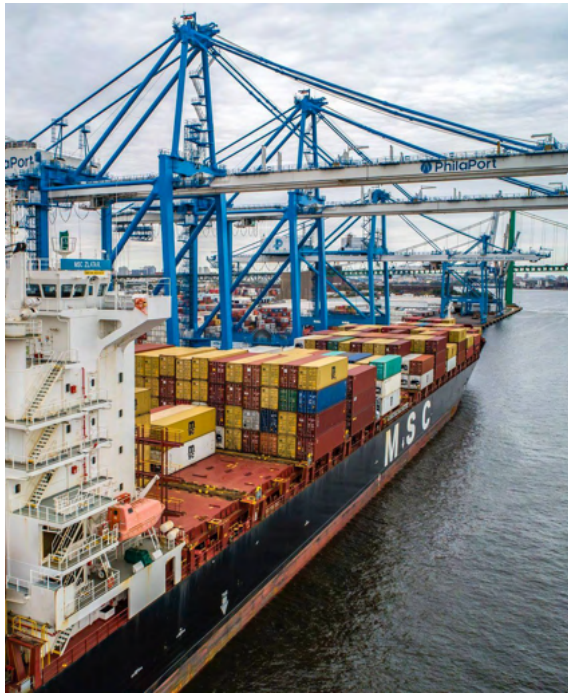

PENNSYLVANIA

2045 Freight Movement Plan

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.penndot.pa.gov

PUB 791 (5-23)

LANGUAGE Assistance Services

Arabic:

تنبيه: إذا كنت تتحدث لغة أخرى غير اللغة الإنجليزية، يمكننا توفير خدمات المساعدة اللغوية لك. اتصل بالرقم 1478 705 (717).

Burmese:

သတိပြုရန်- သင်သည် အင်္ဂလိပ် ဘာသာစကား မဟုတ်သော အခြား ဘာသာစကားကို
ပြောလျှင် သင့်အတွက် ဘာသာစကား အကူအညီ ဝန်ဆောင်မှုကို ရနိုင်ပါသည်။ (717) 705-1478 သို့ ခေါ်ဆိုပါ။

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Greek:

ΠΡΟΣΟΧΗ: Εάν μιλάτε άλλη γλώσσα διαφορετική από τα αγγλικά, οι υπηρεσίες γλωσσικής βοήθειας μπορούν να σας διατεθούν. Καλέστε (717) 705-1478.

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सूचना: यदि आप अंग्रेजी के अलावा कोई अन्य भाषा बोलते हैं, तो आपको भाषा सहायता सेवाएं उपलब्ध कराई जा सकती हैं। कॉल करें (717) 705-1478.

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УВАГА: якщо ви розмовляєте іншою мовою, вам може бути надана мовна допомога. Зверніться до інформаційно-довідкової служби за номером: (717) 705-1478.

Urdu:

توجّہ دیں: اگر آپ انگریزی کے علاوہ کوئی اور زبان بولتے ہیں تو آپ کی زبان میں مدد کے لیے آپ کو خدمات فراہم کرائی جاسکتی ہیں۔ براہ کرم (717) 705-1478 پر کال کریں۔

Vietnamese:

LƯU Ý: Nếu quý vị nói một ngôn ngữ khác không phải tiếng Anh, các dịch vụ hỗ trợ ngôn ngữ có thể được cung cấp cho quý vị. Gọi (717) 705-1478.

Image Credit: This plan contains images from approved sources such as PennDOT, Michael Baker International, Port Authority of Allegheny County, Norfolk Southern and various stock image sites.

INTRODUCTION

Pennsylvania's 2045 Freight Movement Plan (FMP) was developed in conjunction with the statewide 2045 Long-Range Transportation Plan (LRTP), providing a comprehensive strategic direction for moving people and goods.

The disruptions experienced during the COVID-19 pandemic are reminders about the complexity of supply chains and how much we depend on predictable distribution of products of all kinds. Accommodating growing freight traffic and facilities while keeping communities livable requires proactive, coordinated planning and collaborative public- and private-sector problem-solving.

Freight planning is complex due, in part, to the many organizations involved and the interconnected roles of the public and private sectors. Shippers, carriers, and receivers of goods are private-sector businesses. Conversely, most of the infrastructure used to move freight—highways and bridges, railways, waterways and ports, and airports—are public facilities. The investment of public funds to improve transportation dictates that safe and efficient freight movement is a priority.

Freight transportation is increasingly driven by highly sophisticated logistics and technology. State DOTs must be positioned to provide the infrastructure, connections, and system operations in ways that align with the dynamic ever-changing freight industry to the greatest extent feasible.

The FMP is structured to ensure its beneficial and results-oriented implementation. The plan's goals and objectives set a clear direction, and PennDOT will carry out actions and initiatives in coordination with freight stakeholders to make systematic progress. The FMP includes a list of projects aimed at improving goods movement by and between transportation modes. PennDOT will regularly track implementation progress and expand freight-related performance measures in Pennsylvania's biennial Transportation Performance Report (TPR).

Implementation also entails continued work with regional metropolitan planning organizations and rural planning organizations as well as freight stakeholders to develop capital programs and transportation investments with a focus on freight. Even though transportation funding resources are greatly constrained, Pennsylvania still must take a strategic approach to addressing freight mobility needs.

The plan highlights two of Pennsylvania's most pressing freight challenges: improving collaboration in the freight transportation/land use planning process and the shortage of truck parking. There is much at stake in addressing land use issues related to freight, particularly with the rapid growth of warehouses and distribution facilities. The access needs and the associated implications for infrastructure and traffic congestion also make the transportation/land use connection particularly important. Truck parking challenges require collaboration between varied stakeholders to address this need. PennDOT and the regional planning agencies can fulfill an important convener role in handling these multi-faceted issues with both local and private stakeholders.

The FMP's success depends on working together and communicating purposefully across many organizational lines, sectors, and levels of government. Congressional passage of national infrastructure legislation will continue to have many impacts on freight transportation. Implementation of the plan will be closely aligned with the opportunities and requirements from the federal government. The FMP positions Pennsylvania to respond to the major changes that the new Infrastructure Investment and Jobs Act legislation has ushered in.

PennDOT looks to the many individuals and organizations who provided input during the development of the plan to remain involved, along with others, to now achieve the goals and objectives that will strengthen our transportation system, programs, and services long into the future.

Freight Movement Plan Strategic Directions Summary

The plan's five goals and objectives are listed below. They are discussed in more detail beginning on page 56.

LAND USE

Align freight mobility with economic development and land use.

- Establish a core Pennsylvania highway freight network based on a refined methodology for identifying critical urban and rural freight corridors.
- Establish statewide standards to measure benefits and costs of freight-oriented industrial development.
- Collaborate with other organizations to assemble recommended industrial site development standards/ordinances.

MOBILITY

Advance project investments that enhance freight mobility.

- Continue to identify and improve truck bottlenecks.
- Preserve and enhance major freight transportation assets, including waterways, railroads, major truck corridors, and intermodal terminals, with the aim of supporting and promoting energy-efficient modes of freight transportation.
- Pursue opportunities with public and private stakeholders to expand truck parking capacity.
- Expand and diversify the composition of the Freight Work Group (FWG).

ANALYTICAL TOOLS & PROCESSES

Provide planning, data, and analytical tools for improved decision-making and collaboration with freight stakeholders.

- Develop analytical tools, data, and forecasting techniques to measure costs and benefits of freight-related transportation initiatives, programs, and projects.
- Enhance PennDOT's technical capabilities in freight planning, forecasting, modeling, and data.
- Expand PennDOT's data repository for Pennsylvania's freight transportation system.
- Develop methods to track and evaluate air cargo trends, needs, and intermodal implications.
- Examine the key topic areas of the TAC truck weight exemptions study of 2020.
- Develop expanded freight performance measures for Pennsylvania's Transportation Performance Report (TPR).

OPERATIONS/ SAFETY

Improve multimodal freight transportation operations and safety.

- Reduce truck-related crashes, injuries, and fatalities statewide.
- Reduce FRA-reportable incidents, injuries, and fatalities statewide.
- Reduce non-recurring delays on the National Highway Freight Network.
- Adapt to advances in truck automation, electrification, and other technologies.
- Enhance interoperability of the highway network with neighboring states.

ENVIRONMENTAL STEWARDSHIP

Reduce, avoid and/ or mitigate adverse environmental impacts from Pennsylvania's freight transportation system, and plan for environmental impacts to freight movement.

- Mitigate the severity of impacts of extreme weather and natural disasters on freight mobility.
- Reduce freight movement-related emissions and its impact on local air quality.
- Reduce freight movement's impact on flooding and stormwater runoff.
- Support planning for freight movement's impacts on loss of wildlife and habitat.

US 15 in Tioga County

TABLE of Contents

8

Context: What, Why, How and Who

Freight Movement Plan Essentials

Public and Stakeholder Involvement

Public Comment Period

16

Existing Conditions and Trends: Where We Are Now

Overarching Trends and Considerations

Economic Influences

Trucking

Freight Rail

Ports and Waterways

Air Cargo

Military Freight

Critical Urban & Rural Freight Corridors

Pipelines

Impacts of e-Commerce

54

Strategic Directions: Where We Need to Be

Introduction

Goals and Objectives

66

Implementation: How We Will Get There

Overview

Actions and Accountability

Implementation Partners and Projects

Transportation Performance Management

APPENDICES
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Context:

What, Why, How, and Who

SECTION CONTENTS

FMP Essentials

Public and Stakeholder Involvement

Freight Movement Plan Essentials

This statewide Freight Movement Plan (FMP) is designed to assist policymakers and planners in identifying Pennsylvania's multimodal freight transportation needs and prioritizing investments in freight infrastructure to support the Commonwealth's consumers and businesses. The plan's goals and objectives provide a balanced direction for addressing various freight challenges and opportunities appropriate for public-sector support. The FMP was developed in parallel with the statewide 2045 Long-Range Transportation Plan (LRTP).

The 2045 FMP complies with the federal requirements originally established in the Fixing America's Surface Transportation (FAST) Act of 2015, as well as the Bipartisan Infrastructure Law (BIL) of 2021.[1] The FAST Act included important provisions related to establishing a national freight transportation policy and achieving goals related to the nation's freight transportation system. The national freight goals, which are documented in Appendix 1: National Multimodal Freight Policy, are aimed at identifying infrastructure improvements, policies, and innovations to strengthen the U.S. economy; improving industrial productivity; reducing congestion on U.S. freight infrastructure; and improving infrastructure safety, security, efficiency, and resiliency. BIL largely carried over the provisions of the FAST Act, with new formula and discretionary funding programs, and more opportunities for local governments and other non-traditional entities to access new funding. Based on formula funding alone, Pennsylvania will receive approximately $13.2 billion over five years (FY2022-26) in Federal highway formula funding for highways and bridges.

[1] Also known as the Infrastructure Investment and Jobs Act (IIJA)

The FAST Act requirements for state freight plans were established under 49 U.S.C. § 70202. A compliant FMP must include the following:

- An identification of significant freight system trends, needs, and issues with respect to the state;
- A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the state;
- A listing of critical urban and rural freight facilities and corridors in the state;
- A description of how the plan will improve the ability of the state to meet the national multimodal freight policy goals;
- A description of innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of freight movement, under consideration for the state;
- A description of improvements that may be required to reduce or impede the deterioration of roadways subject to excessive deterioration due to oversized/overweight vehicles;
- An inventory of facilities with freight mobility issues, such as bottlenecks, and a description of the strategies the state is employing to address the freight mobility issues;
- Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay;
- A freight investment plan that includes a list of priority projects and describes how funds would be invested and matched; and
- Consultation with the state freight advisory committee, if applicable.

In the months directly following BIL's passage, PennDOT worked to address the new provisions for freight plans, including:

- adequacy of commercial motor vehicle parking and rest facilities;
- supply chain cargo flows;
- inventory of commercial ports;
- considerations of military freight;
- impacts of e-commerce on freight infrastructure; and
- goals and strategies to address impacts of freight movement on the environment.

PennDOT includes the FMP in its statewide planning and programming process. The FMP establishes direction for Pennsylvania's freight transportation system over a 20-year planning horizon. That direction recognizes that most of the investment in the freight system is made by the private-sector freight industry. There is, however, the need for public-sector infrastructure and programs to be as supportive of freight mobility as feasible.

PennDOT has incorporated freight elements in its long-range plans since the mid-1990s and established its first freight plan under the federal requirements of MAP-21 in 2016 with the publication of PA On Track: PA's Long-Range Transportation & Comprehensive Freight Movement Plan.

The FMP helps prioritize projects listed on the state's 12-Year Program (TYP), which is updated biennially. The Pennsylvania Transportation Performance Report, produced in odd-numbered years, serves as a report card on progress, by documenting how well Pennsylvania's transportation system is performing across a variety of measures.

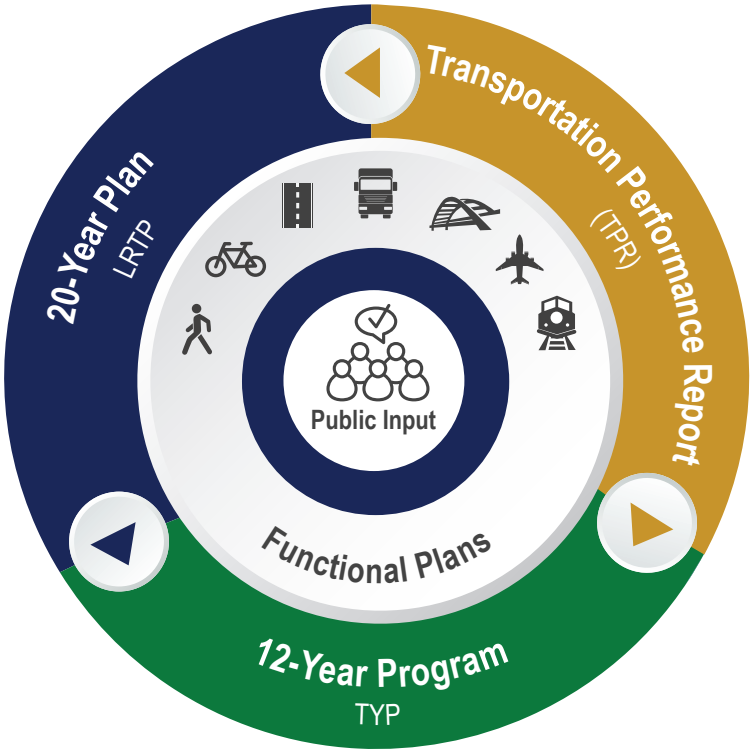
The FMP is also informed by and helps shape other "functional" plans that PennDOT develops. Examples include a statewide rail plan and an aviation system plan.

Long-range planning functions are also carried out by regional metropolitan and rural planning organizations (MPOs and RPOs). Each of the state's MPOs and RPOs administers its own transportation plans, and planning programs at the regional level, which are guided by the statewide LRTP and FMP.

Over the past decade, Pennsylvania's freight planning process has given greater attention and emphasis to asset management, performance measurement, and economic development. Industrial land use and links to the local planning and land development approval process have become increasingly important in developing and maintaining freight transportation infrastructure. These issues and more are addressed as part of this 2045 FMP.

PA developed the 2045 Freight Movement Plan in parallel with the 2045 Long Range Transportation Plan.

A Norfolk Southern unit train crosses the Susquehanna River in Harrisburg



Transportation Planning Process

The FMP process is conducted under federal requirements in parallel with Pennsylvania's planning processes. The FMP is currently updated at five-year intervals and provides direction on freight-related infrastructure elements in conjunction with the long-range planning process, and the other phases of transportation improvement. Plans guide development of improvement programs established at the regional level. These lists of projects are rolled up into the statewide TYP, which is updated every two years.

PennDOT along with the State Transportation Commission (STC) and Transportation Advisory Committee (TAC) creates a Transportation Performance Report (TPR), every two years in conjunction with the TYP. The TPR serves as a report card on the transportation system, and helps direct future programming to achieve plan goals. Freight transportation is included in the TPR, and this FMP establishes expanded freight transportation performance measures for consideration in future reporting.

PLANNING

Sets Direction

Long-Range Transportation Plan (LRTP)
20-Year Plan
(Updated every 6-10 years)

Where do we want to go?
Goals ▪ Objectives ▪ Measures

How are we going to get there?
Implementation Strategies
Policies
Priorities
Functional Plans
MPO/RPO LRTPs

PROGRAMMING

Prioritizes Projects

12-Year Program (TYP)

How can we best use available funding?

Lists funded projects for a 12-year period

First four-year period is the Statewide Transportation Improvement Program (STIP)

STIP compiles MPO/RPO Transportation Improvement Programs (TIP)

PERFORMANCE MEASUREMENT

Measures Progress

Transportation Performance Report (TPR)
(Updated in odd-numbered years)

How did we do?
Monitor ▪ Report ▪ Evaluate

Where do measures come from?
State and Federal Requirements

What do we measure?
Safety
Mobility
Preservation
Accountability
Funding

Public and Stakeholder Involvement

Many voices throughout the Commonwealth provided the foundation for effective development and successful implementation of Pennsylvania's 2045 FMP. The users of the statewide transportation network provide an essential perspective in shaping the strategic direction of the plan. To capture transportation system needs and concerns across Pennsylvania, input was solicited in various forums, and incorporated at strategic points during plan development. In addition to statewide public outreach and stakeholder engagement, extensive "in-reach" was conducted throughout the various PennDOT deputates, and also with transportation stakeholders and partners across the state.

Engagement Highlights

Public Outreach

Public Surveys Completed	7,400
Public Forum Views	1,905
E-News Contacts	2,700
Social Media Posts	11

Stakeholder Engagement

MPOs and RPOs Engaged	24
State Transportation Commission & Transportation Advisory Committee Presentations	8
Freight Focus Group Meetings by Mode	5
Statewide Virtual Freight Forum Registrations	225
Equity & Diversity Workshops Attendance	25
PennDOT Planning Network e-Blasts	9
State Planning Board Attendance	49
Regional Freight Advisory Committee Meetings	3

PennDOT In-reach & Interagency Collaboration

Executive Interviews	35
PennDOT Bureau/ District Personnel Engaged	>40
Partnering Agency Interviews & Presentations	6

Statewide Virtual Freight Forum

A cornerstone of the stakeholder engagement process was the **2020 Statewide Virtual Freight Forum**. Stakeholders across the state and nation convened on November 5, 2020 to share information about the dynamic freight industry, explore current trends, and offer feedback and direction for the future. Common themes from freight stakeholder input are presented below. A detailed set of regional freight profiles shared with the forum participants is included in Appendix 2: Regional Freight Profiles.

Freight Forum Key Themes

Freight networks are critically important to the supply chain which moves essential raw materials as well as finished goods.

Issues such as truck parking will become more challenging as our reliance on goods movement continues to grow.

Trending issues such as automated vehicles, the explosive growth of e-commerce, and changing supply-chain patterns are poised to affect our planning.

It is imperative to reduce the impact of transportation on our changing climate.

We must abide by the value of fairness in working to meet the transportation needs of all our communities and citizens.

Executive Interviews: Key Themes

Several common themes emerged from interviews of agency executives at the start of the planning process, including:

- Transportation and land use connection
- Emerging technology
- Asset management
- Equitable solutions for diverse populations, from urban to rural areas
- Multimodal and intermodal connections
- Transportation's impact on quality of life
- Stronger connections between planning and programming
- Funding to support plan outcomes
- Implementation and accountability

Municipal Collaboration

The following organizations offered local government viewpoints during statewide plan development:

- Pennsylvania State Association of Boroughs (representing 956 boroughs, statewide)
- County Commissioners Association of Pennsylvania (67 counties)
- Pennsylvania State Association of Township Supervisors (1,546 townships)
- Pennsylvania Municipal League (119 members)
- Pennsylvania State Association of Township Commissioners (93 first class townships)

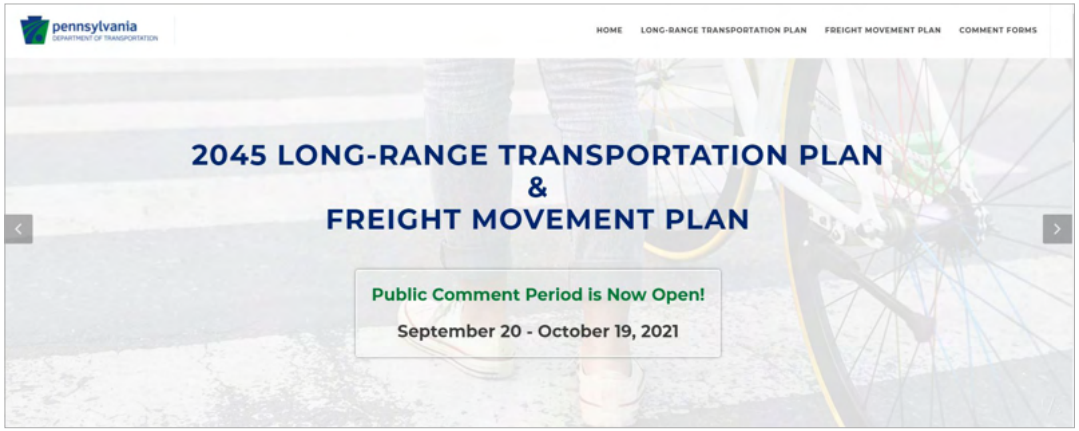
Public Comment Period

Public and Stakeholder Involvement

The success and implementation of the FMP strongly depends on public and stakeholder involvement and participation. Feedback was requested on the draft plan through two Public Comment Periods, from September 20 – October 19, 2021, and September 19 – October 3, 2022. Over 400 comments were received from the public and stakeholders across the statewide.

Significant effort was made to maximize public outreach during the comment period, through social media, email campaigns and targeting underserved populations such as senior citizens, people with disabilities, and marginalized communities. Additional measures were taken to bridge the digital divide in rural communities across the state by having Pennsylvania public libraries serve as access points to the digital and printed plans for review and comment. Opportunity for feedback was also given to Federally Recognized Tribes to better understand how the plans will impact their community now and in the future.

Public Comment Period Website Homepage



Stakeholder Email Campaign Headers

Social Media Campaign

Public Comment Period Outreach by the Numbers

TRIBAL OUTREACH

Opportunity for feedback was also offered to Federally Recognized Tribes with ancestral ties to Pennsylvania to better understand how the plans will impact their community now and in the future.

17 Federally Recognized Tribes received hard copies of the plans and links to the digital versions.

SOCIAL MEDIA

Significant effort was made to maximize public outreach and awareness during the comment period through Facebook, Twitter, Instagram, and LinkedIn. Targeted social media posts were used to reach underserved populations such as senior citizens, people with disabilities, and marginalized communities.

Total Posts	7
Reach*	183,392
Impressions*	287,733
Engagement*	26,436

PUBLIC COMMENT PERIOD WEBSITE

The Public Comment Period website was made available for public review on the PennDOT Planning and Talk PA Transportation websites. The plans were also made available in PDF and text-only formats and accompanied by comment forms for the public to use to provide feedback.

Total Page Views	2,230

PUBLIC LIBRARY ACCESS

Additional measures were taken to bridge the digital gap in rural communities statewide by having Pennsylvania public libraries serve as access points to the digital and printed plans for review and comment.

Libraries received printed copies of the plans	618
Post-Comment Period Survey to Public Libraries	42

STAKEHOLDER EMAIL CAMPAIGNS

Internal and external stakeholders were engaged through several email newsletters sent by PennDOT Planning Network eNews.

Emails Sent	6
Stakeholder Database	8,083
Average Open Rate	32.6%
New Newsletter Sign-ups	53

*SOCIAL MEDIA DEFINITIONS

- Reach is the number of people who saw any content from the PennDOT page or about the PennDOT page.
- Impressions are the number of times any content from PennDOT or about PennDOT entered a person's screen.
- Engagement is any action someone takes on PennDOT's page or one of PennDOT's posts.

Existing Conditions and Trends: Where We are Now

SECTION CONTENTS

- Overarching Trends and Considerations
- Economic Influences
- Trucking
- Freight Rail
- Ports and Waterways
- Air Cargo
- Military Freight
- Critical Urban & Rural Freight Corridors
- Pipelines
- Impacts of e-Commerce

Overarching Trends and Considerations

Pennsylvania has a vast system of highways, railroads, ports, waterways, and airports that accommodates freight movement through multiple transportation modes. This accommodates a full supply chain from producers of raw materials to processing and manufacturing enterprises to distributors, retailers, and "last-mile" package delivery to consumers. Freight transportation has evolved and expanded over centuries, and each transport mode is experiencing distinct trends and opportunities with implications for freight planning.

As diverse as the freight modes are, they share a range of overarching trends, most characterized by increasingly rapid change. Top industry, transportation, and land use trends with implications for freight planning include the following:

- **Logistics and Supply Chains**
  The freight industry continues to make revolutionary changes in where and how freight is stored, when it moves, and how it moves. Most of this occurs independent of the public sector, yet because the infrastructure is part of the overall freight delivery system it is important that PennDOT, along with the transportation partners and stakeholders, is knowledgeable about these trends in order to support and adapt when necessary.
- **Distribution to the Front Door**
  The nature of package delivery to our homes and to businesses, medical facilities, and other destinations was changing long before the COVID-19 pandemic. The pandemic accelerated this trend toward customized deliveries to individual customers. Residential neighborhoods, businesses, and establishments of all kinds have effectively become freight destinations that must be considered in infrastructure planning and design. There are implications of these changing delivery patterns for both state and local transportation facilities that are just starting to be defined and considered.
- **Intermodal Connectivity**
  This trend is not new, but is a focus for the convergence of public infrastructure and freight movement. Location planning for intermodal facilities may be increasingly important in the future to make connections as efficient as possible and to address other issues such as congestion.
- **Electric Vehicles (EV) and Connected/ Autonomous Vehicles (CAV)**
  Vehicle technology is also changing and will likely change at an accelerated rate over the five-year horizon established by the 2045 Freight Movement Plan. In the past year, vehicle manufacturers and the federal government have each taken actions to facilitate an expansion of electric vehicles available to buyers in the U.S. Emissions from idling trucks and other freight vehicles could be significantly reduced by advances in shore power and other methods of facility-based electrification (enabling vehicles to shut down their engines when parked or docked and plug in to a power supply to run HVAC, lighting, and other auxiliary needs). The role of electric vehicles for trucking is still to be determined, yet will need to be understood as federal, state, and local transportation agencies may have an early role in the establishment of charging stations, etc. CAV technology is underway and being tested in various venues and applications. This may have dramatic implications for freight transportation in response to the ongoing challenge of truck driver shortages.
- **Land Use and Development**
  Transportation professionals in Pennsylvania have long emphasized the need for better planning and alignment of land use and transportation. This issue is now widely recognized as demanding attention for both freight movement efficiency and the livability of our communities. For example, the July 2020 Transportation Revenue Options Commission (TROC) report commissioned by Pennsylvania Governor Tom Wolf noted various cost drivers—including freight-related development around interchanges—that PennDOT often must react to by providing access, typically at great expense. There is the opportunity to be more proactive through better planning and problem-solving among PennDOT, local and regional agencies, and the freight sector and developers. Better transportation and land use planning will also be key in efforts to accommodate truck parking.
- **Information Technology Applications for Transportation**
  Information technology has long been changing both public- and private-sector transportation and will continue to evolve, producing breakthroughs and significant challenges. There are some areas of overlap for which public- and private-sector collaboration is beneficial, including Intelligent Transportation Systems (ITS), real-time traffic information, etc. Collaboration is aimed at achieving mutual benefit and support to leverage information technology for the overall betterment of freight mobility.

