ATTENTION: If you speak another language, language assistance services can be made available to you. Call 717-705-1478.

Somali:

Vietnamese:
LUU Ý: Nếu quý vị sử dụng ngôn ngữ khác, các dịch vụ hỗ trợ ngôn ngữ sẽ được cung cấp. Vui lòng gọi số 717-705-1478.

Korean:
주의: 영어 이외의 다른 언어를 사용하는 경우 717-705-1478 을 통해 언어 지원 서비스를 이용할 수 있습니다.

Russian:
ВНИМАНИЕ: если вы говорите на другом языке, вам может быть оказана языковая помощь. Обратитесь в информационно-справочную службу по телефону 717-705-1478.

Ukrainian:
УВАГА: якщо ви розмовляєте іншою мовою, вам може бути надана мова допомога. Зверніться до інформаційно-довідкової служби за телефоном 717-705-1478.

Polish:

French:
ATTENTION : Si vous parlez une autre langue, des services d'assistance linguistique peuvent être mis à votre disposition. Appelez le 717-705-1478.

Simplified Chinese:
请注意：如果您说另一种语言，我们可以为您提供语言援助服务。请致电 717-705-1478。

Traditional Chinese:
请注意：如果您说另一种语言，我们可以为您提供语言援助服务。请致电 717-705-1478。

Arabic:
تبنيه: إذا كنت تتحدث لغة أخرى، يمكننا توفير خدمات المساعدة اللغوية. اتصل بالرقم 717-705-1478.

Spanish:
ATENCIÓN: Si habla otro idioma, habrá servicios de asistencia de idiomas a su disposición. Solo tiene que llamar al 717-705-1478.
Pennsylvania’s 2045 Freight Movement Plan (FMP) was developed in conjunction with our statewide Long-Range Transportation Plan (LRTP), providing a comprehensive direction for moving people and goods.

The disruptions experienced during the pandemic reminded us about the complexity of supply chains and how much we depend on predictable distribution of products of all kinds. However, keeping our communities livable with growing freight traffic and facilities requires proactive, coordinated planning and collaborative public and private sector problem solving.

Freight planning is complex due 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, 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 impactful implementation. The plan’s goals and objectives set a clear direction, and PennDOT will carry out an Action Plan in coordination with freight stakeholders to make systematic progress over the next five years. 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 our 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 developing construction programs and project investments with a focus on freight. Even though transportation funding resources are greatly constrained, we still must take a balanced approach to addressing freight mobility needs.

I am especially encouraged by this plan’s attention to two of Pennsylvania’s most pressing freight challenges: improving the freight transportation/land use, as well as addressing 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 more important. Truck parking challenges require collaboration between public and private stakeholders to address this need. PennDOT and the regional planning agencies can fulfill an important convener role in addressing these multi-faceted issues with both local and private stakeholders.

Thank you to the many freight stakeholders—public and private—who participated in our November 2020 Freight Forum, which was pivotal in shaping this plan, as well as those who participated in the topical freight workshops. We are also indebted to the Department’s Freight Work Group and Freight Plan Advisory Group and ask for your continued involvement in implementing this plan.

The FMP’s success depends on working together and communicating purposefully across many organizational lines, sectors, and levels of government. Our economy will benefit, our businesses will benefit, and our communities and citizens will benefit as well. The department is working hard to ensure that feedback is received equitably from a diverse representation of Pennsylvanians during this period. We rely on your comments to help us ensure that the needs of the commonwealth are reflected and included in the implementation phase of the project.

Tell Us What You Think.

Yassmin Gramian, P.E.
Secretary
Pennsylvania Department of Transportation
Freight Movement Plan Strategic Directions Summary
The plan’s four goals and objectives are listed below. They are discussed in more detail beginning on page 44.

