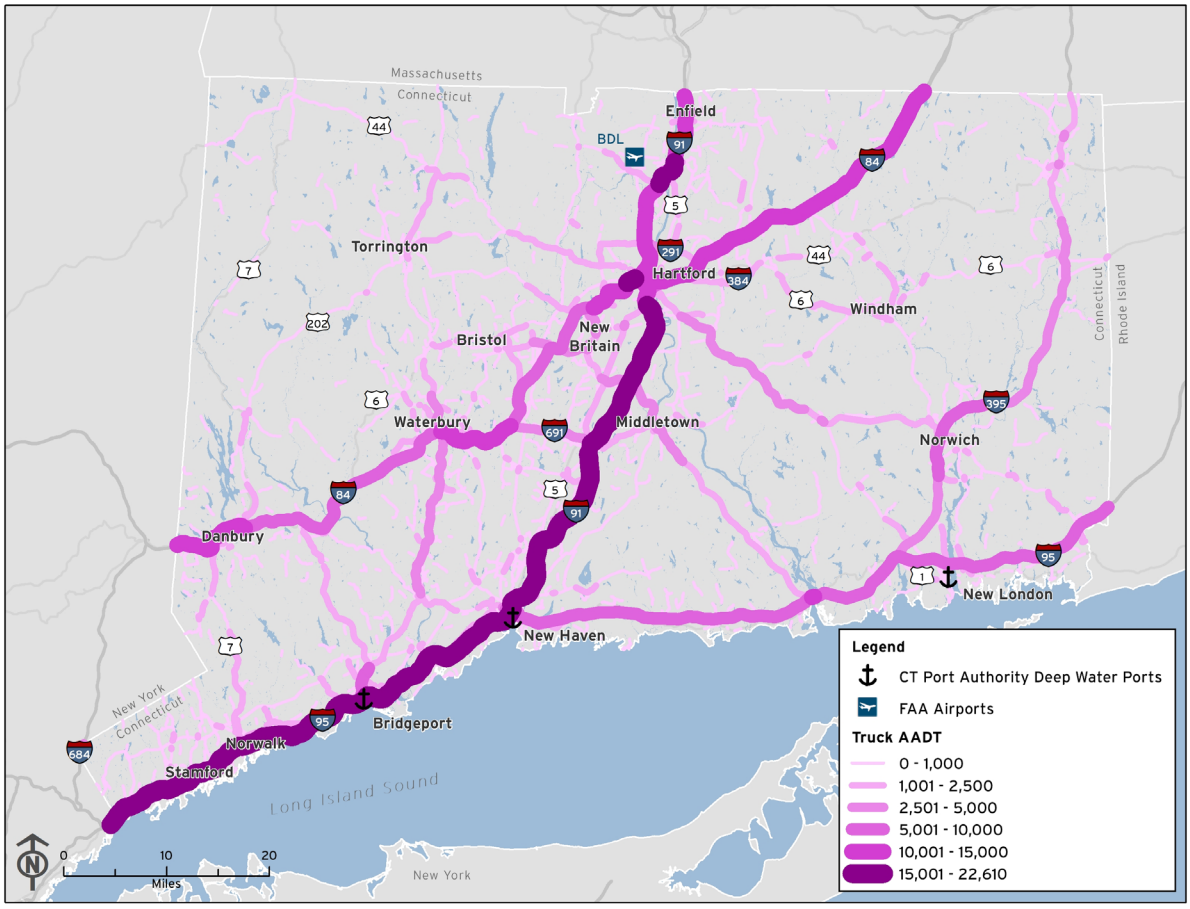
2. STATEWIDE TRUCK VOLUMES AND TRENDS

2.1 2019 TRUCK VOLUMES

Figure 2.1 shows the 2019 average annual daily truck volumes across the State. Truck-based freight in the State is carried over Interstates 95, 84, 91, 291, 395 and 691; US routes including 1, 5, 6, 7, 44 and 202; and State Routes 2, 8, 9, 25, 66, 72 and 85.

I-95 from the New York/Connecticut border to New Haven and I-91 between New Haven and Hartford carry the heaviest truck volumes, generally over 15,000 trucks per day and up to 22,000 trucks per day (near Bridgeport). North of Hartford, the truck traffic splits into I-91 and I-84 corridors and averages over 10,000 trucks per day up to the Connecticut/Massachusetts border. The urban limits of Danbury and Waterbury and the Raymond E Baldwin Bridge across the Connecticut River also experience over 10,000 trucks per day. Rural parts of I-84 from the New York state line to Hartford and I-95 from New Haven to the Connecticut/Rhode Island border carry between 5,000 and 10,000 trucks per day. Other state routes carry under 5,000 trucks per day and provide critical cross-corridor connectivity.

Figure 2.1: 2019 Statewide Annual Average Daily Truck Volumes

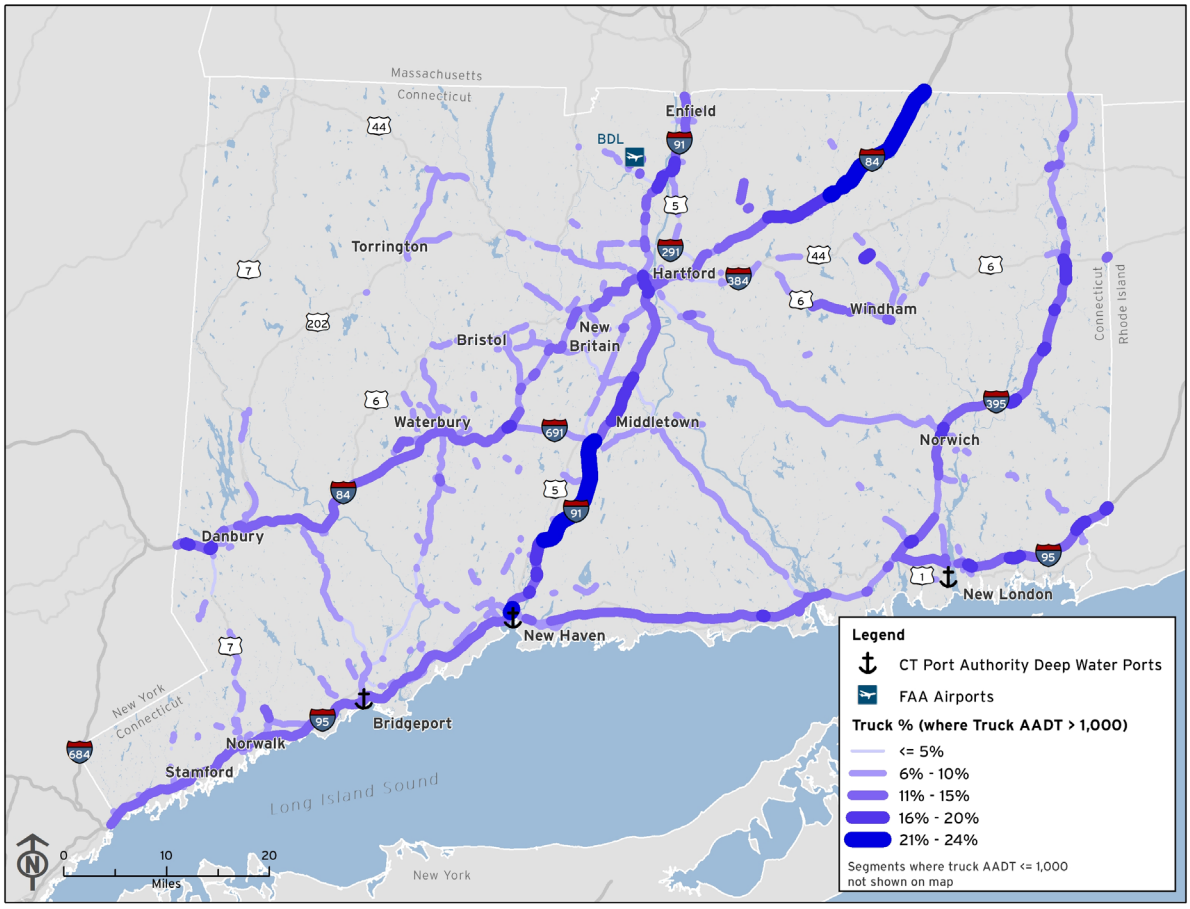


Sources: CTDOT 2015-2019 Truck AADT Data for FHWA HPMS Reporting; CTDOT 2019 Total AADT GIS Data; CDM Smith's GIS Analysis

2.2 2019 Truck Percentages

Figure 2.2 shows the 2019 annual average daily truck percentage across the State. The map excludes information on state routes with less than 1,000 trucks per day. On corridors with truck traffic larger than 5,000 trucks per day, the truck percentage is generally between 10 and 15 percent, and reaches just over 20 percent on portions of I-84 near the Massachusetts line and portions of I-91 between New Haven and Hartford.

Figure 2.2: 2019 Statewide Annual Average Daily Truck Percentage

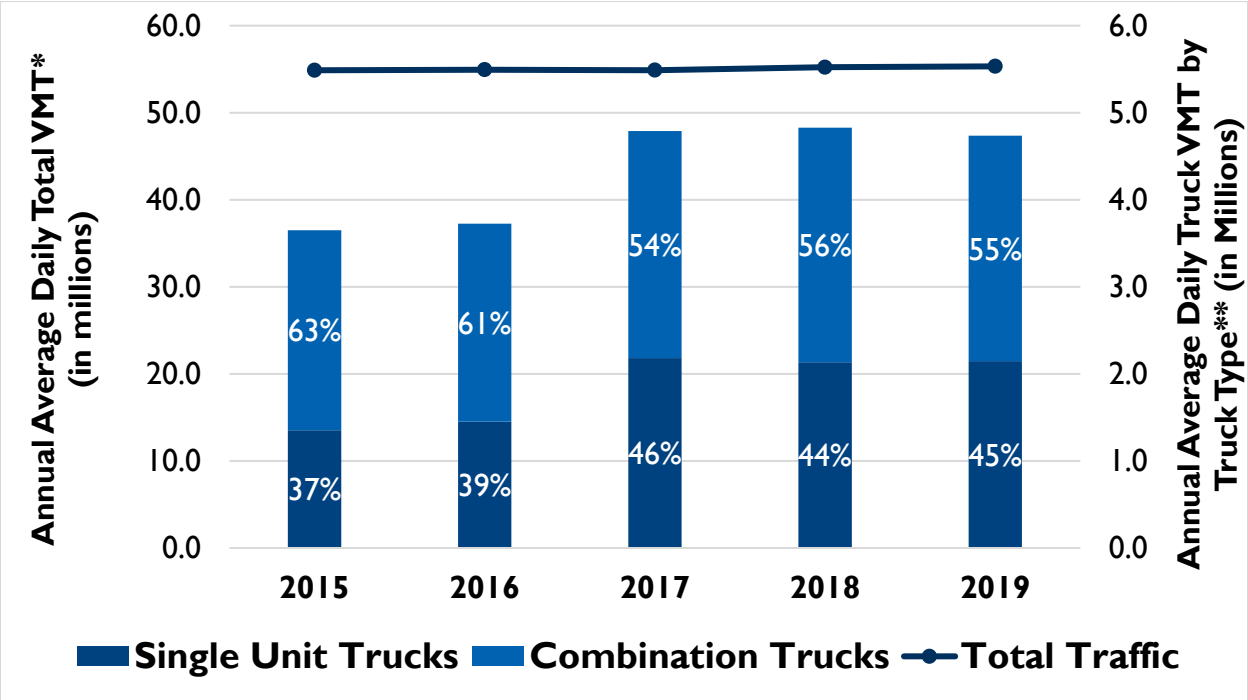


Sources: CTDOT 2015-2019 Truck AADT Data for FHWA HPMS Reporting; CTDOT 2019 Total AADT GIS Data; CDM Smith's GIS Analysis

2.3 2015-2019 Truck VMT Trends

In 2019, the Statewide annual average daily truck vehicle-miles traveled (VMT) was 4.74 million, which was 8.6 percent of the Statewide annual average daily total traffic VMT. The historical annual average daily VMT data as shown in **Figure 2.3** reveals that the average year-to-year change in truck VMT over 2015-2019 is 7.4 percent compared to 0.2 percent for total traffic VMT. So, truck traffic has clearly grown faster than total traffic during this time. Between 2015 and 2017, there was a growth trend in truck VMT in the State. This has slowed down after 2017. Single unit trucks were 37 percent of total truck VMT in 2015 but grew to 45 percent of the total truck VMT in 2019. There is no particular trend in the total traffic VMT, it remained relatively flat.