Interstate 80 in Clarion County

Freight-related development around interchanges often requires PennDOT to react—by providing roadway access—typically at great expense.

- **Transportation System Condition**
  While only 11.5 percent of Pennsylvania's Overall Pavement Index (OPI) for its Interstates is rated as Fair or Poor, conditions tend to be worse on other Business Plan Networks that serve as first- and last-mile connections for shippers and receivers. For rail freight, many of the state's short-line operators inherited infrastructure that was a product of deferred maintenance from the Conrail era, or they operate lines that do not meet the 286K industry standard. Locks and dams in Southwestern Pennsylvania average between 60 to 80 years in age, and many have an extensive backlog of repair needs to remain viable. The passage of BIL in 2021 provided additional funding for Pennsylvania to improve its multimodal freight system.

- **Economic Competitiveness**
  Efficient goods movement is a key factor in supporting and growing a competitive economy. Clearly, the public and private sectors have a shared interest in Pennsylvania's economic health. Transportation is a support system for economic activity. The FMP recognizes the value in public and private freight stakeholders being jointly focused on what they must do separately, and together to support economic wellness. Trade will remain global, of course, and involve all modes of transportation—rail, highways, air, and ports.

- **Climate Change and Resilience**
  Pennsylvania's LRTP addresses climate change, resilience, and emissions reduction, recognizing that transportation must be delivered while stewarding the environment and adapting to climate change, and being as resilient to emergencies and disasters as reasonably possible. The pandemic pointed to the importance of redundancy in the system and contingency planning. This is now a part of the transportation operating environment for both the public and private sectors. As national policy continues to unfold there will no doubt be implications and opportunities for freight transportation in both sectors. Transportation system resilience is especially important in relation to ensuring a reliable movement of goods. Freight-intensive industries will be addressing climate change in various ways including mode shift and other strategies and tactics that will require greater interaction with public-sector agencies.

- **Equity**
  Considerations related to equity, environmental justice, etc., are increasingly a focus of national transportation policy. PennDOT in July 2021 issued a related report linked below. Transportation investments and other decision-making need to responsibly consider people and communities that historically have been impacted by transportation without sufficient opportunity to be considered or involved.
  https://www.penndot.gov/about-us/equity/Documents/PennDOT-DSRI-Report.pdf

The FMP envisions more mutually beneficial interaction among stakeholders—public and private—to be able to reasonably anticipate, position for, and prepare for the trends and changes highlighted above.

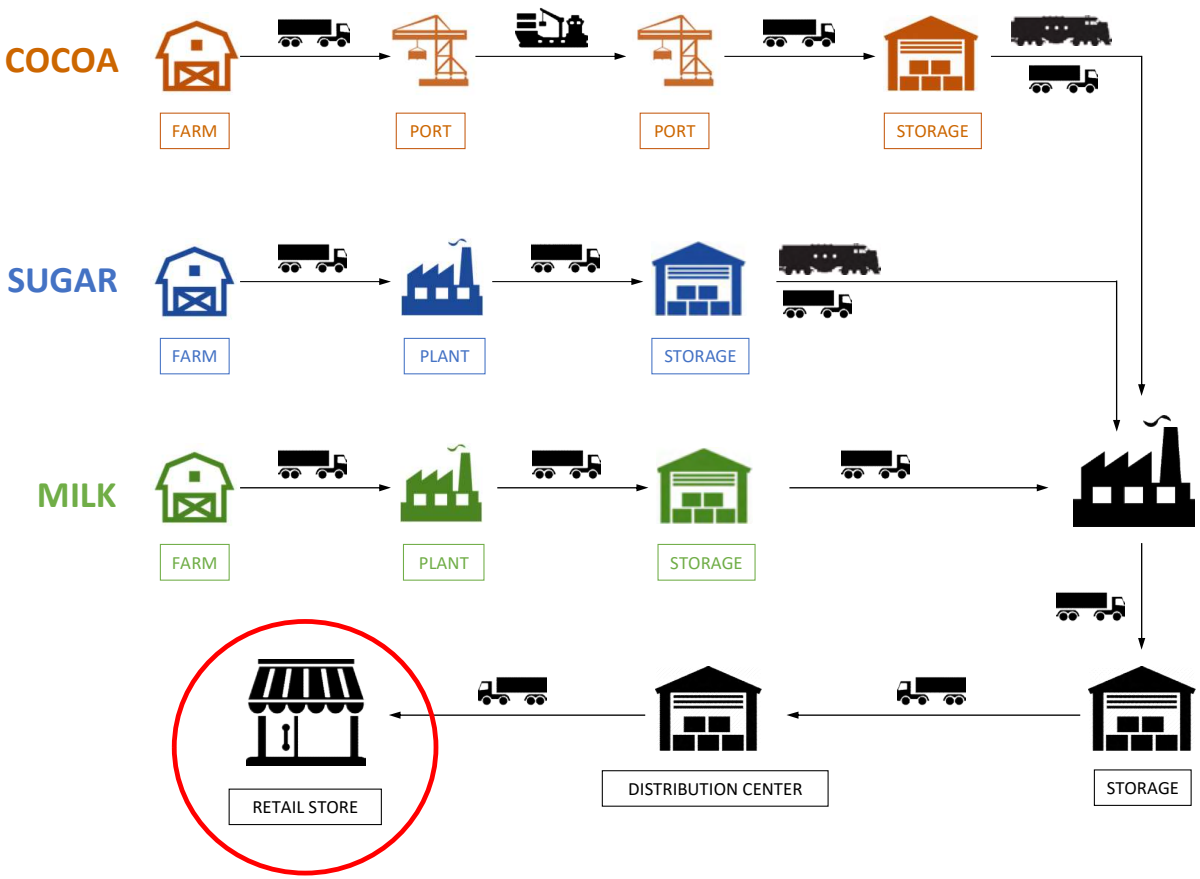
Supply Chain

Freight planning is a challenging endeavor due to the complexity of the supply chain process even for simple products we use on a regular basis. Unlike passenger transportation, which involves the movement of individuals and groups of people by various transport modes, freight transportation is one element of a highly complex process involving the mining and harvesting of raw materials, the production of various components of a finished product, and final assembly before delivery to the point of sale.

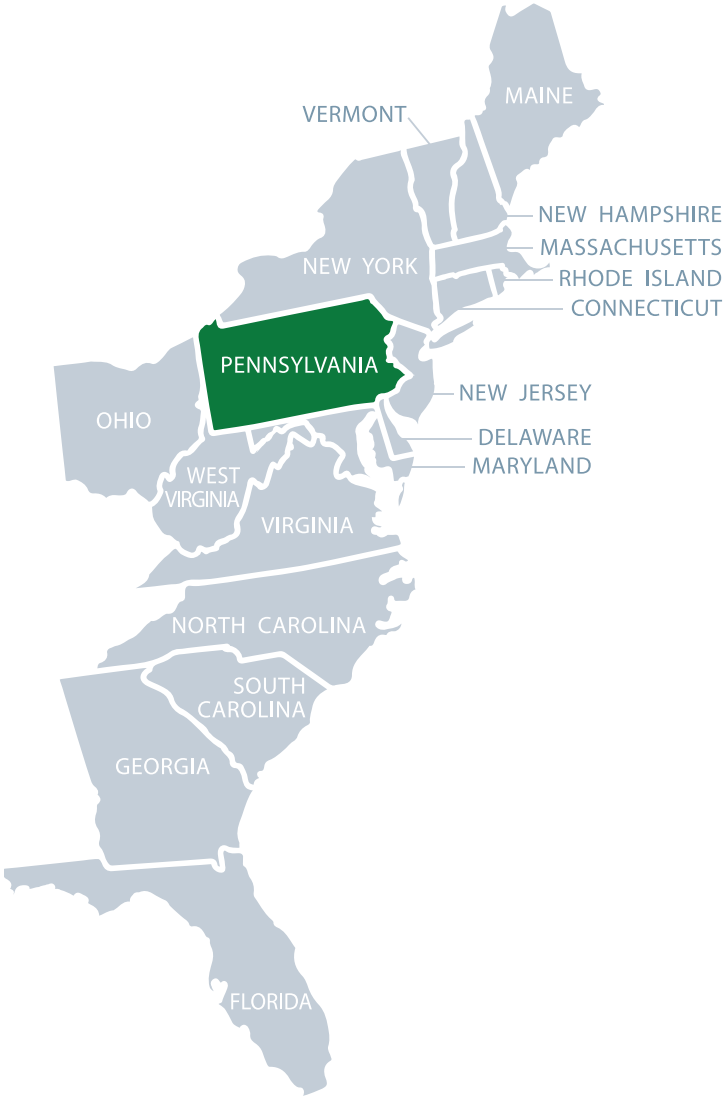
The production and distribution of a simple chocolate candy bar, for example, involves a supply chain that is global in its reach. This production and transportation process is highly refined and is carried out by the private sector and sold under some of America's iconic brand names. An illustrative example (Figure 1) of the deliver process for the three basic ingredients of a chocolate bar – cocoa, sugar and milk – is shown in the accompanying figure. Even this simple process involves more than a dozen transportation movements using multiple transport modes (truck, rail and cargo ship) between different types of facilities ranging from farms to warehouses to production facilities. And this illustrated process does not even account for the packaging material used for wrapping the finished products!

While the various steps in the transportation process for the supply chains that are so critical to our economy and way of life are done largely outside the public eye, supply chain disruptions often have severe consequences that are felt across multiple industries and over large geographic scales. The public sector has a critical role in working with private industry to develop and maintain a freight transportation system that is both efficient and resilient in meeting the needs of Pennsylvania's citizens and business community.

Figure 1: Illustrative Supply Chain: Chocolate Candy Bar



Multi-State Freight Compacts



- In the United States, an interstate compact is a pact or agreement between two or more states, or between states and any foreign government. Congress recognizes the right of States, cities, regional planning organizations, federally recognized Indian Tribes, and local public authorities that are regionally linked with an interest in a specific nationally or regionally significant multi-State freight corridor to enter multi-State compacts to promote the improved mobility of goods. The States negotiate the compacts, and then each party enacts legislation establishing the compact in identical form. Congress must approve the compact unless it has no impact on Federal responsibilities.
- Some compacts create new multi-state governmental agencies which are responsible for administering or improving some shared resource such as a seaport, highway corridor, or public transportation infrastructure. PennDOT has worked diligently with neighboring States through agreements that address topics such as freight movement and interoperability.
- The Delaware Valley Regional Planning Commission (DVRPC) is the federally designated Metropolitan Planning Organization (MPO) for the Greater Philadelphia region, established by an interstate compact between the Commonwealth of Pennsylvania and the State of New Jersey. The DVRPC region is comprised of nine counties, each with a unique freight profile of facilities, employment, and trade patterns. DVRPC's freight advisory committee, the Delaware Valley Goods Movement Task Force, is co-chaired by PennDOT, and DVRPC, meets quarterly, and includes three subcommittees.
- There are other multi-state organizations that are not formally interstate compacts but work together to address freight movement policy in Pennsylvania and neighboring states. These include:

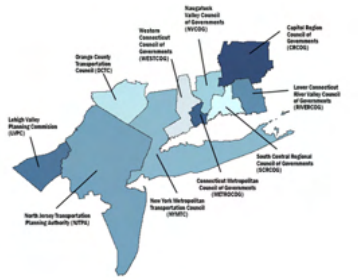
THE EASTERN TRANSPORTATION COALITION

The Eastern Transportation Coalition (TETC)
https://tetcoalition.org/about-us/

The Eastern Transportation Coalition is a partnership of 17 states and Washington D.C. focused on connecting public agencies across modes of travel to increase safety and efficiency. The Coalition Freight Program focuses its efforts on the movement of freight across multiple jurisdictions and across multiple modes. Through the Program's Freight Committee, the Coalition is actively helping states, by working on transportation issues that impact goods movement, to foster safety, mobility, and economic vitality within states and across the Corridor.

Multi-State Freight Compacts

In partnership with FHWA, the I-81 Corridor Coalition hosted a truck parking roundtable in June 2022 to explore considerations for developing a truck parking program for the corridor.



The I-81 Corridor Coalition
https://www.i-81coalition.org/about.html.

The mission of the I-81 Corridor Coalition is to improve the safety and efficiency of freight and passenger movement. The six states through which I-81 traverses share a common interest and work together to "share and coordinate operating and capital plans" and "coordinate freight, truck, and rail study planning" to improve the safety and performance of I-81.

The Appalachian Regional Commission (ARC)
https://www.arc.gov/about-the-appalachian-regional-commission/

An economic development partnership agency of the federal government and 13 state governments focusing on 423 counties across the Appalachian Region, ARC's mission is to innovate, partner, and invest to build community capacity and strengthen economic growth in Appalachia. The Appalachian region within Pennsylvania includes 52 of its 67 counties.

- Early in 2022, Pennsylvania was awarded $17 million in federal Appalachian Development Highway System (ADHS) funding as part of the Bipartisan Infrastructure Law. The ADHS is a 3,090-mile network of highways linking the region to national Interstates and has generated economic development across Appalachia. ADHS's 33 corridors provide access to regional and national markets, contributing to growth opportunities and improved access in Appalachia.

The MAP Forum
https://map-forum-njtpa.hub.arcgis.com/

The Metropolitan Area Planning (MAP) Forum was formed in 2008 and is a consortium of MPOs and Councils of Government (COGs) from Connecticut, New Jersey, New York and Pennsylvania that have entered into an agreement to better coordinate planning activities (including freight) in the multi-state region. The forum includes 10 MPO regions, including the Delaware Valley Regional Planning Commission (DVRPC) and Lehigh Valley Planning Commission (LVPC). A "multi-state freight working group" is an element of the consortium and has coordinated on the looming shortage of truck drivers, and inventoried truck parking and freight studies throughout the region.

Smart Belt

The Smart Belt Coalition was formed in 2016 between PennDOT, the Pennsylvania Turnpike Commission, and Pennsylvania State University along with their counterpart agencies from Ohio and Michigan. While the Coalition's primary focus is on the advancement of connected and automated vehicle technology, it has also collaborated on areas of interest to the efficient movement of freight, including truck platooning and truck parking.

Economic Influences

Trends & Issues

- Pennsylvania has a 2020 population of just over 13 million, ranking fifth among U.S. states. Much of Pennsylvania's population growth has been in the southeastern quadrant of the state. The state's population growth overall has lagged behind many other states in the nation.
- The state retains a consumer-oriented economy in its major metropolitan areas even as many of its traditional industries have faced decline and transition in recent decades. A total of 46 of Pennsylvania's 67 counties have experienced population declines since 2010, with most of the decline seen in outlying rural counties in the northern and western areas of the state.
- Total freight flows into Pennsylvania from other states by all transport modes for 2017 were 217 million tons, with a combined value of $394 billion.[2]
- Total freight flows from Pennsylvania to other states for 2017 were 321 million tons, with a combined value of $464 billion.
- Total freight flows within Pennsylvania for 2017 were 396 million tons, with a combined value of $282 billion.

Planning Implications

- Freight-intensive industries employ more than a million workers in Pennsylvania. These include the following industry groups:
  - Manufacturing..... 531,000
  - Transportation & Warehousing..... 287,400
  - Wholesale Trade..... 151,500
  - Mining..... 23,500
  - Agriculture..... 14,600
- Among Pennsylvania's 67 counties, those with the greatest concentrations of employment in freight-intensive industries include the following:
  - Allegheny..... 76,200
  - Montgomery..... 64,100
  - Lancaster..... 61,000
  - Philadelphia..... 55,700
  - Bucks..... 46,700
  - Berks..... 46,100
  - York..... 45,700
  - Lehigh..... 44,100
  - Delaware..... 39,700
  - Chester..... 38,200

  Many of these counties have high shares of minority populations. Freight-intensive industries represent an important sector for job opportunities.
- The freight-related employment figures by county, census block, and industry group for Pennsylvania are contained in Appendix 3: Freight-Related Employment.

[2] USDOT Freight Analysis Framework (FAF) version 5.1

Trucking

Trends and Issues

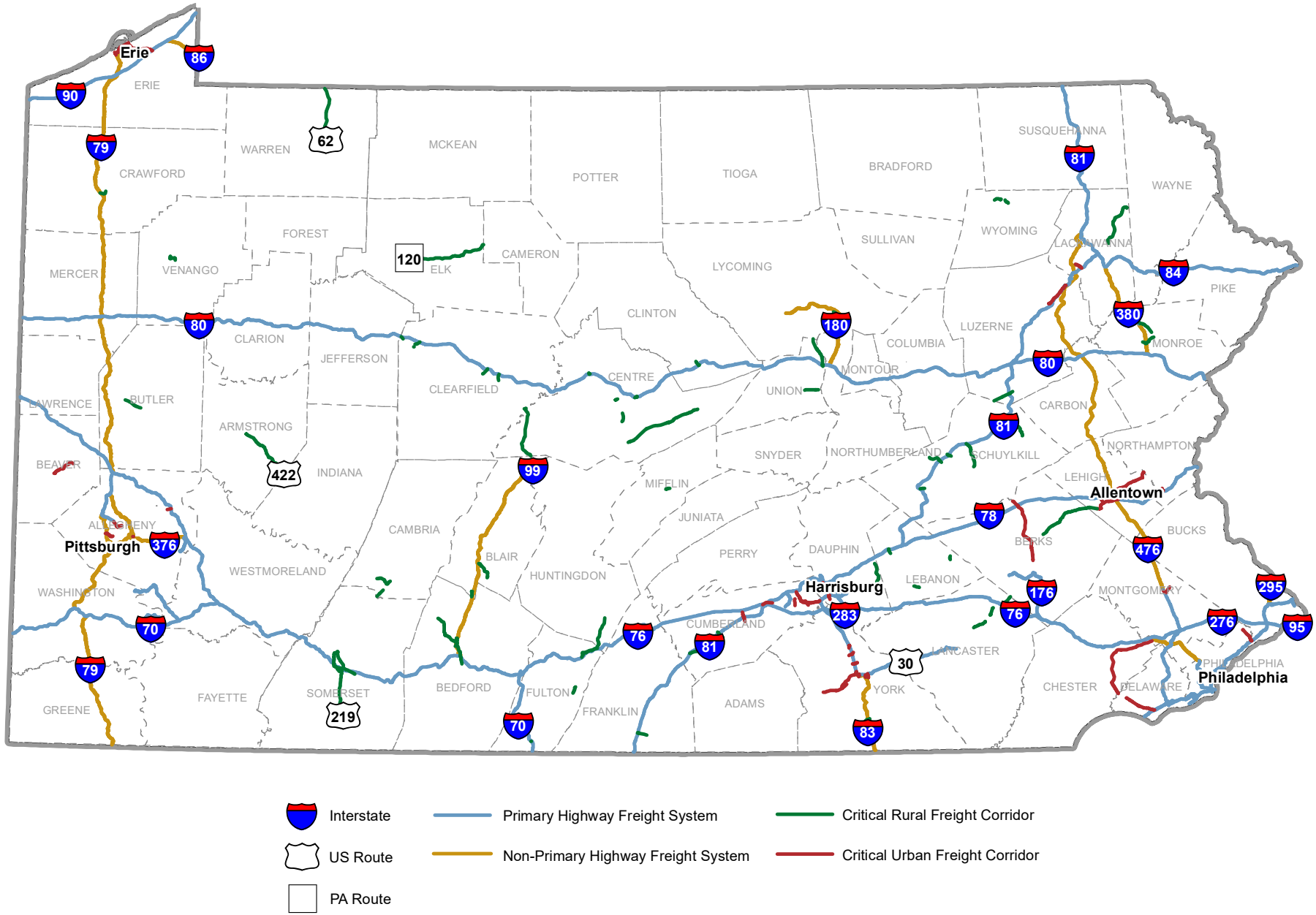
- The U.S. National Highway Freight Network (NHFN) was established under the FAST Act in 2015. NHFN elements in Pennsylvania include the following, as shown in Figure 2:
  - 1,412.64 miles of Primary Highway Freight System (PHFS) roadways
  - 474.54 miles of non-PHFS Interstate Highway
  - 282.33 miles of Critical Rural Freight Corridors (CRFC)*
  - 141.18 miles of Critical Urban Freight Corridors (CUFC)
  - 48 miles of roadway among 18 PHFS Intermodal Connectors
- The NHFN is the primary network of importance for freight nationally, however it is only one element in Pennsylvania's highway system that serves the trucking industry. The National Highway System (NHS) is a network of significant highways for all users that was established by Congress under the National Highway Designation Act of 1995. The roadways in this network include the following, as shown in Figure 3:
  - The Interstate Highway System
  - The Strategic Highway Network (STRAHNET)
  - Connectors to the STRAHNET
  - Connectors to Intermodal Facilities
- Divisible[3] loads in trucks with a gross vehicle weight (GVW)[4] of more than 80,000 pounds (40 tons) are prohibited on Interstate highways in the U.S. Further, Pennsylvania has enacted statutory truck weight exemptions for certain commodity types. Because of these state and federal regulations, much of the state's permitted overweight trucking activity takes place on lower-level PennDOT roadways and local roads where community impacts may be more severe.
- The legislated exemptions described above currently cover 24 commodities and allow maximum GVWs ranging from 90,000 to 150,000 pounds. Typical commodities include heavy equipment, certain manufactured goods, and agricultural products.
- PennDOT issues approximately 450,000 special hauling permits per year. These include single-trip permits as well as seasonal and annual permits for shippers that make many separate truck trips over those periods of time.
- Measured in tonnage, the top commodities transported by truck to destinations in Pennsylvania (not including internal deliveries within Pennsylvania) include gravel, waste/scrap, non-metallic mineral products, "other foodstuffs," and coal. Measured by value, the top commodities destined for Pennsylvania include mixed freight, pharmaceuticals, other foodstuffs, motorized vehicles, and electronics. A full set of commodity tables is shown in Appendix 4: PA Truck Commodity Tables.
- Measured in tonnage, the top commodities transported by truck from origins in Pennsylvania to destinations outside the state include gravel, nonmetallic mineral products, coal, other foodstuffs, and waste/scrap. Measured by value, these most common commodities originating in Pennsylvania include mixed freight, pharmaceuticals, base metals, machinery, and other foodstuffs.
- Pennsylvania's large population centers, along with its Keystone State location on busy national routes and in close proximity to other major metropolitan areas, make trucking a key consideration in terms of highway planning. Pennsylvania is served by major highway corridors of national significance that include Interstates 70, 78, 79, 80, 81, and 95, along with the mainline of the Pennsylvania Turnpike and its Northeast Extension. Some of these Interstates are among the most truck-intensive in the nation.

[3] "Divisible" refers to cargo that can be divided into smaller loads (such as gravel or cartons of finished goods), vs. a large piece of equipment that cannot be disassembled without compromising its structural integrity and therefore must be transported as one unit.

[4] "Gross vehicle weight" is the weight of the truck and trailer plus the weight of the goods being transported.

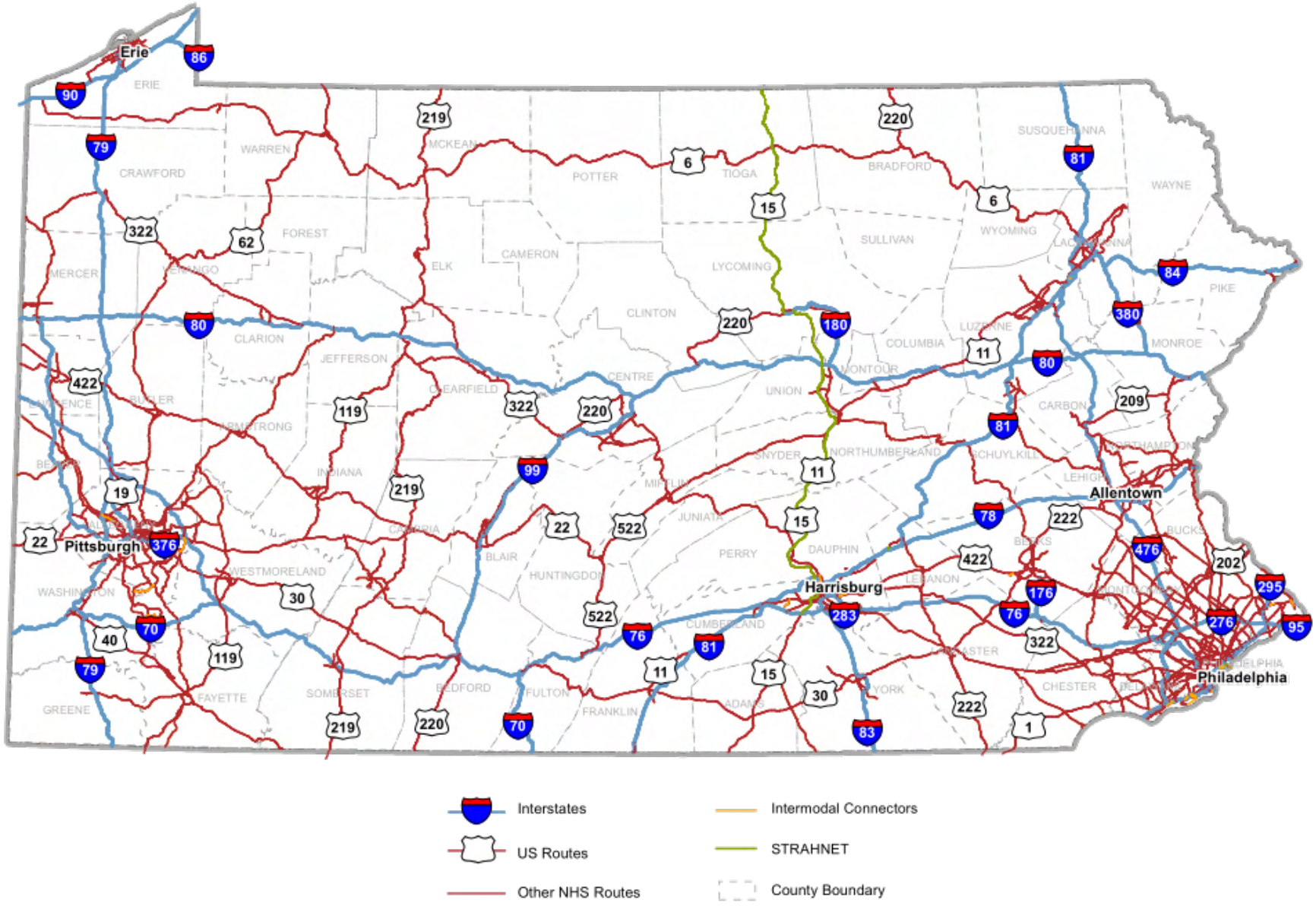
* BIL updated these caps for Pennsylvania to 300 miles for CRFCs, and 150 for CUFCs.

