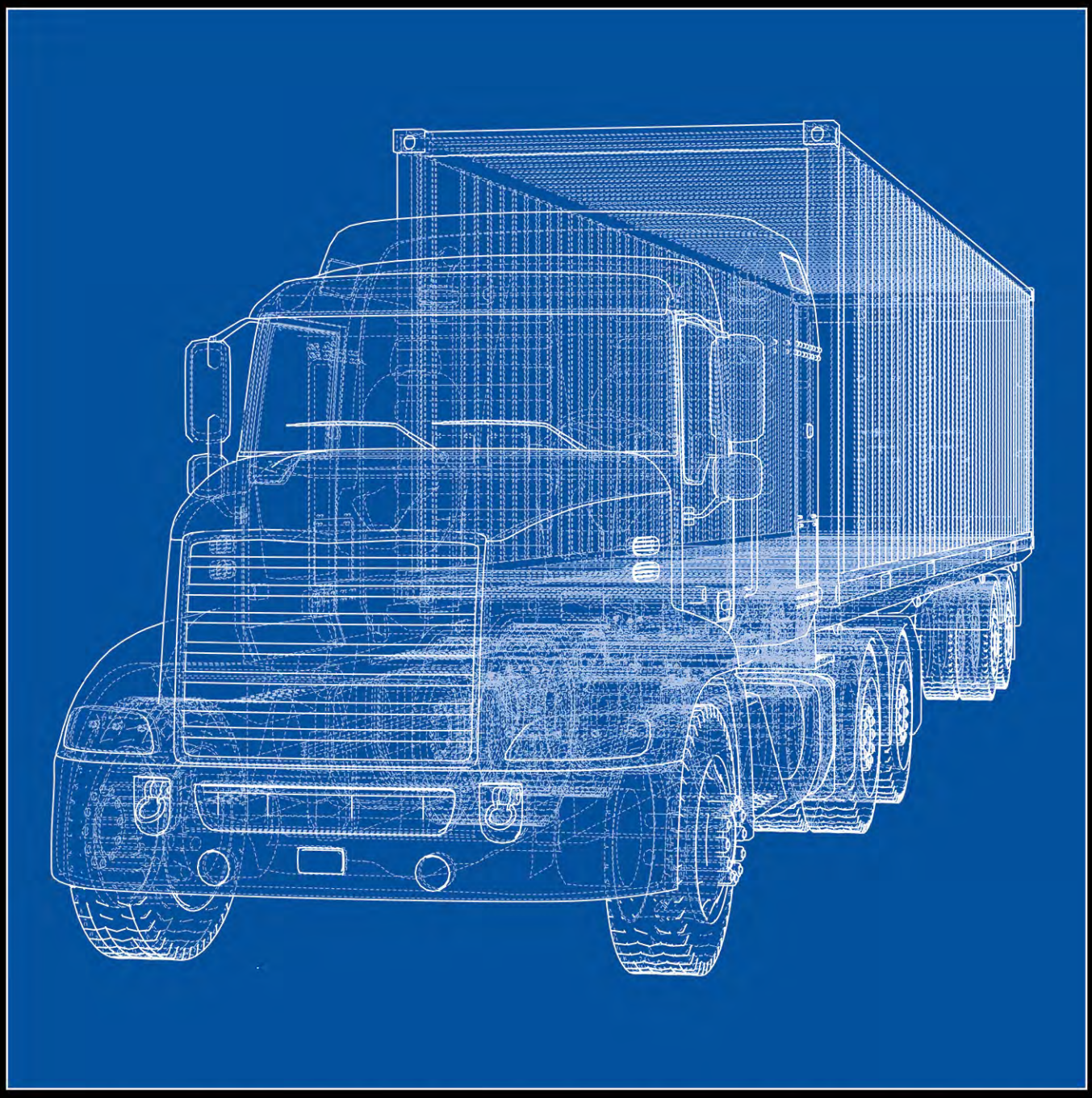

TRUCK WEIGHT EXEMPTIONS

A Pennsylvania Transportation Advisory Committee Policy Impact Study

pennsylvania
DEPARTMENT OF TRANSPORTATION

August 2020

ACKNOWLEDGEMENTS

About the Transportation Advisory Committee

The Pennsylvania Transportation Advisory Committee (TAC) was established in 1970 by Act 120 of the State Legislature, which also created the Pennsylvania Department of Transportation (PennDOT).

TAC has two primary duties. First, it "consults with and advises the State Transportation Commission and the Secretary of Transportation on behalf of all transportation modes in the Commonwealth." In fulfilling this task, TAC assists the Commission and the Secretary "in the determination of goals and the allocation of available resources among and between the alternate modes in the planning, development, and maintenance of programs, and technologies for transportation systems."

TAC's second duty is "to advise the several modes (about) the planning, programs, and goals of the Department and the State Transportation Commission." TAC undertakes in-depth studies on important issues and serves as a liaison between PennDOT and the general public.

TAC consists of the following members: the Secretary of Transportation; the heads (or their designees) of the Department of Agriculture, Department of Education, Department of Community and Economic Development, Public Utility Commission, Department of Environmental Protection, and the Governor's Policy Office; two members of the State House of Representatives; two members of the State Senate; and 18 public members—six appointed by the Governor, six appointed by the President Pro Tempore of the Senate, and six appointed by the Speaker of the House of Representatives.

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SEPTA

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PA Department of Transportation

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Marketing Consultant (ret.)
Allegheny County

Mr. Joel B. McNeil
Brookville Equipment
Jefferson County

Mr. Mark Murawski
Lycoming County Transportation Planner
Lycoming County

The TAC acknowledges the contributions of the various stakeholders who helped to inform and broaden our understanding of this topic and to sharpen our perspectives as to its complexity.

It is important to recognize the involvement of the rail industry and Jerry Vest who coordinated the involvement of several Pennsylvania railroads.

Finally, the TAC was saddened to learn of the passing of Kevin Stewart of the PA Motor Truck Association during the conduct of the study. His contributions, insights, and commitment to Pennsylvania transportation made so very late in his life contribute to his lasting legacy.

Mr. John Pocius, P.E., PLS
LaBella Associates
Lackawanna County

Mr. L. Ashley Porter, P.E.
Porter Consulting Engineers, P.C.
Crawford County

Ms. Karina Ricks
Director, Department of Mobility and Infrastructure
City of Pittsburgh

Ms. Brenda A. Sandberg
Executive Director at Erie-Western PA Port Authority
Erie County

Mr. Jeffrey J. Stroehmann
JDM Consultants
Union County

Mr. Alan Blahovec, CCTM
Executive Director, Westmoreland County Transit Authority
Westmoreland County

Mr. Charles F. Welker, P.E.
EADS Group, Inc. (ret.)
Blair County

Mr. Larry J. Nulton, Ph.D.
Nulton Aviation Services, Inc.
Cambria County

Mr. Elam Herr
Pennsylvania State Association of Township Supervisors (retired)
Lancaster County

Mr. Kevin Stewart
Pennsylvania Motor Truck Association
Cumberland County

Mr. Ron G. Wagenmann
Manager, Upper Merion Township (retired)
Montgomery County

CONTENTS

PA 581, Cumberland County

KEY TERMINOLOGY

PennDOT issued a temporary special hauling permit exemption to support Pennsylvania's disaster emergency response to the COVID-19 pandemic.

Exemption – For purposes of this study, "exemption" is a statutorily approved commodity category of truck movement exceeding Pennsylvania's 80,000-pound weight limit.

It should be noted that PennDOT's special hauling permit process allows for very few true "exemptions" from the statutory 80,000-pound weight limit. Each truck movement exceeding weight and size limits requires a special hauling permit, except those outlined in Chapter 49 (Size, Weight and Load), Title 75 (Pennsylvania Vehicle Code).

PennDOT issued a temporary special hauling permit exemption in April 2020 in response to the COVID-19 pandemic. Exemption 2020-13A temporarily exempted weight and permitting requirements for motor carriers transporting goods and materials necessary to support Governor Wolf's Proclamation of Disaster Emergency. Specifically, motor carriers utilizing combination vehicles with divisible load limits equal to or less than 90,000 pounds were exempt from vehicle weight and permitting requirements provided the transport directly assisted disaster emergency response. According to PennDOT's Special Hauling Permits Manager, the exemption was extended through June 30, 2020. However, it is being monitored and is subject to change in the future.