Figure 2.3: 2015-2019 Statewide Annual Average Daily Truck VMT Trends



*All Traffic Annual Average Daily Total Traffic VMT is shown as Line with Markers
**All Traffic Annual Average Daily Truck VMT by Truck Type is shown as Stacked Column Chart

Source: CTDOT 2015-2019 Truck AADT Data for FHWA HPMS Reporting; CDM Smith

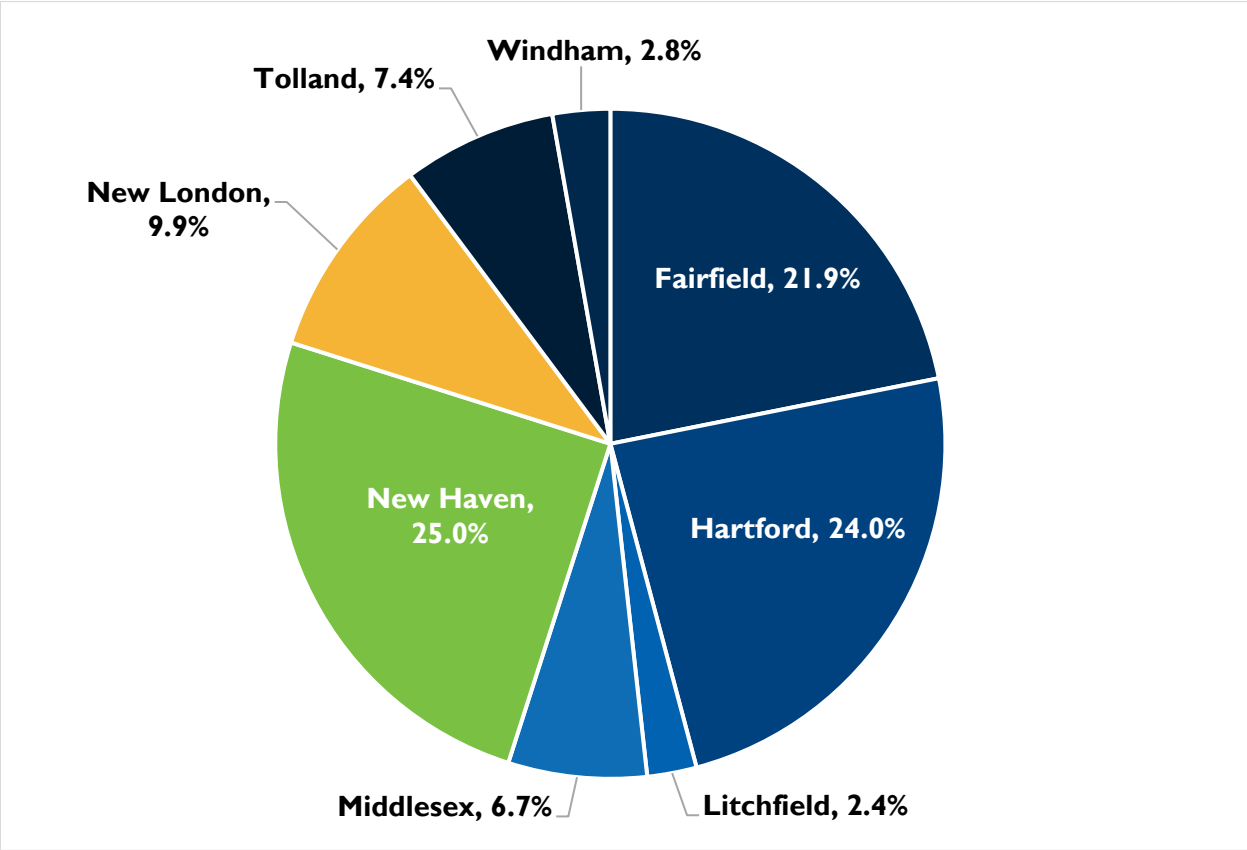
3. COUNTY LEVEL TRUCK VOLUME SHARES AND TRENDS

The county level truck volumes and trends analysis results are discussed in this section.

3.1 2019 TRUCK VMT SHARES OF STATE

As shown in **Figure 3.1**, in 2019, New Haven, Hartford and Fairfield counties jointly contributed 70.8 percent of the statewide annual average daily truck vehicle-miles traveled (VMT); the rest comes from the remaining five counties (Litchfield, Middlesex, New London, Tolland, and Windham).

Figure 3.1: 2019 County Level Annual Average Daily Truck VMT Shares

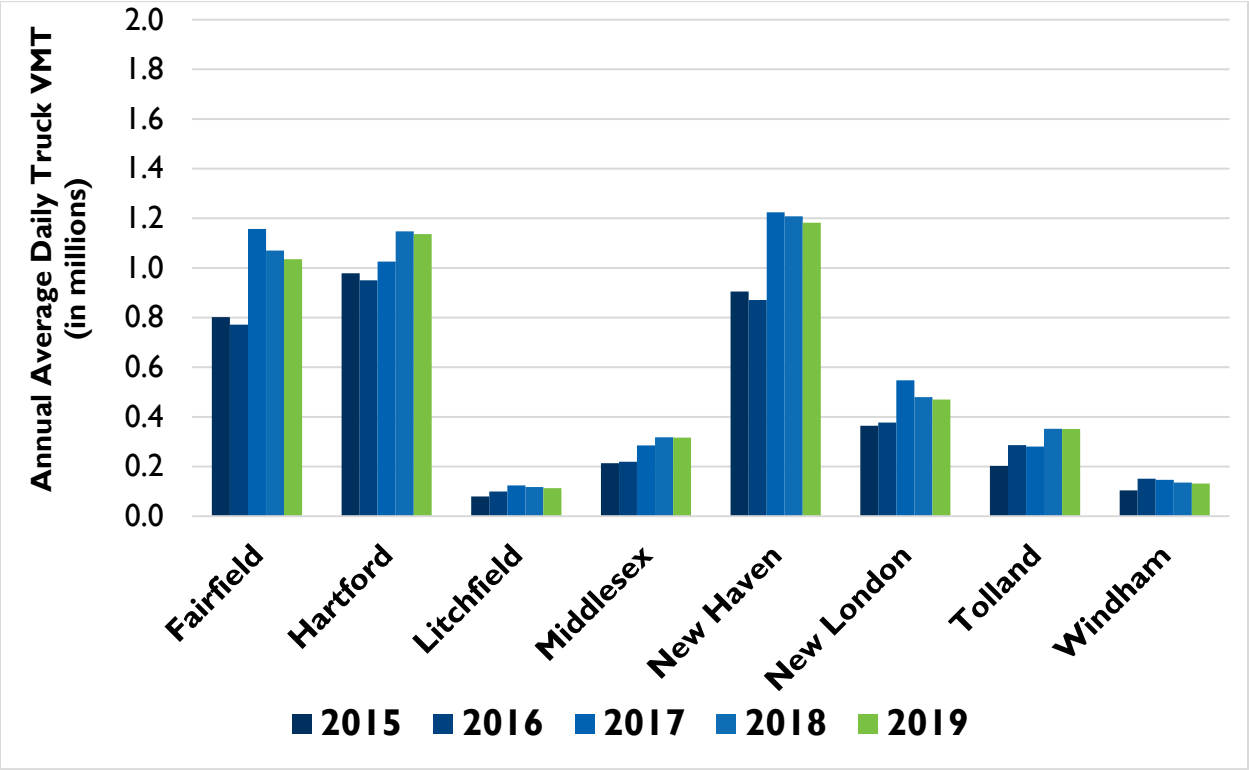


Sources: CTDOT 2015-2019 Truck AADT Data for FHWA HPMS Reporting; CDM Smith

3.2 2015-2019 TRUCK VMT TRENDS

Figure 3.2 shows that the year-to-year percentage changes in truck VMT varied by county. The percentage increase in truck VMT was the highest in 2015-2016 for Litchfield, Tolland, and Windham counties, in 2016-2017 for Fairfield, Middlesex, New Haven, and New London counties; and in 2017-2018 for Hartford county. For all counties, the average year-to-year change over 2015-2019 ranged between 4.0 percent and 16.1 percent (i.e., truck traffic increased in all counties).

Figure 3.2: 2015-2019 County Level Annual Average Daily Truck VMT Trends



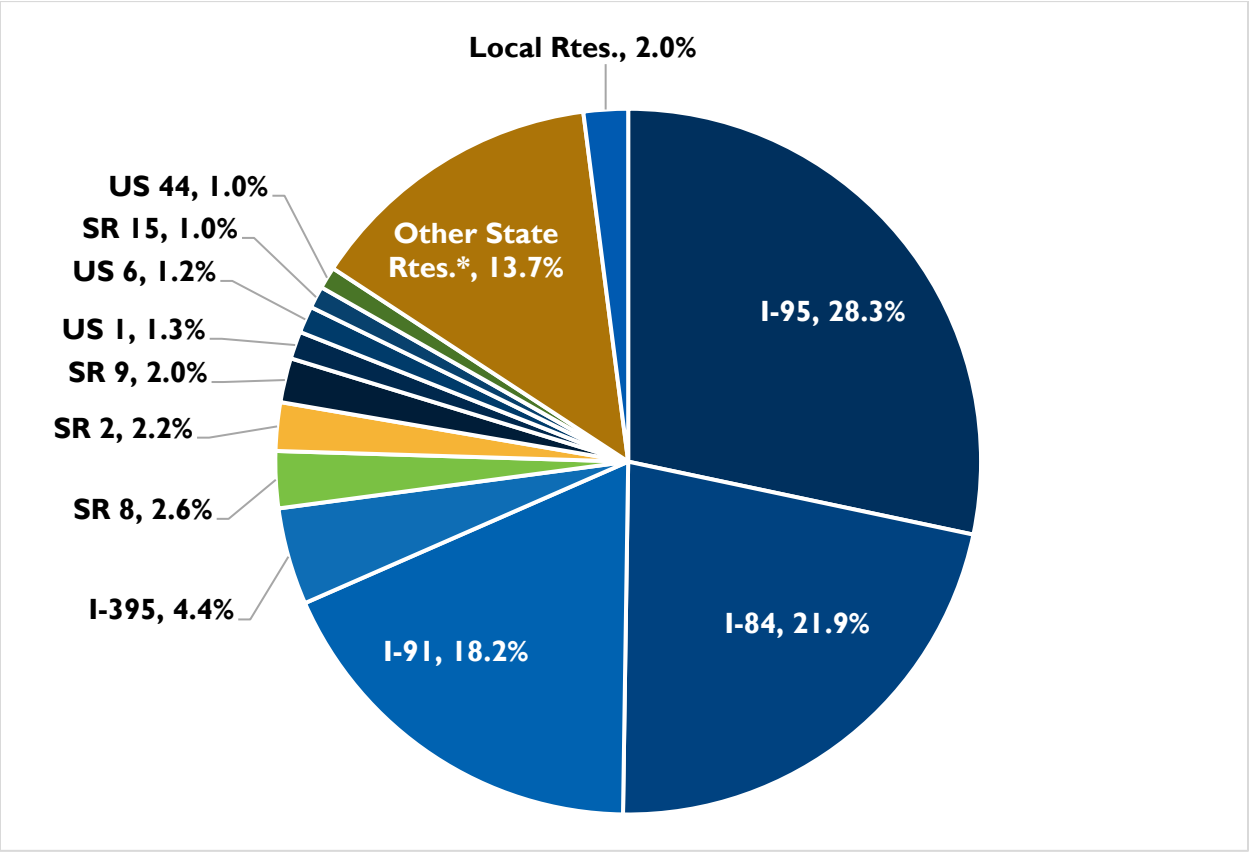
Sources: CTDOT 2015-2019 Truck AADT Data for FHWA HPMS Reporting; CDM Smith

4. Route Level Truck Volumes and Trends

4.1 2019 Truck VMT Shares of State

As shown in **Figure 4.1**, in 2019, I-95, I-84 and I-91 jointly contributed 68.4 percent of the statewide annual average daily truck vehicle-miles traveled (VMT), with the remaining 31.6 percent coming from the remaining state and local routes in Connecticut. Most truck traffic is clearly traveling on Connecticut's state highway network, and more specifically on its Interstates.