Figure 2: National Highway Freight Network



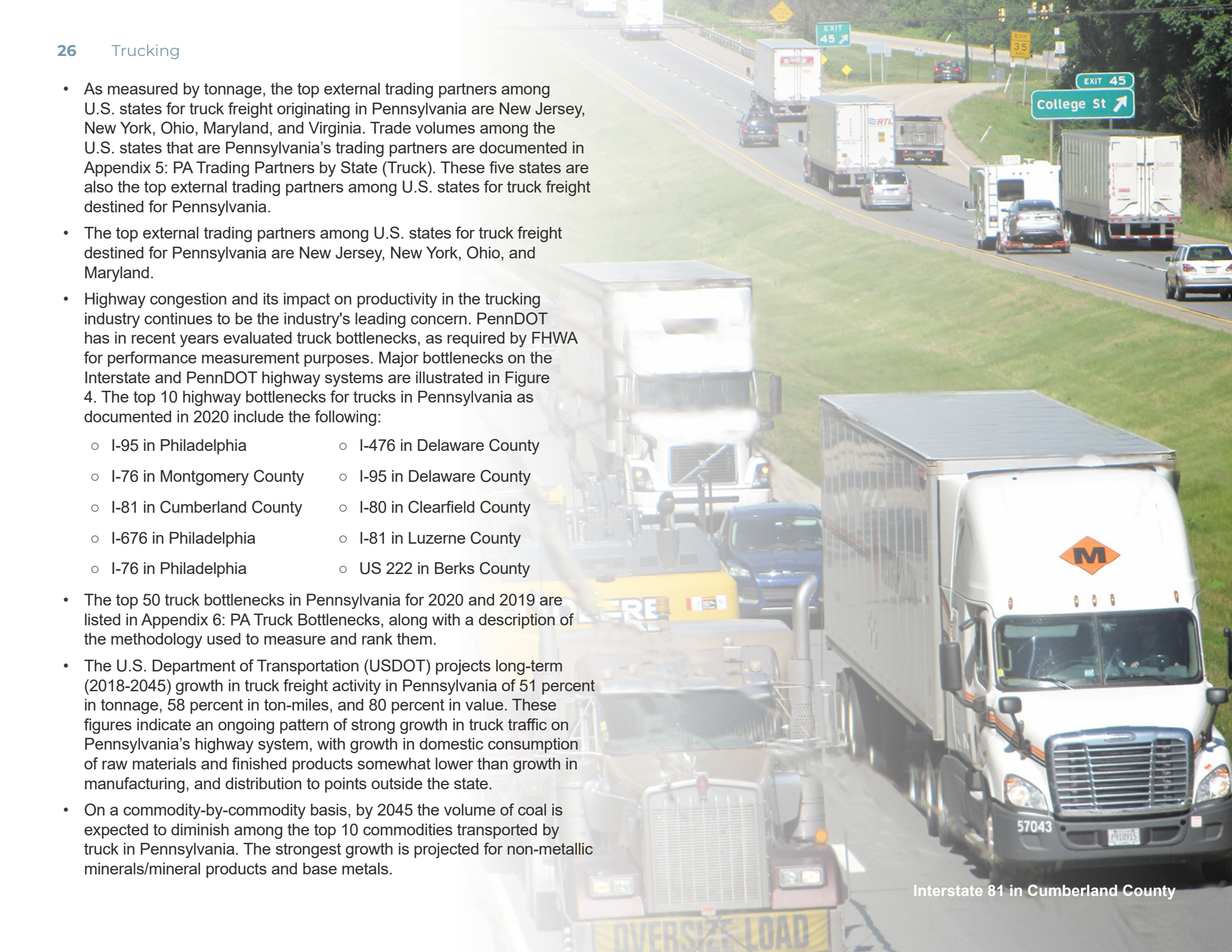
Source: PennDOT

Figure 3: National Highway System



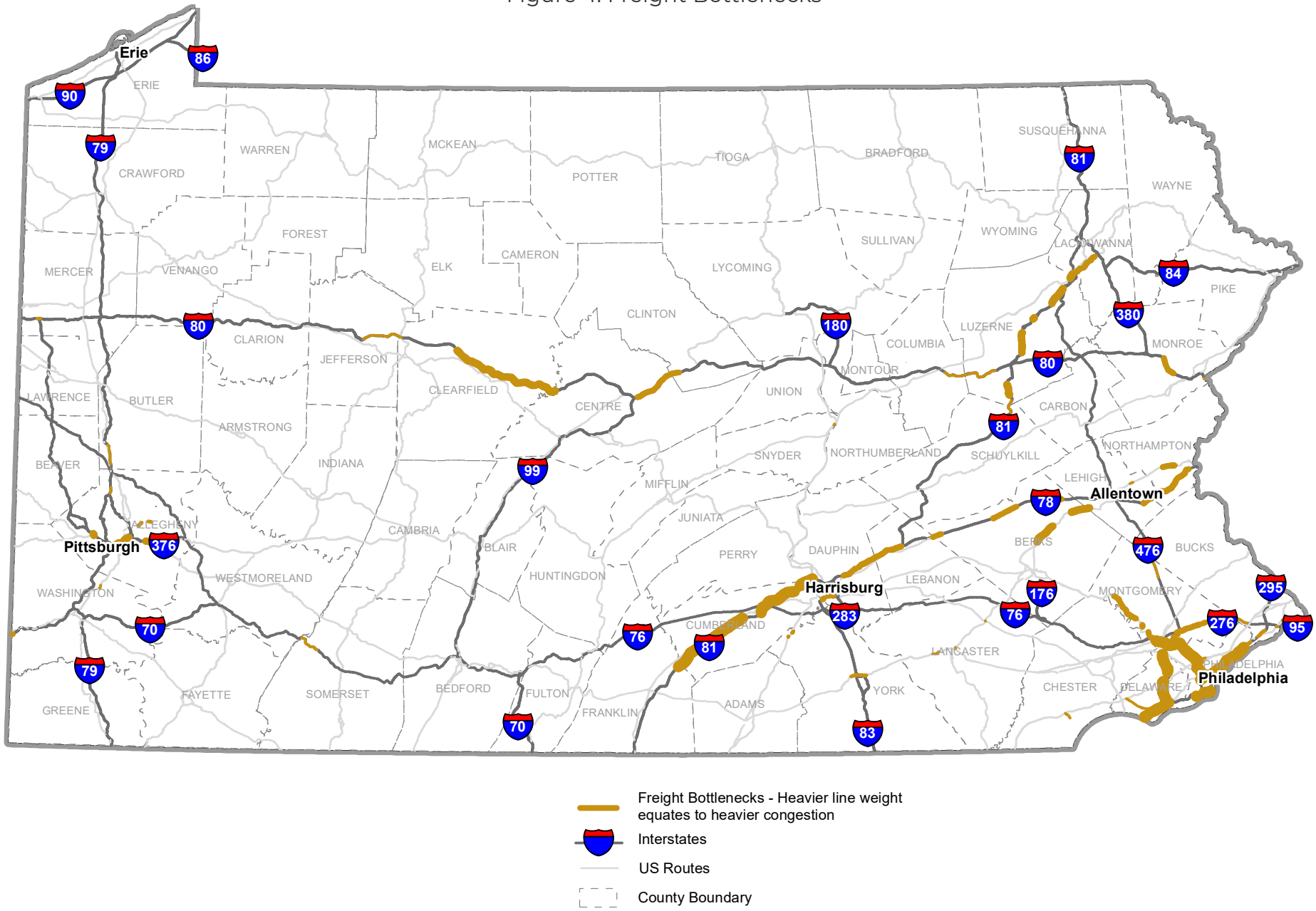
Source: PASDA

- As measured by tonnage, the top external trading partners among U.S. states for truck freight originating in Pennsylvania are New Jersey, New York, Ohio, Maryland, and Virginia. Trade volumes among the U.S. states that are Pennsylvania's trading partners are documented in Appendix 5: PA Trading Partners by State (Truck). These five states are also the top external trading partners among U.S. states for truck freight destined for Pennsylvania.
- The top external trading partners among U.S. states for truck freight destined for Pennsylvania are New Jersey, New York, Ohio, and Maryland.
- Highway congestion and its impact on productivity in the trucking industry continues to be the industry's leading concern. PennDOT has in recent years evaluated truck bottlenecks, as required by FHWA for performance measurement purposes. Major bottlenecks on the Interstate and PennDOT highway systems are illustrated in Figure 4. The top 10 highway bottlenecks for trucks in Pennsylvania as documented in 2020 include the following:
    - I-95 in Philadelphia
    - I-76 in Montgomery County
    - I-81 in Cumberland County
    - I-676 in Philadelphia
    - I-76 in Philadelphia
    - I-476 in Delaware County
    - I-95 in Delaware County
    - I-80 in Clearfield County
    - I-81 in Luzerne County
    - US 222 in Berks County
- The top 50 truck bottlenecks in Pennsylvania for 2020 and 2019 are listed in Appendix 6: PA Truck Bottlenecks, along with a description of the methodology used to measure and rank them.
- The U.S. Department of Transportation (USDOT) projects long-term (2018-2045) growth in truck freight activity in Pennsylvania of 51 percent in tonnage, 58 percent in ton-miles, and 80 percent in value. These figures indicate an ongoing pattern of strong growth in truck traffic on Pennsylvania's highway system, with growth in domestic consumption of raw materials and finished products somewhat lower than growth in manufacturing, and distribution to points outside the state.
- On a commodity-by-commodity basis, by 2045 the volume of coal is expected to diminish among the top 10 commodities transported by truck in Pennsylvania. The strongest growth is projected for non-metallic minerals/mineral products and base metals.



Interstate 81 in Cumberland County

Figure 4: Freight Bottlenecks

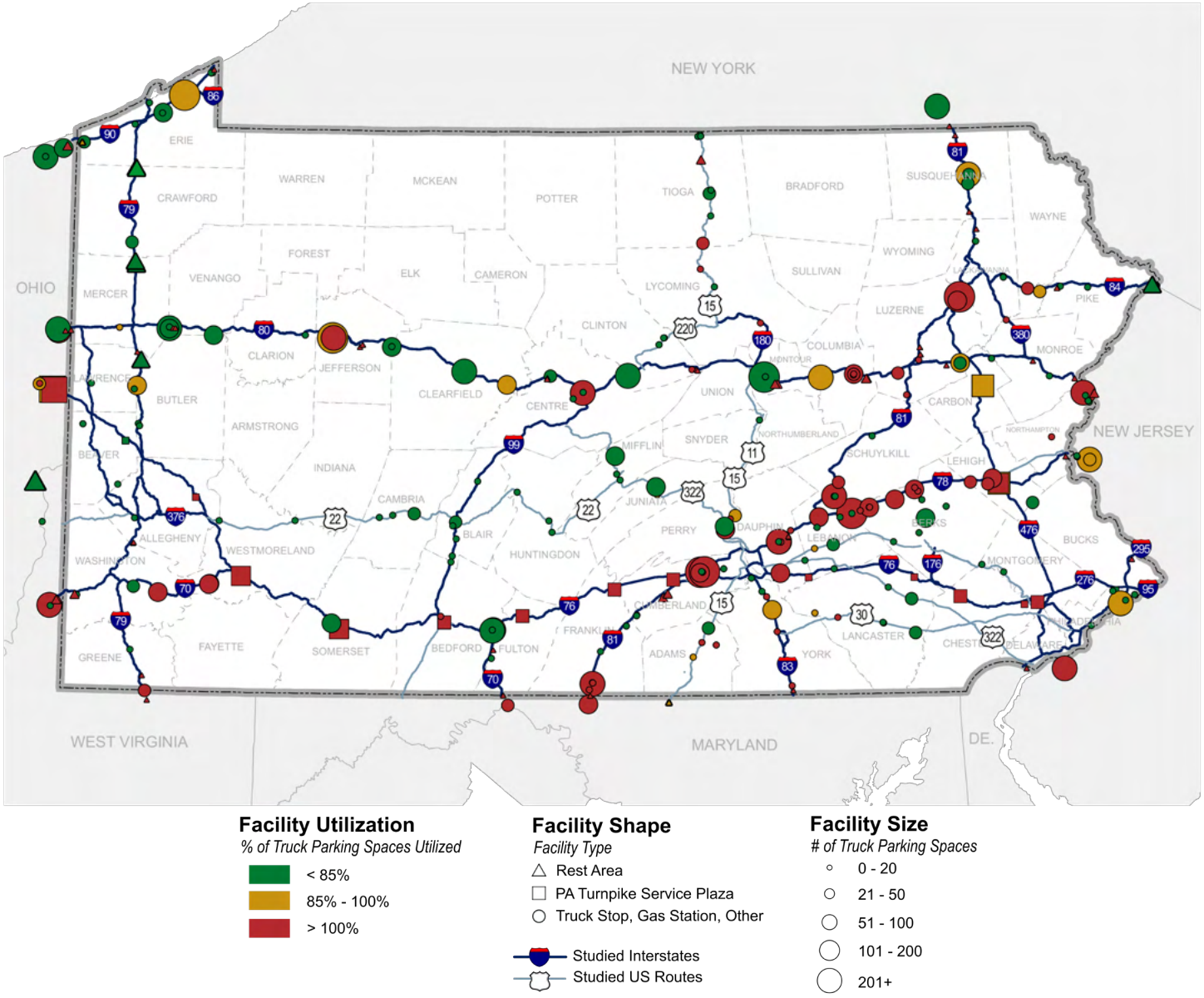


Source: PennDOT, 2020

Commercial Motor Vehicle Parking Facilities Assessment

- PennDOT and its partners have been working to measure truck parking issues and related safety concerns for nearly 20 years. The initial statewide assessment of truck parking was documented in *Truck Parking In Pennsylvania*, the report completed in 2007 for the Pennsylvania State Transportation Advisory Committee (TAC).
- Truck parking is a complex issue that is driven by a range of factors, including Federal Motor Carrier Safety Administration (FMCSA) hours-of-service rules, rest needs for commercial vehicle operators on the Interstate Highway System, and staging for deliveries based on operating schedules at shippers/receivers and freight terminals.
- Meeting the needs of the trucking industry for rest and staging is an important consideration for supply chains and freight-related economic activity.
- Public rest areas represent an operating cost for State DOTs while providing limited opportunities to recover costs from the users of these facilities, as Federal law restricts commercialization of highway rest areas except for those in existence before 1960 (23 U.S. Code §111).
- Truck parking activity can be classified into four general types:
  - long-term (5+ hours) rest
  - short-term parking
  - staging for deliveries
  - emergency operations during travel disruptions and road closures
- Land use is controlled at the municipal level with ramifications for industrial development sites (which generate some truck parking activity) and new or expanded truck stops (which provide parking capacity to meet existing and future demand).
- PennDOT recently completed an update of the data from the 2007 TAC study. The data collected in 2019 and 2020 included documentation of peak overnight truck parking activity at public and private facilities across Pennsylvania, along with overnight parking in non-designated areas such as highway shoulders and interchange ramps. The data collection effort covered all of the limited-access highway corridors in the state. A database of facilities was compiled that includes all locations covered in the 2007 study, and was expanded to include additional parking facilities opened since 2007 and those included in the data submitted by PennDOT to the U.S. Department of Transportation as part of the Jason's Law surveys conducted by USDOT in 2015 and 2018-19.
- The truck parking facility utilization by facility type and size is illustrated in Figure 5. The data used to develop this facility includes more than 280 parking facilities across the state. These facilities had a combined capacity of more than 11,600 truck parking spaces. During the peak overnight data collection periods in 2019 and 2020 they accommodated about 12,150 trucks parked, for an overall peak utilization of 105%.
- The trucks observed parked in undesignated areas on highway shoulders and interchange ramps were aggregated by roadway segment and measured in terms of a rate of parked trucks per linear mile of roadway. This parking activity is shown in Figure 6. Statewide, a total of 980 trucks were observed parked along these ramps and shoulders during a typical peak overnight period.
- General observations about truck parking in Pennsylvania include the following:
  - Peak truck parking demand exceeded the designated capacity at nearly half of the parking facilities in Pennsylvania, including most of the largest truck stops and Pennsylvania Turnpike service plazas.
  - The areas of Pennsylvania where the heaviest truck parking activity takes place include the I-78 corridor, the I-81 corridor from the Maryland state line all the way up to the Scranton area, most segments of I-80 from I-99 east to New Jersey, and the entire length of the Pennsylvania Turnpike.
  - The heaviest concentrations of truck parking in undesignated areas on highway shoulders and interchange ramps was observed along sections of the Pennsylvania Turnpike in the western part of the state, segments of the I-81 corridor in the Harrisburg area and in Schuylkill County, most of I-78 between the I-81 interchange and the New Jersey state line, and a section of I-80 in central Pennsylvania between I-99 and US-220.
  - These figures indicate a shortfall of truck parking spaces that is most acute in areas where long-haul trucks operate on the Interstate Highway System in areas where "last mile" staging for trucks occurs near warehouses/distribution centers and other industrial sites.
  - The Pennsylvania Turnpike has some characteristics that make it challenging to meet truck parking demand in many areas. These include the controlled-access toll operation of the roadway, combined with the long distances between some interchanges in the western part of the state that limit opportunities for trucks to exit the highway to park at private truck stops.

Figure 5: Truck Parking Utilization and Capacity



Facility Utilization
% of Truck Parking Spaces Utilized
- < 85%
- 85% - 100%
- > 100%

Facility Shape
Facility Type
- Rest Area
- PA Turnpike Service Plaza
- Truck Stop, Gas Station, Other
- Studied Interstates
- Studied US Routes

Facility Size
# of Truck Parking Spaces
- 0 - 20
- 21 - 50
- 51 - 100
- 101 - 200
- 201+

Source: PennDOT

Figure 6: Truck Parking on Shoulders and Ramp

Source: PennDOT

Pennsylvania Welcome Center on US 15 in Tioga County

Planning Implications

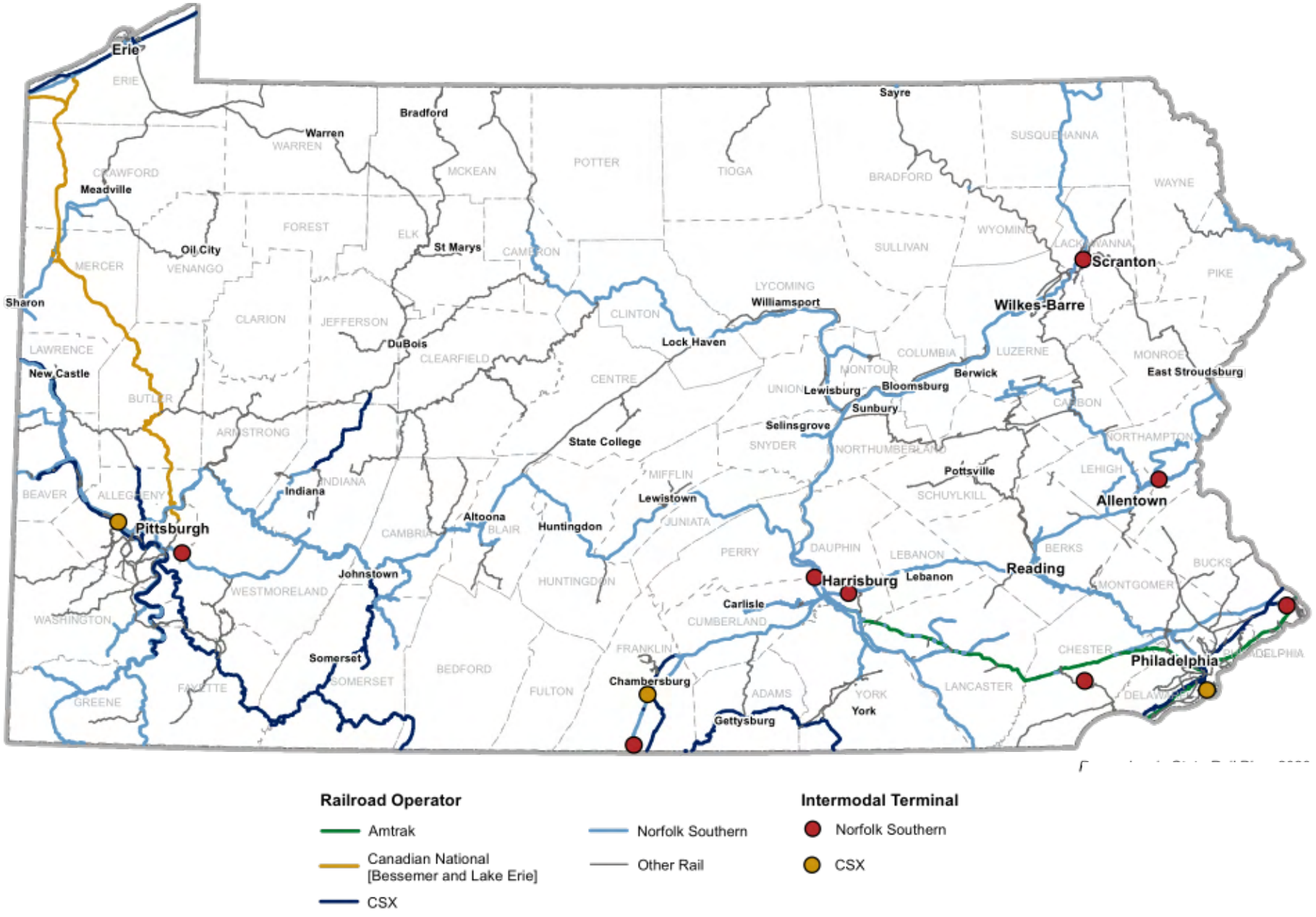
- Trucks are the predominant mode of freight transportation in Pennsylvania and will continue to be for the foreseeable future. Planning and programming for sufficient roadway capacity is one of the biggest challenges facing PennDOT, with trucks being one of many contributors to highway congestion while also serving as a critical transport mode for the Commonwealth.
- A number of the truck bottlenecks identified in Pennsylvania are being addressed through ongoing projects that are being implemented through the 12-Year Program (TYP). These include five projects for I-95 in Philadelphia, which is ranked as the #1 truck bottleneck in Pennsylvania for both 2019 and 2020. A more detailed discussion of the truck bottlenecks and the TYP projects is included in the Implementation section of this plan and Appendix 12.
- Recurring highway congestion on major roadways is driving some truck traffic onto secondary and local roads that are not well suited to handle them. This has some operational implications in areas where roadway geometry, weight limits, and overhead clearance constraints severely limit the mobility of large trucks.
- The growth of e-commerce has resulted in changes in truck operations that will likely accelerate over time, with more frequent trips in smaller trucks and vans, and more “last-mile” deliveries to homes and business establishments that will place a growing burden on local streets.
- TAC completed a 2020 study titled *Truck Weight Exemptions* to document the size and weight regulations that govern Pennsylvania’s roadway system, and provide recommendations for measuring the impact of overweight trucks on Pennsylvania's bridges and pavement. The study recommended collection of more accurate data about actual truck trips under these special hauling permits. This would serve as the basis for a comprehensive analysis of the weight impacts on bridges and pavement through case studies involving PennDOT-owned roads commonly used by overweight trucks.
- The data compiled over a two-year period for the 2020 TAC study indicated that the highways in Pennsylvania listed most frequently on oversize/overweight permits include Interstates 80, 81, 70, 79, and 84. Among non-Interstate highways, the ones listed most frequently on these permits include US 22, US 11, US 15, PA 18, and US 30.
- Advances in truck technology are an opportunity to improve efficiency in the industry, but there are challenges. Truck platooning, automation, and zero-emission vehicles (ZEVs) are areas of rapid technology development that have implications for the trucking industry. The primary implication for the public sector is to understand how to adapt to these changes in a timely manner when planning for infrastructure investments.
- Automation of warehousing/logistics facilities drives an acceleration of freight movement in the supply chain. This results in an increase of truck traffic generated by warehousing and distribution facilities even without changes to the physical size of the building. An integrated approach to transportation planning/programming and local planning for freight-intensive land use is essential to ensuring the viability and sustainability of Pennsylvania’s highway system, and the strength of the state’s industries and overall economy.
- Further, transportation costs are sometimes driven higher by reactively trying to keep pace with warehousing and distribution growth. Coordinated transportation and land use could lessen this problem.
- MPOs and RPOs should continue to work collaboratively with municipal officials and industrial real estate developers to measure impacts of additional truck traffic and freight-related emissions—not only on the local road network but also on the regional highway system.
- Modeling and forecasting tools available through the American Association of State Highway and Transportation Officials (AASHTO) and the Institute of Transportation Engineers (ITE) should be refined and improved to establish more realistic forecasts of truck traffic for industrial sites. Data sources such as weigh-in-motion data and vehicle probe data can be used to more accurately estimate trip rates, vehicle weights, and origin/destination patterns.
- The lack of sufficient truck parking availability across much of the nation is a major operational issue for the trucking industry as well as a safety issue for the trucking industry and the traveling public in general. Truck parking and the associated challenges of federal hours-of-service rules and staging needs at shippers and receivers are issues nationwide. Insufficient capacity in rest areas and truck stops leads to serious safety implications when truck drivers are forced to park on highway on-ramps or shoulders.
- Providing truck parking is not core to the mission of a state DOT, however, state government does have a stake in being a part of the problem-solving given its responsibility for transportation safety.