Special Hauling Permit – Special Permit for Excessive Weight & Size as specified in Chapter 49 (Size, Weight and Load), Title 75, issued for truck movements exceeding Pennsylvania's statutory 80,000-pound weight limit. For purposes of this study, "special hauling permit" is synonymous with "exemption."

Class I Railroads – Each Class I railroad operates in multiple states over thousands of miles of track. They are the largest railway carriers and account for most of the rail infrastructure in the country, according to the Association of American Railroads.

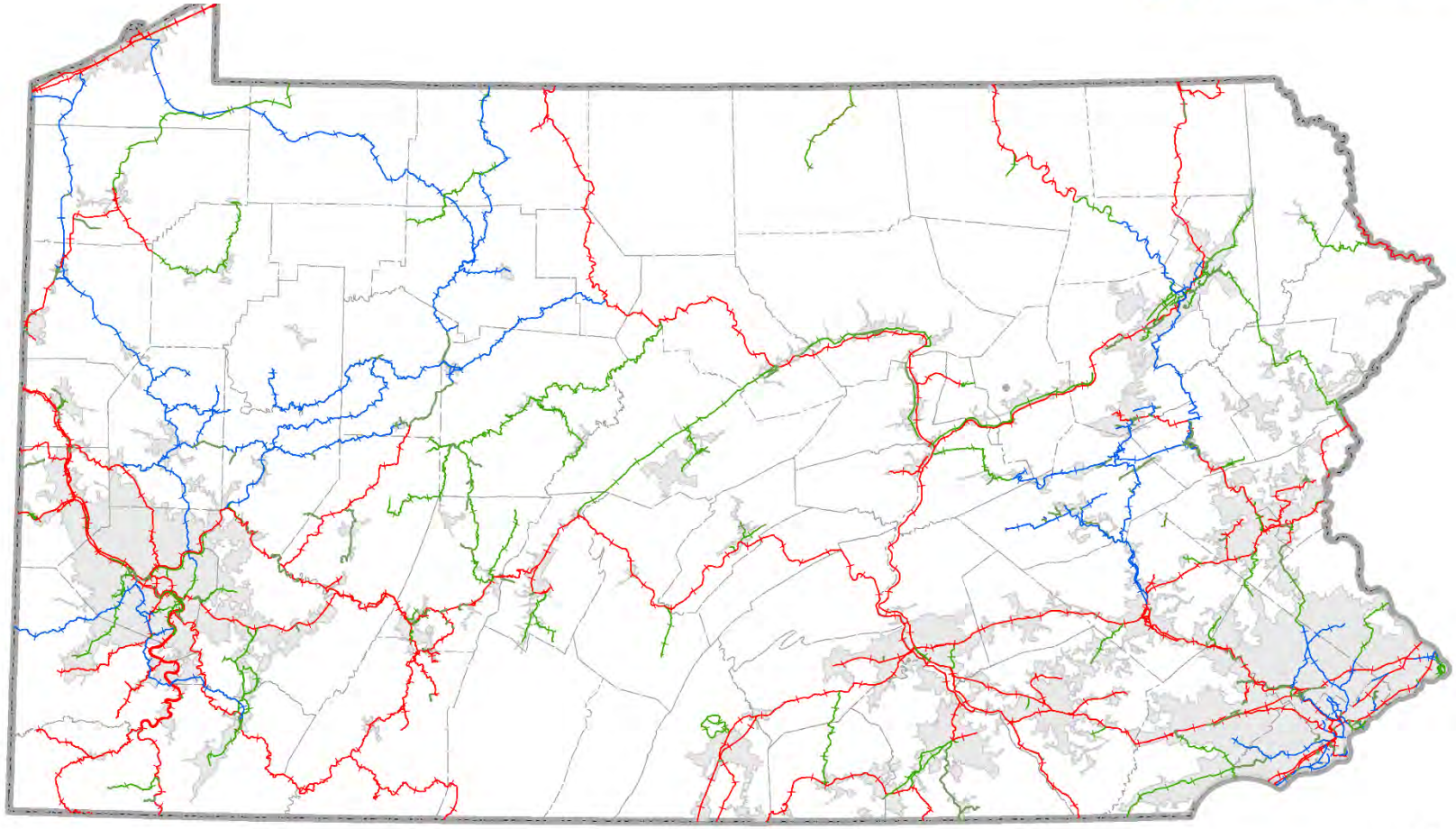
The nation's seven Class I railroads are BNSF Railway Co., CSX Transportation, Grand Trunk Corporation (Canadian National's operations), Kansas City Southern Railway, Norfolk Southern, Soo Line Corporation (Canadian Pacific's operations), and Union Pacific Railroad.

Class II Railroads – These railroads are also known as a "regional railroads" and often provide service spanning one or more regions.

Class III Railroads – These railroads are also known as a "shortline railroads" and typically provide localized shipping services connecting with larger rail carriers and or/intermodal facilities.

Figure 1 on the following page maps Pennsylvania's Class I, Class II, and Class III railroads.

Figure 1: Pennsylvania Railroads by Class



Sources: PennDOT GIS Open Data; Pennsylvania Spatial Data Access

SECTION 1 – BACKGROUND AND STUDY OBJECTIVES

Introduction

Since 1994 when the Pennsylvania General Assembly enacted the first legislation allowing permit issuance for the hauling of an overweight load, 23 additional exemptions have been enacted for a range of commodities and other goods (see Figure 2 on page 5).

The legislation was enacted with the intent of supporting Pennsylvania's economy, and subsequent exemptions were backed by industry groups and/or businesses with the objective of lowering shipping costs for commodities or finished goods.

Cost-effective transportation provides important economic benefits for various entities through the exemptions. However, benefits must be considered in a balanced manner, with a full understanding of the associated costs—wear and tear on state and local roads and bridges, safety, economic harm to other entities, community impacts and enforcement, etc.

Concern has been raised by rail stakeholders and others that the total costs of overweight truck permitting have not been thoroughly understood or considered, while the PA General Assembly has continued authorizing exemptions largely building on precedent. There may even be a perception that the issuance of the permit by PennDOT addresses the full range of potential issues and concerns, which is not the case. The permit application process enables PennDOT staff to review oversize and overweight loads and the proposed routes they would take while being moved through Pennsylvania, but this review is aimed at roadways most appropriate for these movements based on whether the infrastructure can generally accommodate vehicles of the proposed size and weight, and whether there are construction closures or other issues that may need to be considered in determining the most appropriate route. Economic impacts, competitive concerns from other transportation modes, and community impacts are not analyzed in detail as part of this process.

This study is not intended to make recommendations, but rather to begin framing further discussions and research to inform decision-makers.

Study Purpose and Scope

The Pennsylvania Transportation Advisory Committee (TAC) undertook this study as an initial assessment of the complex range of impacts of two decades of overweight truck permitting. These include damage to state and local infrastructure, economic benefits as well as negative consequences, mode shift results, and safety concerns, among others. The work included identifying the extent and characteristics of overweight truck travel based on PennDOT permit data.

As an initial policy impact study, the effort was intentionally broad rather than in-depth, recognizing that key topic areas would need to be

examined further in any subsequent analyses. The study is not intended to make recommendations, but rather to begin framing further discussions and research to inform decision-makers.

Important: Consistent with TAC's commitment to independent and objective analysis, this study is neither pro-trucking nor pro-rail. The sole intent is to begin framing the broader issues and impacts of truck weight exemptions. Readers are strongly encouraged not to take statements out of context that might suggest favoring one mode over another. The full report must be considered as it reflects the balanced, neutral approach that this initial broad-based analysis required.

US 22/322, Perry County

Study Methodology

Key elements in the study process included:

- Stakeholder engagement to solicit the experience of the trucking and rail industries as well as safety and other perspectives.
- Additional information-gathering and interviews of state officials to understand Pennsylvania's legislative background and current practices.
- Literature review to build on previous research efforts, including those at the federal level and by other states.
- Analysis of PennDOT permit data over a two-year period—more than 905,000 records.