Figure 4.1: 2019 Route Level Annual Average Daily Truck VMT Shares



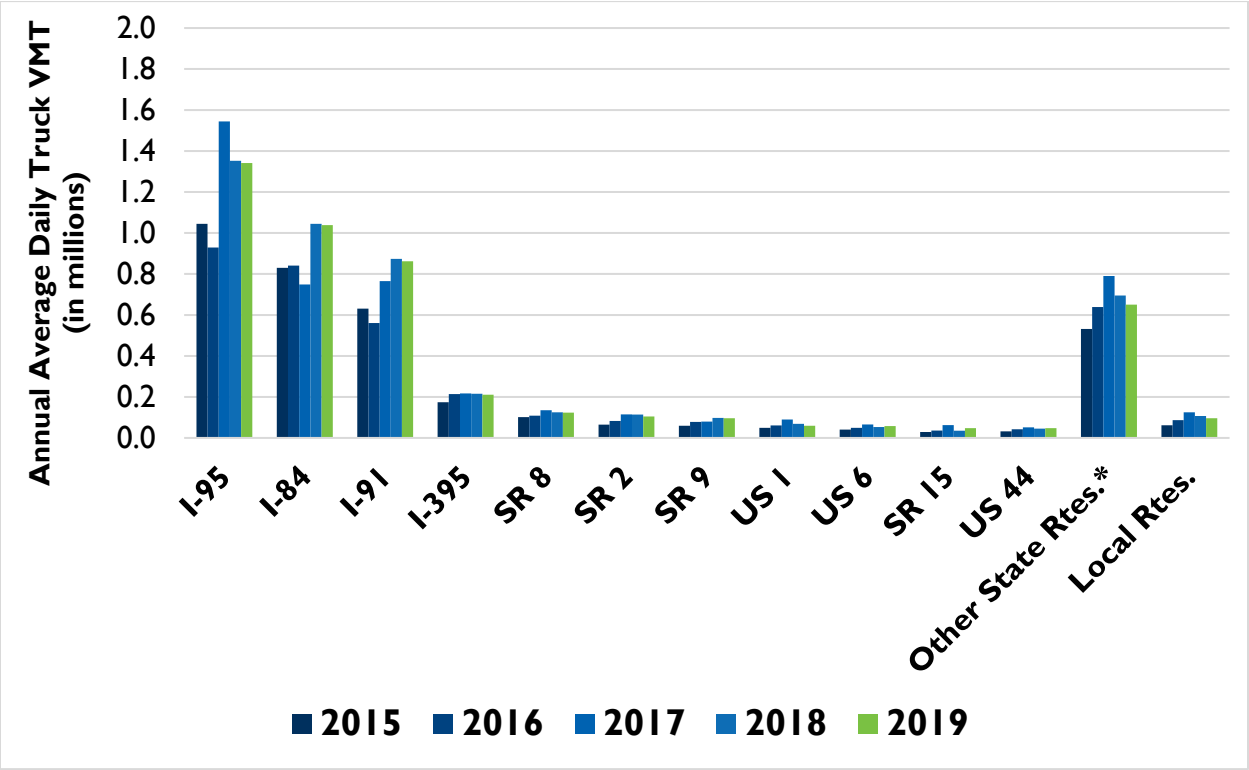
*Other state routes are estimated to carry less than 1 percent of Statewide total daily truck vehicle-miles in 2019.

Sources: CTDOT 2015-2019 Truck AADT Data for FHWA HPMS Reporting; CDM Smith

4.2 2015-2019 Truck VMT Trends

Figure 4.2 shows that the year-to-year percentage changes in truck VMT varied by route. The percentage increase in truck VMT was the highest in 2015-2016 for I-395, SR 9, and US 44; in 2016-2017 for I-95, I-91, SR 8, SR 2, US 1, US 6 and SR 15; and in 2017-2018 for I-84. For all counties, the average year-to-year change over 2015-2019 ranged between 5.4 percent and 22.1 percent (i.e., an increase on all routes).

Figure 4.2: 2015-2019 Route Level Annual Average Daily Truck VMT Trends



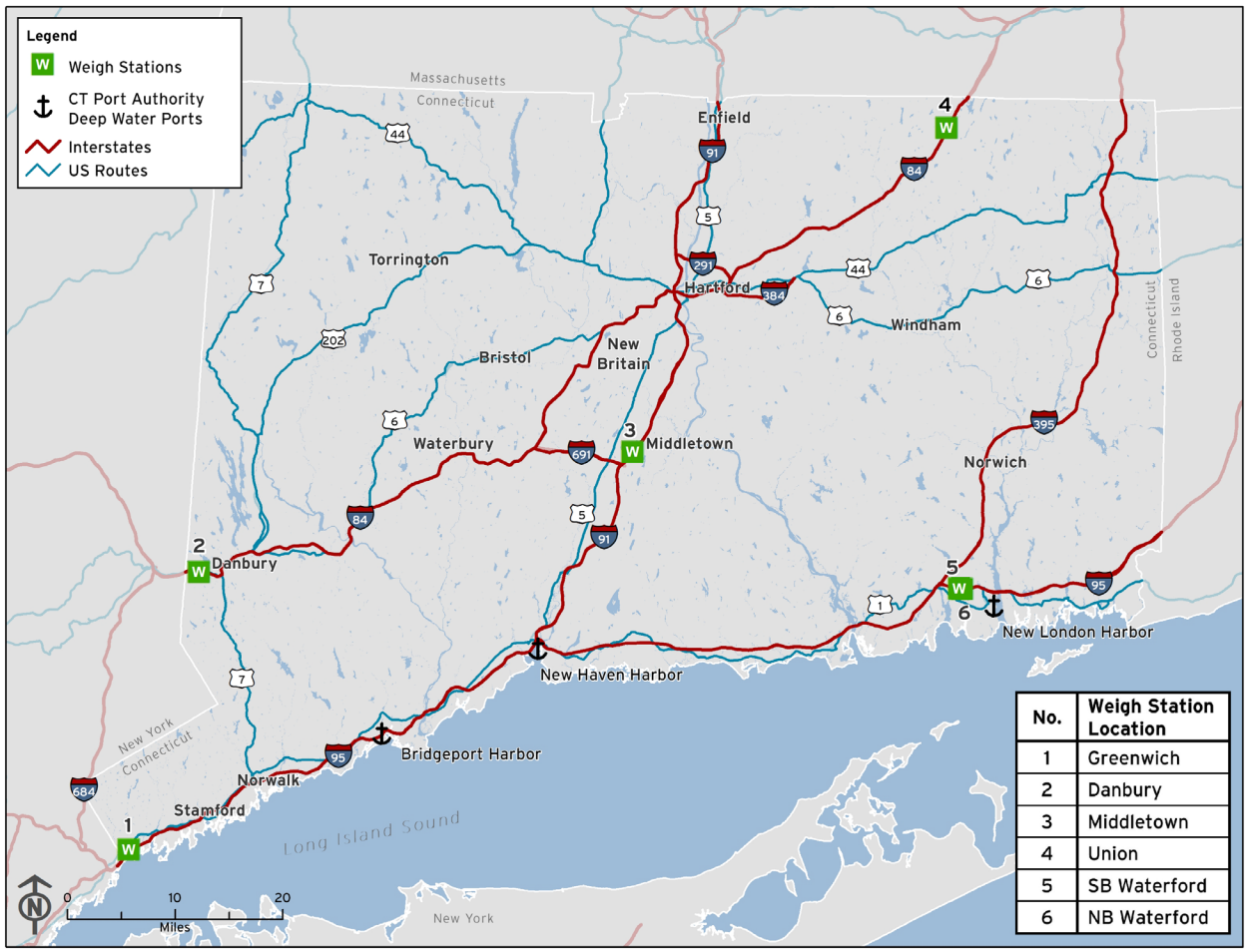
*Other state routes are estimated to carry less than 1 percent of Statewide total daily truck vehicle-miles in 2019.

Sources: CTDOT 2015-2019 Truck AADT Data for FHWA HPMS Reporting; CDM Smith

5. Weigh Station Trends

As mentioned earlier, there are five weigh stations in Connecticut located on the interstate highways in Danbury, Greenwich, Middletown, Union, and Waterford. Their locations are shown in **Figure 5.1**.

Figure 5.1: Weigh Station Locations Map



Source: All Stays Pro Account – Truck Dashboard; CDM Smith's GIS Analysis

Table 5.1 summarizes the 2015-2019 trends in the data for weigh stations. In September 2018, a vehicle crashed into the Waterford weigh station on I-95 southbound and demolished the building.[3] This weigh station has since closed and CTDOT is converting it to a Virtual Weigh Station, which was a recommendation from the 2017 Connecticut Freight Plan. Overall in the state, there is a declining trend in number of vehicles weighed and number of inspections although truck VMT is increasing. As a result, the number of citations are also declining. Partly, this trend may be attributed to bypasses or pre-clearances enabled by Intelligent Transportation Systems (ITS) for commercial vehicle operations (CVO).

[3] https://www.wtnh.com/news/connecticut/new-london/suv-crashes-into-waterford-weigh-station-on-interstate-95/ (last accessed on November 22, 2021)