Freight Rail

Trends & Issues

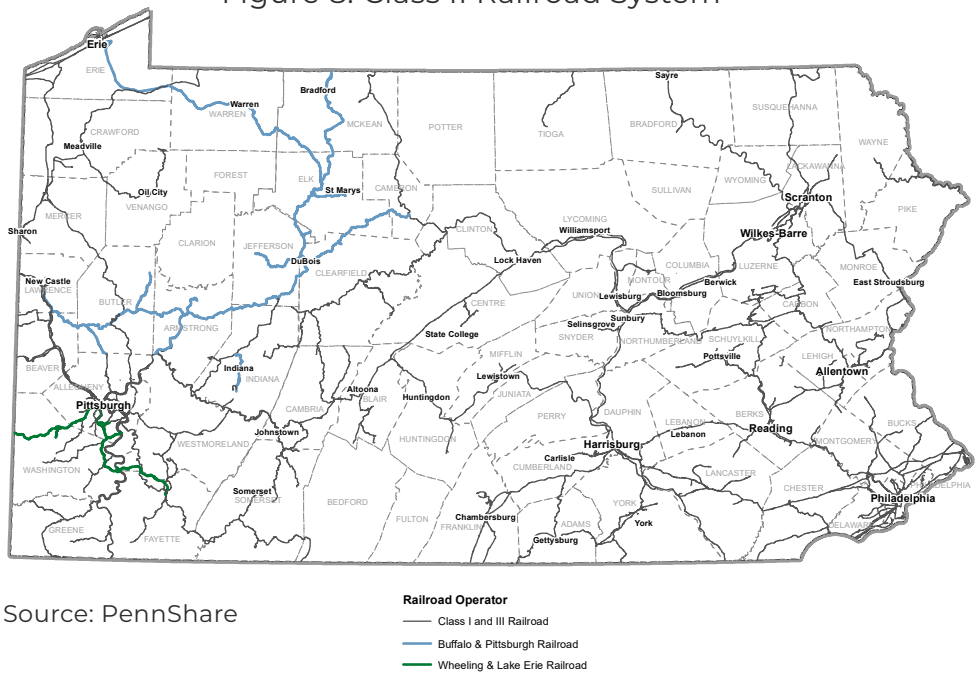
- Pennsylvania's freight railroad activity ranks among the leaders across the U.S. by several measures, including the number of railroad companies operating in the state, track mileage, tonnage, car loadings, employment, and total compensation for railroad employees and retirees.
- While freight rail is primarily a private-sector transport mode, the public benefits are considerable and have long been the basis for state investment. Chief among these benefits is the reduction of highway and bridge travel demand with mode shift to rail.
- The Pennsylvania freight rail network provides the state's industries access to customers and suppliers across North America. The busiest corridors are those east-west links that historically connected Pennsylvania to origins/destinations in the Midwest and Great Plains. The previous two decades have seen strong growth on north-south routes in the eastern U.S. that have emerged since the acquisition of Conrail by Norfolk Southern and CSX in the late 1990s.
- The Pennsylvania freight rail system comprises three general categories established by the Federal Railroad Administration (FRA):
    - Three Class I railroads, comprising 47 percent of the route-miles in Pennsylvania
    - Three regional (Class II) railroads, with 14 percent of the route-miles
    - 57 short-line (Class III) railroads, including local (29 percent of the route-miles) and terminal/switching railroads (10 percent of the route-miles)
- The Pennsylvania railroad networks for each of the three major FRA categories are shown in Figures 7, 8, and 9.
- One of the unique elements of the Pennsylvania freight rail network is the Conrail Shared Assets system. After the acquisition of Conrail by Norfolk Southern and CSX in the late 1990s, a remnant of Conrail remained as a switching and terminal railroad in several regions of the Northeast. The railroad is jointly owned by CSX and NS, and in Pennsylvania it operates on more than 65 miles of right-of-way in the Philadelphia area.
- Intermodal terminals and transload facilities are integral elements of the freight railroad network, providing connectivity between the rail system and other freight transport modes, including water ports and trucking. The major intermodal terminals in Pennsylvania are shown in Figure 5. The transload facilities are listed in Appendix 7: PA Rail Transload Facilities.
- Measured in tonnage, the top commodities transported by rail to destinations in Pennsylvania (not including internal deliveries within Pennsylvania) include coal, crude petroleum, plastics/rubber, newsprint/paper, and base metals. Measured by value, the top commodities destined for Pennsylvania include plastics/rubber, articles of base metals, base metals, machinery, and newsprint/paper. A full set of commodity tables is shown in Appendix 8: PA Rail Commodity Tables.
- Measured in tonnage, the top commodities transported by rail from origins in Pennsylvania to destinations outside PA include coal, crude petroleum, gravel, plastics/rubber, and base metals. Measured by value, the top commodities originating in Pennsylvania include crude petroleum, plastics/rubber, coal, articles of base metals, and other agricultural products.
- The top commodities transported by rail within Pennsylvania include (by tonnage) coal, gravel, plastics/rubber, articles of base metals, and fuel oils. By value, the top commodities include articles of base metals, plastics/rubber, coal, textiles/leather, and pharmaceuticals.

Figure 7: Class I Railroad System



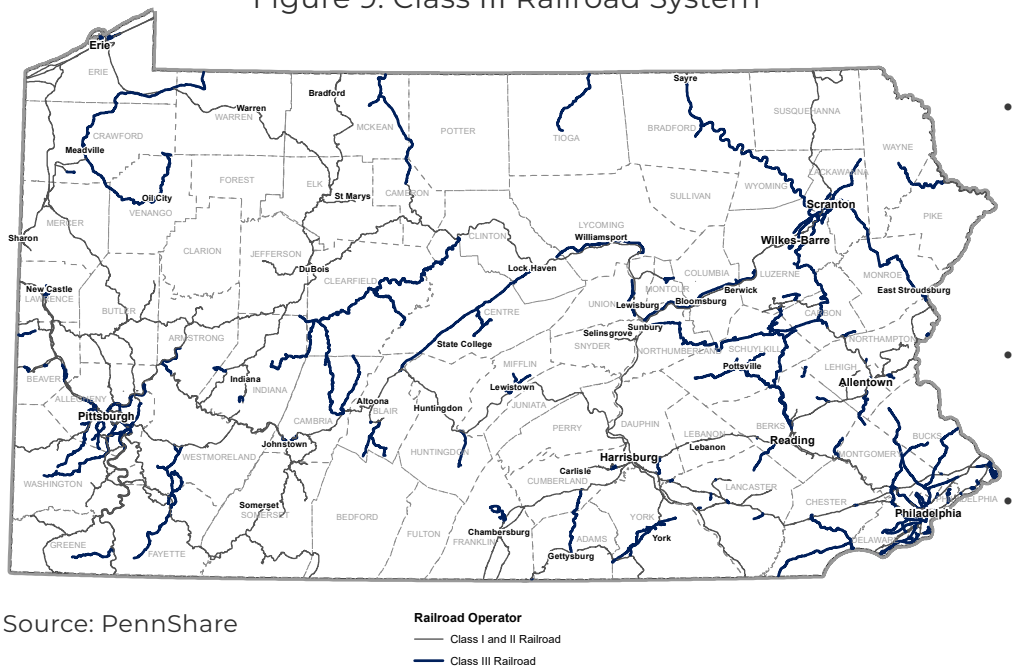
Source: Pennsylvania State Rail Plan, 2020

Figure 8: Class II Railroad System



Source: PennShare

Figure 9: Class III Railroad System



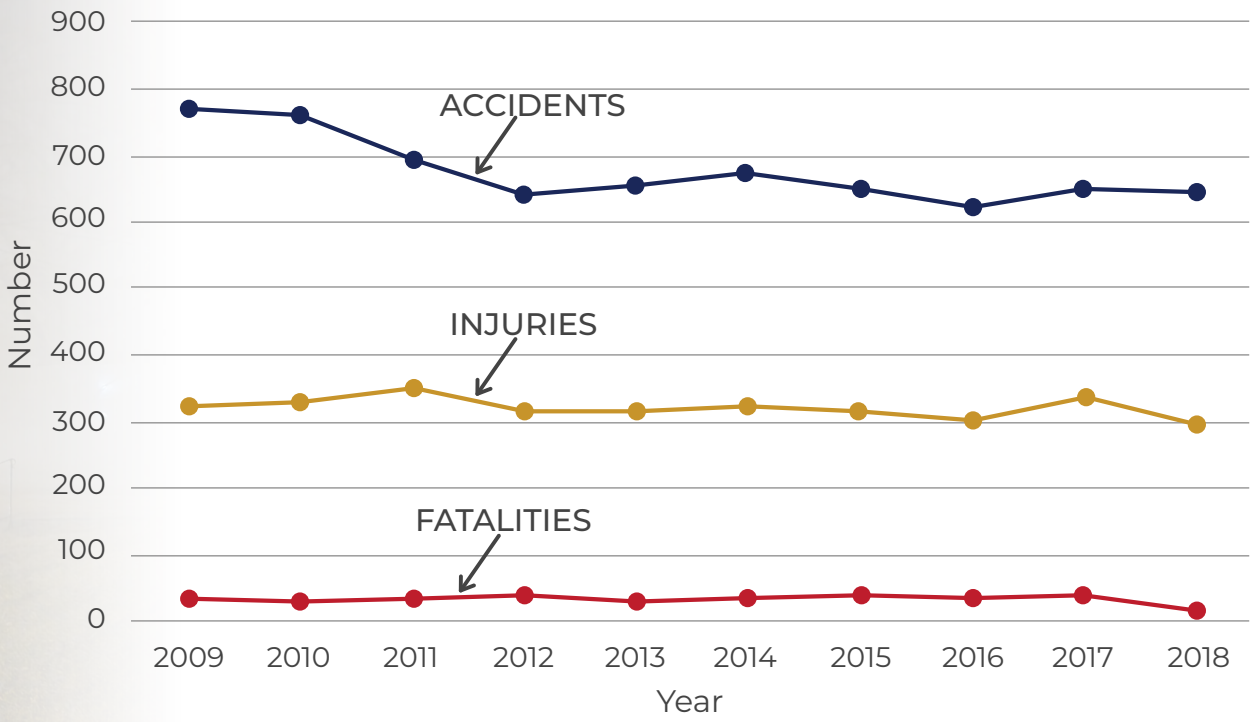
Source: PennShare

- As measured by tonnage, the top external trading partners among U.S. states for rail freight originating in Pennsylvania are New Jersey, Maryland, North Carolina, New York, and Virginia. Trade volumes among the U.S. states that are Pennsylvania's trading partners are documented in Appendix 9: PA Trading Partners by State (Rail). The top external trading partners among states for freight transported by rail to Pennsylvania (by tonnage) include West Virginia, North Dakota, New York, Texas, and Iowa.
- USDOT projects long-term (2018-2045) growth in rail freight in Pennsylvania of 36 percent in tonnage, 23 percent in ton-miles, and 129 percent in value. These figures indicate a long-term pattern of growth in activity on Pennsylvania's freight rail system. However, with the exception of the increase in the value of commodities moved by rail, the growth pattern reflected by these USDOT projections is indicative of slower growth in rail freight volumes than in trucking activity.
- Separate forecasts were developed as part of the 2020 update of the Pennsylvania State Rail Plan (SRP). These forecasts are based on the same 2017 STB Confidential Carload Waybill Sample Data that is used for the USDOT Freight Analysis Framework figures, but with additional economic analyses from IHS Global Insight. These forecasts include Baseline, Low-Growth, and High-Growth scenarios. The SRP forecast of reduced tonnage is largely driven by an anticipated decline in coal traffic. Railroad activity measured by rail car movements shows modest growth in rail traffic by 2045 even under a "Low-Growth" scenario. This is heavily influenced by continued strong growth in intermodal rail traffic.
- The growth of intermodal freight transportation in the railroad industry has been an ongoing trend that has accelerated in recent decades as global trade in containerized shipments has grown dramatically. This has been coupled with consolidation in the North American railroad industry that has extended the reach of the remaining Class I railroads and improved the competitive position of rail transport of shipping containers versus long-haul trucking on many domestic trade corridors.
- On a commodity-by-commodity basis, by 2045 the volumes of coal and crude oil are expected to diminish among the top 10 commodities transported by rail in Pennsylvania. The strongest growth is projected for plastics/rubber and basic chemicals.
- The FRA is responsible for the regulation of railroad safety across the U.S. The combined total of all types of railroad accidents documented by the FRA in Pennsylvania over the last 10 years is shown in Figure 10. These figures indicate a gradual decline in railroad accidents, injuries, and fatalities over that period.

- Some of the major Class I rail lines in Pennsylvania are used jointly by freight and passenger trains. This shared use of right-of-way presents operational capacity and safety concerns for current and future rail service.
- Highway–railroad grade crossing safety has been a major national railroad safety priority over the years. The 2020 SRP indicates that there are more than 3,500 public grade crossings in Pennsylvania and documents a slight increase in grade-crossing accidents in recent years. Pennsylvania has made the elimination of grade crossings (where feasible) a major initiative through the Railway–Highway Grade Crossing (Section 130) Program. The 2019-2022 Statewide Transportation Improvement Program (STIP) includes more than 80 planned grade-crossing projects at locations with high FRA hazard ratings.
- There have been a number of technology-based improvements in railroad operations and rolling stock that have helped the industry improve its efficiency and safety, and reduce its impact on the environment. Key ongoing developments related to technology in the railroad industry include the following:
    - The use of distributed power (or "mid-train locomotives") to operate longer trains, thereby reducing overall crew requirements.
    - Positive Train Control (PTC) implementation and GPS-based technology enhancements that are aimed at reducing train incidents related to excessive speed and signal violations.
    - Operational improvements built on PTC technology to enable railroads to operate trains more efficiently.
    - Implementation of Precision Scheduled Railroading (PSR) by Class I carriers to improve operating efficiency by reducing rail car dwell times in yards and operating trains based on fixed schedules rather than maximizing train length.
    - Alternative fuels such as electric and compressed natural gas (CNG) locomotives.
    - Upgraded grade-crossing detection, monitoring, and protection systems.
    - Advances in technology to potentially automate locomotives in the future.

Norfolk Southern in Juniata County

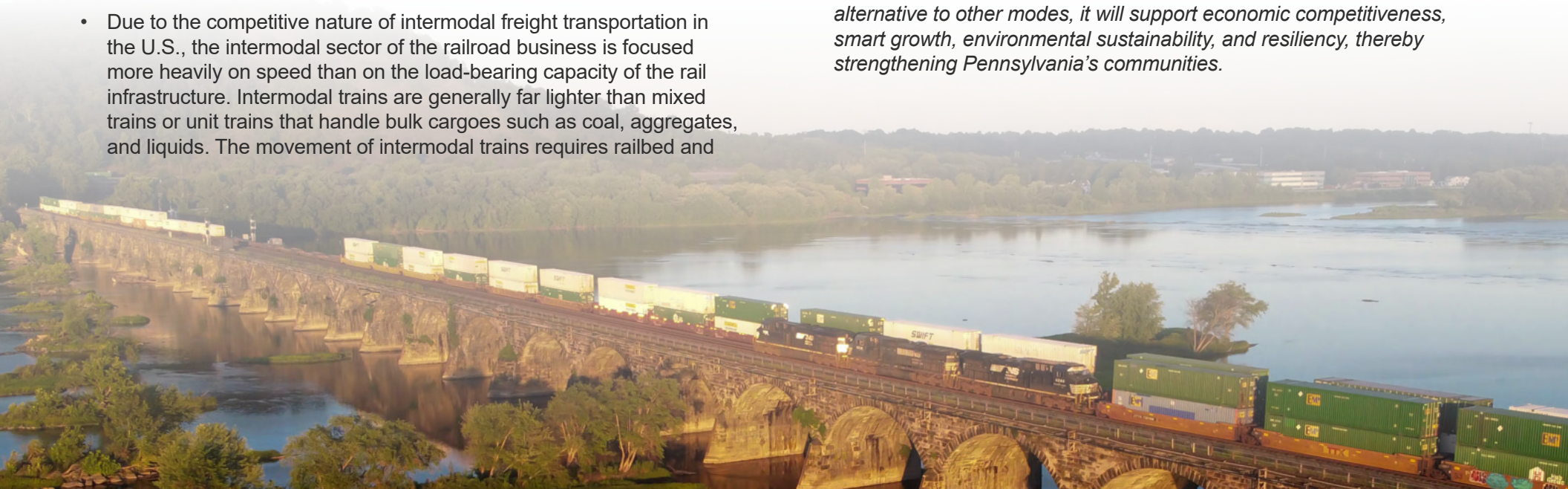
Figure 10: Rail Accidents, Fatalities, and Injuries in Pennsylvania, 2009–2018



Source: 2020 PA State Rail Plan – Federal Railroad Administration (2019)

Planning Implications

- As a result of the growth in rail intermodal traffic discussed previously, connections between transport modes have increasingly become bottlenecks in the transportation process over time. Roadside access to marine terminals and intermodal rail yards is critical to the efficient movement of containerized freight.
- The 2020 SRP identified one Class I freight mainline segment that is projected to face a borderline capacity constraint in the future. The Norfolk Southern Crescent Corridor segment between Philadelphia and Harrisburg currently operates at Level of Service (LOS) E, which corresponds to a volume-to-capacity ratio of 0.81 to 1.00. This is projected to improve to LOS D in the "Baseline" 2045 horizon year documented in the SRP due to the projected decline in freight rail traffic described previously. Under the "High-Growth" scenario, this segment would remain at LOS E.
- On-dock and near-dock rail infrastructure development has been incorporated in major container ports throughout the U.S. The infrastructure is essential for ports that seek to attract discretionary cargo destined for the interior of North America as a crucial element of their business model. Intermodal connections have been identified as a key issue by stakeholders involved in multiple freight transportation modes, including trucking, air cargo, maritime trade (for both ocean ports and inland waterways), and railroads.
- Due to the competitive nature of intermodal freight transportation in the U.S., the intermodal sector of the railroad business is focused more heavily on speed than on the load-bearing capacity of the rail infrastructure. Intermodal trains are generally far lighter than mixed trains or unit trains that handle bulk cargoes such as coal, aggregates, and liquids. The movement of intermodal trains requires railbed and track infrastructure that is suitable for faster trains. The mountainous terrain across much of the state and the legacy rail network originally built to handle other commodities is generally unsuitable for this type of operation. Accommodating and improving intermodal access in areas of Pennsylvania that are suitable for a wide range of land uses presents a challenge in terms of both real estate costs and the impacts of rail terminal operations on surrounding communities.
- Another implication of this growth in intermodal traffic is that it has had adverse impacts on many Class II and Class III railroads. The 53-foot domestic intermodal container has gradually displaced the boxcar as a preferred mode of transport for many industries that have traditionally been among the core customers of these smaller railroads. Consequently, many short-line railroads have been forced to develop a business model focused on commodities that are moved in specialized rail equipment, including liquid bulk loads in tankers, dry bulk loads in hopper cars, lumber on center-beam cars, etc. Flexibility in meeting the changing needs of Pennsylvania's industries, and the local railroads that serve them, is critical for protecting the long-term viability of the state's non-highway freight transport modes.
- The 2020 SRP is built around the following vision statement: *Pennsylvania's integrated rail system will provide safe, convenient, reliable, cost-effective connections for people and goods. As a viable alternative to other modes, it will support economic competitiveness, smart growth, environmental sustainability, and resiliency, thereby strengthening Pennsylvania's communities.*



The goals and objectives of the FMP will align with the **EIGHT KEY GOALS** of the State Rail Plan.

1. Bring the priority rail system to a state of good repair and maintain it.
2. Develop an integrated rail system.
3. Support the future needs of residents and businesses.
4. Enhance the quality of life in Pennsylvania.
5. Ensure personal safety and infrastructure security.
6. Support energy efficiency, environmental sustainability and resiliency.
7. Identify stable and predictable funding.
8. Build public support for rail system services and assets.

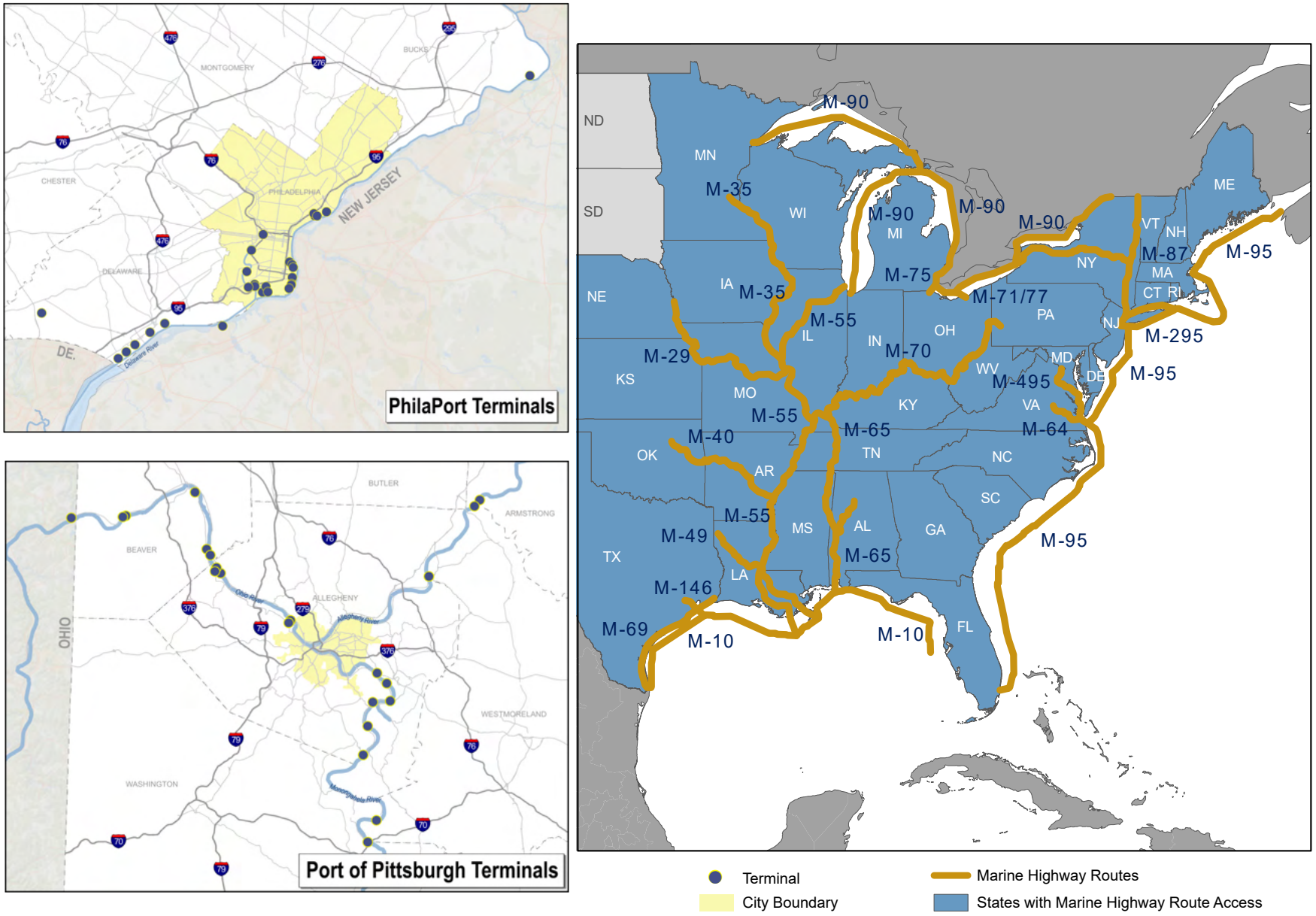
CSX Intermodal Terminal in Chambersburg

Ports and Waterways

Trends & Issues

- Pennsylvania is the only state with direct access to the Atlantic Ocean, inland waterways, and the Great Lakes.
- Maritime transportation is the most cost-competitive long-distance transportation mode, and water ports provide the essential intermodal connection between waterways and the landside systems that handle final delivery of goods.
- Pennsylvania's three water ports each function uniquely to move domestic and international commerce across deep-water, inland, and Great Lakes waterways. The Port of Philadelphia serves Atlantic Ocean vessels and transfers raw materials in bulk, as well as finished goods in containers. The Port of Pittsburgh serves predominantly river barge traffic carrying dry bulk materials for the metal, chemical, and energy industries. The Port of Erie connects the interior of North America to international waters along the St. Lawrence Seaway. Its top freight includes aggregates used in construction and specialized equipment for a growing wind power generation market.
- Port performance, as defined by the FAST Act, focuses on capacity and throughput of freight measured in tons or containerized units known as twenty-foot equivalent units (TEUs). Port capacity or maximum throughput is defined by physical constraints, including the acreage of terminals, number and length of berths, depth of access channels, and the amount and type of cargo-handling equipment (e.g., container cranes). Port capacity is also influenced by operational factors (e.g., gate hours), and labor availability and cost, which vary according to local labor markets.
- According to USDOT port statistics for 2018, Philadelphia ranks 25th among U.S. ports for overall tonnage and 18th for intermodal containers, while Pittsburgh ranks 13th for dry bulk tonnage.
- Each port is associated with a federally designated Marine Highway. The Marine Highway system serves as an extension of the surface transportation system. Each all-water route is designated to offer relief to landside corridors suffering from traffic congestion, excessive air emissions, or other environmental challenges. The navigable inland waterways require significant capital investment and maintenance. Locks and dams enable vessels to traverse inland waterways. Dredging is necessary to maintain inland and coastal channel widths and depths for commercial navigation. The U.S. Army Corps of Engineers (USACE) is responsible for maintaining waterway access and its associated infrastructure. The U.S. Marine Highway system is illustrated in Figure 11.
- The Philadelphia Regional Port Authority, also known as PhilaPort, was established as an independent agency of the Commonwealth to oversee the strategic planning and development of the port district along the Delaware River in Pennsylvania. This port district encompasses approximately 3,500 acres of federal, state, and privately owned properties across Delaware, Philadelphia, and Bucks counties that are served by 56 miles of navigable waterway.
- PhilaPort and its facilities compete with 12 ocean ports along the Northeast Corridor. Notably, PhilaPort is the number-one fruit gateway in the U.S., and one of the leading entry points in North America for meat and dairy products. It has nearby access to I-95 and I-76/PA Turnpike and is served by four railroads, making it directly accessible to more major cities by rail and truck than any other port in the United States. Waterside, it is served by Marine Highway M-95, which parallels the east coast of the United States from Maine to Florida.
- The shipping channel of the Delaware River has been deepened to 45 feet. The channel depth, bridge heights, and passage width represent the limiting constraints for vessel size at the Port of Philadelphia.
- One factor in the growth of container traffic handled at the Port of Philadelphia has been the Pennsylvania Intermodal Cargo Growth Incentive Program (PICGIP). Originally established in 2015, it provided shippers a financial incentive to transport containerized cargo through Pennsylvania ports. The program was originally scheduled to terminate in June 2020 but was extended through June 2022.