The study team synthesized this quantitative, qualitative, and anecdotal information into nine core findings, which form the heart of this report. The final section of the report briefly offers considerations moving

forward, to help guide Pennsylvania's continued progress on this important issue. The considerations could be a starting point for any future targeted and in-depth analysis.

Federal and State Regulations and Practices

The purpose of this sub-section is to provide a general foundational overview of federal and state (Pennsylvania) laws and regulations governing truck weight limits.

Federal[1]

The applicable federal legislation governing truck weight limits is the Surface Transportation Assistance Act (STAA) of 1982 (P.L. 97-424). Under this statute, the general overall weight limit for a five-axle tractor-trailer configuration with a 53-foot trailer (designated as a 3-S2 configuration) was established as 80,000 pounds for the roadway system designated as the STAA National Network. Other weight limits were established for different truck and trailer configurations, but the five-axle tractor-trailer combination is the predominant form of long-haul truck transportation in the U.S. and the one most relevant to an analysis related to overall weight limits.

A typical five-axle tractor-trailer combination

In addition to the gross vehicle weight of 80,000 pounds, the federal regulations also include separate maximum weight limits of 20,000 pounds on one axle and 34,000 pounds on a pair of tandem axles. The federal regulations also contain a series of restrictions tied to a Bridge Gross Weight Formula that relates to axle loads and axle spacing. For

[1] Federal-Aid Highway Act Amendments (1974) and 23 CFR Part 658.17

the purpose of this study, it should be assumed that any trucks operating under Pennsylvania weight exemptions either meet the applicable regulations related to the federal formula—or are not required to meet them.

The weight limits documented here can be described as a "minimum limit" in that states are not permitted to establish lower weight limits than these on Interstate Highways except in limited circumstances.[2] These weight limits are applicable to the "National System of Interstate and Defense Highways and reasonable access thereto."[3]

The federal regulations have one specific provision that relates to an Interstate Highway segment in Pennsylvania that was previously a U.S. Route. Under §658.17(m), the weight limits described above "shall not apply to the operation, on I-99 between Bedford and Bald Eagle, Pennsylvania, of any vehicle that could legally operate on this highway section before December 29, 1995." In addition, there are other statutory and regulatory exceptions to current size and weight limits established under "grandfather" provisions related to the federal highway bills of 1956, 1975, and 1991.

A key exception to the 80,000-pound federal limit on Interstate highways involves "non-divisible" loads (such as a large construction crane). States can issue permits for trucks hauling non-divisible loads that exceed the 80,000-pound limit.[4] A non-divisible load is one that would meet one or more of the following conditions if it were separated into smaller loads: (a) would compromise the intended use of the vehicle; (b) would destroy the value of the load or vehicle; or (c) would require more than 8 work hours to dismantle.

State (Pennsylvania)

In Pennsylvania, each truck movement exceeding the statutory 80,000-pound weight limit is required to be permitted by PennDOT. Special Permits for Excessive Weight & Size, or special hauling permits, require an application and associated fee as specified in Chapter 49 (Size, Weight and Load) Title 75 (Pennsylvania Vehicle Code). Special hauling permits may be issued for a vehicle or combination of vehicles exceeding weight limits. Permits are issued based on weight, dimension, route, and current state and local road and bridge restrictions. Permits may be issued annually, seasonally, and by single trip with fee amounts varying by load type.

The regulations provide criteria for the movement of specific equipment and/or commodities enabled through legislative authority. Since the 1990s, legislation has been enacted to authorize the transport of 24 commodities and equipment via an overweight load permit. Figure 2 lists

[2] CFR §658.17(f)
[3] CFR §658.17(a)
[4] CFR §658.17(h)

these commodities and equipment, current maximum permitted weight, and the initial year legislation was enacted.

Figure 2: Pennsylvania Legislative Authorization for Overweight Commodities & Equipment

Commodity/Equipment	Maximum Truck Weight (pounds)	Year Legislation First Enacted
Containerized Cargo	90,000	1994
Bulk Refined Oil	107,000	1998
Construction Equipment	135,000	1998
Limestone	95,000	1998
Live Domestic Animals	95,000	1998
Particleboard/Fiberboard	107,000	1998
Waste Coal/Beneficial Combustion Ash	95,000	1998
Course of Manufacture: Pulpwood/Wood Chips (5-Axle)	95,000	1999
Course of Manufacture: Pulpwood/Wood Chips (6-Axle)	107,000	1999
Course of Manufacture: Raw Water	96,900	1999
Course of Manufacture: Self Propelled Cranes (Road Tested)	150,000	1999
Float Glass/Flat Glass	100,000	1999
Building Structural Components	116,000	2001
Course of Manufacture: Flat-Rolled Steel Coils or Steel Slabs	100,000	2001
Course of Manufacture: Raw Coal	95,000	2001
Containerized Cargo: Refrigerated Meat Products	107,500	2005
Animal Feed/Unprocessed Grain	95,000	2006
Nonhazardous Liquid Glue	105,000	2010
Waste Tires	95,000	2010
Course of Manufacture: Hot Ingot/Hot Box	150,000	2010
Eggs	95,000	2012
Course of Manufacture: Raw Milk	95,000	2013
Course of Manufacture: Cryogenic Liquid	102,000	2012
Course of Manufacture: Sugar	95,000	2016

According to PennDOT's Special Hauling Permits Manager, PennDOT issues approximately 450,000 special hauling permits per year. These include permits for trucks that are operating above the posted weight limit for any given route, along with those that are oversized (height, width, and/or length) but still operating at or below the posted weight limit. The latter group is not included in this study.

Approximately 80 percent of special hauling permit applications are issued through PennDOT's automated permitting software, Automated Permit Routing Analysis System (APRAS). The remaining 20 percent are processed manually by PennDOT staff. APRAS, in place since 1998, analyzes truck movements and determines the route a truck carrier should use. The system takes road and bridge construction and closures into account. If there is a restriction along a route, the system automatically forwards the application to PennDOT staff for manual review.

Further details pertaining to the permit requirements for the commodities listed above may be found in PennDOT Publication 31, Special Hauling Permit Manual, and in PennDOT's *Load Type Quick Reference Guide:* Load Type Quick Reference Guide.

I-80, Clarion County

SECTION 2 – FINDINGS

FINDING 1

PennDOT issued nearly 577,000 overweight permits over a two-year period from 2016 to 2018; overweight and oversize permits yielded a combined $72 million in estimated revenue.

FINDING 2

Most truck weight-exempted travel under PennDOT permits originates and ends in Pennsylvania.

FINDING 3

Truck weight exemptions accelerate deterioration of Pennsylvania's aging state and local road and bridge network. The cost of this damage cannot be determined using available data.

FINDING 4

Overweight truck permits may increase or decrease truck trips or truck miles depending on the freight economics of the situation.

FINDING 5

Truck weight exemptions appear to shift a significant portion of heavy truck traffic off Interstate highways and onto state and local roads, raising both infrastructure and safety concerns.

FINDING 6

Shippers whose commodities are transported using overweight permitted trucks are beneficiaries of the transport cost savings provided by the overweight permits. But the economic benefits of overweight permitting are not distributed evenly across Pennsylvania businesses and residents.

FINDING 7

Pennsylvania's rail freight operators, particularly regional and shortlines, are placed at a competitive disadvantage by some truck weight exemptions.

FINDING 8

Enforcement of truck weight limits is likely inconsistent across Pennsylvania's municipalities.

FINDING 9

Experiences of other states can help inform PA's further evaluation of truck weight exemptions.

FINDING 1

PennDOT issued nearly 577,000 overweight permits over a two-year period from 2016 to 2018; overweight and oversize permits yielded a combined $72 million in estimated revenue.

Overview

The findings related to PennDOT permits for this study were obtained and derived through a review of detailed data from PennDOT's Automated Permit Routing and Analysis System (APRAS). PennDOT implemented APRAS to streamline the permit application and review process, process payments from carriers obtaining permits, eliminate paperwork, and provide analytical capability to assess the viability of highways and local roads to accommodate overweight and/or oversized loads on specific routes.