Table 5.1: 2015-2019 Weigh Station Data Trends

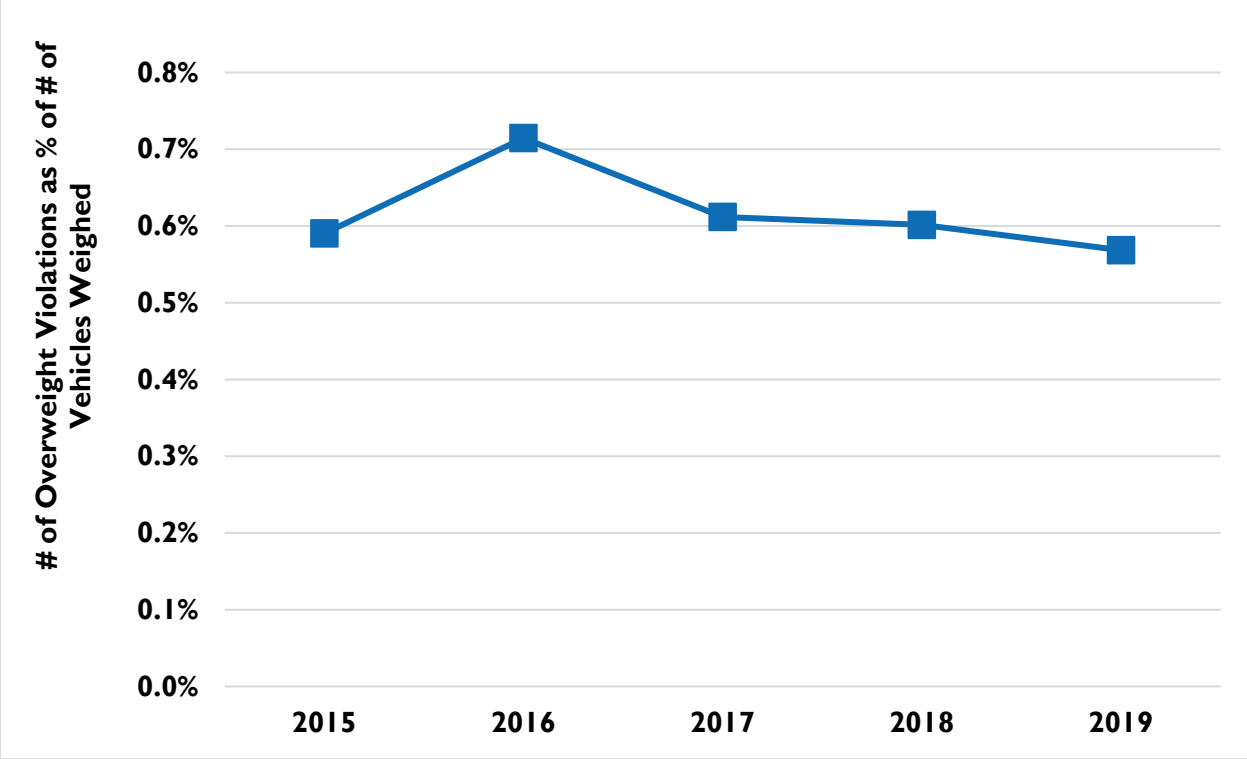
Weigh Station	Metric	2015	2016	2017	2018	2019
Danbury	# of Veh. Weighed	91,124	87,718	60,659	44,136	60,375
	# of Veh. Inspections	1,755	1,366	1,054	663	664
	Total # of Citations	3,814	2,214	1,610	1,005	744
	# of Citations relating to Overweight Violations	1,008	648	606	340	155
	# of Citations relating to Oversize Violations	596	400	155	69	30
Greenwich	# of Veh. Weighed	144,600	190,949	199,121	119,296	105,941
	# of Veh. Inspections	1,687	2,478	2,028	1,795	1,400
	Total # of Citations	3,374	4,499	3,652	3,873	2,870
	# of Citations relating to Overweight Violations	1,109	1,882	1,403	1,336	927
	# of Citations relating to Oversize Violations	378	221	164	104	57
Middletown	# of Veh. Weighed	75,468	63,463	48,878	76,759	54,559
	# of Veh. Inspections	1,781	1,536	1,186	1,334	976
	Total # of Citations	1,868	2,007	1,360	946	1,493
	# of Citations relating to Overweight Violations	797	781	551	294	355
	# of Citations relating to Oversize Violations	69	76	44	38	37
Union	# of Veh. Weighed	203,884	152,244	195,668	205,878	199,998
	# of Veh. Inspections	1,381	1,448	1,422	1,386	1,209
	Total # of Citations	402	641	743	1,489	2,625
	# of Citations relating to Overweight Violations	38	189	271	553	887
	# of Citations relating to Oversize Violations	31	32	30	82	257
Waterford N/B	# of Veh. Weighed	34,660	50,143	49,421	33,226	40,920
	# of Veh. Inspections	622	652	715	468	677
	Total # of Citations	962	976	880	510	868
	# of Citations relating to Overweight Violations	191	239	372	174	301
	# of Citations relating to Oversize Violations	18	22	21	8	16
Waterford S/B*	# of Veh. Weighed	20,339	5,945	3,647	223	0
	# of Veh. Inspections	431	190	153	185	0
	Total # of Citations	1,304	875	666	575	0
	# of Citations relating to Overweight Violations	222	194	207	187	0
	# of Citations relating to Oversize Violations	20	9	8	6	0
State Total	**# of Veh. Weighed**	**570,075**	**550,462**	**557,394**	**479,518**	**461,793**

Weigh Station	Metric	2015	2016	2017	2018	2019
	# of Veh. Inspections	7,657	7,670	6,558	5,831	4,926
	Total # of Citations	11,724	11,212	8,911	8,398	8,600
	# of Citations relating to Overweight Violations	3,365	3,933	3,410	2,884	2,625
	# of Citations relating to Oversize Violations	1,112	760	422	307	397

Source: Connecticut DMV – Weigh Station Reports, Available at: https://portal.ct.gov/DMV/Commercial-Vehicle-Safety/Weigh-Station-Reports/Weigh-Station-Reports (last accessed on November 22, 2021)
**Not operational since September 2018, this affects numerical values for Waterford S/B and State Total metrics.*

Figure 5.2 shows the overweight violations trends normalized using number of vehicles weighed. The share of overweight violations seems to be fairly flat at around 0.6 percent.

Figure 5.2: 2015-2019 Statewide Normalized Overweight Violations Trends



Source: Connecticut DMV – Weigh Station Reports, Available at: https://portal.ct.gov/DMV/Commercial-Vehicle-Safety/Weigh-Station-Reports/Weigh-Station-Reports (last accessed on November 22, 2021)

Connecticut Statewide Freight Plan Update

Appendix D – Truck Bottleneck Analysis

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September 2022

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1. Truck Bottleneck Analysis Methodology

CDM Smith is supporting Connecticut Department of Transportation (CTDOT) in the development of Baseline Performance Period Report [23 CFR 490.107(b)(1)(ii)(E)] as part of the truck freight bottleneck analysis for the Connecticut Statewide Freight Plan Update.

This technical memorandum describes the methodology and analysis of truck freight bottlenecks as well as the methodology and calculation of freight performance measures for the State of Connecticut.

Truck freight bottlenecks are mainly caused by:

1) Congestion – Slow average truck travel speeds due to congestion, often at daily or seasonal peaks causes recurrent and non-recurrent bottlenecks:

    a. Recurrent bottlenecks occur at predictable times and locations when traffic demand at peak periods exceeds a road's capacity.

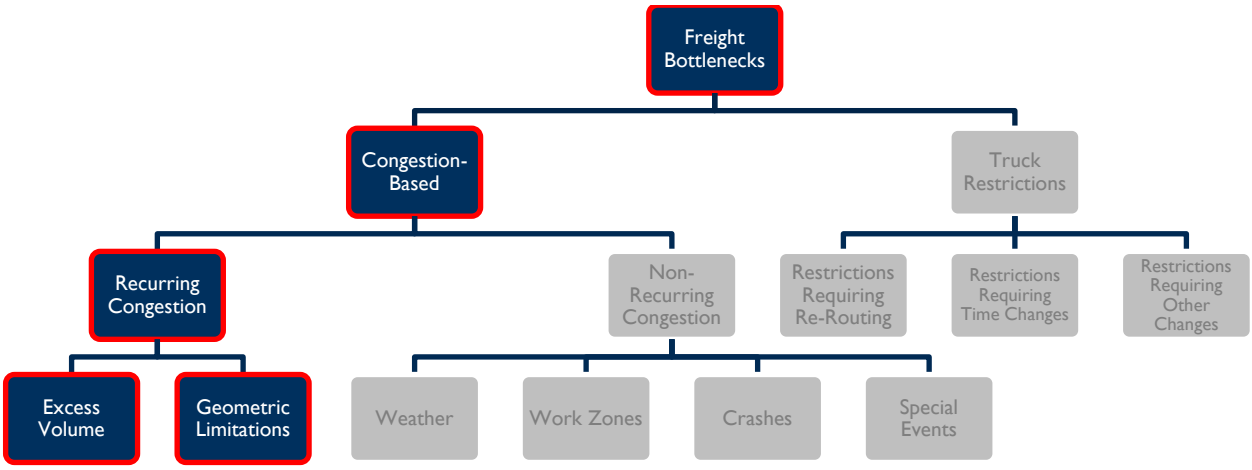
    b. Non-recurrent bottlenecks occur when temporary incidents like crashes, special events, bad weather, or work zones can reduce road capacity, increase travel demand or in extreme cases necessitate re-routing or a complete halt to all travel.

2) Truck restrictions – Infrastructure restrictions that delay trucks by forcing them to take longer routes, carry smaller loads or move at different travel times.[1]

A bottleneck for truck freight is "a segment of roadway identified by the United States Department of Transportation (USDOT) as having constraints that cause a significant impact on freight mobility and reliability."[2] Truck freight bottlenecks occur either when trucks are delayed by slow speeds due to general traffic congestion or where restrictions limit truck travel. **Figure 1** shows a taxonomy for truck freight bottlenecks. This analysis is based on congestion-based bottlenecks; it excludes bottlenecks caused by truck restrictions and non-recurring congestion.

[1] Truck Freight Bottleneck Reporting Guidebook, July 2018, FHWA-HOP-18-070
[2] 23 CFR 490.101

Figure 1: Taxonomy for Truck Freight Bottlenecks



Source: Truck Freight Bottleneck Reporting Guidebook, July 2018, FHWA-HOP-18-070

Bottlenecks characterized by significant reductions in average truck speeds can be either recurrent or non-recurrent. Their severity is a function of how many trucks are affected, how significantly truck speeds are reduced, how long the congestion exists, and how often it reoccurs. According to the Federal Highway Administration's (FHWA) Localized Bottleneck Reduction Program materials,[3] recurrent congestion occurs when traffic over-demand at peak periods routinely exceeds a road's capacity, defined primarily by the number of lanes and the travel speed for which they were designed. The foremost examples are the familiar peak morning and afternoon weekday commute hours, but recurrent congestion may also occur around midday, seasonally or at factory shift-change hours. In addition to lane or speed limitations, recurrent congestion bottlenecks can be caused or exacerbated by other limitations in physical roadway characteristics that particularly affect truck travel speeds.

The truck freight bottleneck identification and analysis framework performed for this study is divided into six main steps which are detailed in the following sections.

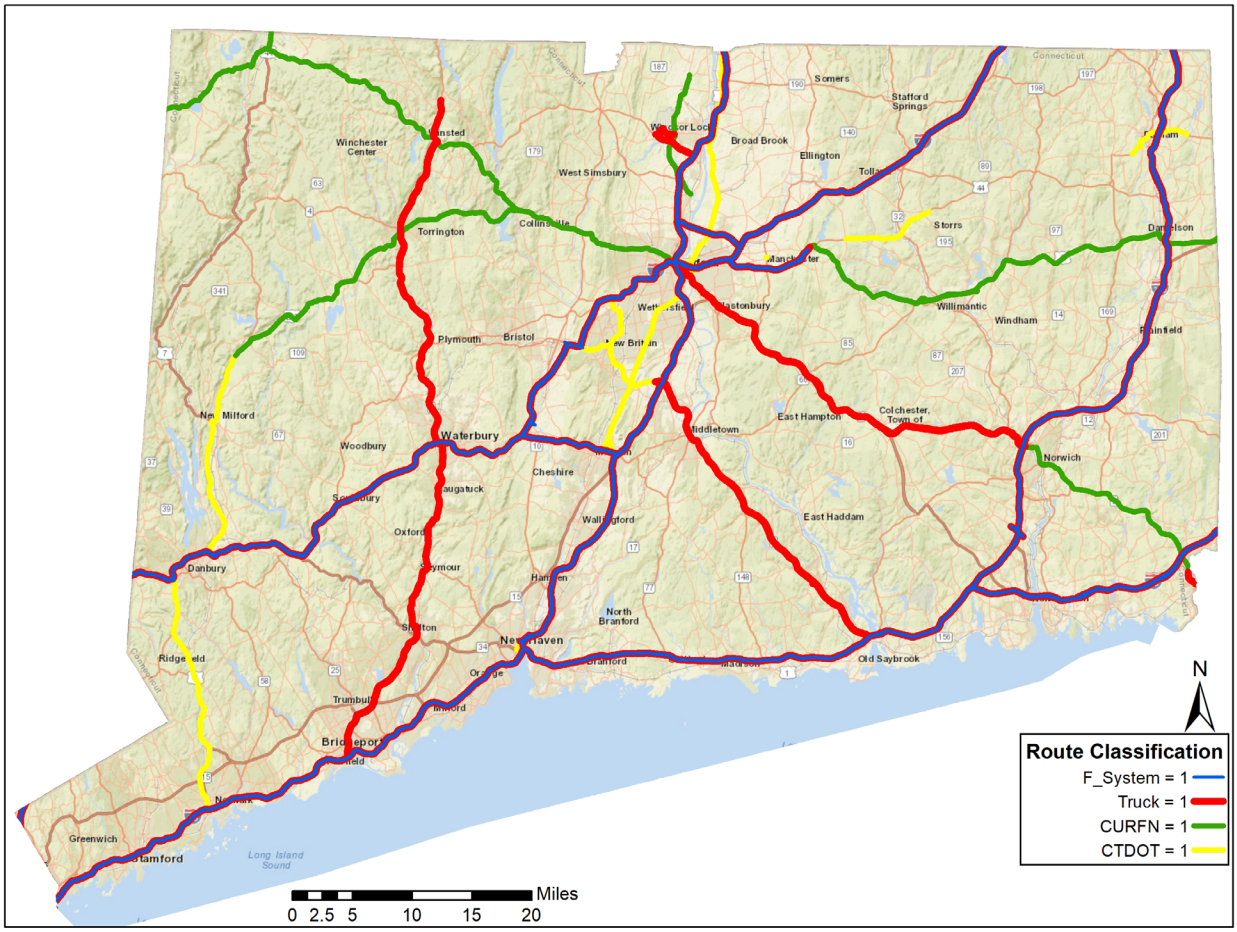
2. STEP 1: SELECT ROADS FOR ANALYSIS

Truck freight bottleneck reporting applies, at a minimum, to the Interstate System. But given that the truck freight bottleneck reporting process should be integrated with the State Freight Plan bottleneck analysis and must include any highway bottlenecks identified in the National Strategic Freight Plan,[4] the bottleneck analyses may also include other roadways that the State determines to be vital to the goods movement. In this analysis, the 2019 National Performance Management Research Data Set (NPMRDS) Traffic Message Channel (TMC) network for Connecticut was downloaded, then conflated to the

[3] https://ops.fhwa.dot.gov/bn/lbr.htm
[4] Per 23 CFR 490.107(b)(1)(ii)(E)

CTDOT Linear Referencing System (LRS), and used for route selection. **Figure 2** shows the roads selected for the freight bottleneck analysis.