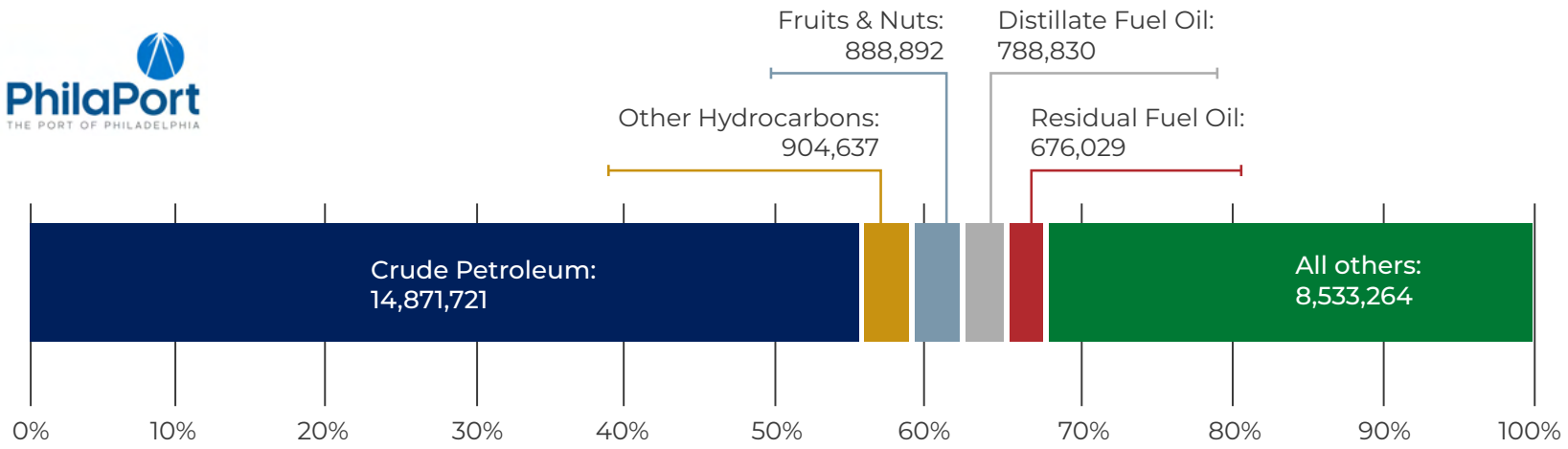
Figure 11: U.S. Marine Highway Routes and Port Terminals



Source: U.S. DOT; PennDOT Bureau of Rail, Freight, Ports, and Waterways; PhilaPort; and Southwestern Pennsylvania Commission

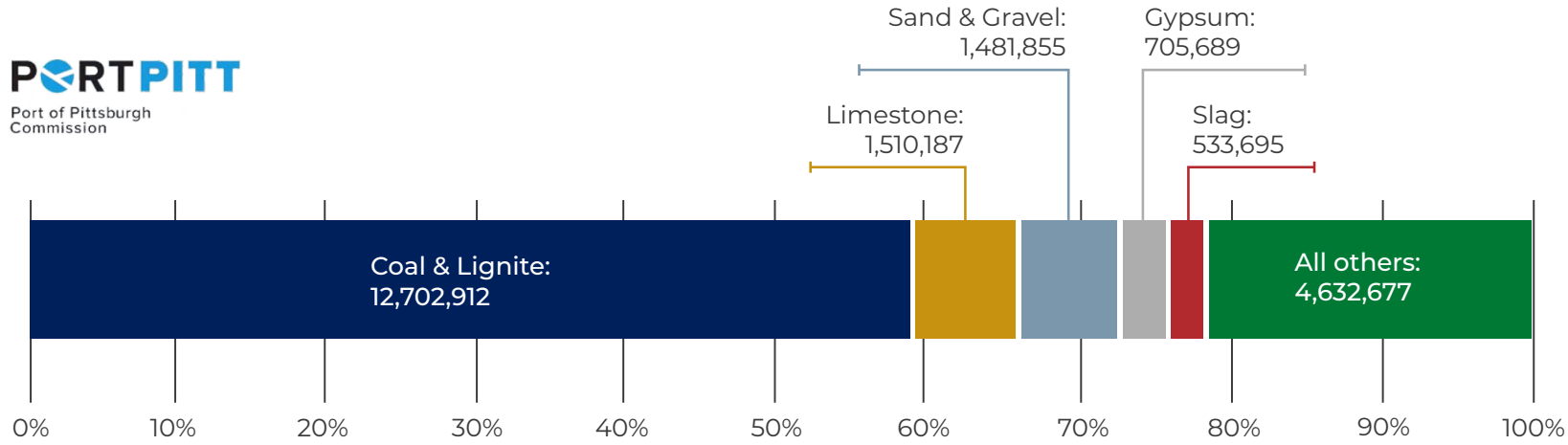
- The top commodities handled at the Port of Philadelphia are illustrated in Figure 12.
- The Port of Pittsburgh is a river-traffic district spanning approximately 200 miles of navigable waterways in 12 counties in southwestern Pennsylvania. The Port of Pittsburgh Commission promotes use and landside development of the waterway, as well as the intermodal transportation system throughout southwestern Pennsylvania. The port district consists of barge industry suppliers and more than 200 intermodal and transloading terminals and processing facilities, including 20 major river terminals with cranes supporting between 50 and 150 tons. Many of the facilities within the port district serve specific industries, including timber, metals, chemicals, and energy.
- There are numerous waterfront industrial sites along the Monongahela, Ohio and Allegheny rivers that represent potential freight-oriented redevelopment opportunities. On the Monongahela River, these sites extend south into West Virginia.
- The Port of Pittsburgh district is served by the CSX and Norfolk Southern railroads, including on-dock rail service at multiple terminals, and four Interstate highways—I-79, I-76/PA Turnpike, I-70, and I-80 —extending and expanding cargo transport options. The Port of Pittsburgh is the eastern terminus of Marine Highway M-70, which extends from Kansas City and connects with both the Mississippi River and the Intracoastal Waterway, providing access to domestic and foreign markets.
- The top commodities handled at the Port of Pittsburgh are illustrated in Figure 13.
- PhilaPort has experienced a period of growth that reflects the overall growth of global maritime trade in recent decades. The Port of Pittsburgh is well-positioned at the easternmost end of the M-70 Marine Highway and provides access to many industrial properties along the Ohio, Allegheny, and Monongahela rivers. However, the Port of Pittsburgh faces challenges including a decline in coal traffic and a system of aging locks and dams along the entire Mississippi–Ohio River System.
- The Port of Erie is located on the southeast shore of Lake Erie in a natural bay sheltered by the Presque Isle peninsula. The port provides industries in northwestern Pennsylvania with intermodal access to Mid-Atlantic, Mid-West, and Canadian markets across the Great Lakes region, as well as to international markets via Lake Ontario and the St. Lawrence Seaway. A port-owned rail spur connects the dock face and shipyard to the CSX mainline about a half-mile from shore. The Bayfront Parkway provides roadway connections to I-79 and I-90.
- The Port of Erie is managed by the Erie-Western Pennsylvania Port Authority (EWPPA), which owns, operates, plans, and develops facilities and projects for the port. The commercial shipping and industrial activity at the Port of Erie is only one component of a larger set of assets and land uses at the port, including retail, office, institutional, and recreational properties, as well as protected open space.
- In 2019, Erie handled an annual tonnage of approximately 695,000 tons. Much of the cargo consisted of aggregates (primarily construction and road salt materials), as well as inbound or outbound manufactured machinery such as generators for the Pennsylvania Shell ethylene cracker plant in Beaver County, along with specialized international cargoes (e.g., windmill parts).
- USDOT commodity flow data include domestic freight movement by mode. As measured in tonnage, the top commodities transported by water to Pennsylvania from domestic origins include coal, crude petroleum, gasoline, gravel, and coal (not elsewhere classified). The top commodities transported by water from Pennsylvania to domestic destinations include crude petroleum, coal, fuel oils, gasoline, and gravel. A full set of commodity tables for domestic waterborne transportation is shown in Appendix 10: PA Water Commodity Tables (Domestic Only).

Figure 12: Top 5 Commodities, PhilaPort, 2018



Source: U.S. Department of Transportation, Bureau of Transportation Statistics (2018). Units are measured in short tons.

Figure 13: Top 5 Commodities, Port of Pittsburgh, 2018



Source: U.S. Department of Transportation, Bureau of Transportation Statistics (2018). Units are measured in short tons.

Planning Implications

- Pennsylvania's water ports are major economic generators. Freight planning at the state and regional levels must focus on ways to support the efficiency and effectiveness of our water ports. This includes roadway connections and other investments that help to keep the ports competitive.
- Recent infrastructure investments under PhilaPort's Port Development Plan (2016), including new warehouses, cranes, and floodplain mitigation, have been made toward a goal of doubling container and automobile processing capacity, and increasing breakbulk volume by more than 20 percent. Yet fixed barriers, such as the Ben Franklin Bridge (limiting air draft to 135 feet), and I-95 and Amtrak rail lines (limiting landside accessibility), impact port accessibility and efficiency.
- At PhilaPort, a portion of fruit and cocoa bean cargo has transitioned from breakbulk to container, shifting the need and location of appropriate terminal and storage facilities.
- Due to its location at the eastern reaches of the Mississippi River system, port district operations at the Port of Pittsburgh area are heavily impacted by lock and dam closures downstream to address maintenance and repairs. The downstream locks and dams outside Pennsylvania represent the bottlenecks in the inland waterway system. Automated locks in Pittsburgh will be tested to increase goods movement while decreasing the cost of operations.
- Container-on-barge is a growing national trend as containers are easily transferred to truck or rail for final delivery. This has implications for the ports in both Philadelphia and Pittsburgh, as facilities and equipment used for containerized cargo movement are eligible for funding under the U.S. Marine Highway program for marine highways M-95 and M-70, respectively.
- The EWPPA Master Development and Facilities Plan (2018) established goals and objectives for maintaining and expanding facilities at the Port of Erie for industrial use and freight transportation. These include:
    - Repair/replacement of failing seawalls
    - Maintenance/expansion of wharfs for large vessel shipping and cargo conveyance
    - Maintenance/enhancement of rail and road connectivity to commercial vessel docks
    - Providing opportunities for smaller, specialized industrial/ manufacturing operations
- Waterfront land ownership is a key factor for port activity, while connectivity to inland facilities influences operational efficiency for cargo distribution. Land use and development opportunities at all three Pennsylvania ports are important considerations for expanding their operations and providing for potential expansion opportunities.
- Multimodal transportation access and intermodal connections to port facilities are critical elements of an efficient, environmentally sound freight transportation system. Improvements to first-mile/last-mile truck access to waterfront properties and on-dock rail capabilities should be encouraged, and promoted where feasible. The USDOT and the Maritime Administration outlined a policy framework for improving the maritime transportation system in Goals and Objectives for a Stronger Maritime Nation: A Report to Congress (February 2020). The policy framework establishes that maritime transportation is essential to national security and economic prosperity, and requires workforce, infrastructure, and industry innovations to serve the nation's interests.
- Technology presents opportunities for port and waterway efficiency and reliability that can reduce risk in the supply chain from source to consumer. From an operations perspective, automated/semi-automated, robotic, and electrified vessels, terminals, as well as landside facilities can improve overall throughput and efficiency. Additionally, information technology can enable automated appointment scheduling at terminals to expedite truck movements/turn-around times, thus updating changes in schedule to reduce downstream impacts. Technology can also monitor infrastructure conditions, with results anticipating and informing capital project needs.

Barge transportation can relieve highway congestion by using the natural resource of our river system.

ONE BARGE
1,750 TON
58,333 BUSHELS
1,555,000 GALLONS

ONE 15-BARGE TOW
26,250 TON
874,995 BUSHELS
23,325,000 GALLONS

ONE RAIL CAR
110 TON
4,000 BUSHELS
33,870 GALLONS

ONE 108-CAR TRAIN
11,880 TON
432,000 BUSHELS
3,657,960 GALLONS

ONE LARGE SEMI
25 TON
910 BUSHELS
7,865 GALLONS

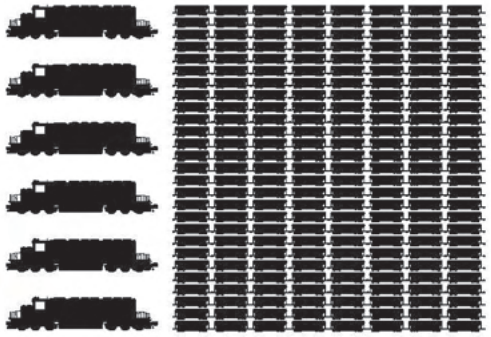
EQUIVALENT UNITS

ONE BARGE

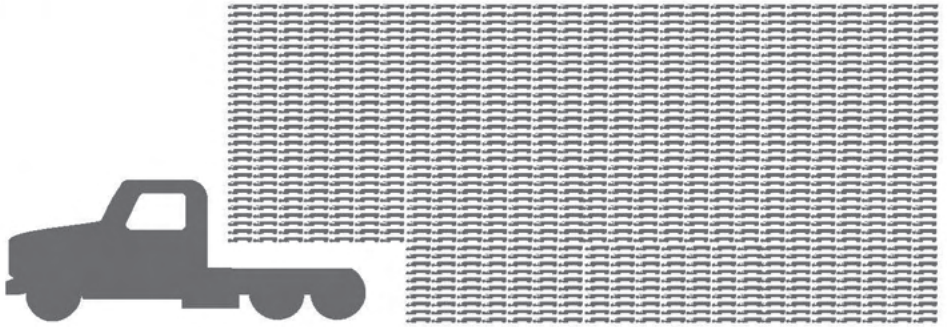
16 RAIL CARS

70 LARGE SEMIS / TRACTOR TRAILERS

ONE 15-BARGE TOW AND TOW BOAT



6 LOCOMOTIVES & 216 RAIL CARS



1,050 LARGE SEMIS / TRACTOR TRAILERS

EQUIVALENT LENGTHS

ONE 15-BARGE TOW
0.25 MILE

TWO 108-CAR TRAINS
2.6 MILES

1,050 LARGE SEMIS / TRACTOR TRAILERS
14.9 MILES (BUMPER TO BUMPER)

WATERWAYS COUNCIL, INC.

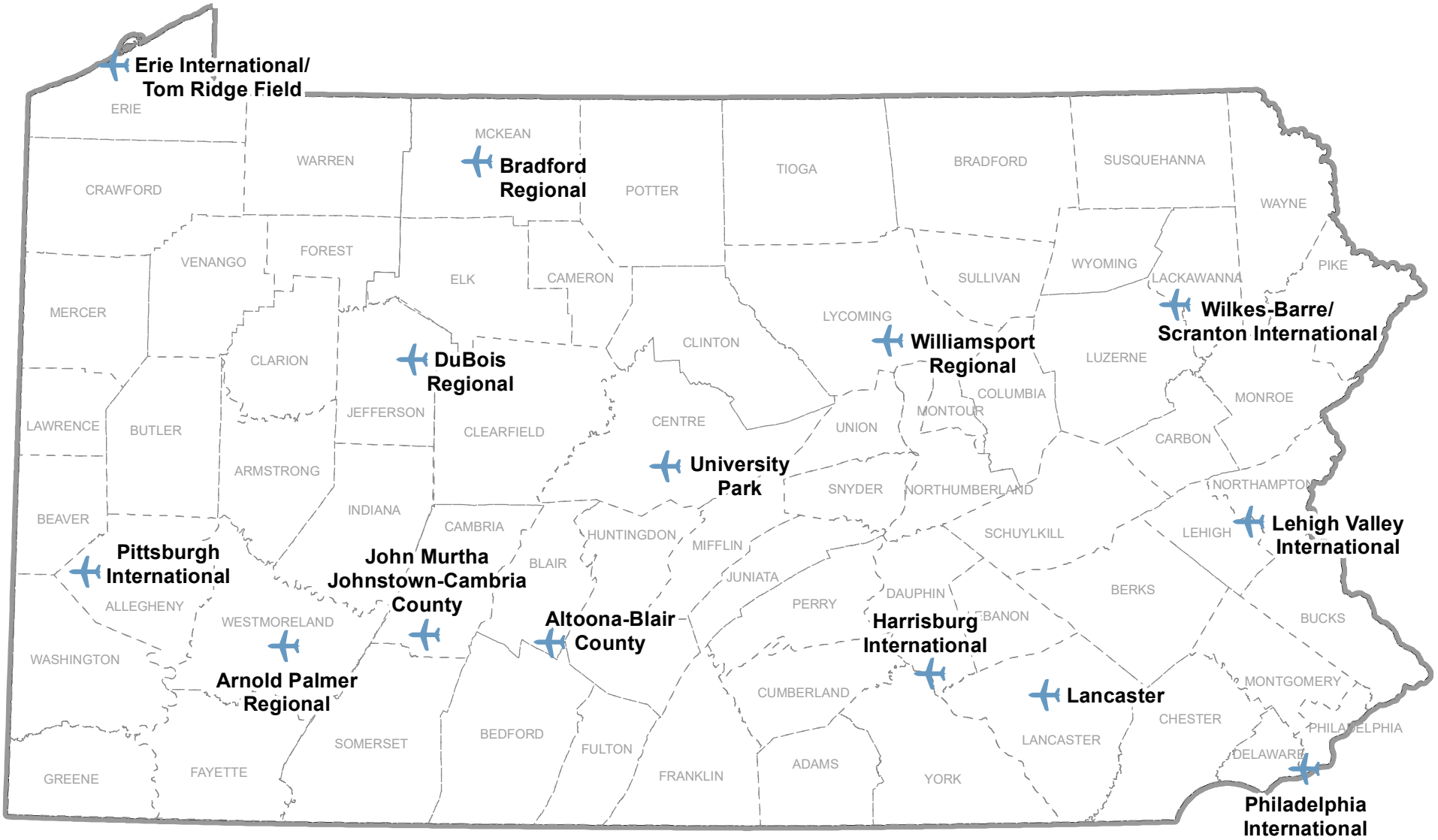
WCI@waterwayscouncil.org | WWW.WATERWAYSCOUNCIL.ORG
202.765.2166 (DC Office) • 314.422.2268 (Midwest Office)

Air Cargo

Trends & Issues

- Pennsylvania is home to more than 650 aviation facilities, including 123 licensed public-use airports, 230 private-use airports, and 282 private-use heliports. Several small airports serving rural areas, including those in Altoona, Bradford, DuBois, Franklin, Johnstown, and Lancaster, are classified as Essential Air Service (EAS) airports, with federally subsidized connections to larger airports.
- Fourteen of these facilities are designated as "commercial service airports" under 49 U.S.C. 47102 (7), which means they have regularly scheduled service and a minimum of 2,500 passenger boardings per year. Most air cargo in Pennsylvania is handled at these commercial service airports. Pennsylvania's commercial service airports are mapped in Figure 14.
- Air transportation is the fastest mode for moving freight, but is also the most costly. Therefore, it is generally used to transport lower-weight, time-sensitive, and high-value cargoes over long distances.
- Key industries that rely on air transportation for goods movement include technology/biotechnology, pharmaceuticals, and overnight parcel delivery.
- Air cargo hubs are typically located in major metropolitan areas with access to aviation facilities with sufficient capacity to handle large cargo aircraft, a large population base for customers and employees, and access to nearby industrial properties for cargo-handling capacity. According to the 2019 Interim Aviation Economic Impact Study, Pennsylvania's commercial and general aviation airports provide an annual economic impact of $28.5 billion to the state (including passenger and freight activity). The state's 15 commercial airports generate approximately $26.7 billion of this amount, with Philadelphia and Pittsburgh International Airports contributing 62.0 percent and 26.2 percent of the latter figure, respectively.
- One of the trends in air cargo transportation has been a gradual migration of many types of cargo delivery from dedicated air freighters to belly cargo holds in passenger aircraft. Consequently, the air cargo industry in North America has gradually dispersed from a small number of hubs to a wider array of airports that also handle large passenger volumes.
- Data from the USDOT Bureau of Transportation Statistics (BTS) show that air cargo demand in the U.S. increased by about 40 percent from 2009 to 2019. In 2020, domestic air cargo demand grew while international demand was much lower due to COVID-19. More than 78 percent of the air cargo volume handled in the U.S. is international cargo.
- Boeing's World Air Cargo Forecast, 2018-2037, projects an average 2.3 percent growth rate in air cargo during the next 10- and 20-year forecast periods based on recent increases in industrial production. The same report calls out a range of market, public policy, and regulatory issues that influence the future of air cargo markets, including modal competition, environmental regulations, globalization, national development programs, inventory management techniques, and new air-eligible commodities.
- Philadelphia International Airport (PHL) could face major operational constraints in the future due to crowded airspace. The introduction of larger passenger aircraft may result in the consolidation of flight schedules and help alleviate some of this pressure. Strengthening the role of reliever general aviation (GA) airports in Southeastern Pennsylvania will help reduce congestion in and around the PHL airspace and minimize delays for non-commercial activity.
- Drone technology represents a major potential opportunity for transformational development in cargo deliveries. Rapid advances in technology have been offset by the complexity of regulatory hurdles for widespread deployment of this technology. The most promising opportunities in this area are likely to be in the delivery of specialized, time-sensitive, lightweight cargoes in areas where operations can be carried out in controlled environments with limited safety and privacy concerns.

Figure 14: Commercial Public-Use Airports



Use Classification

Commercial Aviation/Paved Runways

Source: U.S. DOT Open Data

Planning Implications

- Intermodal connectivity—particularly highway/truck access—is essential for air cargo. Air cargo facilities rarely handle freight that is moved to or from an origin or destination in the immediate vicinity of an airport; most travels longer distances by a different mode.
- Public- and private-sector stakeholders involved in the FMP outreach process indicated that a lack of uniform data across different types of airports is a potential problem, particularly for small airports that do not have their data reported in national resources. This makes it difficult for airport managers and public officials to identify and respond to changing trends.
- Overnight carriers such as FedEx and UPS are the main form of air cargo activity at small airports, but there may be great potential at these airports for economic development related to specialized cargoes in the technology, pharmaceutical, and biomedical industries.
- The potential application of drone deliveries presents unique challenges in terms of public safety and aviation regulation. There is minimal legislation at the state level dealing with drones. Any state regulations must complement the ongoing updates to federal drone regulations.
- Links between air cargo and economic development are critical. Tying infrastructure improvements and enhanced air cargo amenities to industrial recruitment is a sound approach to collaborative land use and transportation planning.
- Opportunity exists for greater involvement of airports in regional planning with MPOs/RPOs and PennDOT Districts. This tie is generally not as strong as with other modes such as public transportation.

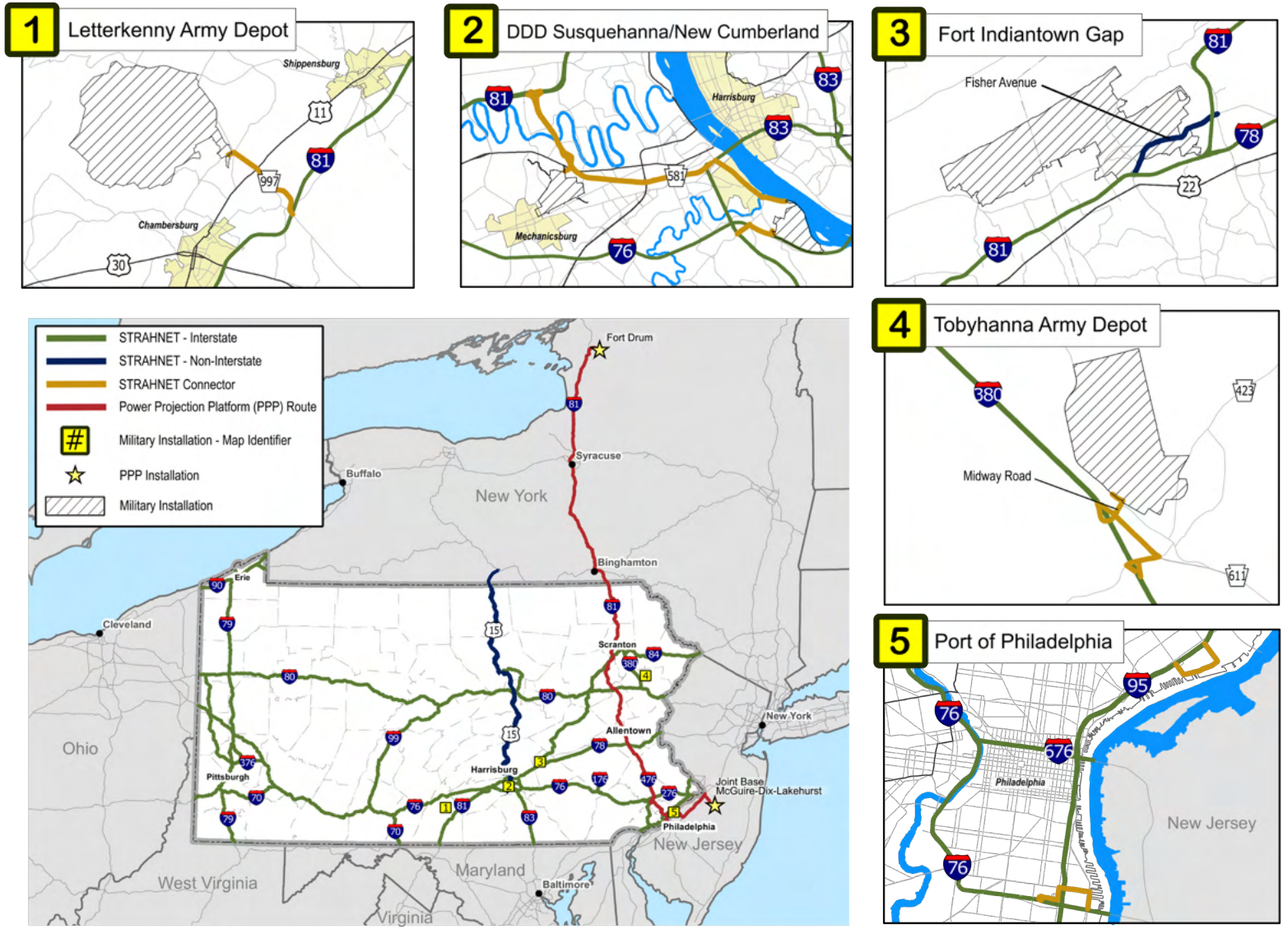
Harrisburg International Airport

Consideration of Military Freight

- U.S. military needs on the civilian transportation network are established through the United States Transportation Command (USTRANSCOM), a unified combatant command which provides support to other U.S. combatant commands, the military services, defense agencies and other government organizations.
- USTRANSCOM has established two primary national transportation route networks that serve as strategic assets for the U.S. Department of Defense. These include the Strategic Highway Network (STRAHNET) and the Strategic Rail Corridor Network (STRACNET).
- The STRAHNET, originally established in 1956, is a nationwide system of about 62,400 miles of highways, including the Interstate System, plus an additional 1,800 miles of STRAHNET Connectors that link military installations, marine ports, and airports.
- The STRACNET is a network of civil railroad lines and connectors that are designated to meet minimum U.S. Department of Defense requirements for defense readiness. The STRACNET was established in 1993 and has undergone review and revisions at five-year intervals since then.
- The U.S. Department of Defense has identified five military installations in Pennsylvania as key facilities. These include:
    1. Defense Distribution Depot (DDD) New Cumberland (includes DDD Susquehanna in Mechanicsburg) in Cumberland and York Counties
    2. Tobyhanna Army Depot in Monroe County
    3. Fort Indiantown Gap in Dauphin and Lebanon County
    4. Letterkenny Army Depot in Franklin County
    5. Port of Philadelphia
- In Pennsylvania, the sole non-Interstate STRAHNET route is US 15 from I-81 in Cumberland County to the New York State line. The STRAHNET and Connectors in Pennsylvania are shown in Figure 15.
- Pennsylvania's STRACNET routes include railroad mainlines and designated connector routes (Figure 16).
- U.S. Military Power Projection Platforms (PPPs) are facilities that serve a strategic purpose in deploying one or more active or high-priority reserve units. Roadways between PPP installations and designated airfields and marine ports of embarkation are designated as PPP Routes. These routes are a subset of the STRAHNET system.
- U.S. Department of Defense mission requirements call for "ensuring PPP Routes are maintained at a capable design, performance, and condition standard to support national emergency deployments."[5]
- The PPP routes within Pennsylvania provide access to the Port of Philadelphia from two military installations in the Northeastern U.S.: Fort Drum in upstate New York and Joint Base McGuire-Dix-Lakehurst in central New Jersey (Figure 15).