APRAS data provides a starting point for this broad study; however, it has significant limitations that constrain analysis of overweight truck traffic and impacts.

Note that PennDOT data is based on the number of permits, not the number of truck trips.

One seasonal or annual permit may actually represent hundreds of truck trips.

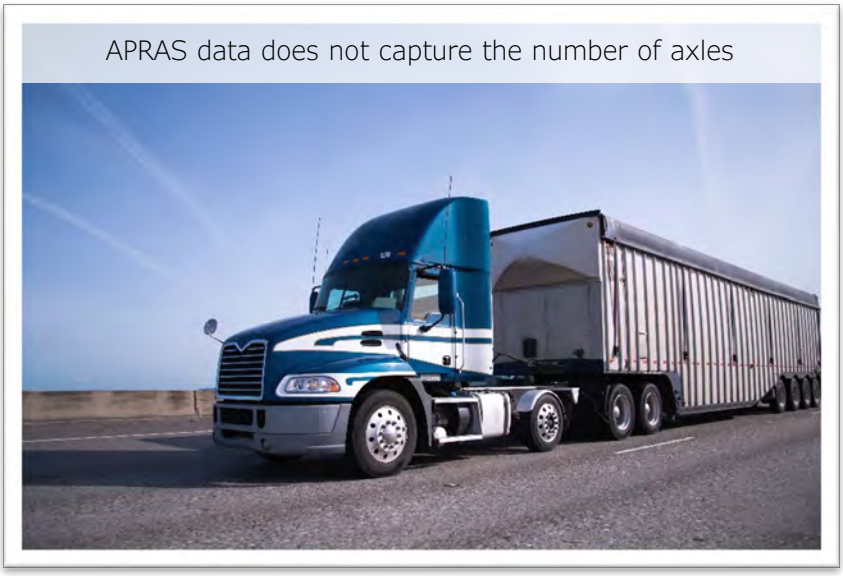
Analysis

- **APRAS data has important limitations.**
  - The data includes permits for oversize loads, which may or may not be overweight. As a result, some of the computations used in TAC's analysis are an aggregation of all oversize and overweight loads, not just overweight loads.
  - It contains detailed information on permits, not individual truck trips. There is a direct correlation between a permit and a truck trip for a single-trip permit, but not for seasonal and annual permits. When estimating the total number of overweight truck trips on the Pennsylvania highway system over any given period of time, there is a high degree of uncertainty in the number of individual trips being made under seasonal and annual permits.
  - The data doesn't record all the details needed to estimate infrastructure impacts. As discussed in Finding 3, actual wear-and-tear to roads and bridges depends on more than the total weight of a vehicle—it is a function of many factors, particularly the number and configuration of axles, and the characteristics of the infrastructure traveled.

A single-trip permit in APRAS typically includes a "start date" and "end date" approximately one week apart, giving the permit holder some flexibility in the exact time when a permitted trip would be made. Annual permits typically cover a period of 364-365 days. For the purpose of this study, the permits listed in the APRAS data file were organized by duration, based on the following parameters:

Permits covering a period up to 10 days are considered "single-trip" permits. These comprise 526,515 of the records in the APRAS overweight permit data, or 91.27 percent of the total.

- Permits covering a period longer than 200 days are considered "annual" permits for the purpose of this analysis. These comprise 49,539 of the overweight permit records, or 8.59 percent of the total.
- The remainder of the permits covering a duration of 10-200 days comprise only 792 of the records, or 0.14 percent of the total.



- **With the aforementioned limitations in view, APRAS data does provide a starting point for understanding overweight truck travel in PA.**
  - PennDOT provided a series of APRAS data files covering a two-year period from 8/23/2016 to 8/22/2018. A total of 905,050 records were included in the two-year data output for actual overweight and oversize permits out of 907,351 applications originally submitted.
  - About $72.16 million of overweight and oversized permit fees were paid to PennDOT for these applications.
  - The APRAS data included 576,846 overweight permits, of which 526,515 were single-trip permits that can be used to estimate cost impacts on the Pennsylvania roadway system associated with individual truck trips.
  - The average weight for overweight trucks operating under single-trip permits documented in the APRAS data file was 119,600 pounds.[5]
  - Trucks operating with single-trip permits have an average trip length within Pennsylvania of 75.8 miles.
  - Those operating under "annual" permits have an average trip length of 19.0 miles within the state. All of the goods listed in Figure 2 are granted annual permits except Building Structural Components, which are issued seasonal permits. Note that "Construction Equipment" as a general Load Type is an annual permit, but subcategories such as cranes, etc., are not.

[5] APRAS data does not include travel on the Pennsylvania Turnpike system.

The average single-trip permit documented in the APRAS data file during the analysis period was for a truck that weighed 119,600 pounds and traveled 75.8 miles on PennDOT and local roads.

The number of special hauling permits issued is small in comparison to total truck movements.

- Those trucks that operate under the remaining 792 permits (see sidebar) travel an average distance of 37.0 miles on Pennsylvania roads.

- **PennDOT's administrative costs for overweight and oversize permit processing for the two-year period is estimated at between $9 million and $14 million.**

  APRAS data indicates that 80 percent of the online applications are processed and approved automatically. The remaining 20 percent are processed by PennDOT staff and take an average of one hour to process.[6] Based on the 907,351 total applications documented above, this translates into an estimated staff administrative cost to PennDOT of $9.04 million to $13.57 million, assuming an hourly PennDOT staff cost of $50 to $75 (this is a reasonable to conservative estimate if all overhead costs are included).

- **Issuance of special hauling permits is small in comparison to total truck movements.**

  PennDOT issues approximately 450,000 permits for excessive weight and size (special hauling permits) each year, as documented above. This is a very small percentage of Pennsylvania's total annual truck trips by any measure. Data compiled by the Federal Highway Administration and the Bureau of Transportation Statistics indicates that more than 550 million tons of freight are moved by truck to, from or within Pennsylvania.[7] Even a highly conservative assumption that all of this freight is moving in fully loaded 80,000-pound trucks,[8] and there are no partially loaded or empty trucks on the highway system, would yield a minimum annual total of 24 million truck trips with an origin and/or a destination in Pennsylvania.[9]

[6] Pennsylvania Department of Transportation, *Automated Permit Routing/Analysis System Online Training Manual, Volume 2: Using APRAS,* PennDOT Publication 393, Volume 2 (February 2010), page 6.
[7] U.S. Department of Transportation, Federal Highway Administration, Bureau of Transportation Statistics, "Shipments Within, Outbound, and Inbound U.S. States – Tons by Trade Type & Transportation Mode: 2018," *Freight Analysis Framework (FAF) Version 4.5.1.*
[8] A tractor-trailer combination typically has a tare (empty) weight of about 35,000, so the calculation referenced here is based on a 45,000-pound load in an 80,000-pound GVW truck.
[9] This is not intended to be an accurate representation of total truck trips to, from, and within Pennsylvania, but to demonstrate the order of magnitude of overall truck trips compared to the number of trucks operating under special permits in Pennsylvania.

FINDING 2

Most truck weight-exempted travel under PennDOT permits originates and ends in Pennsylvania.

Overview

According to the two-year data review described in Finding 1, most of the truck movements using PennDOT overweight permits serve shippers and/or receivers in Pennsylvania—62 percent of the permits had both an origin and a destination in Pennsylvania. (Note: A cursory review of other states suggests that permit processes are comparable.)

Analysis

Most of the truck movements using PennDOT overweight permits serve shippers and/or receivers in Pennsylvania.