Figure 2: Selected Roads for Analysis



Source: CTDOT

The first criteria for the selection of roads were the Interstate system which are selected using the attribute F_System =1, that indicates the Interstate system. The second criteria, belonging to the National Highway System (NHS) and Interstates indicated as Truck = 1. For the third criteria, the raw 2019 TMC data was merged with Critical Rural and Urban Freight Corridor network (CURFN) data in ArcGIS software and an attribute was created to indicate those CURFN roadways which are marked as CURFN = 1. The last criteria are additional routes identified in collaboration with CTDOT.

The 2019 TMC network data were checked for TMCs that do not have a route assigned. Such TMCs were assigned a route based on spatial location of the TMC and visualization with Open Street Map/Google Maps using ArcGIS software. For example, if a TMC was located on I-95 but it was not assigned the appropriate route name or number, it was manually assigned a route name and number based on spatial location and visualization.

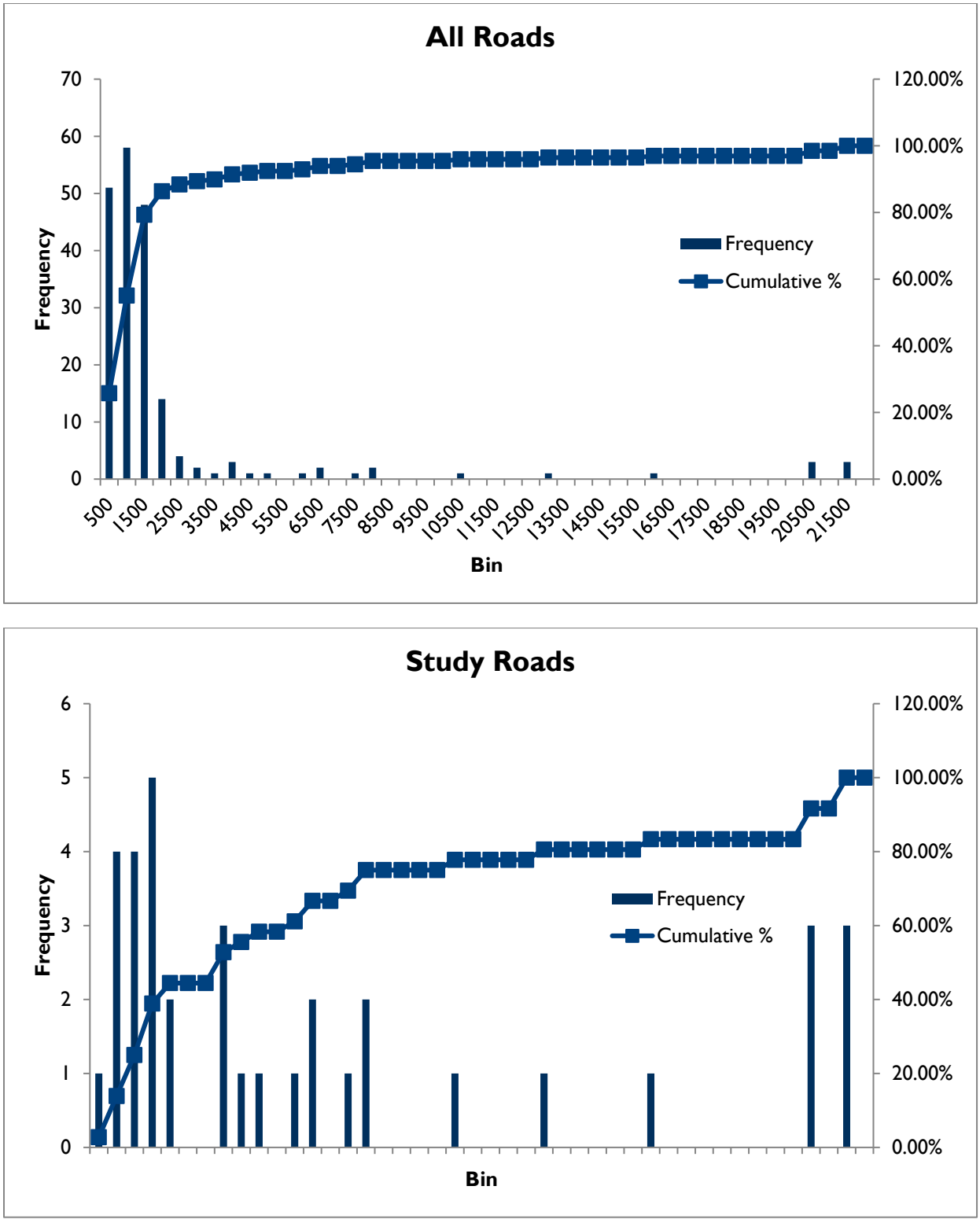
The TMC data includes the single and combined truck average annual daily traffic (AADT) and the Truck AADT was calculated by adding the two numbers for each TMC. After every TMC was assigned a route, it was exported to a spreadsheet where the first step was to calculate the harmonic mean of the truck

AADT for each route. Next, using the histogram function within the 'Data Analysis' toolbox in Microsoft Excel (available as an Add-in), the frequency and distribution of the harmonic mean truck AADT was calculated and plotted for both study roads as well as for all the roads. The representation of the study roads was then calculated to find what percentage of the study roads is representation from all the roads. **Table 1** shows the study road representation and **Figure 3** shows the frequency and cumulative percentages of the study roads and all roads.

Table 1: Study Roads Representation

Bin	All Roads		Study Roads		Representation
	Frequency	Cumulative %	Frequency	Cumulative %	
500	51	25.76%	1	2.78%	2%
1000	58	55.05%	4	13.89%	7%
1500	48	79.29%	4	25.00%	8%
2000	14	86.36%	5	38.89%	36%
2500	4	88.38%	2	44.44%	50%
4000	3	91.41%	3	52.78%	100%
4500	1	91.92%	1	55.56%	100%
5000	1	92.42%	1	58.33%	100%
6000	1	92.93%	1	61.11%	100%
6500	2	93.94%	2	66.67%	100%
7500	1	94.44%	1	69.44%	100%
8000	2	95.45%	2	75.00%	100%
10500	1	95.96%	1	77.78%	100%
13000	1	96.46%	1	80.56%	100%
16000	1	96.97%	1	83.33%	100%
20500	3	98.48%	3	91.67%	100%
21500	3	100.00%	3	100.00%	100%

Figure 3: Frequency and Distribution of Harmonic Mean Truck AADT



3. STEP 2: GATHER DATA FOR ANALYSIS

The FHWA encourages states to use truck travel time data as a core element for bottleneck identification; a data-driven approach helps expedite bottleneck identification by automating scanning of roadway system segments while also providing an objective basis for selecting bottlenecks.

This analysis used 2019 NPMRDS data for the State of Connecticut. The FHWA sponsors production of the NPMRDS, which contains archived speed and travel time information for all road segments on the National Highway System (NHS), including intermodal connectors, and additional roadways near 26 key border crossings with Canada (20 crossings) and Mexico (6 crossings). The NPMRDS provides information about average travel times reported at five-minute increments for roadway segments and includes data broken out by passenger vehicles, freight trucks, and combined traffic. The NPMRDS road segments are based on the TMC network, which is the industry standard for depicting road segments in navigation and mapping applications. The new NPMRDS includes AADT and AADTT conflated from the Highway Performance Monitoring System (HPMS).

4. STEP 3: SCREEN FOR TRUCK FREIGHT BOTTLENECKS

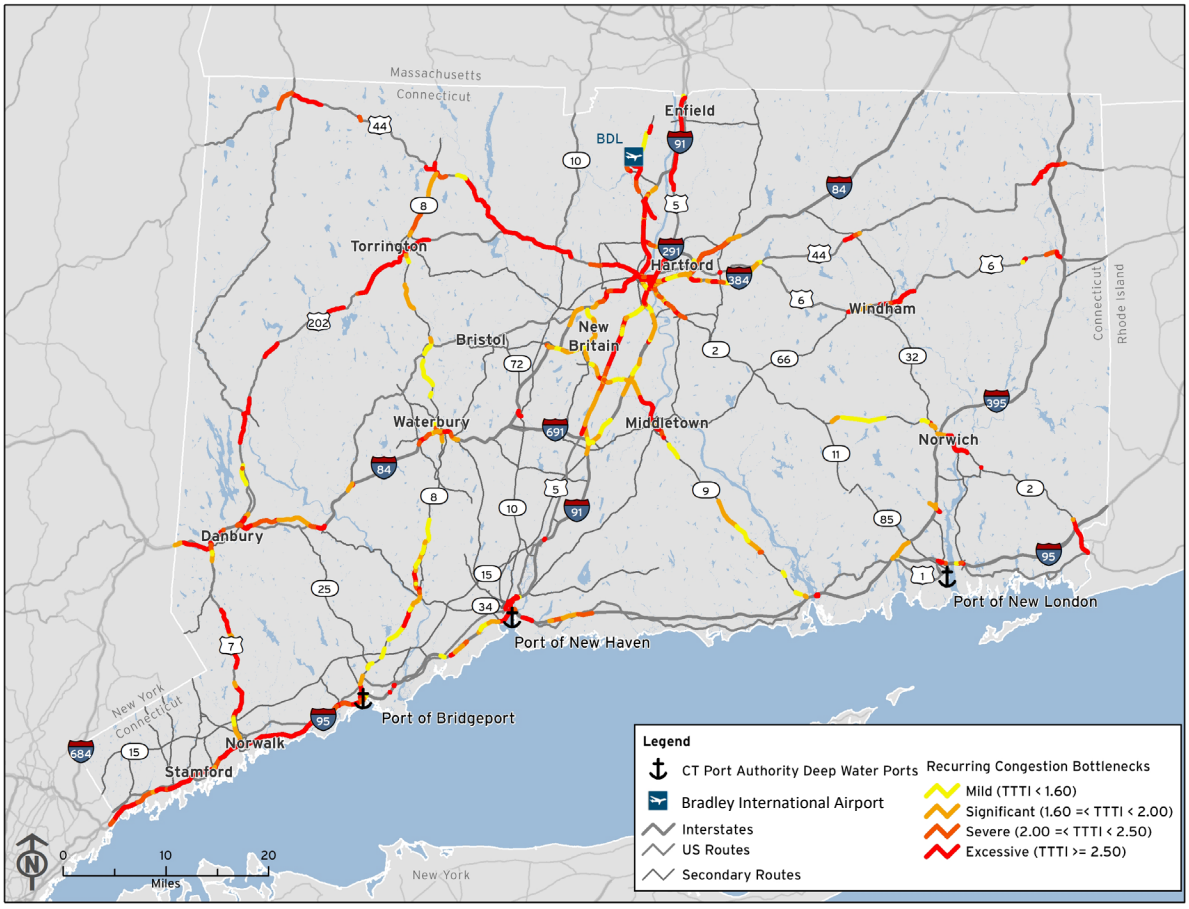
Truck speed data sets like NPMRDS make data-driven approaches for identifying congestion-related truck bottlenecks an efficient and accurate solution for speedy screening on a statewide scale to identify serious bottlenecks. Screening results can serve as a starting point for both detailed site-specific analysis of selected bottlenecks and engagement with stakeholders that will help to fine-tune an eventual list of bottlenecks.