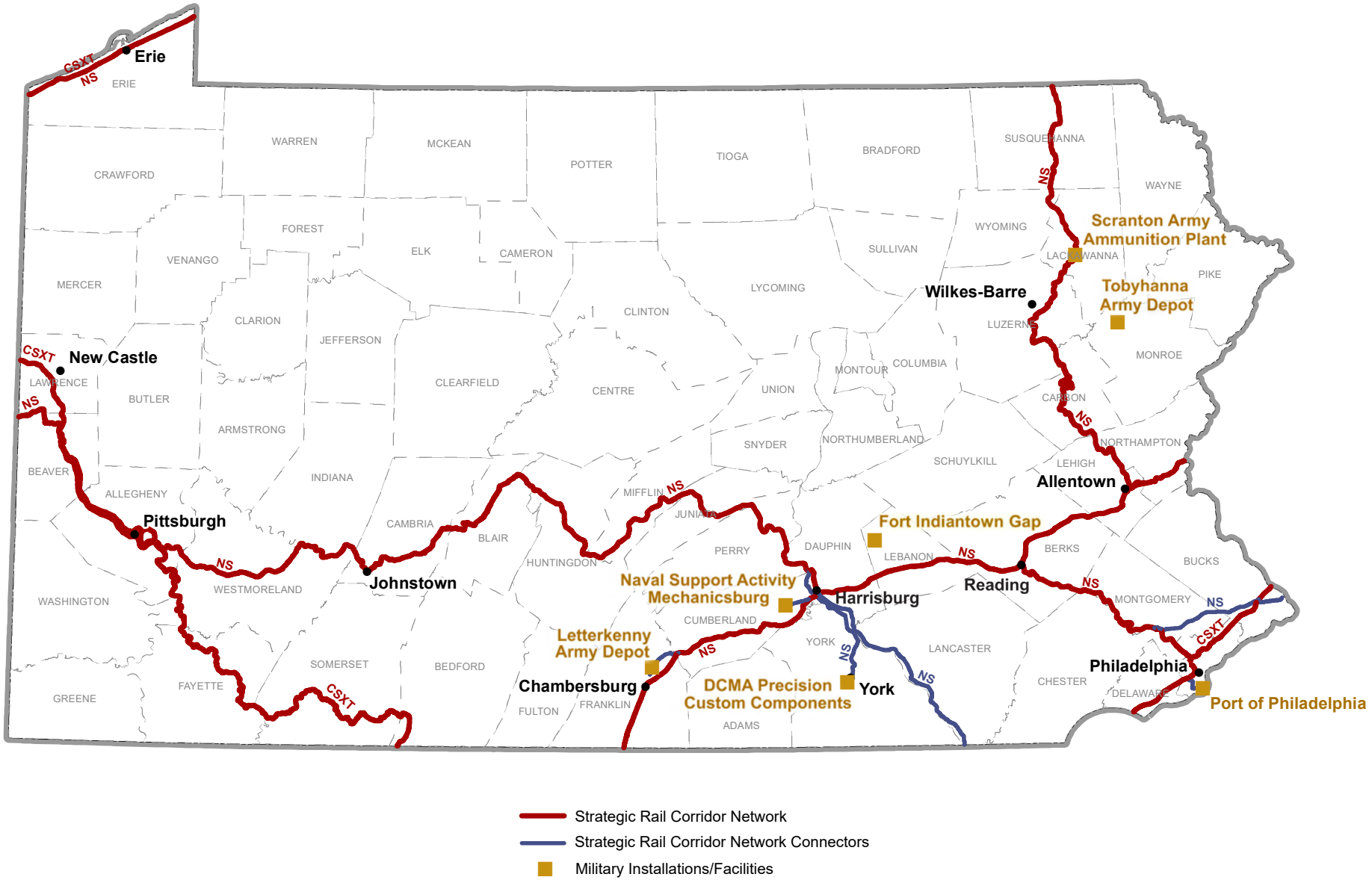
[5] U.S. Military Surface Deployment and Distribution Command, Transportation Engineering Agency, PPP Route Designations (5/11/2022)

Figure 15: Pennsylvania Strategic Highway Network (STRAHNET) and Power Projection Platform Routes



Source: Military Surface Deployment and Distribution Command – Transportation Engineering Agency

Figure 16: Pennsylvania Strategic Rail Corridor Network (STRACNET)



Source: Federal Railroad Administration

Critical Urban & Rural Freight Corridors

Trends & Issues

- The federal requirements and parameters for designating critical urban freight corridors (CUFCs) and critical rural freight corridors (CRFCs) in each state were established shortly after the completion of PA On Track in 2016.
- PennDOT developed a detailed methodology for evaluating roadway segments across the state and prioritizing them for potential certification as CUFCs and CRFCs. This evaluation process included a wide range of criteria, such as freight tonnage, truck volumes, truck vehicle-miles traveled, proximity to major freight generators and intermodal facilities, weight restrictions, truck bottleneck locations, and others.
- PennDOT designated a listing of proposed CUFCs and CRFCs, which FHWA certified in February 2019. The lists of the critical urban and rural freight corridors are included as Appendix 11 and mapped in Figure 2.

Planning Implications

- The PennDOT evaluation criteria used to develop the current list of CUFCs and CRFCs was a cohesive approach to identifying freight transportation infrastructure needs in the context of freight-related land use characteristics.
- This evaluation process can be refined and expanded to incorporate a larger freight network in Pennsylvania that goes beyond the critical freight corridors identified in the FAST Act requirements.
- The aggregate lengths of the CUFC and CRFC segments listed in Appendix 11 are established under the FAST Act and its accompanying USDOT guidance, and may be revised over time. PennDOT should be prepared to implement its refined methodology to meet future changes in federal requirements for freight corridors with special designations such as these CUFCs and CRFCs.

PA 120 in Cameron County

Pipelines

Trends & Issues

- Pennsylvania ranks second to Texas among U.S. states in estimated natural gas reserves and natural gas production. These reserves grew dramatically after 2010 as a result of extensive natural gas development across the Marcellus Shale region.
- A July 2021 study published by the American Petroleum Institute (API) indicates that oil and natural gas extraction in Pennsylvania directly and indirectly supports 9.7 percent of the state's GDP, and 6.1 percent of the state's employment.
- Pennsylvania has an extensive network of more than 90,000 miles of gas pipelines organized under the following categories[6]
  - 48,700 miles of distribution main lines[7]
  - 30,500 miles of distribution service lines
  - 10,500 miles of transmission pipelines[8]
  - 750 miles of gas gathering lines
- The state is also served by more than 4,100 miles of liquid pipelines for the following commodities:
  - 2,400 miles for refined petroleum products
  - 1,700 miles for highly volatile, flammable and toxic liquids
  - 40 miles for crude oil
- The gas distribution pipeline network in Pennsylvania has grown by approximately 8.5 percent between 2010 and 2020. The gas transmission pipeline network has grown by about 5.4 percent over that same period.
- As measured by tonnage, the top originating states for commodities transported by pipeline to Pennsylvania are West Virginia, New York, Delaware, New Jersey, and Louisiana.[9]
- The top destination states for commodities transported by pipeline from Pennsylvania are New Jersey, New York, Maryland, Ohio, and West Virginia.

Planning Implications

- Pipelines are generally considered the safest and most cost-effective means of transporting bulk liquid and gas commodities over long distances.
- Natural gas extraction and processing will continue to play a major role in Pennsylvania's economy, driven by natural gas development from the Marcellus and Utica Shale deposits.
- While gas plays a major role in the state's economy, it is less likely to be economically viable when stricter regulations regarding greenhouse gas emissions are enacted.
- Secondary industrial development tied to Pennsylvania's natural gas resources may drive strong economic growth in the state's old manufacturing centers. The Shell Polymers ethylene cracker plant nearing completion in Beaver County is one example of a modern, state-of-the-art manufacturing facility for the secondary processing of raw oil and gas resources.
- Manufacturing sites and transload terminals for materials transported by pipeline should be considered in identifying future surface transportation needs for freight movement.

[6] All pipeline statistics obtained from the U.S. Department of Transportation, Pipelines and Hazardous Materials Administration, Annual Report Summary (2020).

[7] Distribution pipelines are low-pressure lines that serve individual homes and businesses.

[8] Transmission pipelines are large, high-pressure lines that transport gas over long distances.

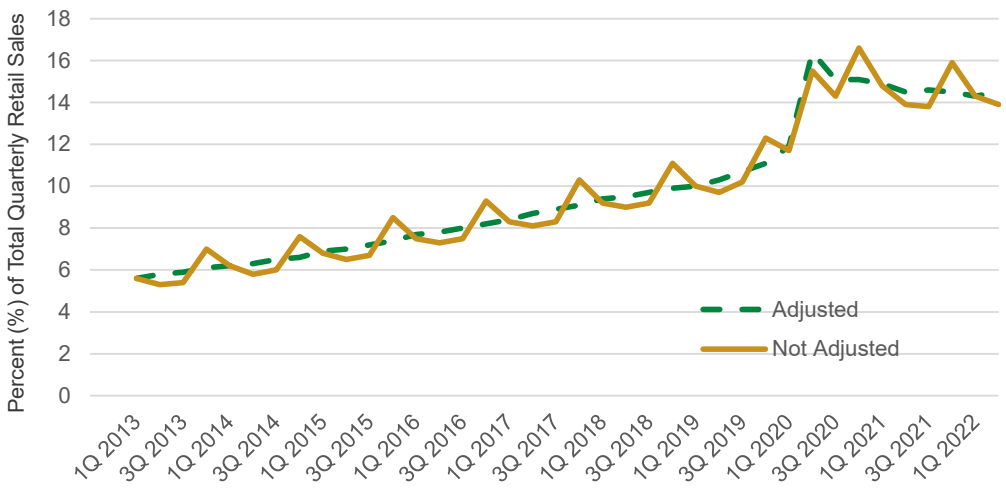
[9] USDOT Freight Analysis Framework (FAF) version 5.1

Impacts of e-Commerce on Freight Infrastructure

Trends & Issues

- E-commerce has steadily grown as a share of all sales (Figure 17). National e-commerce sales have started to show slight decline since early 2020, when the COVID-19 pandemic began. At the start of 2020, e-commerce sales reached a 16 percent share of quarterly retail sales nationwide (adjusted for seasonal variation). Preliminary data show that this share has declined to nearly 14 percent in the first quarter of 2022.
- Pennsylvania's e-commerce operations and employment are concentrated in and around the state's urbanized areas. In addition to the freight and delivery-related trips that e-commerce development generates, the state's highway infrastructure must be able to accommodate employment trips as facilities grow and expand to meet demand. Employment related to e-commerce is largely centered on the state's Interstate system, particularly I-78 and I-81 (Figure 18).

Figure 17: E-Commerce as a Share of Total, US Retail Sales

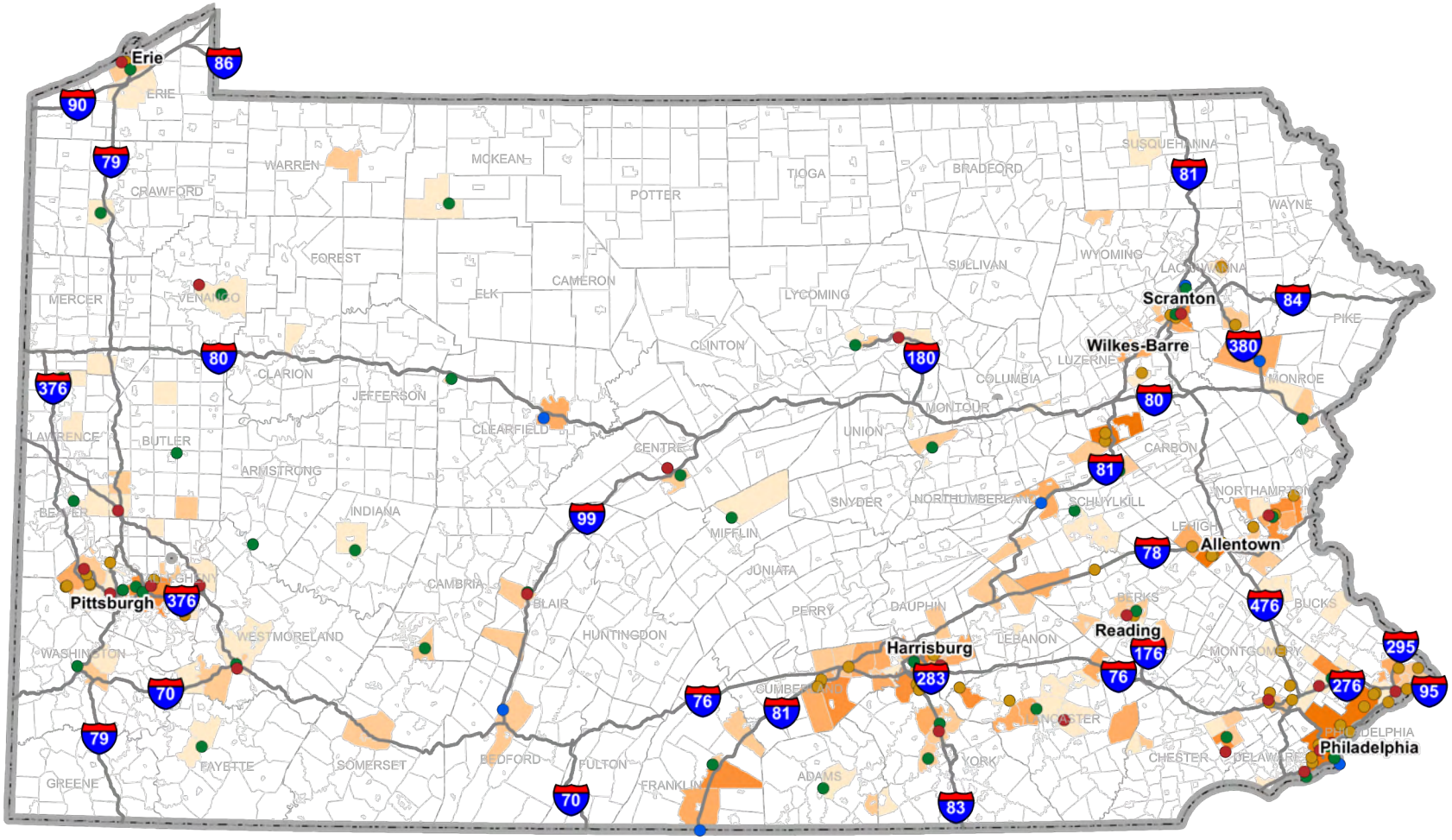


Source: US Census Bureau - Retail Indicators Branch

Planning Implications

- As the e-commerce sector and supply chains continue to change and evolve, Pennsylvania's cities and communities will need to address the implications to land use and curb management. Some of the state's urban areas have already taken steps to plan for and address downtown deliveries:
  - The Delaware Valley Regional Planning Commission (DVRPC)'s Office of Freight and Aviation Planning developed the Philadelphia Delivery Handbook in 2017. The handbook provides a framework to "foster a delivery-friendly city where deliveries are executed in ways that are equally as conducive and sensitive to business interests as they are to individual communities."
  - As part of its 2016 Regional Freight Plan, the Southwestern Pennsylvania Commission (SPC) MPO includes urban freight delivery studies as one of its action strategies under the plan's "Highway Freight System Operations and Maintenance" objective.
  - Additionally, the City of Pittsburgh developed a plan for the neighborhood of Oakland – one of the city's major cultural centers, which includes freight operations as a goal and curbside management as a policy. One of the resulting products of the plan was a curbside management toolkit. https://engage.pittsburghpa.gov/oakland/strategy-curbside-management-toolkit
- PennDOT and its fellow state agencies can coordinate with its regional and local partners to ensure aging infrastructure is able to keep up with the demands of a growing industry, while balancing the needs of local residents and businesses.

Figure 18: E-commerce Employment and Locations of Major Logistics Firms, 2018



The growth of e-commerce has resulted in changes in truck operations that will likely accelerate over time, with more frequent trips in smaller trucks and vans.

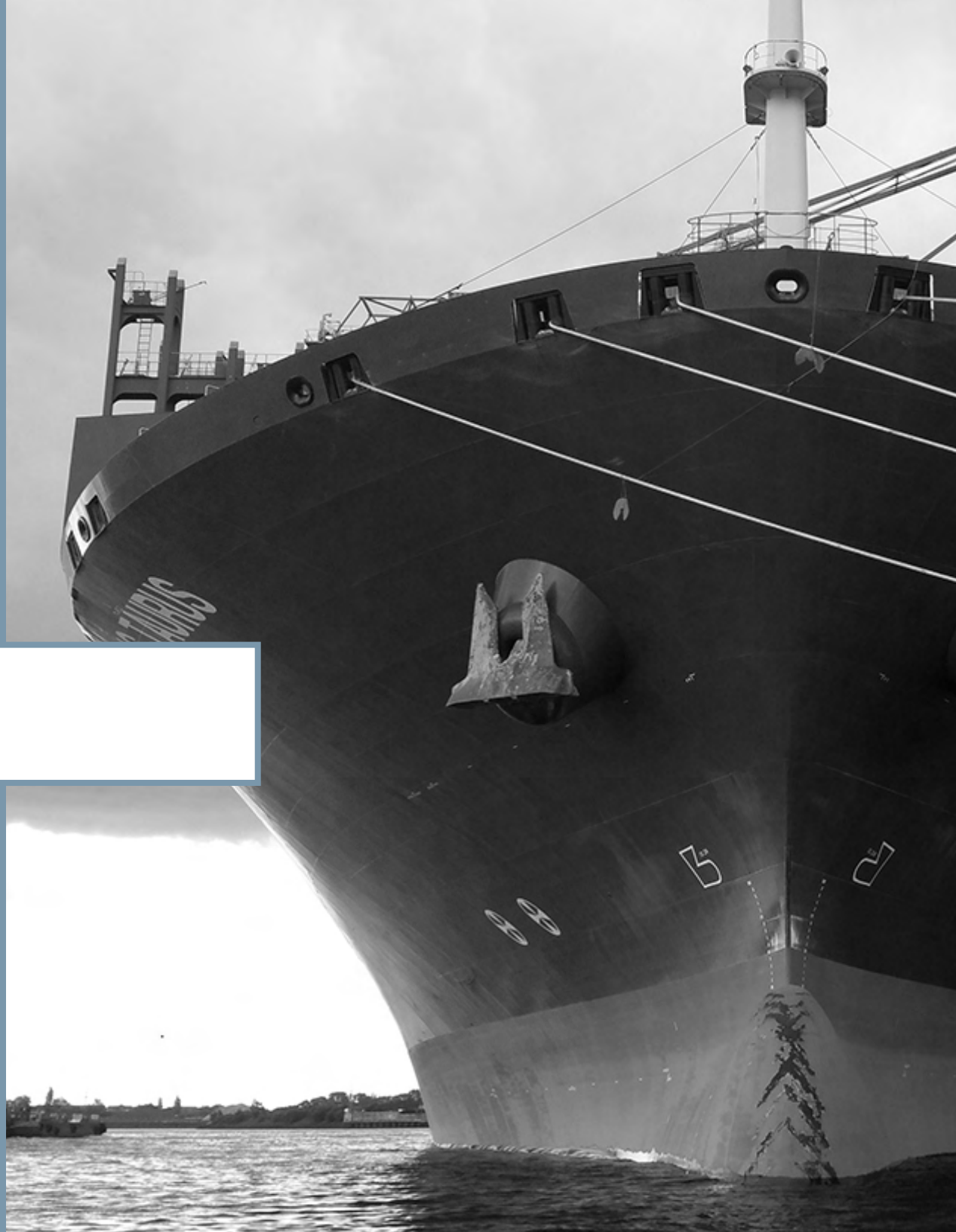
Source: Pennsylvania Department of Labor and Industry, MWPVL International, FedEx, UPS

Strategic Directions: Where We Need to Be

SECTION CONTENTS

Introduction

Goals and Objectives



Introduction

Establishing strategic directions in a planning process is about defining a desired future and determining how to achieve that future. What are the characteristics of the transportation system Pennsylvania needs now and in 20 years? How can limited resources best be directed to achieve that future system?

Goals and Objectives

Goal statements, listed in Figure 19 and described on the following pages, convey various facets of that envisioned future. They are developed to align with national planning priorities and requirements, while also reflecting top concerns expressed by regional planning partners, local governments, and the general public.

Objectives are more specific, defining what needs to be done to make progress under each goal area. They consider the starting point (existing conditions) as well as current trends and opportunities.

Together, the FMP's goals and objectives set a course for PennDOT and its partner agencies.

Land Use
Align freight mobility with economic development and land use.

Mobility
Advance project investments that enhance freight mobility.

Analytical Tools & Processes
Provide planning, data and analytical tools for improved decision-making and collaboration with freight stakeholders.

Operations / Safety
Improve multimodal freight transportation operations and safety.

Environmental Stewardship
Reduce, avoid and/or mitigate adverse environmental impacts from Pennsylvania's freight transportation system, and plan for environmental impacts to freight movement.

GOAL A

LAND USE

Align freight mobility with economic development and land use.

Freight-intensive land uses are directly linked to the growing demands on Pennsylvania's transportation infrastructure. Major generators of freight transportation demand include manufacturing facilities, warehousing/ distribution centers, ports, intermodal terminals, and air cargo facilities. In addition, resource-related industry sectors such as energy, mining, and agriculture are an integral part of the state's economy, and support a global customer base.

Aligning transportation infrastructure investment with freight-oriented economic development and land use planning is an effective way to ensure that infrastructure costs correlate closely with the economic benefits of these investments. This goal is intended to establish and enhance a process in which economic benefits of various industries are measured, and industries that provide substantial benefits in terms of employment, contributions to gross regional product (GRP), tax revenues, supply chain relationships to other Pennsylvania industries, and links to national and global transportation assets become an integral part of decision-making for transportation infrastructure investments (Figure 13).

Further, there is the need to coordinate transportation and land use in the best interest of communities, PennDOT, and others. This more proactive approach has great potential for more orderly development and cost savings, and presents an opportunity to coordinate with other federal and state agencies to promote brownfield redevelopment opportunities in Pennsylvania's legacy industrial areas.

Land Use Objectives

A-1 Establish a core Pennsylvania highway freight network based on a refined methodology for identifying critical urban and rural freight corridors.

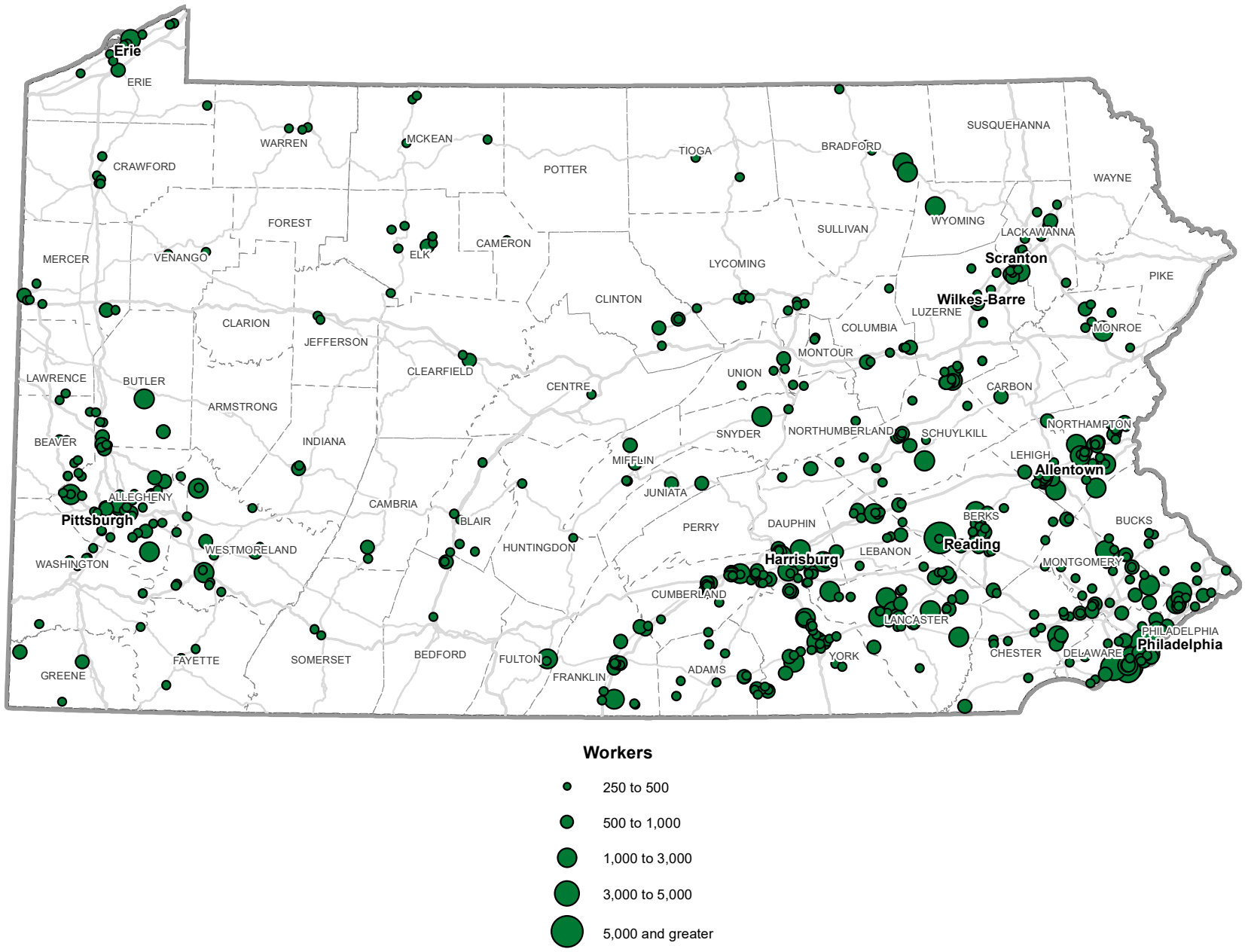
A-2 Establish statewide standards to measure benefits and costs of freight-oriented industrial development.

A-3 Collaborate with other organizations to assemble recommended industrial site development standards/ ordinances.

Related Progress and Performance Measures

- Complete the formal development of a Core Pennsylvania Highway Freight Network.
- Development and implementation of an assessment tool to measure statewide standards of benefits and costs of freight-oriented industrial development.
- Development of industrial site development standards/ordinances.