- **APRAS origin and destination data provide a profile of the movements of permitted overweight trucks.**

  Of the permits analyzed (described in Finding 1):

  - 76.0 percent are for origins in Pennsylvania.
  - 20.7 percent have origins in neighboring states.
  - 0.5 percent list the "PA Turnpike" as the origin.
  - 2.7 percent have no origin listed.
  - 74.3 percent have Pennsylvania destinations.
  - 22.0 percent have destinations in neighboring states.
  - 0.5 percent list the "PA Turnpike" as the destination.
  - 3.2 percent have no destination listed.
  - 62.2 percent have both an origin and a destination in Pennsylvania.
  - 9.0 percent have both an origin and a destination in neighboring states.
  - 2.7 percent have neither an origin nor a destination listed.
  - Among trips originating out of state, the most common entry points into Pennsylvania are West Virginia (7.2 percent of the total permits), Maryland (4.9 percent) and Ohio (3.3 percent).
  - For trips destined to points out of state, the most common exit points where overweight trucks leave the state are West Virginia (6.9 percent of the total permits), New York (4.5 percent), and Maryland (3.6 percent).

FINDING 3

Truck weight exemptions accelerate deterioration of Pennsylvania's aging state and local road and bridge network. The cost of this damage cannot be determined using available data.

The total cost to the transportation system of a tractor-trailer weighing more than 100,000 pounds is 25 times that of an automobile.

Overview

Federal cost allocation and truck size and weight studies have demonstrated that heavy trucks occasion a cost on the system far greater than automobiles, and that this cost is considerably higher, the heavier the truck. The total cost to the transportation system of a typical tractor-trailer combination weighing 75,000-80,000 pounds (not overweight) was estimated to be nearly 11 times that of an automobile. For a typical tractor-trailer combination in excess of 100,000 pounds, this ratio exceeds 25 to 1, an increase of well over 200 percent.[10]

Although a reliable dollar figure cannot be readily associated with this damage, heavier loads on PA's state and local road and bridge network accelerate deterioration. This strain makes it even more challenging for Pennsylvania—under current funding levels—to maintain its roads and bridges in a state of good repair. State of good repair is a top federal and state priority as reflected, for example, in federal transportation asset management. The cost of needed local road and bridge improvements is extremely challenging for local municipalities throughout the Commonwealth.

Analysis

- **Despite inherent limitations, USDOT truck size and weight studies provide objective research and criteria for comparing the damage to highways and bridges caused by trucks vs. cars.**

  The U.S. Department of Transportation (USDOT) has conducted research over the years on overweight and oversized trucks on the nation's highway system. The two most notable studies are the 1997 Federal Highway Cost Allocation Study and the 2015 MAP-21 Comprehensive Truck Size & Weight Limits Study. Because the 1997 USDOT study that developed detailed cost-per-mile measures by vehicle class only measures impacts to Interstate highways, it has limited applicability to this study—roads under PennDOT jurisdiction do not have the same functional class and vehicle mix as the Interstates. The 2015

[10] U.S. Department of Transportation, Federal Highway Administration, *1997 Federal Highway Cost Allocation Study Summary Report*, Table 3.

study was instructive. It highlighted a series of data gaps and predictive modeling deficiencies related to forecasting the costs and impacts of allowing larger and heavier trucks to operate on the nation's highway system. As a result of the shortcomings in the 2015 study, the USDOT recommended no changes to the current federal regulations related to truck size and weight. In terms of infrastructure impacts, the USDOT study specifically cited the lack of an appropriate bridge deck wear model suitable for analyses with heavier truck weights.[11]

The USDOT study specifically cited the lack of an appropriate bridge deck wear model suitable for analyses with heavier truck weights.

Despite these limitations, the 2015 USDOT study highlighted several items relevant to this effort. These include:

- For an analytical scenario in which the 80,000-pound federal weight limit for a five-axle tractor-trailer combination is increased to 88,000 pounds: pavement service intervals were projected to be 0.3 percent shorter (i.e., maintenance would be required more frequently), and pavement life cycle costs 0.4 percent to 0.7 percent higher. This reflects a net impact that considers both the heavier trucks and the decrease in the number of trucks due to the higher weight limit per truck.[12] This scenario would also require a one-time national investment of $400 million (in 2011 dollars) for bridge replacement or strengthening projects to accommodate the heavier trucks.[13]

- Pavement service intervals are projected to be 2.7 percent longer, and pavement life cycle costs 2.4 percent to 4.2 percent lower, for an analytical scenario in which the 80,000-pound federal weight limit for a tractor-trailer combination is increased to 91,000 pounds and the axle configuration is increased from five to six. This is the net impact associated with the heavier trucks operating with an extra axle combined with the decrease in the number of trucks due to the higher weight limit per truck.[14] This scenario would also require a one-time national investment of $1.1 billion (in 2011 dollars) for bridge replacement or strengthening projects to accommodate the 91,000-pound trucks.[15]

- Similarly, pavement service intervals are projected to be 2.7 percent longer, and pavement life cycle costs 2.6 percent to 4.1

[11] The USDOT, through the Transportation Research Board (TRB), has recently completed development of a research program aimed at addressing the data gaps and model limitations identified in the 2015 study: National Academy of Sciences, Engineering, and Medicine, *Research to Support Evaluation of Truck Size and Weight Regulations*, The National Academies Press, Transportation Research Board Special Report 328 (2019).
[12] U.S. Department of Transportation, Federal Highway Administration, *Comprehensive Truck Size and Weight Limits Study, Pavement Comparative Analysis Technical Report* (June 2015), Table ES-2.
[13] U.S. Department of Transportation, Federal Highway Administration, *Comprehensive Truck Size and Weight Limits Study, Bridge Structure Comparative Analysis Technical Report* (June 2015), Table ES-3.
[14] USDOT, *Pavement Repor*t, Table ES-2.
[15] USDOT, *Bridge Report,* Table ES-3.

percent lower, for an analytical scenario with 97,000-pound trucks operating with a six-axle configuration.[16] Conversely, the 97,000-pound truck weight would require a one-time investment nationwide of $2.2 billion (2011 dollars) for bridge replacement or strengthening projects. This demonstrates the importance of axle configuration as a part of any future considerations of overweight trucks.

PA 120, Emporium, Cameron County

- **Costs to the PA transportation system of permitted overweight trucks can only be roughly estimated based on limited available data.**
  - As discussed in Finding 1, the average single-trip permit documented in the APRAS data file was for a truck that weighed 119,600 pounds and traveled 75.8 miles on PennDOT and local roads. A total of 526,515 overweight single-trip permits were issued for the analysis period covered in this study.
  - Using the rather dated 1997 federal allocation model of highway costs by vehicle classification and weight as a basic rule of thumb, the cost to the transportation system of a 119,600-pound truck is about $0.20-$0.25 per mile of travel in 2000 dollars.[17] This computes to a total cost of $7.98 million to $10 million, or approximately $12.1 million to $15.1 million in 2020 dollars.[18] This represents a rough

[16] USDOT, *Pavement Report,* Table ES-2.
[17] *1997 Federal Highway Summary Report*, Table 3, "Allocation of 2000 Federal Highway Program Costs" (extrapolated to estimate a 120,000-pound cost range).
[18] An inflation conversion factor of 1.5164 was used to convert 2000 costs to 2020 costs.

estimated cost incurred on the Pennsylvania roadway system from these 526,515 overweight, single-trip permits.

- These 526,515 trucks weighing an average of 119,600 pounds would translate to 787,272 "equivalent" trucks operating at a maximum weight of 80,000 pounds.[19]

- Under the same 1997 federal allocation model of highway costs by vehicle classification and weight, an 80,000-pound truck causes $0.0708 in costs per mile of travel.[20] This computes to a total cost of $4.23 million, or about $6.4 million in 2020 dollars.

- Based on this rough calculation, the difference between the $12.1 million to $15.1 million cost for the 526,515 trucks at an average weight of 119,600 pounds and the $6.4 million cost for 787,272 "equivalent trucks" at an average weight of 80,000 pounds is approximately $5.7 million to $8.7 million. This represents a starting point order-of-magnitude estimate of the excess cost borne by the Pennsylvania highway system for the 526,515 overweight trucks operating under single-trip permits for the two-year period from 8/23/2016 to 8/22/2018.

- It should be noted that these estimated infrastructure costs do not correlate directly with the PennDOT staff costs or with the $72.16 million in permit fee revenue documented in Finding 1. The permit fee revenues and PennDOT staff costs are for all permit applications, including those for oversized vehicles that are not overweight.