<table>
<thead>
<tr>
<th>LAND USE</th>
<th>MOBILITY</th>
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<tbody>
<tr>
<td>Align freight mobility with economic development and land use.</td>
<td>• Establish a core Pennsylvania highway freight network.</td>
</tr>
<tr>
<td>• Establish statewide standards to measure benefits and costs of freight-oriented industrial development.</td>
<td>• Continue to identify and address truck bottlenecks.</td>
</tr>
<tr>
<td>• Collaborate with other organizations to assemble recommended industrial site development standards/ordinances.</td>
<td>• Preserve and enhance major freight transportation assets, including waterways, railroads, major truck corridors, and intermodal terminals.</td>
</tr>
<tr>
<td></td>
<td>• Pursue opportunities with public and private stakeholders to expand truck parking capacity.</td>
</tr>
<tr>
<td></td>
<td>• Expand the composition of the Freight Work Group (FWG).</td>
</tr>
</tbody>
</table>
ANALYTICAL TOOLS & PROCESSES

Provide planning, data, and analytical tools for improved decision-making.

- Develop analytical tools, data, and forecasting techniques to measure costs and benefits of freight-related transportation initiatives, programs, and projects.
- Maintain and enhance PennDOT's technical capabilities in freight planning, forecasting, modeling, and data.
- Maintain and expand PennDOT’s data repository for Pennsylvania's freight transportation system.
- Develop basic approaches to understand and assess air cargo trends, needs, and intermodal implications.
- Evaluate and implement select recommendations of the PA Transportation Advisory Committee (TAC) truck weight exemptions study of 2020.

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.
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What, Why, How, and Who

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FMP Essentials
Public and Stakeholder Involvement
Freight Movement Plan Essentials

This statewide Freight Movement Plan (FMP) is 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), available at penndot.gov/planning.

The 2045 FMP complies with the federal requirements established in the Fixing America’s Surface Transportation (FAST) Act of 2015. 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.

The FAST Act requirements for state freight plans were established under 49 U.S.C. § 70202 and 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.

The FAST Act requirements include additional provisions related to the planning horizon, update intervals, the relationship of the Freight Movement Plan to the Long-Range Transportation Plan, and fiscal constraints for the freight investment plan.
The FMP is one in a series of products PennDOT uses as part of its statewide planning and programming process. The FMP establishes a direction for Pennsylvania’s freight transportation system over a 20-year planning horizon. That direction is from the public-sector support standpoint, recognizing 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 of 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 of these include a statewide rail plan and an aviation system plan.

Long-range planning functions are also carried out by PennDOT’s regional Planning Partners: the 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.
The FMP process is conducted under federal requirements in parallel with Pennsylvania’s planning processes. The FMP is 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.

In the off-year, the State Transportation Commission (STC) and Transportation Advisory Committee (TAC) compile a Transportation Performance Report (TPR), which 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.
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, summarized in Figure 1, 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 Commonwealth.

Figure 1: 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: 49

PennDOT In-reach & Interagency Collaboration
- Executive Interviews: 35
- PennDOT Bureau/District Personnel Engaged: >40
- Partnering Agency Interviews & Presentations: 5
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 for a full day on November 5, 2020 to learn about the dynamic freight industry, explore current trends, and offer feedback and direction for the future. Figure 3 presents common themes from freight stakeholder input. A detailed set of regional freight profiles shared with the Forum participants is included in Appendix 2: Regional Freight Profiles.

Freight Forum Key Themes

- **Municipal Collaboration**
  - Pennsylvania State Association of Boroughs
  - County Commissioners Association of Pennsylvania
  - Pennsylvania State Association of Township Supervisors
  - Pennsylvania Municipal League
  - Pennsylvania State Association of Township Commissioners

Executive Interviews: Key Themes

Several common themes emerged from the initial interviews of agency executives, 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 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
- County Commissioners Association of Pennsylvania
- Pennsylvania State Association of Township Supervisors
- Pennsylvania Municipal League
- Pennsylvania State Association of Township Commissioners

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

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

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

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

Freight networks are critically important in moving essential finished goods and raw materials.

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Existing Conditions and Trends: Where We are Now

SECTION CONTENTS

- Overarching Trends and Considerations
- Economic Influences
- Trucking
- Freight Rail
- Ports and Waterways
- Air Cargo
- Critical Urban & Rural Freight Corridors
- Pipelines
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 includes 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 are 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 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. 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, a recent Transportation Revenue Options Commission (TROC) proposal commissioned by Governor 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 between 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.
• 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 instead first- and last-mile connections for shippers and receivers. For rail freight, many of the state’s shortline 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. Climate change will likely increase precipitation and stress stream flows which will test the resilience of the inland waterways’ system of 16 dams and reservoirs.