Figure 19: Freight-Related Employment



Source: DLI, 2018

GOAL B

MOBILITY

Advance project investments that enhance freight mobility.

Long-term forecasts indicate that freight transportation demand will grow substantially in Pennsylvania in the future, driven by population changes (primarily growth in the state's urbanized areas), employment growth, and associated consumer and business demand for products and services. According to Freight Analysis Framework (FAF) forecasts developed by the USDOT, truck and rail freight (measured in tonnage) in Pennsylvania is projected to grow by 51 percent and 36 percent, respectively, between 2018 and 2045. Additionally, the Port of Philadelphia was the fastest-growing container port on the East Coast in 2020 (Figure 20).

This freight transportation activity will take place on an aging transportation system in a mature region where opportunities to expand capacity are limited. Key highway links on the regional roadway network are subject to recurring congestion that add time and cost to truck movements. It will be essential that project investments in transportation infrastructure be focused on assets that provide the most value in terms of capacity utilization and allow the state to meet its freight transportation needs in a manner that is as cost-effective as possible while minimizing environmental impacts.

The overarching goal for the future is for improved freight mobility across multiple transportation modes, with a focus on non-truck transport for long-haul shipments that can be made using more energy-efficient modes such as railroads and waterways. This will require ongoing investment not only in highway, railroad, and marine infrastructure, but in protecting and enhancing access to terminals that are critical to the overall operation of the freight transportation system.

A Freight Investment Plan (FIP) outlining a fiscally constrained program of highway mobility improvements under the National Highway Freight Program (NHFP) and a set of proposed freight rail projects from the 2020 State Rail Plan is included as Appendix 12.

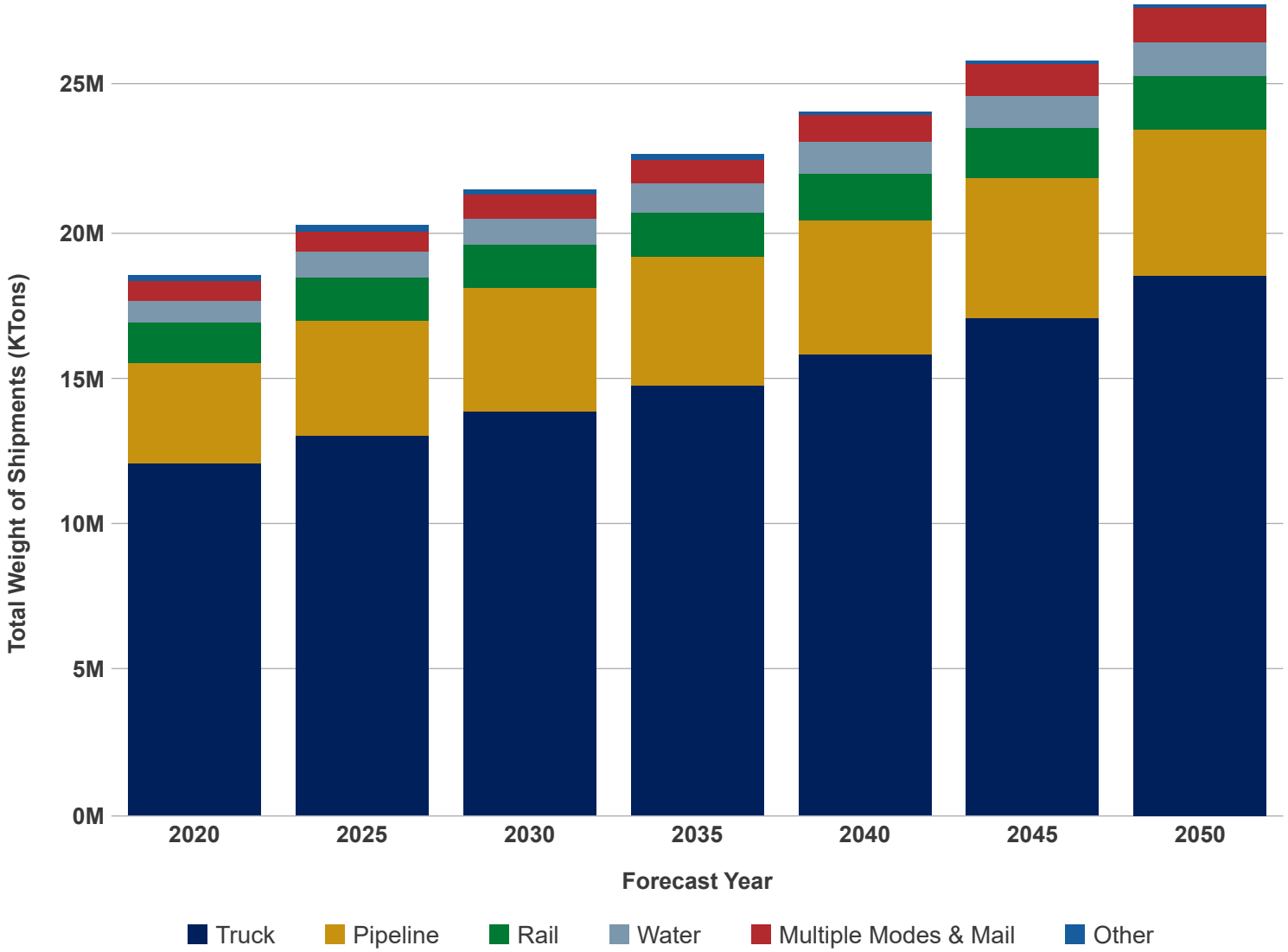
Mobility Objectives

- **B-1** Continue to identify and improve truck bottlenecks.
- **B-2** Preserve and enhance major freight transportation assets, including waterways, railroads, major truck corridors, and intermodal terminals, with the aim of supporting and promoting energy-efficient modes of freight transportation.
- **B-3** Pursue opportunities with public and private stakeholders to expand truck parking capacity.
- **B-4** Expand and diversify the composition of the Freight Work Group (FWG).

Related Progress and Performance Measures

- Reduction in the number and impact of truck bottlenecks.
- Truck parking capacity change over time in areas of demonstrated need.
- Freight Work Group expansion to include private-sector participation.

Figure 20: Total Weight of Shipments Originating in Pennsylvania by Mode and Year



Source: USDOT Freight Analysis Framework (FAF)

GOAL C

ANALYTICAL TOOLS & PROCESSES

Provide planning, data, and analytical tools for improved decision-making and collaboration with freight stakeholders.

Freight activity has been growing faster than passenger travel for many modes of transportation in Pennsylvania and across the U.S. as a whole. It is incumbent upon transportation agencies to expand and enhance their capabilities in understanding freight flows and forecasting future freight demand. Planning for future system needs dictates the need for these capabilities.

This goal is aimed at improving upon the traditional methods of forecasting freight based on a four-step process used for passenger transportation and expanding the performance measures used to assess freight transportation in Pennsylvania under the FAST Act requirements. Passenger transportation forecasting models are based on economic and demographic variables, along with capacity limitations in roadway and transit networks. These methods are generally inadequate for forecasting freight transportation demand, which is linked to a wide range of factors related to complex supply chains, changing manufacturing and distribution processes, and rapidly changing business and consumer demand.

The next five years present the Commonwealth with an opportunity to improve on its freight planning capabilities by building on its existing platform of transportation data and tools. This effort should include several of the key recommendations of the second Strategic Highway Research Program research effort, Freight Demand Modeling and Data Improvement (SHRP2 Report S2-C20-RR-1). These are:

1. the compilation of industry-level freight data at a finer geographic level than the regional and county-level data typically used in freight planning;
2. incorporating local land use policies and controls in the freight forecasting process; and
3. tying freight planning to broader economic trends and supply chain dynamics.

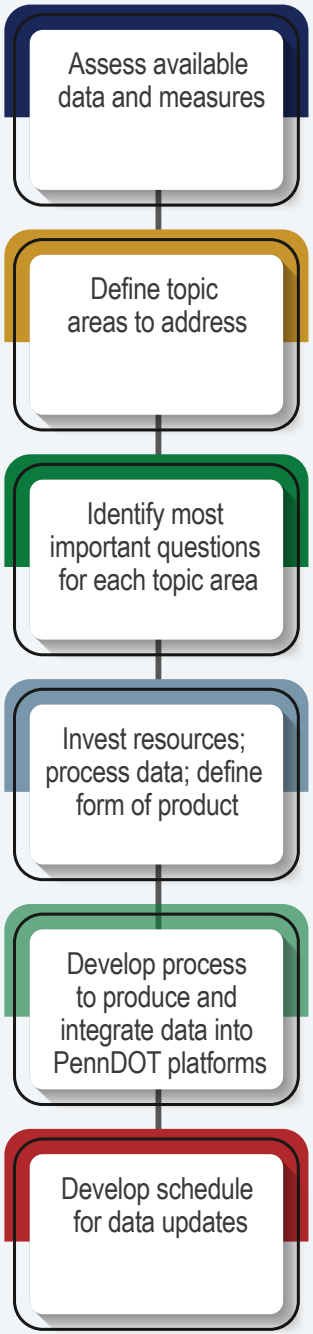
Analytical Tools & Processes Objectives

- C-1 Develop analytical tools, data, and forecasting techniques to measure costs and benefits of freight-related transportation initiatives, programs, and projects.
- C-2 Enhance PennDOT’s technical capabilities in freight planning, forecasting, modeling, and data.
- C-3 Develop and expand PennDOT's data repository for Pennsylvania's freight transportation system.
- C-4 Develop methods to track and evaluate air cargo trends, needs, and intermodal implications.
- C-5 Examine the key topic areas of the TAC Truck Weight Exemptions Study of 2020.
- C-6 Develop expanded freight performance measures for Pennsylvania’s Transportation Performance Report (TPR).

Related Progress and Performance Measures

- Expanded use of freight performance measures, including freight-related emissions in the TPR, over time.
- Freight-related data and tools added to the data repository.

Key Elements of the
PennDOT Data Repository Initiative



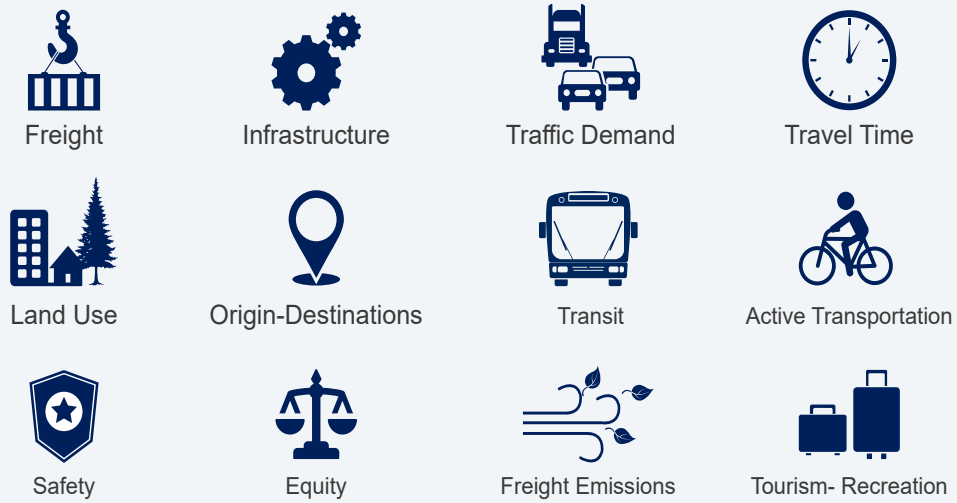
Implementation Resource: Transportation Planning Data Repository

PennDOT and its partner MPOs/RPOs use a variety of data to forecast, and plan for future transportation system needs and priorities. PennDOT is working to develop a data repository to support regional and local Planning Partners across the state. The effort is aimed at identifying the best available data sources, processing data into easy-to-use products, sharing data in an organized manner, and updating the data on a periodic schedule. Initial efforts will focus on data that can support solutions to our most frequently asked transportation planning questions.

Some of the most important data needs relate to infrastructure (bridges and pavement), freight, and land use. PennDOT has already initiated efforts to develop data products that help address planning questions across these topic areas. This includes developing maps highlighting the density of employment by type. Other priority data products (referred to as the “Core Metrics”) will focus on better understanding the national transportation performance measures and mapping innovative data sources such as cellular and GPS travel time and origin–destination data.

The data repository is envisioned to be an evolving resource that will address new data sources and changes to our future transportation planning needs and questions. It is expected to become available to the state’s MPOs and RPOs in 2023, and will be an important resource for regional planning and PA FMP implementation.

Data Categories to be Addressed by PennDOT’s Data Repository



GOAL D

OPERATIONS/SAFETY

Improve multimodal freight transportation operations and safety.

The 2016 update of Pennsylvania's Comprehensive Freight Movement Plan contained ambitious actions to support an overarching goal of improving freight transportation and safety across all transport modes. Many of these were tied to general initiatives aimed at improving overall transportation operations and safety, with the added benefit of enhancing freight transportation.

Much of the freight transportation activity in Pennsylvania takes place on public roads and on other infrastructure used for passenger transportation, including privately owned railroads with no passenger rail activity but with numerous grade crossings where train/vehicle interactions represent a major safety exposure. As such, this goal ties closely to the LRTP Safety goal and its associated objectives and actions. The overall goal is to improve the safety and efficiency of freight transportation through operational improvements, technology applications, and safety enhancements across all modes of freight transportation.

Operations/Safety Objectives

- D-1 Reduce truck-related crashes, injuries, and fatalities statewide.
- D-2 Reduce FRA-reportable incidents, injuries, and fatalities statewide.
- D-3 Reduce non-recurring delays on the National Highway Freight Network.[10]
- D-4 Adapt to advances in truck automation, electrification, and other technologies.
- D-5 Enhance interoperability of the transportation network with neighboring states.

Related Progress and Performance Measures

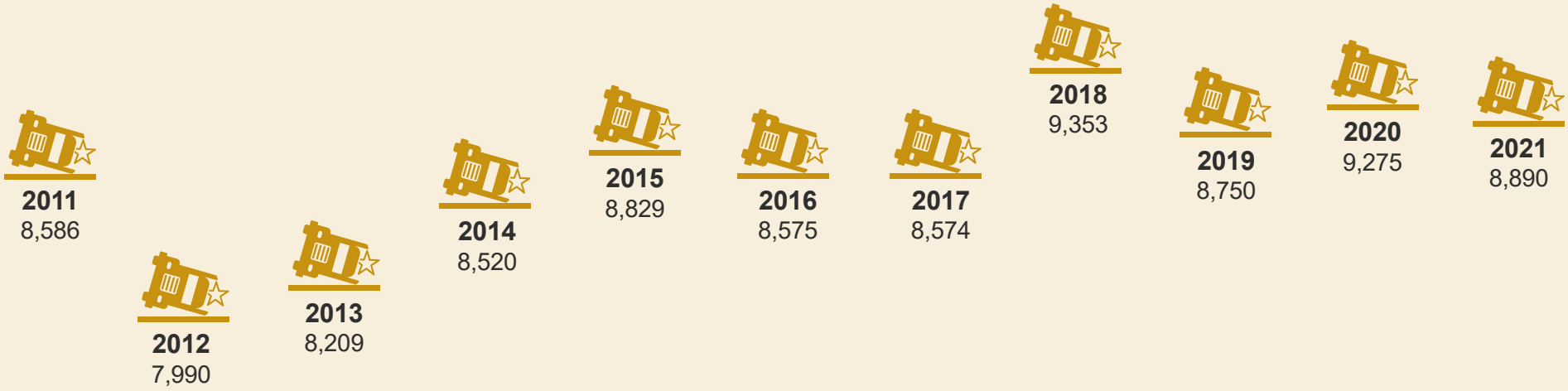
- Rate of truck-related crashes (i.e., truck crashes per million truck-miles traveled). Target 20 percent reduction by 2031. Monitor by year to determine if 2 percent annualized rate is being met (Figure 21 and 22).
- Development of framework of implementation approach for addressing emergency truck parking issues (by 2022) through PennDOT's ongoing truck parking initiative.

[10] Non-recurring roadway delays are indicative of operational and safety issues. Recurring delays are indicative of capacity constraints; they are identified and addressed through the objectives outlined in Goal B (Mobility).

Figure 21 : Crash Trends

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Heavy Truck Crashes	6,344	5,889	6,121	6,596	6,916	6,740	6,807	7,336	7,018	6,118	7,244
Truck DVMT (000s)	73,888	73,700	74,561	77,418	78,326	78,597	79,388	78,433	80,202	65,957	81,481
Total DVMT (000s)	274,444	272,684	270,214	273,648	276,563	276,967	278,414	279,767	281,547	233,668	281,339
Truck % of Total DVMT	26.9	27.0	27.6	28.3	28.3	28.4	28.5	28.0	28.5	28.2	29.0
Truck % of Interstate DVMT	33.9	34.36	34.98	37.12	37.04	37	36.94	35.62	36.32	35.69	37.15

Figure 22: Truck Crashes per 100M Daily Vehicle Miles of Travel (DVMT)



Source: Pennsylvania Crash Information Tool (PCIT), and PennDOT Publication 600.

GOAL E

ENVIRONMENTAL STEWARDSHIP

Mitigate adverse environmental impacts from the freight system, and plan for environmental impacts to freight movement.

Environmental stewardship is the responsible use and protection of the natural environment through conservation and sustainable practices to enhance ecosystem resilience and human well-being. As a public policy issue of increasing importance, it represents a timely and meaningful framework for ensuring that freight transportation does not adversely affect the environment. Conversely, there is also an intent to ensure that freight movement itself is not adversely affected by environmental events.

PennDOT historically has sought to minimize transportation's impact on the natural environment, whether it be in reference to air quality, stormwater runoff, or loss of wildlife and habitat. PennDOT and its network of MPOs and RPOs regularly consult with representatives from environmental resource agencies through the Agency Coordination Meeting (ACM) framework on a wide range of planning initiatives – including complex project Environmental Impact Statements (EIS's) and regional long-range transportation plans.

Pennsylvania has regularly experienced severe weather events (such as heavy flooding) that has damaged roadways and bridges, triggered mudslides, and closed down commercial corridors, affecting freight mobility. Disruptions like these to Pennsylvania's transportation and distribution networks negatively affects supply chains and the cost of doing business.

Pennsylvania can mitigate the impacts of extreme weather events on the transportation system by investing in system resiliency. FHWA defines resilience as "the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions." In Pennsylvania, the top transportation system resilience concerns are flooding, rock and mud slides, and the results of other severe weather events such as winter storms. Accidents such as hazardous materials releases and bridge strikes can also cause sudden and serious disruptions.

Reducing transportation and freight-related greenhouse gas (GHG) emissions is an important component of national and state climate change initiatives. At this time, specific transportation GHG emission targets have not been established in Pennsylvania. FHWA has recently proposed to amend its regulations on the national performance measures to establish methods for reporting GHG emissions and setting targets. In addition, the Bipartisan Infrastructure Law (BIL) has established the Carbon Reduction Program (CRP), which provides funds for projects that reduce transportation GHG emissions. A state plan on carbon reduction strategies (CRS) is due by November 15, 2023 and must be updated every 4 years. The plan will address specific strategies including efforts to reduce the environmental and community impacts of freight movement. The plan will be developed in coordination with state, regional and local stakeholders and be coordinated with freight initiatives provided in this state freight plan.

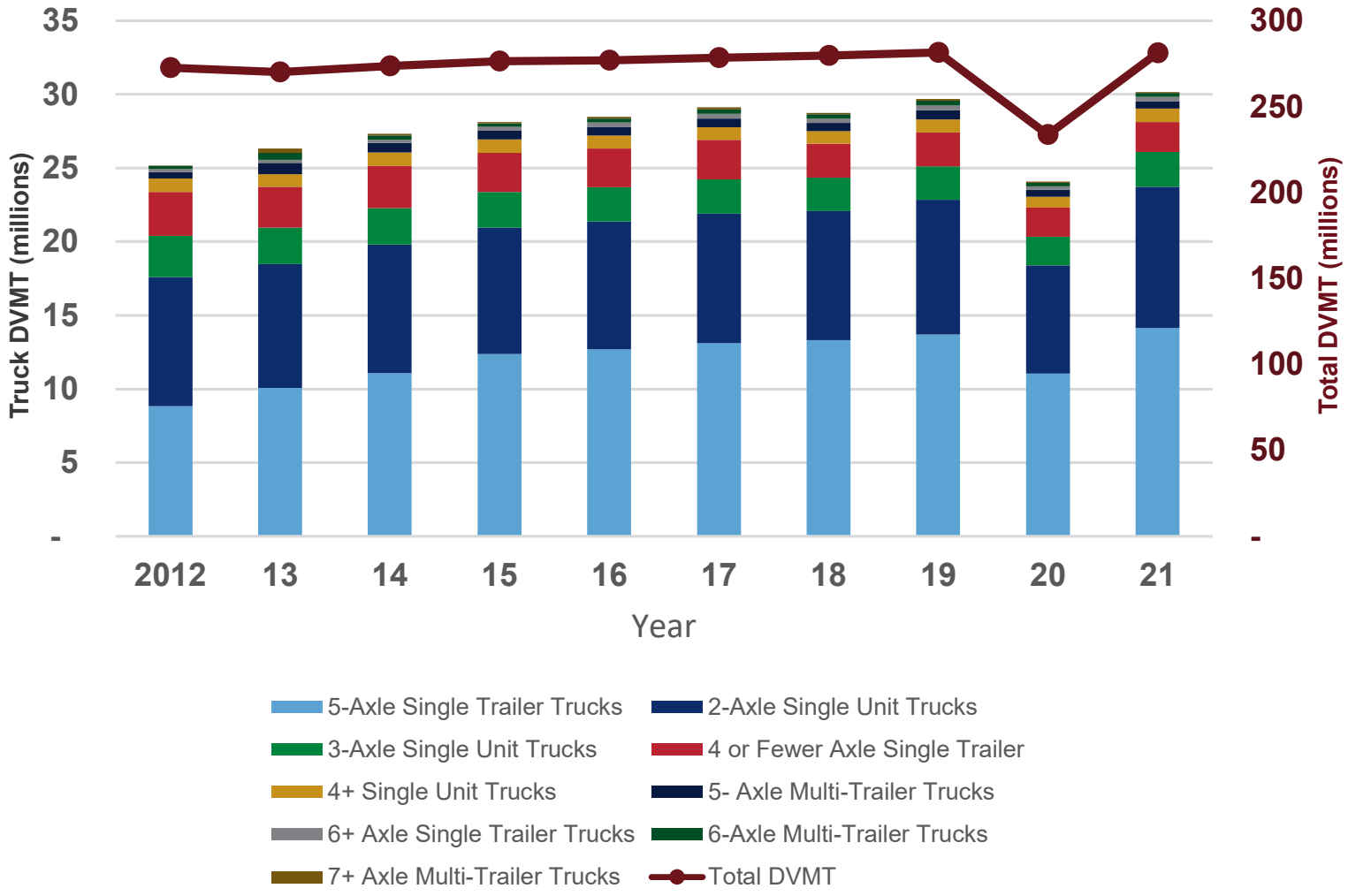
Environmental Stewardship Objectives

- **E-1** Mitigate the severity of impacts of extreme weather and natural disasters on freight mobility.
- **E-2** Reduce freight movement-related emissions and its impact on local air quality and climate.
- **E-3** Reduce freight movement's impact on flooding and stormwater runoff.
- **E-4** Support planning for freight movement's impacts on loss of wildlife and habitat.

Related Progress and Performance Measures

- EV charging infrastructure to support medium and heavy-duty trucks. Monitor locations within the state. Work with industry to identify targets.
- Monitoring of weather-related impacts to freight movement on Pennsylvania's share of the NHFN including road closures due to flooding, winter weather or other natural hazards.
- Monitoring of greenhouse gas emissions (GHG) related to Pennsylvania's freight movement, ensuring that our objectives directly make positive impacts to EJ/DAC/ underserved communities.
- Evaluation and sharing of best practices or industry strategies used in Pennsylvania to improve freight air quality.

Figure 23: Truck DVMT by Axle



Source: PennDOT Pub 600

Implementation: How We Will Get There

SECTION CONTENTS

Overview

Actions and Accountability

Implementation Partners and Projects

Transportation Performance Management

Implementation Resource: Transportation Planning Data Repository

Overview

Implementation is about putting the FMP to work—translating Pennsylvania's desired big-picture, long-range transportation direction for freight into real, tangible progress over the next five years. At that point the FMP will be updated to adjust to changing conditions.

The overarching principles for plan implementation are:

- Accountability
- Flexibility and adaptation
- Information-sharing, especially in support of stakeholder collaboration
- Strengthening the Planning–Programming–Performance linkage

Actions and Accountability

PennDOT developed an Action Plan that establishes the initial activities for advancing each plan objective. Actions are defined at a level to be assigned, scheduled, tracked, and collaborated on with other organizations. The Action Plan is a dynamic document that will be updated to reflect both new activity and progress made over the five-year implementation cycle.

For this 2045 FMP update, the Action Plan was started through "in-reach" meetings with a cross-section of PennDOT managers and program leaders. Broad involvement in shaping the Action Plan ensures that the actions consider and appropriately reflect work that is already underway or planned. It also builds ownership of and commitment to the Action Plan by those on the front lines of implementation.

The initial Action Plan, and the supporting process for regular review and reporting, will be ready to go into effect by January 2022. Certain FMP actions sustain initiatives already ongoing at PennDOT, such as continuing efforts to enhance work zone safety. Other FMP actions double-down on initiatives that require more emphasis, such as expanding PennDOT's contingency planning and preparations for weather-related and other emergencies. Some FMP actions line up PennDOT to meet longer-range needs, such as training the next generation of the state's workforce in areas related to traffic operations, and connected and autonomous vehicles. Other actions are important first steps in understanding needs, such as efforts related to assessing transportation equity issues across the state.

The Action Plan includes various progress indicators and measures. The FMP and associated progress will be reviewed twice a year by PennDOT's Freight Work Group and reported on annually to PennDOT leadership in conjunction with the LRTP implementation progress. Basic summaries of plan implementation progress will be provided to PennDOT's Center for Program Development and Management, and PennDOT's Multimodal Deputate, as well as the STC, TAC, and the various stakeholder groups involved in shaping the plan as part of routine progress updates aimed at keeping the plan highly visible, and to maintain implementation momentum.

PennDOT's Program Management Committee will conduct periodic reviews of the Action Plan and specific goals, objectives, and initiatives aimed at maximizing and optimizing plan implementation.

The level of participation in developing this FMP's Action Plan is unprecedented for PennDOT and provides important momentum for implementation.