- Further, and of particular note, these infrastructure costs are for single-trip permits only, and do not account for the potentially large number of overweight truck trips that are made under annual and seasonal permits. In addition, the cost/revenue comparison does not account for the potentially higher fuel tax revenue for overweight trucks assuming that the fuel efficiency for these heavier vehicles is less than for their 80,000-pound counterparts.

- Infrastructure impacts are a function of a wide range of variables that were not included in the research for this study and/or were not included in the APRAS data used as the basis for the quantitative measurements of overweight truck activity and its implications for PennDOT. Key variables not included in this analysis include:
  - Axle count and spacing for overweight trucks
  - Truck tire pressure
  - Single axle vs. tandem axle configurations
  - Axle loadings for drive axles vs. load-bearing axles

Axle spacing and loads are particularly relevant for pavement impacts, while overall truck weight is more critical for assessing bridge impacts.

[19] This conversion is only for illustrative purposes, because it would only apply to divisible loads (grain or coal, for example) that could be shipped in quantities smaller than the weight listed on the permit. By definition, a non-divisible load in excess of 80,000 pounds (a construction crane, for example) cannot be "converted" to multiple smaller loads and shipped at a lower weight per load.
[20] *1997 Federal Highway Summary Report*, Table 3 (75,000- to 80,000-pound cost).

- Pavement depth and type for each roadway segment accommodating an overweight truck
- Structural components and bridge deck features for individual bridge structures

Axle spacing and loads are particularly relevant for pavement impacts, while overall truck weight is more critical for assessing bridge impacts. This too is an important consideration going forward given Pennsylvania's vast inventory of state and local bridges, many of which are very old.

- **Pennsylvania's overweight truck permitting appears to be at cross-purposes with the federal and state asset management focus.**
  - TAC has previously issued transportation funding studies, including a funding risk analysis in 2019. These studies have emphasized that improving and maintaining Pennsylvania's roadways and bridges is essential to ensure mobility and access, however, transportation needs greatly exceed funding. The coronavirus has had a further dampening effect on fuel tax revenues.
  - Asset management, broadly described, is the practice of making strategic timely road and bridge repairs to reduce overall life-cycle costs. The aim is to keep the transportation system in a state of good repair to the greatest extent feasible within the limited funding available. There has been an increasing and major emphasis on asset management at the federal and state levels. Pennsylvania, through its Transportation Asset Management Plan (TAMP), has committed to FHWA-required state-of-good-repair thresholds for National Highway System pavements and bridges. Based on current funding, Pennsylvania (and other states as well) will struggle to meet these standards in the coming years and may be forced to divert funding from non-NHS (local) infrastructure to meet FHWA condition requirements. Having insufficient resources to keep the network in a state of good repair is a vexing problem that is only compounded by larger and heavier trucks.

FINDING 4

Overweight truck permits may increase or decrease truck trips or truck miles depending on the freight economics of the situation.

Overview

The net effect of the permits issued to date on the number of truck trips taken and the number of truck vehicle-miles traveled could not be measured within the scope of this study. What is clear is that issuing overweight truck permits does not always decrease truck trips or truck miles as is sometimes assumed. Truck weight exemptions can have positive or negative effects on those measures depending on numerous other factors.

Analysis

- **The net impact of truck weight exemptions on truck travel volume is not clear.**

  The math appears simple. Hauling 800,000 pounds for a distance of 10 miles, in 80,000-pound loads, will take 10 truck trips and 100 truck miles (setting aside the weight of the truck itself for this simplified example). Issue an overweight permit to 100,000 tons, and the same load on the same route can be transported in eight truck trips with a total of 80 truck vehicle miles traveled (a 20 percent reduction). This appears to be a win for the trucking company and/or the shipper (depending on the pricing power), the environment, other motorists,[21] and people adjacent to the route.

  In reality, however, the outcome is probably not that clear-cut. There are scenarios in which overweight permitting could result in **more** truck trips and more truck miles than if the permit had not been issued. There are also scenarios in which overweight permitting could result in fewer truck trips but more truck miles.

  For example, a shipper may elect to use the overweight truck for the entire trip, whereas without the permit, rail might have been used for at least part of the trip. Two instances of this scenario are described in Finding 6—a shipper was using rail but switched to truck after an authorization for overweight permitting of their commodity was enacted.

Issuing overweight truck permits does not always decrease truck trips and truck miles.

[21] Setting aside the question of possible accelerated road damage and effect on ride quality or frequency of repair.

PA 153, Clearfield County

There is also a possible scenario in which the number of truck trips is lower but the truck miles are greater, due to the need to take a more circuitous route to avoid Interstates and load-posted bridges. The route diversion effect is explored in Finding 3. A situation in which the increased route length more than offsets the decreasing truck trips is not likely; it is simply noted as a possibility. Raising this possible, but not likely, scenario highlights the phenomenon, described under Finding 3, that, with an overweight permit, truck trips on a given route may be lower on some routes but higher on others, with potential implications for community impacts as heavier trucks move through these locales.

- **Overweight permitting affects logistics costs and other logistics factors that may impact company location and sourcing choices.**

  There are also more subtle changes in freight transportation patterns that may result from overweight permitting and that play out over the longer term. These changes stem from the interrelationships between shipper location and logistics considerations. That is, over the longer term, shippers will choose their locations and their suppliers in part based on logistics advantages. Overweight permitting has effects on logistics costs and other logistics factors that may impact company location and sourcing choices in ways that are not foreseen when permitting authorization decisions are made.

  Some casual counterfactual (i.e., "**if not for**…") scenarios can provide examples of how the economics could play out and add further insight for how dynamic this issue can be:

  - **If not for** the overweight permit, the shipper would have lost competitive advantage to an upstart supply source that was able to locate closer to the product user. In this scenario, total truck trips may be higher, but truck miles lower.

- **If not for** the overweight permit, the cost of shipping the product input (raw materials or other components) would be such a significant part of production costs that it would lead the manufacturer to change the production process to use less of the input, or to substitute an entirely different input. In this case, without the permit, truck trips and truck miles would presumably have been lower without the permit (conversely, higher with the permit).
- **If not for** the overweight permit, the processor that uses the shipped input would not be cost-competitive and would lose the business to an out-of-state firm. Both the manufacturer and the shipper of the raw materials would lose business, Pennsylvania would lose economic activity, and truck trips and truck vehicle miles would decrease compared to the scenario where the permit is issued. That is, the permit results in more truck trips than had the permit not been issued, but the permitting is beneficial for the Pennsylvania economy.

Of particular concern is the prospect of legislating more overweight permit authorizations without careful consideration of both the benefits and costs as well as the varied impacts that might not be quantifiable.

There are many other paths that the economic developments could follow, but a final scenario worth noting is one that involves rail freight and the cumulative impacts of overweight permits. Of particular concern is the prospect of legislating more overweight permit authorizations without careful consideration of both the benefits and costs as well as the varied impacts that might not be quantifiable. As described under Finding 8, railroads may be forced to increase rates and/or decrease levels of service if overweight permitting causes them to lose revenue to increased truck competition. If an overweight permit causes a railroad operator to need to raise rates and/or reduce service to unrelated shipments, this may lead indirectly to a shift from rail to truck transport for some of these shippers, and thereby to an increase in truck trips.

The alternative scenarios are raised here not to suggest that most overweight permits will not decrease truck trips, but rather to illustrate that it is not a given that issuing overweight permits will decrease truck trips and truck vehicle miles.

FINDING 5

Truck weight exemptions appear to shift a significant portion of heavy truck traffic off Interstate highways and onto state and local roads, raising both infrastructure and safety concerns.

Overview

There are currently 90 different/specific load types that can operate under Pennsylvania's commodity-based weight exemptions. Of these, 29 are considered divisible loads and are explicitly prohibited from traveling on Interstate highways.[22] These 29 load types comprise 45,710 of the records in PennDOT's Automated Permit Routing Analysis System (APRAS) data files, or about 7.9 percent of the total permits issued over the two-year period covered in those data.