• 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
The LRTP addresses climate change and resilience as a major goal, 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 on both sectors. Transportation system resilience is especially important in relation to ensuring a reliable movement of goods.

• 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.


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.

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

**Trends & Issues**

- Pennsylvania has a 2020 population of just over 13 million, ranking fifth among the 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 much of the rest of 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 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.¹
- 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. Transportation is key to supporting the economy. Freight movement will likely become a greater focus for supporting economic development and job creation. 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
- The freight-related employment figures by county, census block and industry group for Pennsylvania are contained in Appendix 3: Freight-Related Employment.

¹ USDOT Freight Analysis Framework (FAF) version 5.1
Trucking

Trends and Issues

- The U.S. National Highway Freight Network (NHFN) was designated 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\(^2\) loads in trucks with a gross vehicle weight (GVW)\(^3\) 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.
- 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 (including internal deliveries within Pennsylvania) include gravel, non-metallic mineral products, waste/scrap, other foodstuffs and coal. Measured by value, the top commodities destined for Pennsylvania include mixed freight, pharmaceuticals, other foodstuffs, electronics and motorized vehicles. 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 (including internal deliveries within Pennsylvania) include gravel, non-metallic 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.

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\(^2\) “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.

\(^3\) “Gross vehicle weight” is the weight of the truck and trailer plus the weight of the goods being transported.
Figure 2: National Highway Freight Network

Legend
- Non-Primary Highway Freight System Routes
- National Highway Freight Network
- Critical Rural Freight Corridors (CRFCs)
- Critical Urban Freight Corridors (CUFCs)
- County Boundaries
- Urbanized Areas

Source: Federal Highway Administration (FHWA) and PennDOT
Figure 3: National Highway System

Pennsylvania Freight Movement Plan: DRAFT
• As measured by tonnage, the top external trading partners among U.S. states for truck freight originating in Pennsylvania are New Jersey, New York, Maryland and Ohio. Trade volumes among the U.S. states that are Pennsylvania’s trading partners are documented in Appendix 4: PA Trading Partners by State (Truck).

• 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.

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**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.

• 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 commissioned a [2020 study](#) 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.

• Overweight trucks make PennDOT’s asset management priority even more challenging. Reducing the backlog of highway and bridge improvements is difficult enough at current resource levels.
Figure 4: Freight Bottlenecks

Pennsylvania Freight Movement Plan: DRAFT

PennDOT, 2020
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 work collaboratively with municipal officials and industrial real estate developers to measures impacts of additional truck traffic, not just 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 and 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 with its responsibility for transportation safety.
Freight Rail

Trends & Issues

- Pennsylvania’s freight railroad activity ranks it 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 been the basis for state investment for a long time. Chief among these benefits is the reduction of highway and bridge 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 four types of railroads that fall into three general categories established by the Federal Railroad Administration (FRA). These include:
  ○ 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)

- As measured by tonnage, the top external trading partners among U.S. states for rail freight originating in Pennsylvania are Maryland, Ohio, New Jersey and New York. Trade volumes among the U.S. states that are Pennsylvania’s trading partners are documented in Appendix 9: PA Trading Partners by State (Rail).

- Measured in tonnage, the top commodities transported by rail from origins in Pennsylvania (including internal deliveries within Pennsylvania) include coal, gravel, plastics/rubber, other agricultural products and fuel oils. Measured by value, the top commodities originating in Pennsylvania include coal, plastics/rubber, articles of base metals, other agricultural products and base metals.

- 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 8. 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 (including internal deliveries within Pennsylvania) include coal, plastics/rubber, crude petroleum, newsprint/paper and “other foodstuffs.” Measured by value, the top commodities destined for Pennsylvania include plastics/rubber, base metals, articles of base metals, machinery and coal. A full set of commodity tables is shown in Appendix 8: PA Rail Commodity Tables.