In this study, first, the congested condition was checked for each TMC by means of the chosen metric called Truck Travel Time Index (TTTI) which is the ratio of the observed truck travel time to free flow travel time. The threshold for uninterrupted facility (defined as F_System = 1 or 2) was set at TTTI ≥ 1.33 and the threshold for interrupted facility (defined as F_System = 3, 4 or 5) was set at TTTI ≥ 2.50. The second metric was chosen to check for recurring congestion, and it is called Truck Speed Standard Normal Deviate (TSSND) which is the index of variation of the speed from the average speed in terms of standard deviation. The threshold chosen was TSSND > -1.50.

The first step of the calculation was performed by developing a programmable script in RStudio. The script is provided in the Appendix section of the memo (R Script for Truck Bottleneck Analysis). The script was used to read the large NPMRDS speed data available for the State of Connecticut. The data was then filtered for only the study roads and also the removal of the missing data. Next, the free flow travel time was calculated by dividing the length of the TMC by the reference speed. Next, TTTI for each TMC was calculated by dividing the truck travel time by the free flow travel time. In addition, the average speed and the speed standard deviation were also calculated. In the next step, TSSND values were calculated, and 'recurring' and 'congested' columns were created using the thresholds defined above. Finally, the calculated data was grouped by TMC ID and hour and was summarized for Max TTTI, Mean TTTI, TTTI Standard deviation, probability of recurring, and recurring TTTI. The final summarized data was then written out in an Excel spreadsheet.

From the summarized Excel spreadsheet, the maximum value of the recurring congestion TTTI was calculated for each TMC and imported into ArcGIS where this value for the study TMCs was joined into the raw TMC data. **Figure 4** shows the recurring congestion bottlenecks defined by the thresholds as displayed in the map.

Figure 4: Recurring Congestion Bottlenecks



The next step was to identify the segments for these study TMCs. Segments were assigned based on the existing corridors in the Open Street Map. Such route segments help identify the extent of recurring congestion. **Table 2** shows a sample of the recurring congestion showing the routes, the extent, and the recurring congestion summary values.

Table 2: Recurring Congestion by Route

Route	Limits or Location		TMC ID	Time	Recurring Congestion				
	From	To			Max. TTTI	Mean TTTI	SD TTTI	Probability	Expected Mean TTTI
I-95	CT-136 at I-95		120N13112	8:00 AM	3.91	3.08	1.17	1.00	3.08
				9:00 AM	1.43	1.38	0.06	1.00	1.38
				5:00 PM	2.87	2.17	0.98	1.00	2.17
				8:00 PM	3.07	2.25	1.16	1.00	2.25
			120P13112	3:00 AM	1.60	1.47	0.16	1.00	1.47
				3:00 PM	2.50	1.92	0.83	1.00	1.92
	US-1 at I-95 NB Exit 51		120N12591	2:00 AM	7.57	3.32	2.04	1.00	3.32
	US-1 at I-95 SB Exit 83		120+12604	12:00 AM	17.00	5.24	4.08	1.00	5.24
				1:00 AM	17.00	8.20	5.12	1.00	8.20
				2:00 AM	11.33	5.97	3.83	1.00	5.97
				6:00 AM	2.83	2.33	0.49	1.00	2.33
				7:00 AM	13.60	5.86	3.98	1.00	5.86
				9:00 AM	22.66	8.87	8.29	1.00	8.87
				1:00 PM	17.00	5.20	5.85	1.00	5.20
				2:00 PM	17.00	3.75	4.73	0.82	3.07
				3:00 PM	7.55	2.72	2.18	0.86	2.34
				4:00 PM	11.33	4.20	4.77	1.00	4.20
				8:00 PM	2.27	1.93	0.43	1.00	1.93
				9:00 PM	17.00	8.87	6.63	1.00	8.87
				10:00 PM	4.25	2.67	1.20	1.00	2.67
				11:00 PM	17.00	5.13	6.69	1.00	5.13
LINDEN AVE	Main St	King St	120N56864	7:00 AM	6.27	5.50	0.69	1.00	5.50
				10:00 AM	6.90	5.12	1.69	1.00	5.12
				1:00 PM	17.25	7.90	6.32	1.00	7.90
				2:00 PM	5.31	5.12	0.27	1.00	5.12
				4:00 PM	5.75	3.95	1.64	1.00	3.95
				5:00 PM	17.25	8.88	7.33	1.00	8.88

5. Step 4: Validate Bottlenecks Identified by Data

Validation of screening helps to ensure that agencies' final bottleneck lists accurately reflect a region or state's most significant highway bottlenecks for freight trucks. A presentation was provided to seek stakeholder's validation of locations.

6. Step 5: Evaluate Bottleneck Causes

Understanding bottleneck causes is still a challenging process that potentially demands a combination of travel time data analysis, scrutiny of roadway characteristics, field assessment, and discussions with affected road users. Because knowledge of bottleneck causes is inherently part of the process for development of appropriate solutions, FHWA encourages all agencies to examine the underlying causes of bottlenecks as much as possible as part of their compliance activities. Key techniques for understanding bottleneck causes include data visualizations, indicator analysis and location research. A number of bottlenecks were located in the previous section which will be evaluated based on the excess volume and roadway geometry.

Excess Volume (Volume Bottlenecks)

In order to evaluate bottlenecks for this study with respect to excess volumes, vehicle to capacity (V/C) ratio was calculated for each TMC having recurring congestion. The volume is calculated based on the following assumptions:

- Assume D = 0.5 (directional split)
- Hourly adjustment factors are used from Highway Capacity Manual (Exhibit 17-5) as shown in the Appendix.
- The hourly adjustment factor for each TMC was calculated based on the hour of recurring congestion and functional classification system as follows:

F_System	Functional Class
1	Interstate
2	Principal Arterial-Other Freeways and expressways
3	Principal Arterial-Other
4	Minor Arterial
5	Major Collector
6	Minor Collector
7	Local

- If the field, 'number of thru lanes' in the TMC data is zero, it was assumed that the TMC will have 2 lanes per direction.

The capacity was calculated based on the Highway Economic Requirements System (HERS) capacity procedures. The HERS procedure follows the HCM procedure verbatim, with adjustments for lane width, lateral clearance, interchange density, heavy trucks, and the peak-hour factor. The equation below shows the calculation for freeway capacity:

$$Capacity = \frac{(2{,}200 + 10 \times (\min(70, FFS) - 50))}{1 + \%HV/100} \times Lanes$$

Where: FFS = free flow speed

%HV = percent of heavy vehicles (decimal), with heavy vehicles consisting of trucks with more than four tires, buses, and recreational vehicles Multilane Highways

Lanes = Number of through lanes in the direction of travel from NPMRDS dataset

The free flow speed for each TMC segment was already provided in the NPMRDS dataset and therefore did not need to be calculated separately.

After calculation of volume and capacity, V/C ratio was calculated for each TMC, and demand was flagged as a probable cause for bottlenecks if: V/C ratio >= 0.75.

Geometric Bottlenecks

To evaluate truck bottlenecks due to roadway geometry, the HPMS dataset was extracted for each TMC and joined using the 'Spatial Join' tool in ArcGIS using the method of 'Closest GEODESIC'.

Curvature

It was assumed that the number of lanes were evenly distributed between directions and lane fractions were rounded to whole lanes. The congestion criteria for curvature were selected as – if the TMC segment contained portions with curvature higher than 3.5 degrees.

Grades

The congestion criteria for grades were selected as – if the TMC segment contained portions with grade higher than 2.5 percent.

Traffic Control

The number of signals (NUMBER_SIG) and stop signs (STOP_SIGNS) for each TMC was also extracted from the HPMS dataset. This was further verified by visual inspection of ArcGIS Imagery. If the TMC had a traffic control measure such as stop signs or signalized/non-signalized intersections, it was marked for traffic control. The traffic control criteria were therefore assumed to be the presence of any traffic control measure on the TMC segment.

7. STEP 6: PRIORITIZE BOTTLENECKS

Prioritizing bottlenecks can help focus freight planning efforts on the highest and best use of limited resources. It is a component of performance-based planning and programming practices that seek to prioritize funding needs across multiple competing objectives. Developing a prioritized list of freight

bottlenecks can also help in measuring progress toward addressing bottlenecks in performance reporting. In this study, the bottlenecks were ranked based on the estimates of 'Total Delay'. Like the calculation of volume, the calculation of delay also assumes directional split to be 50% (D = 0.5) and hourly adjustment factors are used from the HCM as shown in the Appendix. The delay is calculated only for those TMCs which are highly likely (RC_TTTI > 1) to have recurring congestion. Delay is calculated in seconds by subtracting the free flow travel time from the congested travel time. **Table 3** summarizes delay (converted to hours) in 2019 by bottleneck cause and route type. A majority of the truck delay occurs on Connecticut's Interstate highways, followed by NHS routes.

Table 3: Delay by Cause and Route Type (2019, in Hours)

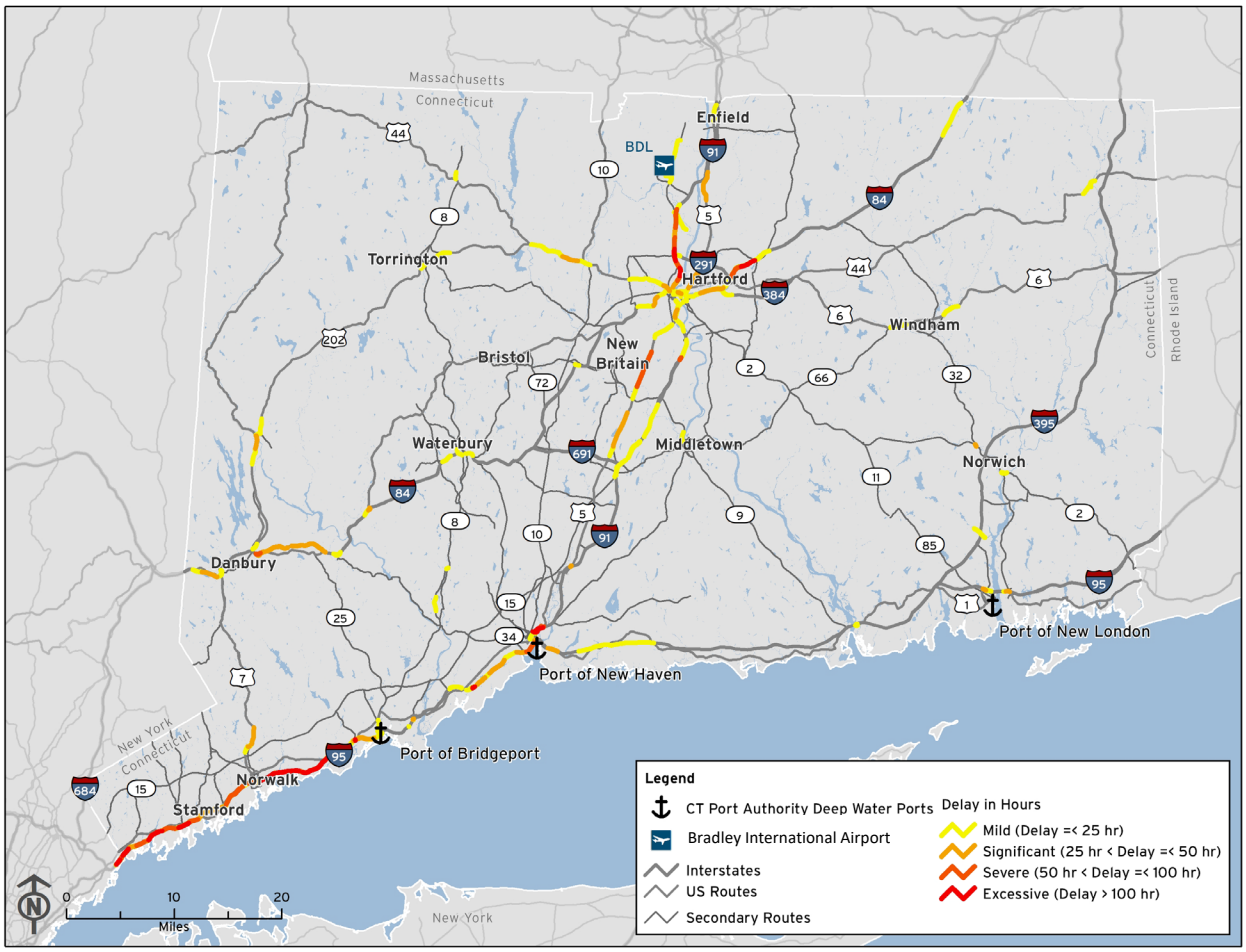
	Interstate	NHS Routes	CURFN	CTDOT Designated
Traffic Control	2,684	218	1,493	27
Demand	2,987	16	-	-
Combination of Causes*	466	21	82	-
Grades	54	26	1	-
Curvature	16	33	1	-
Unknown	6,737	797	442	8
Total	**12,945**	**1,112**	**2,018**	**35**