Most of the overweight permits for these commodities are annual and seasonal permits, which means the total number of trucks hauling these loads on Pennsylvania's highways is likely to be larger—perhaps far larger—than the 7.9 percent of the total permits that are issued for them.

Analysis

Secondary roads and arterials are not typically the most efficient or suitable routes for truck travel.

Diverting overweight trucks to these roads has implications for infrastructure life, congestion, safety, and community impacts.

- **Federal law has precedence for truck weight, restricting overweight trucks from the Interstate Highway System.**

  Due to the complex combination of federal and Pennsylvania laws and regulations, some of the trucks operating under the Commonwealth's weight exemptions must travel on secondary roads and arterials that are not the most efficient and/or suitable routes for truck travel. This has implications for infrastructure costs, congestion, motor vehicle safety, and community impacts.

  Weight limits on the Interstate Highway System are controlled by federal law, under which the maximum gross vehicle weight (GVW) is established as 80,000 pounds. Axle weight limits are set at 20,000 pounds on a single axle and 34,000 pounds for a tandem axle pair.[23] The Interstate Highway System in Pennsylvania[24] is comprised of 22 designated highways with a total net length of about 1,862 miles and a total length of 1,953 miles.[25] Under the applicable federal regulations, Pennsylvania has one segment of Interstate Highway

[22] Pennsylvania Department of Transportation, *Load Type Quick Reference Guide* (2019).
[23] Federal-Aid Highway Act Amendments (1974) and 23 CFR Part 658.17.
[24] U.S. Department of Transportation, Federal Highway Administration, "FHWA Route Log and Finder List," Table 3 (accessed June 12, 2020).
[25] There are 87.2 miles of roadway in Central Pennsylvania designated as both I-70 and I-76, and 3.6 miles of roadway south of Pittsburgh designated as both I-70 and I-79.

One example of a load operated on secondary routes due to federal weight restrictions is an agricultural shipper in Gettysburg (Adams County) that ships animal feed to customers in the Selinsgrove and Allentown areas. The trucks used for these deliveries can operate at a weight of up to 95,000 pounds. Under normal conditions, the fastest and most efficient route for the Allentown trip would be via US 15, I-81, PA 581, I-83, I-81, and I-78. This trip would cover 120 miles in about two hours, mostly on Interstate highways. Due to the federal restriction applied to a divisible load in excess of 80,000 pounds, the trucking company must use US 30, US 222, and other local roads. This route is slightly shorter than the Interstate route (120 miles vs. 123) but takes 25-30 minutes longer and travels through the cities of York, Lancaster, and Reading.

The route this customer's trucks use from Gettysburg to Selinsgrove is challenging under any circumstances because there is no Interstate route along the Susquehanna River north of Harrisburg. As a result, these loads would be hauled on US 15 and US 22 for much of the trip regardless of any weight restrictions. However, the prohibition against overweight trucks on the Interstate system forces these trucks to use the Harvey Taylor Bridge and travel through downtown Harrisburg instead of bypassing the city center on I-83 and I-81 to continue north along US 22 and US 15.

(I-99) between Bedford and Bald Eagle with a special axle limit that dates back to the legal truck configurations permitted on this stretch before December 29, 1995.[26] The 80,000-pound GVW limit is the established federal weight limit on all other Interstate Highways in Pennsylvania.

- **Divisible vs. non-divisible loads is an important distinction.**

  One key exception to the 80,000-pound federal limit on Interstate highways involves "non-divisible" loads. States can issue permits for trucks hauling non-divisible loads that exceed the 80,000-pound limit.[27] A non-divisible load is one that would meet one or more of the following conditions if it were separated into smaller loads: (a) would compromise the intended use of the vehicle; (b) would destroy the value of the load or vehicle; or (c) would require more than 8 work hours to dismantle.

  Pennsylvania's commodity-based weight exemptions include various load types that are prohibited from traveling on Interstate highways because they are categorized as divisible loads. These are typically loads such as agricultural products (grain, milk, etc.), coal, waste materials, or other bulk materials. Due to federal regulations, these loads cannot be moved on Interstate highways. A truck carrying raw milk, for example, can operate up to a GVW of 95,000 with a special permit under Pennsylvania law, but it cannot operate on an Interstate highway.

  In addition to the federal regulatory implications described here, divisible loads are also an important consideration for Pennsylvania because these are the commodities for which the truck trip comparison calculations described in Finding 4 are most relevant. Under the current overweight permit system, overweight trucks moving divisible loads are most likely to be found on PennDOT highways and local roads operating over short distances. Truck volumes along these routes, therefore, would be somewhat higher if the same commodities were being moved along the same routes in 80,000-pound trucks.

- **Trucks hauling divisible loads tend to make shorter trips, but they may be on unsuitable roads.**

  The average trip length for the 45,710 relevant APRAS records was only about nine miles. However, many of the APRAS records for these loads did not list an origin and/or a destination. In any case, the permit regulations for many divisible oversize loads include distance restrictions that would make Interstates somewhat less attractive routes even if these trucks were permitted to use them. Trucks operating under a permit for "Course of Manufacture: Raw Coal" (Load Type #50E), for example, can move their loads up to 30 miles, while those hauling under

[26] CFR §658.17(m)
[27] CFR §658.17(h)

a permit for “Course of Manufacture: Milk/Coal” can only carry the load up to one mile.

The industry outreach conducted for this study indicates that some of these loads—particularly those for commodities that are not subject to a distance restriction (see sidebar)—are diverted from Interstates onto other roads that are less suitable for heavy truck traffic.

Weaversville Road/SR 3017, Northampton County

FINDING 6

Shippers whose commodities are transported using overweight permitted trucks are beneficiaries of the transport cost savings provided by the overweight permits. But the economic benefits of overweight permitting are not distributed evenly across Pennsylvania businesses and residents.

Overview

Shippers whose commodities are transported using overweight permitted trucks benefit from the transport cost savings that the overweight permits make possible. The receivers of these commodities, the end consumer, and the trucking firms that obtain the permits may also share in some of these cost savings. Nevertheless, there are enterprises (other shippers, receivers, and carriers) that can be negatively affected by overweight permitting. Also, considering that the overwhelming majority of truck trips are made without special hauling permits, there are likely many other shippers that, while not harmed by the special permits per se, would benefit from using overweight trucks for their loads.

To the extent that the overweight travel imposes additional road damage cost that is not covered by the permit fee,[28] shipping cost savings is actually a transfer from those traveling on the damaged roads and those paying for the road repairs to those enjoying the shipping cost savings. By authorizing the issuance of special hauling permits to a limited set of commodities, the Pennsylvania General Assembly is *de facto* choosing winners. This challenging point is made only to raise awareness of the "winners–losers" dynamic when future weight limit increases are analyzed and debated. Obviously, this must also be considered in the context of the range of public policies and programs that each have a varied mix of those who benefit and those who do not.

According to a 2018 report prepared for the Pennsylvania Department of Agriculture, issuing special hauling permits leads to increased efficiency and profits, particularly for Pennsylvania's dairy industry.

Analysis

- **Special hauling permits reduce shipping costs for the permitted loads.**

  Several stakeholders talked about the shipping cost savings benefits resulting from obtaining a special hauling permit.[29] The projected costs savings are potentially substantial in some instances. One Pennsylvania

[28] This (truck permit fees not covering the cost of associated road damage) is not always the case.
[29] Interviews with Pennsylvania Motor Truck Association (April 10, 2020), PennAg Industries Association (April 20, 2020), and an agricultural shipper (April 21, 2020).

An agricultural shipper reported the ability to transport grain on a 95,000-pound truck weight permit has the following benefits:

- Improved efficiency as the number of trips to deliver agricultural products is reduced.
- Reduction in the number of experienced drivers the company needs to hire and retain.
- Reduction in capital expenditures required to purchase a truck which currently averages $225,000.
- Reduced fuel costs as the number of trucks on the road are reduced.