- Pennsylvania’s freight railroad activity ranks it 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.
Figure 5: Class I Railroad System

Railroad Operator
- Amtrak
- Canadian National
- District of Columbia [Bessemer and Lake Erie]
- CSX
- Norfolk Southern
- Other Rail

PennShare: Pennsylvania Freight Movement Plan: DRAFT
The top external trading partners among U.S. states for rail freight destined for Pennsylvania are West Virginia, Illinois, New Jersey and New York.

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 Statewide 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.
Figure 8: Class I Lines and Intermodal Terminals
• 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 9. These figures indicate a gradual decline in railroad accidents, injuries and fatalities over that period.

• 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. There are more than 80 planned grade crossing projects at locations with high FRA hazard ratings in the 2019-2022 Statewide Transportation Improvement Program (STIP).

• 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 railcar 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.
The State’s Existing Rail System

2:000 2020 Pennsylvania State Rail Plan

Figure 2-9: Rail Accidents, Fatalities, and Injuries in Pennsylvania (2009–2018)

Total rail accidents/incidents in Pennsylvania have decreased between 2009 and 2018, as have deaths and injuries. The first half of the decade saw an average of 705 incidents, 30 fatalities, and 329 injuries, while the most recent 5-year period saw averages of 651 total incidents, 30 fatalities, and 314 injuries. The following sections discuss the various types of rail accidents and incidents in more detail.

2.1.6.1.6 Train Accidents

Train accidents include train derailments, collisions, and other events involving on-track rail equipment that result in fatalities, injuries, or monetary damage above a threshold set by FRA. Train accident statistics in the state over the past decade are provided in Figure 2-10.

Figure 2-10: Train Accidents, Fatalities, and Injuries in Pennsylvania (2009–2018)

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., and 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 shortline 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 FMP reinforces this vision statement as it applies to freight transportation. To that end, the goals and objectives of the FMP will align with the EIGHT KEY GOALS of the SRP:

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.
7. Identify stable and predictable funding.
8. Build public support for rail system services and assets.
CSX Intermodal Terminal, Chambersburg
Ports and Waterways

Trends & Issues

- 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 metals, chemicals 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 can also be 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 10.
- The Philadelphia Regional Port Authority, also known as PhilaPort, was established as an independent agency 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. The southernmost facilities are located 43 miles inland from the coast.
- PhilaPort and its facilities compete with 12 other 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. This depth represents the limiting constraint for vessel size at the Port of Philadelphia.
Figure 10: U.S. Marine Highway Routes

Source: https://www.maritime.dot.gov/grants/marine-highways/marine-highway
• 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 the end of 2022.

• 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 windmill parts and generators for the Pennsylvania Shell ethylene cracker plant in Beaver County.

• 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).

• 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 12.

• 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.
Figure 11: Top 5 Commodities, PhilaPort, 2018

- Crude Petroleum: 14,871,721
- Other Hydrocarbons: 904,637
- Distillate Fuel Oil: 788,830
- Residual Fuel Oil: 676,029
- All others: 8,533,264

Source: U.S. Department of Transportation, Bureau of Transportation Statistics (2018)

Figure 12: Top 5 Commodities, Port of Pittsburgh, 2018

- Coal & Lignite: 12,702,912
- Limestone: 1,481,855
- Slag: 533,695
- Gypsum: 705,689
- All others: 4,632,677

Source: U.S. Department of Transportation, Bureau of Transportation Statistics (2018)
Planning Implications

• Pennsylvania’s water ports are major economic generators. Freight planning at the state, and regional generators 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 (2018), including new storage buildings, 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 efficiency and thus performance.

• At PhilaPort, a portion of fruit and cocoa bean cargo has transitioned from break bulk to container, shifting the need, and location of appropriate terminal and storage facilities.