Source: CTDOT, National Performance Management Research Data Set, and CDM Smith analysis
**Combination of any two or more causes from traffic control, demand, grades, and curvature causes*

The delay that could not be diagnosed based on available data can be diagnosed if other data could be available such as pavement type, access control, shoulder width, presence of high occupancy vehicles (HOV), toll road or auxiliary lanes, media and shoulder type and presence of any obstacles. These attributes may be able to explain some of the delay that are otherwise flagged as unknown. FHWA defines a truck bottleneck as a combination of three features: the type of constraint, the type of roadway, and the type of freight route. Knowing the freight route such as if it is Urban, Intercity, Truck Access or Intermodal connector can also help to identify some of the reasons for potential delays.

Figure 5 shows the TMC segments with various levels of delay. Based on this map, the top 10 segments with high delay include I-95 segments in Fairfield, Norwalk and Stamford, I-91 segments near Humphreys Street, New Haven, Hartford and from Day hill road to Jennings Road and I-84 near East Hartford and from I-291 to Deming Street. Segments with top delays also include US-1 at I-95 intersection at Fairfield, CT-15/CT-5 between Newington and Berlin (Merritt Burlington turnpike) and also includes two local streets, South State Street at Stamford, and State Street at New Haven.

Figure 5: TMC Segments with Various Levels of Delay



Source: CTDOT, National Performance Management Research Data Set, and CDM Smith analysis

Based on the figure above, the top ten segments with high delay are listed in **Table 4** and shown on **Figure 6**.

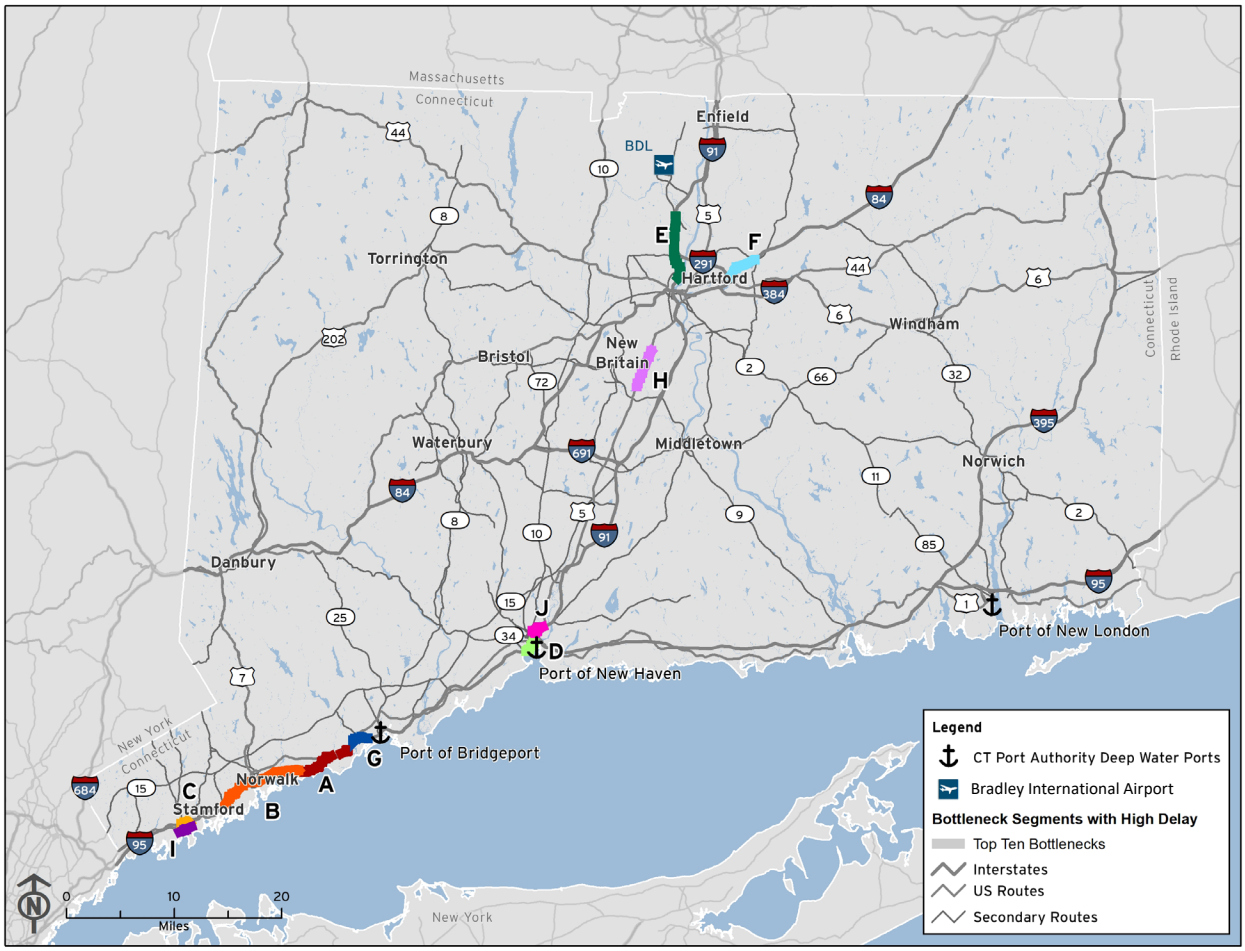
Table 4: Top Ten Segments with High Delay

Map ID	Segment	From	To	Causes of Delay
A	I-95 (Fairfield)	Mill Hill Rd	Sherwood Island Connector	Demand
B	I-95 (Norwalk)	Sherwood Island Connector	Exit 13	Demand
C	I-95 (Stamford)	Lafayette St	Sachem Rd	Demand, Traffic Control
D	I-91 (New Haven)	Orange St	East St	Demand
E	I-91 (Hartford)	Day Hill Rd	Jennings Rd	Unknown
F	I-84 (East Hartford)	I-291	Deming St	Unknown
G	US-1 (I-95 intersection at Fairfield)	Stephens Ln	Johnson Dr	Demand, Traffic Control
H	CT-15/CT-5 (B/W Newington and Berlin)	Deming Rd	Prospect St	Traffic Control

Map ID	Segment	From	To	Causes of Delay
I	South State Street, Stamford	Exit 7	Elm St	Demand, Traffic Control
J	State Street (Route 5), New Haven	Bradley St	Willow St	Traffic Control

Source: CTDOT, National Performance Management Research Data Set, and CDM Smith analysis

Figure 6: Top Ten Bottlenecks with High Delay



Source: CTDOT, National Performance Management Research Data Set, and CDM Smith analysis

The American Transportation Research Institute (ATRI), develop a list of top 100 truck bottlenecks every year. ATRI's methodology to identify bottlenecks is not the same as the FHWA methodology used in this analysis, but are considered here as another input for truck bottlenecks in the state. Based on the top 100 truck bottlenecks of 2022 published by American Transportation Research Institute (ATRI)[5], there are six truck bottlenecks identified in Connecticut:

- Hartford, CT: I-84 at I-91

[5] https://truckingresearch.org/2022/02/08/top-100-truck-bottlenecks-2022/

- Stamford, CT: I-95
- Waterbury, CT: I-84 at SR 8
- Norwalk, CT: I-95
- Bridgeport, CT: I-95 at SR 8/SR 25
- New Haven, CT: I-95 at I-91

All of these bottleneck locations published by ATRI are captured based on the various levels of delay as shown in **Figure 5**, however not all of the ATRI bottlenecks are identified in the top 10 bottleneck list. This bottleneck analysis combined with ATRI's locations identified in Connecticut corroborates CTDOT's emphasis on the need for congestion relief and the need for improved sections of I-95 and I-84.

8. Freight Performance Measures Methodology

As part of this analysis, two additional measures were calculated to address the statewide freight performance measure. A programmable script was developed to calculate these measures in RStudio environment which is provided in the Appendix below (R Script for Freight Performance Measures Calculation).

9. Truck Travel Time Reliability (TTTR) Metric

- Only reporting segments on the Interstate system are used in the calculation of the Freight Reliability metrics (where F_system = 1)
- Create a new data element that takes on the value of truck travel time if truck travel time is not null or not zero, and the travel time of combined trucks and passenger cars if truck travel time is null or zero
- For each reporting segment (e.g., TMC) and Freight Reliability time period (Freight_Period) combination, compute the 50th and 95th percentile travel times
- Compute the Truck Travel Time Reliability (TTTR) metric as the 95th percentile travel time divided by the 50th percentile travel time for each of the five time periods for each reporting segment. Round the TTTR metric to the nearest hundredth

Table 5 shows the truck TTTR metric for a sample of the study TMCs.

Table 5: Sample TTTR values by TMC

TMC	Period	50th Percentile	95th Percentile	TTTR
120-04143	10-4 Weekdays	27.08	36.82	1.36
120-04143	4-8 Weekdays	27.53	32.499	1.18

TMC	Period	50th Percentile	95th Percentile	TTTR
120-04143	6-10 Weekdays	27.36	34.7185	1.27
120-04143	Overnight	26.98	31.4725	1.17
120-04143	Weekend	27.43	41.5925	1.52
120-04144	10-4 Weekdays	111.195	117.0185	1.05
120-04144	4-8 Weekdays	112.72	121.828	1.08
120-04144	6-10 Weekdays	111.86	119.8555	1.07
120-04144	Overnight	111.46	121.768	1.09
120-04144	Weekend	112.36	122.102	1.09
120-04145	10-4 Weekdays	4.14	4.45	1.07
120-04145	4-8 Weekdays	4.22	4.679	1.11
120-04145	6-10 Weekdays	4.22	4.5985	1.09
120-04145	Overnight	4.13	4.6	1.11
120-04145	Weekend	4.18	4.63	1.11
120-04146	10-4 Weekdays	70.98	77.157	1.09
120-04146	4-8 Weekdays	72.45	81.747	1.13
120-04146	6-10 Weekdays	73.5	87.2265	1.19
120-04146	Overnight	70.1	77.859	1.11
120-04146	Weekend	71.745	80.111	1.12
120-04148	10-4 Weekdays	83.44	109.0185	1.31
120-04148	4-8 Weekdays	86.48	115.323	1.33
120-04148	6-10 Weekdays	88.735	116.552	1.31
120-04148	Overnight	81.38	90.124	1.11
120-04148	Weekend	84.82	118.0095	1.39

10. Freight Reliability (FR) Measure

- For each reporting segment, the TTTR metric with the highest value of the five TTTR metrics is selected as the "maximum TTTR"
- The Freight Reliability Measure is then calculated as a weighted average of the maximum TTTR by reporting segment length

The FR measure for the study area is 1.85.