Implementation Partners and Projects

The FMP represents Pennsylvania's highest-level freight plan—setting the broad long-term directions as an overall compass for project investments, program and service delivery and other initiatives, and supporting compliance with federal planning requirements. PennDOT's Office of Planning will oversee various efforts to ensure that there is a coordinated effort to integrate the plans with:

- PennDOT's Strategic Plan
- 12-Year Program (TYP)
- Modal plans – aviation, rail freight, intercity rail, ports, etc.
- Functional plans – technology, asset management, etc.
- Regional LRTPs and freight plans
- Regional modal plans
- Ongoing changes in federal statutes and regulations related to freight planning

The FMP will be implemented in collaboration with PennDOT's various regional partners, particularly those that have freight task forces or committees. This promotes collaboration, joint problem-solving, and resource optimization. Specific projects such as a roadway widening or bridge replacement are identified, prioritized, and programmed (placed on a list of funded projects) at the regional level by MPOs and RPOs, mapped in Figure 24. They develop regional LRTPs with project lists and establish Transportation Improvement Programs (TIPs)—the list of funded projects expected to be undertaken within the next four years. These regional efforts should generally align with the statewide direction but not be prescribed by a centralized approach. This recognizes the necessity and practicality of customized solutions for each of Pennsylvania's unique regions.

Pennsylvania has a long history of working effectively with the Federal Aviation Administration and the Federal Railroad Administration. The multimodal emphasis of the LRTP and the Freight Mobility Plan highlights the importance of this intergovernmental collaboration. In fact, the federal partner in the federal–state–local system will play a key role in implementing the 2021 infrastructure legislation and associated program changes and rule-making. Federal policy for 30 years has emphasized freight for public-sector transportation organizations. That needed priority will increase. The FMP has been developed with this policy priority much in view.

The State Transportation Commission and the TYP that the commission approves are key to the implementation of the plan. The STC also oversees the issuance of the Transportation Performance Report, which will take on greater significance as this FMP supports greater integration of planning, programming, and performance monitoring.

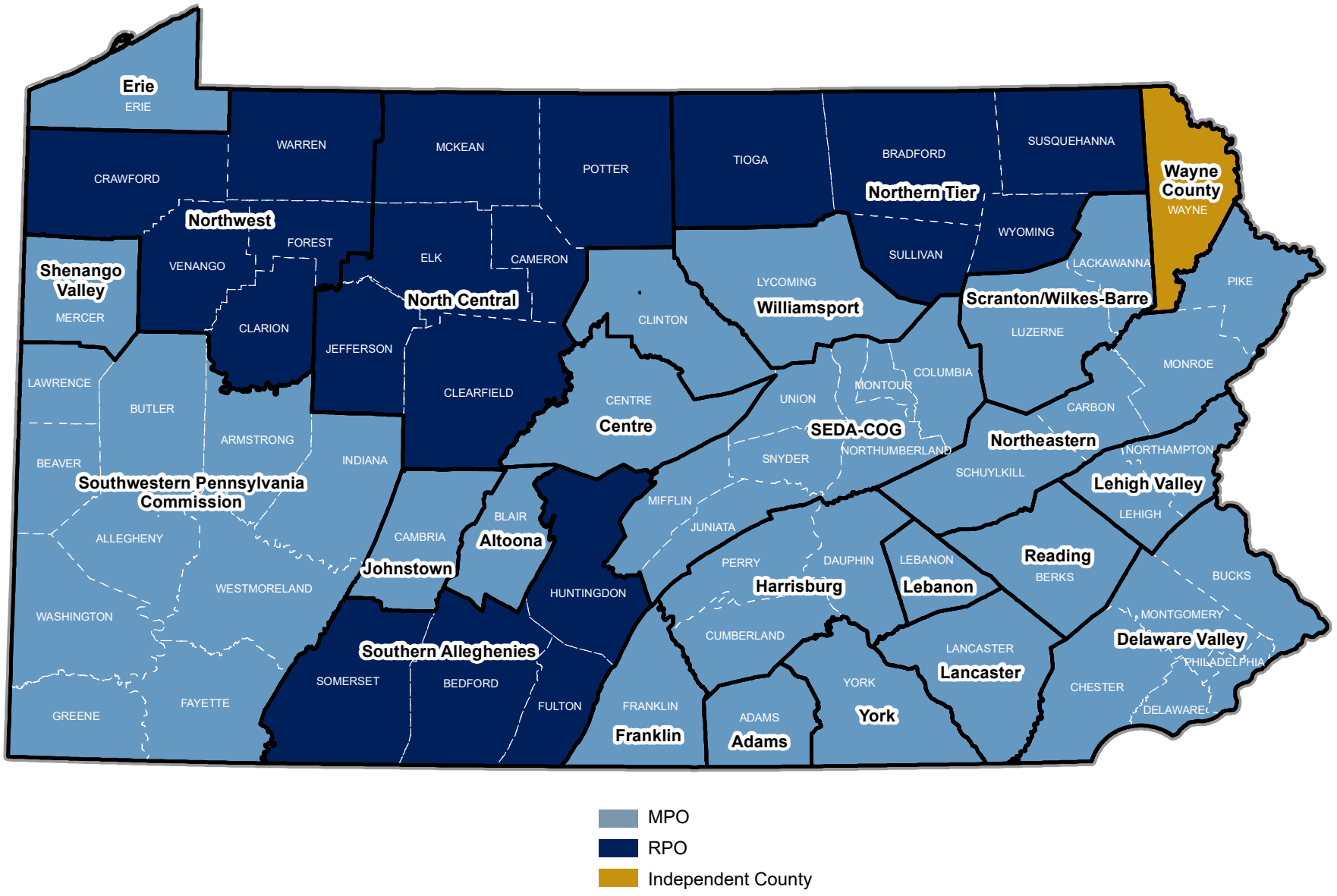
Greater involvement of private-sector stakeholders will enhance freight plan implementation with the associated improvements and benefits. Historically, private-sector freight stakeholders have not always participated in the public-sector freight planning process. As the federal government continues to elevate the importance of initiatives related to climate change, resiliency, and sustainability, Pennsylvania can further enhance freight plan implementation by collaborating with experts in environmental sustainability such as the Pennsylvania Department of Environmental Protection and non-profit organizations with environmental expertise.

Broad state direction is provided through financial guidance to help guide program development by MPOs and RPOs. This helps to ensure a generally consistent procedural approach statewide—again without being project-prescriptive. It is anticipated that future financial guidance will incorporate the direction of the LRTP and the FMP as part of the overall framework. In a similar manner PennDOT uses the goals and objectives of the two plans to help frame its longer-term budgetary and financial horizon planning.

Project selection is also shaped by transportation performance management targets, described in the following section.

Finally, because freight transportation is ideally seamless at state lines, PennDOT will collaborate with neighboring states and others beyond Pennsylvania as beneficial in the implementation of the FMP.

Figure 24: Planning Partner Regions



Source: PennShare

Transportation Performance Management

Ultimately, plan implementation success is measured by how well the transportation system works. Measures of various aspects of system performance in turn guide future planning and project investments to ensure Pennsylvania is making progress toward its goals.

Transportation performance management (TPM) is a federally required approach to prioritizing transportation investment that is focused on results—measurable, strategic improvements to the transportation system.

TPM involves setting measurable performance goals for the transportation system, tracking progress, and directing funds to projects that best achieve those goals. In a funding environment where needs consistently exceed available funding, a TPM approach is essential to maximize the benefits of every dollar spent.

The federal government established TPM requirements in its transportation funding legislation. Both the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act include performance management requirements to ensure that federal transportation funds are invested efficiently toward achieving national goals. The United States Congress established the following national performance goal areas:

- Safety
- Infrastructure condition
- Congestion reduction
- System reliability
- Freight mobility
- Environmental sustainability
- Reduced project delivery delay (getting roadway and other improvements built faster)

FHWA was responsible for determining a way of measuring current conditions and progress toward each of those goals. FHWA established the national transportation performance measures shown in Figure 25.

Figure 25: National Transportation Performance Measures

Source: Federal Highway Administration

The national TPM approach is implemented through the states and their regional and local partners. Pennsylvania has long utilized a comprehensive planning and programming process, with a focus on collaboration among PennDOT, FHWA, and Planning Partners at the county and regional levels. This foundation is used to implement TPM and Performance-Based Planning and Programming (PBPP). Performance-based planning aims to make the transportation investment decision-making process both informed and accountable. Key elements of TPM and PBPP include managing performance data, selecting performance targets, monitoring progress in meeting targets, and defining ways to integrate performance measures into the transportation decision-making process.

To support the integration and monitoring of the National Performance Measures, PennDOT produces biennial reports to FHWA documenting progress in meeting defined targets. Federal performance measures for freight can be found in the following Pennsylvania Statewide Dashboard.

Through the STC, PennDOT produces a biennial Transportation Performance Report (TPR) on progress made in safety, mobility, preservation, accountability, and funding. This report card provides an assessment of performance ratings and recent trends for each of the measures. Information and insights from these measures are used to inform the statewide FMP goals, objectives, and actions. They are also used to inform the development of PennDOT's 12-year and 4-year programs (TYP and STIP, respectively). PennDOT continues to enhance methods to track and share statewide transportation performance, and to expand on freight performance measures used in the TPR. Additional freight-related performance measure items for the 2023 update of the TPR could include:

- Expand the Mobility/Water Ports section of the TPR to include the Ports of Pittsburgh and Erie.
- Measure long-haul truck tonnage as a mode share relative to railroads and waterways, and measure positive trends based on a reduction in this mode share.
- Develop air cargo performance measures based on tonnage, market coverage for small airports, and air cargo facilities.
- Report truck-related crashes as a separate safety measure.
- Measure truck congestion and truck-miles traveled separately in the Mobility/Congestion and Mobility/Highway Capacity sections of the TPR, respectively. Tie the truck congestion to PennDOT's FHWA truck bottleneck reporting process.

PennDOT continues to work with regional and local partners to improve ways to integrate TPM. PennDOT has developed PBPP Procedures and Procedural Guidance for the development of the regional MPO/RPO TIPs. This includes formalizing methods to directly consider the performance measures in project identification and prioritization.

For long-range planning, PennDOT continues to support its regional planning organization with the integration of performance measures into each MPO/RPO LRTP. PennDOT works with MPOs/RPOs to ensure their LRTP:

- Describes the performance measures and performance targets used in assessing the performance of the transportation system.
- Includes a System Performance Report that (1) Evaluates the condition and performance of the transportation system with respect to performance targets, and (2) Documents the progress achieved by the MPO/RPO in meeting the targets in comparison to performance recorded in past reports.
- Integrates the goals, objectives, performance measures, and targets described in all the plans and processes required as part of a performance-based program.

PennDOT has also launched development of a TPM Resource Toolbox to support PennDOT and MPOs/RPOs with the integration of the federal performance measures into the transportation planning process. The toolbox includes: Q&A channels; handouts with guidance on TPM implementation, best practices, and case studies; and ideas for communicating the TPM measures to the public. The TPM Resource Toolbox is regularly updated based on the needs and questions of PennDOT and planning partner staff.

The national transportation performance measurement approach is implemented through the states and their regional and local partners.

GLOSSARY

12-Year Program (TYP)
PennDOT's listing of statewide transportation projects over a 12-year period; guided by the goals of the LRTP and updated every two years.

Active Transportation
Any non-motorized mode of transportation, including bicycling, walking or wheeling.

Airport Hazard Zoning
Zoning regulations required by Pennsylvania Act 164 entitled the "Airport Zoning Act"; required adoption by local municipalities within an airport hazard area to maintain compatible neighboring land uses and to protect the safety of pilots, aircraft, people, and property.

Americans with Disabilities Act (ADA) of 1990
A civil rights law that prevents discrimination of individuals with disabilities in employment, transportation, communications, access to government services and other public accommodations.

Asset Management
Defined by FHWA as a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the life cycle of the assets at minimum practicable cost.

At-Grade Railroad Crossing
An intersection where a highway crosses railroad tracks at the same level.

Bike-sharing
A shared transportation service in which bicycles are made available for shared use to individuals on a short-term basis for free or at low cost.

Bipartisan Infrastructure Law (BIL)
The federal transportation reauthorization bill passed by the Biden Administration in 2021. Based on formula funding alone, Pennsylvania will receive approximately $13.2 billion in Federal highway formula funding for highways and bridges across fiscal years 2022 through 2026. On an average annual basis, this is approximately 40% more than the State's Federal-aid highway formula funding under current law. BIL is also known as the Infrastructure Investment and Jobs Act (IIJA).

Bridge Asset Management System (BAMS)
PennDOT software that assists both engineers and planners by providing a recommended list of projects, based on individual or regional input and needs, in accordance with federally mandated lowest life cycle cost (LLCC) methodology. Bridge condition forecasts are generated over 12 years based on current condition data housed in PennDOT databases and the improved conditions expected as a result of future projects.

Bridge Deck
The roadway or walkway surface of a bridge.

Carsharing
An on-demand, membership-based shared vehicle service that allows a driver to rent a vehicle for short periods of time as needed (usually hourly or daily).

Class I Railroad
Rail carriers with annual operating revenues of $900 million or more; usually the largest railroads (ex. Norfolk Southern, CSX).

Class II Railroad
Often referred to as "regional railroads"; carriers with annual operating revenues less than $900 million but more than $40.4 million.

Class III Railroad
Often referred to as a "short line railroad"; carriers with annual operating revenues of $40.4 million or less.

Commercial Service Airport
Defined by the Federal Aviation Administration as a publicly owned airport that receives scheduled passenger service and has at least 2,500 passenger boardings each calendar year.

Connected and Automated Vehicles (CAV)
Connected vehicles enable safe, interoperable communications among vehicles, roadside infrastructure, and others. Automated vehicles have varying capability levels, ranging from no automation to full driving automation. Definitions for all automated vehicle levels and additional information on CAV can be found in the Pennsylvania Automated Vehicle Strategic Plan.

Dismantling Systemic Racism and Inequity Report (DSRI)
A report developed by PennDOT in 2021 to assess internal diversity and inclusion efforts, understand structural racism in transportation generally, and evaluates programs and initiatives in which PennDOT can achieve greater equity.

E-commerce
Commercial transactions conducted electronically on the Internet.

Environmental Sustainability
Meeting the needs of the present without compromising the ability of future generations to meet their own needs.*

Essential Air Service (EAS)
A program enacted by the U.S. government that maintains commercial air service in small communities affected by the Airline Deregulation Act of 1978. Without EAS, residents of small communities would have to spend many hours to access a larger, "hub" airport for travel, medical care and other services.

Equity
The fair distribution of impacts (benefits, costs) and resources. In transportation, it means providing affordable, accessible, and inclusive transportation services and programs and creating and supporting a quality transportation system that works for everyone.

Federal Highway Administration (FHWA)
Federal agency responsible for overseeing the use of Federal funds for a variety of roadway, bridge, and other transportation programs; One agency of the U.S. Department of Transportation.

Fiscal Year
a one-year period, commonly used by governments and companies for financial reporting and budgeting. The federal fiscal year is October 1 through September 30.

Fixing America's Surface Transportation (FAST) Act
The federal transportation reauthorization bill passed by the Obama Administration in 2015; authorized over $305 billion to fund surface transportation programs across fiscal years 2016 through 2020.

Fixed Route Transit
Defined by the Federal Transit Administration as services provided on a repetitive, fixed schedule basis along a specific route with vehicles stopping to pick up and deliver passengers to specific locations; each fixed route trip serves the same origins and destinations.

Infrastructure Investment and Jobs Act (IIJA)
The federal transportation reauthorization bill passed by the Biden Administration in 2021. Based on formula funding alone, Pennsylvania will receive approximately $13.2 billion in Federal highway formula funding for highways and bridges across fiscal years 2022 through 2026. On an average annual basis, this is approximately 40% more than the State's Federal-aid highway formula funding under current law. IIJA is also known as the Bipartisan Infrastructure Law (BIL).

Intelligent Transportation Systems (ITS)
A broad range of wireless and traditional communications-based information and electronic technologies that advance transportation safety and mobility through integration into transportation infrastructure, and into vehicles.

Interstate Highway System
A continuous network of controlled-access highways in the contiguous 48 US states that serve as part of the National Highway System.

Land Use
The human use of land; a representation of economic and cultural activities (e.g., agricultural, residential, industrial, recreational, mining, etc.) that are practiced in a given place.

Lock and Dam System
A system that raises or lowers large ships in order between bodies of water at varying levels.

Lowest Life Cycle Cost (LLCC)
A process designed to maximize the life of an asset at the lowest cost through a risk-based prioritization of preservation, rehabilitation and reconstruction.

* United Nations. https://www.un.org/en/academic-impact/sustainability

Metropolitan Planning Organization (MPO)
Planning organizations responsible for regional transportation planning and programming for all modes of transportation in urbanized areas with a population of over 50,000.

Mileage-Based User Fee
A user charge based on miles driven in a specific vehicle (i.e., cents per mile) as opposed to the current excise tax on fuel consumed, as defined by the Mileage-Based User Fee Alliance.

Moving Ahead for Progress in the 21st Century (MAP-21) Act
The federal transportation reauthorization bill signed into law by President Obama in 2012.

National Highway System (NHS)
A federally-designated highway system that consists of roadways important to the nation's economy, defense and mobility. The subsystems of the NHS include Interstates, Principal Arterials, Strategic Highway Network (STRAHNET), Strategic Highway Network Connectors, Intermodal Connectors.

Non-Motorized Transportation
To travel by means other than a motorized vehicle including by foot, bicycle or horse.

PA Act 44 of 2007
An act passed by the Pennsylvania legislature in July 2007 that established a framework to assess transit agency performance through a formal review process.

PA Act 89 of 2013
An act passed by the Pennsylvania legislature in 2013 as a one-time comprehensive transportation funding package, providing $2.3 billion in additional funding for road projects, bridge repairs, and public transportation improvements.

Pavement Asset Management System (PAMS)
PennDOT software that assists both engineers and planners by providing a recommended list of projects, based on individual or regional input and needs, in accordance with federally mandated lowest life cycle cost (LLCC) methodology. Pavement condition forecasts are generated over 12 years based on current condition data housed in PennDOT databases and the improved conditions expected as a result of future projects.

PennDOT Connects
PennDOT's approach to enhance local engagement and improve transportation-project planning, design and delivery. This policy was launched in December 2016 and expands PennDOT's requirements for engaging local and planning partners by requiring collaboration with stakeholders before project scopes are developed, and ensures community collaboration happens early in the process. It certifies that each project is considered in a holistic way for opportunities to improve safety, mobility, access, and environmental outcomes for all modes and local contexts.

PennDOT Districts
PennDOT's eleven field offices throughout the state responsible for administrating project development, design, construction, and maintenance activities within their geographic region.

PennDOT Program Management Committee (PMC)
An administrative group within PennDOT, chaired by the Secretary of Transportation, which includes all Deputy Secretaries, representatives of the District Offices, and the Federal Highway Administration. The Center for Program Development and Management supports this group by developing agendas and making presentations and PMC approval is required to fund and initiate the development of specified phases of a given project.

PennSTART
In Spring 2018, PennDOT, the Pennsylvania Turnpike Commission, and Penn State University partnered to develop PennSTART, a state-of-the-art training and testing facility to address the transportation safety and operational needs of Pennsylvania and the Mid-Atlantic Region. When completed, PennSTART will address safety training and research needs in six key areas: traffic incident management (TIM); connected and automated vehicles; tolling and intelligent transportation systems (ITS) technology; work zones; commercial vehicles; and transit vehicles.

Performance Based Planning and Programming (PBPP)
The Moving Ahead for Progress in the 21st Century Act (MAP-21) and subsequent Fixing America's Surface Transportation (FAST) Act require State DOTs, Transit Operators, and MPOs to establish and use a performance-based approach to transportation decision making. This includes tracking performance measures, setting data-driven targets for each measure, and selecting projects to help meet those targets. The FAST Act also requires that the TIP include a description of its anticipated effect toward achieving the established performance targets, linking investment priorities to those performance targets.

Performance Measures
Operational characteristics, physical conditions, or other appropriate parameters used as a benchmark to evaluate the adequacy of transportation facilities and estimate needed improvements.

Performance Targets
A quantifiable level of performance or condition, expressed as a value for the measure, to be achieved within a time period.

Private Use Airport
An airport that is accessible to private users only and not open to the public.

Project Delivery
The process that takes a project concept from the planning and programming stage, though the design process (including environmental, utility, railroad, and right-of-way clearances, as required), to the completion of a constructed project

Project Development
The development and implementation of a project and its progress through a number of phases (or stages).

Public-Private Partnership (P3)
A contractual agreement between a public entity and a private entity (or another public entity) in which the public entity transfers the responsibility for engineering, construction, operation, financing, and/or maintenance (or any combination) of a transportation project or facility to the private sector for a defined period of time.

Public Transportation Trust Fund
Created as part of PA Act 44 of 2007 to provide money to transit agencies for capital and operation assistance; funded by sales tax, PA Turnpike funding, other use taxes and fees that are not constitutionally protected for highway funding.

Public Use Airport
An airport that is open to the general public and can be owned publicly or privately.

Rapid Bridge Replacement Program
A program that replaced 558 structurally deficient bridges across Pennsylvania under a design-build-finance-maintain (DBFM) public-private partnership (P3) arrangement between PennDOT and Plenary Keystone Partners.

Real-Time Travel Information
Current travel condition information that can be used to monitor and manage traffic in terms of road safety, congestion, regulatory compliance, and supply chain information.

Regional Operations Plan (ROP)
A plan which lays out the strategic transportation operations program for the region, including specification of regional projects. The program delineated in the ROP is to be implemented and mainstreamed in transportation planning documents and day-to-day activities.

Resiliency
The ability to adapt to, recover from, respond to and bounce back quickly from threats to physical infrastructure and operations, and threats of cybersecurity, terrorism, and all hazards.

Rural Planning Organization (RPO)
An organization that identifies local transportation needs, conducts planning, assists local governments and supports the statewide transportation planning process in non-metropolitan regions of the state. RPOs can be designated as a method for formalizing the engagement of officials from areas with a population size less than 50,000 as they incorporate rural transportation needs in the statewide transportation planning process.

Security
Freedom from intentional harm and tampering that affects both motorized and non-motorized travelers, and may also include natural disasters.

State of Good Repair
A condition sufficient for the asset to operate at a full level of performance.

State Transportation Commission (STC)
Established by state law to address transportation program priorities, evaluate and determine the condition and performance of the statewide transportation system, and to set transportation policy direction; consists of fifteen members: the Secretary of Transportation (chairman), the chairman and minority chairman of both the Senate Transportation Committee and the House Transportation Committee; and ten public members appointed by the Governor.

Technical Assistance
Providing technical information, and proven technologies dealing with roadway maintenance and safety methods to meet the growing demands on municipal governments.

Transportation Advisory Committee (TAC)
A body that advises the Secretary of Transportation and the State Transportation Commission on transportation issues in Pennsylvania, including the determination of goals and the allocation of resources among the alternate modes in the planning, development and maintenance of programs and technologies for transportation systems. The committee which is composed of representatives of government, industry, labor and education, was mandated by PA Act 120 of 1970.

Transportation Improvement Program (TIP)
A plan established by the MPOs and RPOs which consists of a prioritized list of projects or project segments to be carried out within the next four years after adoption. It is updated every two years.

Transportation Performance Management (TPM)
A strategic approach that uses system information to make investment and policy decisions to achieve national performance goals.

Transportation Revenue Options Commission (TROC)
A commission established by Governor Tom Wolf in March 2021 to investigate comprehensive funding recommendations for Pennsylvania's transportation network.

Transportation Systems Management and Operations (TSMO)
A way to address reliability, mobility and congestion by implementing various strategies that utilize existing infrastructure; rather than just trying to "build our way out".

Travel Time Reliability
Measurement of unexpected delay; the consistency or dependability in travel times, as measured from
day-to-day and/or across different times of the day.

United States-Mexico-Canada Agreement (USMCA)
A free trade agreement between the United States, Canada, and Mexico that went into effect on July 1, 2020 and replaced the North American Free Trade Agreement (NAFTA). The trade deal phased out tariffs on many goods passing between the three countries.

Vehicle Miles Traveled (VMT)
A measure of total travel, by all vehicles.

ACKNOWLEDGMENTS

Freight Work Group (*denotes member of the Freight Plan Advisory Group)

Andrea Bahoric*
PennDOT Bureau of Planning and Research

Marie Bishop
PennDOT District 4-0

Beth Bonini*
PennDOT State Safety Oversight

Mike Bonini
PennDOT Public-Private Transportation Partnership Office

Becky Bradley, AICP
Lehigh Valley Planning Commission

Jessica Clark*
PennDOT Program Center

Roger Cohen*
PennDOT Senior Policy Advisor to the Secretary

Victor DeFazio
PennDOT District 11-0

Lyndsie DeVito*
PennDOT District 1-0

Anna Ellis
PennDOT Bureau of Aviation

Natasha Fackler
PennDOT Policy Office

Steve Fisher
PennDOT District 4-0

John Frankosky
PennDOT District 4-0

Linda Guarini
PennDOT District 6-0

Joe Gurinko, AICP
PennDOT Public-Private Transportation Partnership Office

Brian Hare, PE
PennDOT Program Center

Amy Kessler*
North Central PA Regional Planning and Development Commission

Chris King
PennDOT District 3-0

Vanessa Koenigkramer
PennDOT District 5-0

Jonathan Korus
PennDOT District 6-0

Amanda Leindecker
PennDOT District 5-0

Courtney Lyle
PennDOT District 1-0

Tony McCloskey
PennDOT Bureau of Aviation

Hugh McGowan
PennDOT Program Center

Kate McMahon, AICP
Northeastern Pennsylvania Alliance

Robert Miskanic
PennDOT District 11-0

Ngani Ndimbie
PennDOT Policy Office

Tracy Oscavich
Lehigh Valley Planning Commission

Steve Panko*
PennDOT Multimodal

Bob Pento, PE*
PennDOT Bureau of Maintenance and Operations

Emma Pugh
PennDOT District 4-0

John Quatman
PennDOT District 11-0

Shane Rice*
PennDOT Policy Office

Michael Rimer, AICP*
PennDOT Program Center

Brian Ross
Department of Community and Economic Development

David Rostron
PennDOT District 5-0

Mike Ruane
Delaware Valley Regional Planning Commission

Justin Ruggles
PennDOT District 10-0

Angela Saunders
PennDOT District 12-0

Jessica Setmire
PennDOT District 12-0

Larry Shifflet
PennDOT Deputy Secretary for Planning

Denise Soisson
PennDOT Multimodal

Stephanie Spang
PennDOT District 11-0

Jeff Spotts
PennDOT Senior Counsel

Anne Stich
PennDOT District 9-0

Harold Swan
PennDOT District 10-0

Michelle Tarquino*
PennDOT Multimodal

Joshua Theakston
PennDOT District 12-0

Tom Tomczyk
PennDOT Bureau of Aviation

Doug Tomlinson, PE*
PennDOT Bureau of Maintenance and Operations

Nick Mackereth*
Department of Community and Economic Development

Sara Walfoort*
Southwestern Pennsylvania Commission

Nate Walker
PennDOT District 8-0

Brian Wall*
PennDOT Bureau of Planning and Research

Dan Walston*
Federal Highway Administration

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