• Due to its location at the eastern reaches of the Ohio 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:
  o Repair/replacement of failing seawalls
  o Maintenance/expansion of wharfs for large vessel shipping and cargo conveyance
  o Maintenance/enhancement of rail and road connectivity to commercial vessel docks
  o 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.
Air Cargo

Trends & Issues

- Pennsylvania is home to more than 650 aviation facilities, including 128 licensed public-use airports, 243 private-use airports and 284 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.
- Fifteen 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 13.
- 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.
Figure 13: Commercial Public-Use Airports

- **Erie International/Tom Ridge Field**
- **Venango Regional**
- **DuBois Regional**
- **Bradford Regional**
- **University Park**
- **Pittsburgh International**
- **John Murtha Johnstown-Cambria County**
- **Altoona-Blair County**
- **Harrisburg International**
- **Arnold Palmer Regional**
- **Lehigh Valley International**
- **Wilkes-Barre/Scranton International**
- **Philadelphia International**

Use Classification:
- **Commercial Aviation/Paved Runways**

**Sources:**
- US DOT Open Data
- Pennsylvania Freight Movement Plan: DRAFT
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 loading commercial cargo planes.
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 commonwealth 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.
- A preliminary list of CUFCs and CRFCs was developed and submitted to the Federal Highway Administration in 2018, then subject to final revisions in 2020. The lists of the critical and urban freight corridors are included as Appendix 11: CUFCs & CRFCs to the FMP.

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.
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 gas pipelines organized under the following categories:
  ○ 48,700 miles of distribution main lines
  ○ 30,500 miles of distribution service lines
  ○ 10,500 miles of transmission pipelines
  ○ 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.

• 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. 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.

• 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 ethanol 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.

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

5 USDOT Freight Analysis Framework (FAF) version 5.1
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 14 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.

Figure 14: PA Freight Movement Plan Goals

- **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.
- **Operations / Safety**: Improve multimodal freight transportation operations and safety.
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.

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 as well.

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

Related Progress and Performance Measures

- Establishment 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.
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.

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.

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 in Appendix 12.

**GOAL B MOBILITY**

**Mobility Objectives**

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

**Related Progress and Performance Measures**

- Reduction in number of truck bottlenecks.
- Truck parking capacity change over time in areas of demonstrated need.
- Freight Work Group expansion to include private sector participation.
GOAL C
ANALYTICAL TOOLS & PROCESSES
Provide planning, data, and analytical tools for improved decision-making.

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 on the traditional methods of forecasting freight based on a four-step process used for passenger transportation. 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 in 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.

Related Progress and Performance Measures
• Expanded use of freight performance measures in the TPR, over time.

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
Maintain and enhance PennDOT’s technical capabilities in freight planning, forecasting, modeling and data.

C-3
Maintain and expand PennDOT’s data repository for Pennsylvania’s freight transportation system.

C-4
Develop basic approaches to understand and assess air cargo trends, needs, and intermodal implications.

C-5
Evaluate and implement select recommendations of the TAC truck weight exemptions study of 2020.
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 high 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.

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.
- Development of framework of implementation approach for addressing emergency truck parking issues (by 2022) through PennDOT’s ongoing truck parking initiative.
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 (not included in this document) 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.

For this 2045 FMP update, the Action Plan was started through an "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 plan 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 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.
Implementation
Partners and Projects

The LRTP and FMP represent Pennsylvania’s highest-level transportation plans—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 Deputy Secretary for Planning will oversee various efforts to ensure that there is a coordinated effort to integrate the plans with:

- PennDOT’s Strategic Plan
- Modal plans – aviation, rail freight, intercity rail, transit, ports, etc.
- Functional plans – technology, asset management, etc.
- Regional LRTPs and freight plans
- Regional modal plans such as public transportation 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 (Figure 15). 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 16. 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.

Greater involvement of private sector stakeholders will enhance the overall collaboration. 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 does not know borders, PennDOT will collaborate with neighboring states and others beyond Pennsylvania as beneficial in the implementation of the FMP.
Figure 15: Planning Partner Regions
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 16.

![Figure 16: National Transportation Performance Measures](image-url)
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. A Pennsylvania Statewide Dashboard documents performance according to each of the national measures.

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.

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.

PennDOT continues to support its regional planning partners 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 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.
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 employment type. Other priority data products (referred to as the “Core Metrics”) will focus on better understanding the national transportation performance measures and mapping of 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 2022, and will be an important resource for regional planning and PA FMP implementation.
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.

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.

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.

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.

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.


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.
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