11. APPENDIX

R Script for Truck Bottleneck Analysis

```
# Load required libraries

library(readr)

library(dplyr)

library(psych)

library(lubridate)


# Get working directory

folder <- getwd()


# Create output folder and read input folder

dir.create("./Output", showWarnings = FALSE, recursive = TRUE)

dataFolder <- paste0(folder, "/Input")

outFolder <- paste0(folder, "/Output")


# Read travel time data

NPMRDSdata <-  read_csv(paste0(dataFolder, "/CT_Hourly_Truck.csv"),

                        col_types = cols( average_speed = col_skip(),

                        data_density = col_skip(),

                        measurement_tstamp = col_datetime(format = "%Y-%m-%d %H:%M:%S")),

                        locale = locale(tz="America/New_York"))


# Read Tmc data

F1TMC <- read_csv(paste0(dataFolder, "/TMC_Identification_AllRoads.csv"))

# F1TMC <- read_csv(paste0(dataFolder, "/Tmcs_newhaven_I-84.csv"))
```

```
F1TMC <- F1TMC %>%

 filter(STUDY_AREA==1)


# filter to study Tmcs

NPMRDSdata_CT_TMC <- NPMRDSdata %>%

 filter(NPMRDSdata$tmc_code %in% F1TMC$Tmc)


# Filter all missing values

NPMRDSdata_CT_TMC_omit <- na.omit(NPMRDSdata_CT_TMC)


# Add Time Stamp only for aggregation

NPMRDSdata_CT_TMC_omit$Time <- format(NPMRDSdata_CT_TMC_omit$measurement_tstamp,
format="%H:%M:%S")

NPMRDSdata_CT_TMC_omit$Date <- format(NPMRDSdata_CT_TMC_omit$measurement_tstamp,
'%Y-%m-%d')


# Join attributes to calculate FFTT

F1TMC <- F1TMC %>%

 select(Tmc, Miles, F_System)

NPMRDSdata_CT_TMC_omit_join <- left_join(NPMRDSdata_CT_TMC_omit, F1TMC, by=
c("tmc_code"="Tmc"))


# Calculate FFTT in seconds

NPMRDSdata_CT_TMC_omit_join$FFTT <-
round(NPMRDSdata_CT_TMC_omit_join$Miles/NPMRDSdata_CT_TMC_omit_join$reference_speed
*60*60, digits = 2)
```

```
# Calculate TTTI

NPMRDSdata_CT_TMC_omit_join$TTTI <-
round(NPMRDSdata_CT_TMC_omit_join$travel_time_seconds/NPMRDSdata_CT_TMC_omit_join$F
FTT, digits = 2)


# Get Average speed

NPMRDSdata_Summary <- aggregate(speed ~ Time + tmc_code, NPMRDSdata_CT_TMC_omit_join,
mean)

names(NPMRDSdata_Summary)[names(NPMRDSdata_Summary)=="speed"] <- "Speed_Avg"


# Get speed standard deviation

NPMRDSdata_Summary$Speed_SD <- aggregate(speed ~ Time + tmc_code,
NPMRDSdata_CT_TMC_omit_join, sd)$speed


# Join summary to data

NPMRDSdata_CT_TMC_omit_join_summ <- NPMRDSdata_CT_TMC_omit_join %>%

  left_join(NPMRDSdata_Summary, by = c("tmc_code"="tmc_code", "Time"="Time"))


# Create recurring/congested columns

NPMRDSdata_summ_final <- NPMRDSdata_CT_TMC_omit_join_summ %>%

  mutate(Congested=if_else(F_System %in% c(1,2) & TTTI >= 1.33,1,

                           if_else(F_System %in% c(3,4,5) & TTTI >= 2.5,1,0)))

NPMRDSdata_summ_final <- NPMRDSdata_summ_final %>%

  mutate(TSSND=case_when(Congested == 1 ~ round((speed-Speed_Avg)/Speed_SD, digits = 2)))

NPMRDSdata_summ_final <- NPMRDSdata_summ_final %>%

  mutate(Recurring=case_when(TSSND > -1.5 ~ 1,

                             TSSND <= -1.5 ~ 0))
```

```
# omit missing values

NPMRDSdata_summ_final_omit <- na.omit(NPMRDSdata_summ_final)


# Summarize results

NPMRDS_data_output <- NPMRDSdata_summ_final_omit %>%

  group_by(tmc_code, Time) %>%

  summarise(Max_TTTI = round(max(TTTI), digits = 2),

            Mean_TTTI = round(mean(TTTI), digits = 2),

            SD_TTTI = round(sd(TTTI), digits = 2),

            Prob_REC = round(mean(Recurring), digits = 2)) %>%

  mutate(RC_TTTI = round(Mean_TTTI*Prob_REC, digits = 2))


# Filter all missing values

# NPMRDS_data_output <- na.omit(NPMRDS_data_output)


# Write final output

write.csv(NPMRDS_data_output, paste0(outFolder, "/263760_bottleneck_analysis_results.csv"),
row.names = FALSE)
```

R Script for Freight Performance Measures Calculation

```
# Prepare and Calculate TTTR and FR


# NOTE: Please unzip the data in the 'Data' folder and rename it as "CT_NPMRDS_Truck_Hourly"


library(readr)

library(dplyr)

library(psych)
```

```
library(lubridate)
library(tidyverse)

folder <- setwd("..")
folder <- getwd()
dir.create(file.path(folder, "Output"), showWarnings = FALSE)
dataFolder <- paste0(folder, "/Data/Hourly/2019 Truck/CT_2019_hourly (1)")
outFolder <- paste0(folder, "/Output")

NPMRDSdata <-  read_csv(paste0(dataFolder,"/CT_NPMRDS_Truck_Hourly.csv"),
                        col_types = cols( average_speed = col_skip(),
                        data_density = col_skip(),
                        measurement_tstamp = col_datetime(format = "%Y-%m-%d %H:%M:%S")),
                        locale = locale(tz="America/New_York"))

segDefinition <- read_csv(paste0(dataFolder,"/TMC_Identification.csv"),
                          col_types = cols_only(miles = col_guess(),
                          tmc = col_guess(),
                          f_system = col_guess()))

#join length and f_System
NPMRDSdata_CT_TMC <- left_join(NPMRDSdata, segDefinition, by= c("tmc_code"="tmc"))

#filter all missing and zero values and F_system=1
NPMRDSdata_CT_TMC <- na.omit(NPMRDSdata_CT_TMC)
NPMRDSdata_CT_TMC <- NPMRDSdata_CT_TMC %>%
  filter(travel_time_seconds!=0,
```

```
        f_system==1)


#Add Time Stamp for Aggregation and percentile calculation

NPMRDSdata_CT_TMC$Time <- format(NPMRDSdata_CT_TMC$measurement_tstamp,
format="%H:%M:%S")

NPMRDSdata_CT_TMC$Date <- format(NPMRDSdata_CT_TMC$measurement_tstamp, '%Y-%m-%d')

NPMRDSdata_CT_TMC <- NPMRDSdata_CT_TMC %>%

  mutate(Weekday=wday(Date)) %>%

  mutate(wkday=if_else(Weekday %in% c(1,7),"Weekend","Weekday")) %>%

  mutate(Hour=hour(measurement_tstamp)) %>%

  mutate(Period=case_when(Hour >= 6 & Hour < 10 & wkday=="Weekday" ~ "6-10 Weekdays",

                          Hour >= 10 & Hour < 16 & wkday=="Weekday" ~ "10-4 Weekdays",

                          Hour >= 16 & Hour < 20 & wkday=="Weekday" ~ "4-8 Weekdays",

                          Hour >= 6 & Hour < 20 & wkday=="Weekend" ~ "Weekend",

                          TRUE ~ "Overnight"))


#calculate travel time percentiles and TTTR

NPMRDSdata_CT_TMC_Summ <- NPMRDSdata_CT_TMC %>%

  group_by(tmc_code, Period) %>%

  summarise(P_50th=quantile(travel_time_seconds, 0.5),

            P_95th=quantile(travel_time_seconds, 0.95)) %>%

  mutate(TTTR=round(P_95th/P_50th, digits = 2))


#calculate FR

NPMRDSdata_CT_TMC_FR <- NPMRDSdata_CT_TMC_Summ %>%

  group_by(tmc_code) %>%

  summarise(maxTTTR=max(TTTR)) %>%
```

```
  left_join(segDefinition, by= c("tmc_code"="tmc")) %>%

  select(-f_system) %>%

  mutate(sumMaxTTTR=maxTTTR*miles)

FR <-
round(sum(NPMRDSdata_CT_TMC_FR$sumMaxTTTR)/sum(NPMRDSdata_CT_TMC_FR$miles),digits
= 2)

print(paste0("Freight Reliability value is = ", FR))

write.csv(NPMRDSdata_CT_TMC_Summ, paste0(outFolder, "/Summary_table_TTTR.csv"), row.names
= FALSE)

write.table(FR, paste0(outFolder, "/Freight_Reliability.txt"), row.names = FALSE, quote = FALSE,
col.names = FALSE)
```

Default Hour-of-Day Demand Ratios (ADT/AADT)

Hour Starting	Expressway			Principal Arterial			Minor Arterial		
	Weekday	Weekend	Weekly Average	Weekday	Weekend	Weekly Average	Weekday	Weekend	Weekly Average
00:00:00	0.010	0.023	0.013	0.010	0.010	0.010	0.010	0.010	0.010
01:00:00	0.006	0.015	0.008	0.006	0.006	0.006	0.006	0.006	0.006
02:00:00	0.004	0.008	0.005	0.005	0.005	0.005	0.004	0.004	0.004
03:00:00	0.004	0.005	0.004	0.005	0.005	0.005	0.002	0.002	0.002
04:00:00	0.007	0.005	0.006	0.009	0.009	0.009	0.002	0.002	0.002
05:00:00	0.025	0.009	0.021	0.030	0.030	0.030	0.007	0.007	0.007
06:00:00	0.058	0.016	0.047	0.054	0.054	0.054	0.023	0.023	0.023
07:00:00	0.077	0.023	0.063	0.071	0.071	0.071	0.067	0.067	0.067
08:00:00	0.053	0.036	0.048	0.058	0.058	0.058	0.066	0.066	0.066
09:00:00	0.037	0.045	0.039	0.047	0.047	0.047	0.054	0.054	0.054
10:00:00	0.037	0.057	0.042	0.046	0.046	0.046	0.051	0.051	0.051
11:00:00	0.042	0.066	0.048	0.050	0.050	0.050	0.056	0.056	0.056
12:00:00	0.045	0.076	0.053	0.053	0.053	0.053	0.071	0.071	0.071
13:00:00	0.045	0.073	0.052	0.054	0.054	0.054	0.066	0.066	0.066
14:00:00	0.057	0.074	0.062	0.063	0.063	0.063	0.060	0.060	0.060
15:00:00	0.073	0.075	0.074	0.069	0.069	0.069	0.062	0.062	0.062
16:00:00	0.087	0.075	0.084	0.072	0.072	0.072	0.063	0.063	0.063
17:00:00	0.090	0.071	0.085	0.077	0.077	0.077	0.075	0.075	0.075
18:00:00	0.068	0.063	0.067	0.062	0.062	0.062	0.07	0.070	0.070
19:00:00	0.049	0.051	0.050	0.044	0.044	0.044	0.053	0.053	0.053
20:00:00	0.040	0.043	0.041	0.035	0.035	0.035	0.044	0.044	0.044
21:00:00	0.037	0.037	0.037	0.033	0.033	0.033	0.035	0.035	0.035
22:00:00	0.029	0.032	0.030	0.026	0.026	0.026	0.033	0.033	0.033
23:00:00	0.019	0.023	0.020	0.021	0.021	0.021	0.019	0.019	0.019

Source: The National Academics of Sciences, Engineering, Medicine. Highway Capacity Manual: A Guide for Multimodal Mobility Analysis. Transportation Research Board, 2016.