Collectively, the agricultural shipper reports these benefits result in reduced shipping costs and that these savings are passed on to customers.

legislator indicating that a special hauling permit "…could assist a company in his area, saving near $300,000 in shipping costs."[30]

A report prepared for the Pennsylvania Department of Agriculture documents the efficiency benefits of overweight permits for Pennsylvania's dairy industry. Act 34 of 2016, which authorized the issuance of a special hauling permit for milk hauling trucks to transport 95,000-pound loads, was enacted in response to milk haulers taking longer routes due to weight restrictions placed on aging bridges. "The permits allow the 80,000-plus-pound milk-hauling trucks to travel on Interstate highways,[31] increasing the efficiency of dairy distribution systems and increasing profit margins for the state's dairy producers."[32]

- **Shippers that do not use overweight permits can be affected indirectly.**

  As described in Finding 7, the overweight permitting can reduce a railroad's customer base and revenue. Besides being a negative impact on the railroad, this can negatively affect the other rail customers if this revenue loss compels the railroad to raise rates and/or reduce service to its remaining customers.

- **Small trucking firms and independent truckers can be placed at a competitive disadvantage by overweight permitting.**

  Small trucking firms and independent truckers may find it more difficult to make the capital investment in the vehicles needed to haul overweight loads. Other factors and costs such as insurance may be prohibitive as well. Stakeholders speaking for smaller truck operations do express concern over the impacts of truck weight permitting on their operations. This is an important discovery to dispel the notion that truck weight exemptions impact freight railroads only.

[30] Pennsylvania House of Representatives, Transportation Committee, *PLS Committee News*, SB 1147, June 26, 2012.
[31] For the purpose of Interstate weight limits, federal law defines fluid milk to be a "non-divisible load," per FAST Act §1409; 23 U.S.C. 127(a).
[32] Econsult Solutions and Temple University Fox School of Business, *Pennsylvania Agriculture: A Look at the Economic Impact and Future Trends (Version 1),* Pennsylvania Department of Agriculture (January 2018), p. 79.

FINDING 7

Pennsylvania's rail freight operators, particularly regional and shortlines, are placed at a competitive disadvantage by some truck weight exemptions.

Overview

Rail freight and trucking have fundamentally different cost structures and infrastructure. A change in weight restrictions for trucks can undercut rail's competitive advantage for certain commodities and customers, to a point where some regional and shortline railroads may be driven out of business.

Certainly, however, not all origins and destinations are readily connected by rail. In those instances where railroads are not located in proximity to customers requiring service and transload services are not practical, overweight trucks do not appear to pose a competitive disadvantage to rail. Rail stakeholders do, however, suggest that larger trucks can "take shortlines out of the logistics flow" in some instances, and that Class 1 railroads themselves may opt to use trucks for "last-mile" connections to customers.

Policymakers need to be mindful that Pennsylvania has a strong history of supporting and preserving regional and shortline railroads. This occurred over decades and included efforts to help smaller railroads to acquire and improve Class I lines and in doing so improve service and local economics. The precise impact of greater truck weights, as important as that may be, is for the near term less important than raising awareness through this study that future proposals must consider the value of smaller railroads and the history of the Commonwealth's strategic support.

Analysis

- **Railroads excel in moving heavy, bulky loads long distances. Overweight truck permitting reduces rail's competitive advantage with regard to heavy freight.**

  Rail stakeholders noted several examples of commodities being diverted from rail to truck transport when truck weight limits were increased (see sidebar).

  According to a 2007 Massachusetts Institute of Technology study, increasing truck weights "can be expected to have a large effect on rail

A Class II regional railroad reports that increasing the allowable truck weight limit for wood pulp to 95,000 pounds diverts approximately 400 railcars per year.

In addition, diverting the transport of raw coal from rail to truck at 95,000 pounds would reduce the railroad's economic return on investment at its port facilities in western Pennsylvania.

A Class III shortline railroad states that grain movements are easily diverted from rail to truck. Grain prices are highly influenced by domestic, global, and seasonal fluctuations and truck pricing can be very nimble to accommodate these price shifts. Rail pricing is not as nimble as rail assets are 'fixed' in place. Grain brokers will easily shift grain freight from rail to truck to maintain profit margins. When grain is diverted from rail to truck shipment, the shortline loses on average the movement of 150 rail cars per year. This increases the number of trucks on local roads by 600 per year.

In neighboring Ohio, two **Class III shortline railroads** note that 2008 legislation for permitting the transport of 3 or fewer coils of steel or aluminum up to 120,000 pounds has resulted in the diversion of approximately 400 rail cars per year to truck. The truck movements are intrastate moves, meaning the diversion drew from already established rail movements at origins and destinations within Ohio.

traffic, with diversions of 10-15 percent possible even under the most modest proposals."[33]

Privately owned railroads are directly responsible for more of their infrastructure costs, unlike trucking companies that operate on public roadways.

Rynd Farm Station, Oil Creek & Titusville Railroad (shortline), Venango County

- **The competitive balance between rail freight and truck freight is shaped by the major differences in their cost structures.**

  Railroads must cover the large fixed-cost burdens of the infrastructure and real estate they own. Conversely, trucking costs are nearly all variable (e.g., labor). Further, the true cost of trucking does not capture the full costs of the highway system. Truck operators pay fuel tax that supports highway improvement and maintenance, but not at a level that offsets all of those costs.

  Any loss of rail business means a loss of revenue required to cover those fixed costs, creating a need to raise prices for remaining freight customers.[34] That in turn threatens to drive away some of those

[33] Carl D. Martland, *Estimating the Competitive Effects of Larger Trucks on Rail Freight Traffic,* Massachusetts Institute of Technology (2007).
[34] University of Minnesota, Department of Applied Economics, *Long-Run Diversion Effects of Changes in Truck Size and Weight (TS&W) Restrictions: An Update of the 1980 Friedlaender Spady Analysis* (April 2013), p. 21.

customers—and so on in a negative spiral that can threaten the viability of a shortline or regional railroad.

For example, a regional railroad operating a line between Dubois and Brookville in North Central Pennsylvania has been affected by the national decline of the coal industry. The line once served several coal load-outs. Most of the coal load-outs have ceased operations, leaving only one customer to bear the cost of the line.

- **Issuing special hauling permits appears to provide the trucking industry with a shipping cost advantage.**

  Special hauling permits are by definition intended for trucking carriers; the economic benefit afforded by reduced shipping costs is not available to railroads. Railroad stakeholders perceive this shipping cost advantage as a subsidy for both trucking companies and shippers.

  That benefit likely has broader economic impacts, including making shippers more competitive and the job creation and retention plusses that sometimes result. Presumably, cost savings get passed on to customers and then consumers. From a public policy standpoint both the benefits and costs need to be well understood in evaluating proposals for increasing truck weights.

- **Some transload operations may be impacted—positively or negatively—by overweight permitting.**

  Railroads that serve customers via a transload operation are particularly sensitive to competitive pricing pressure from overweight trucking. As a short portion of the customer's delivery is made via truck, allowing heavier trucks provides the shipper a greater incentive to make the entire delivery by truck instead of having a rail haul in the mix.

Transload facility

Conversely, allowing heavier trucks on local roads may also give the railroad access to more customers who can now use railroads to move a load from some distance away to a transload facility, then hauled the last few miles in an overweight truck. This is the case with an agricultural shipper in southcentral Pennsylvania which operates a transload facility on a Class I railroad. The partnership with the Class I railroad is economically advantageous for both the railroad and the shipper.

The arrangement might not; however, be advantageous to local shortline railroads. This is particularly true for shortline railroads transporting grain, who indicate that grain brokers readily shift from rail to truck due to slim profit margins. Truck pricing can be more flexible than rail pricing due to the high fixed costs discussed above.

- **Increasing truck weight limits may be at odds with private- and public-sector investment in rail infrastructure.**

  Railroad owners and operators as well as PennDOT invest in the repair, maintenance, and construction of railroad infrastructure. One aim of PennDOT's investment in rail freight is to promote multimodal options and help provide a more balanced transportation system with options for moving freight and less congestion. Further, promotion of rail freight helps to ease demand and stress on the aging highway and bridge network—state and local.

  By making allowances for more overweight trucks over several decades, the Commonwealth may have in effect diminished the impact of its own rail investment, as well as those investments made by private railroad investments.

  For example, both the Commonwealth and a Class II regional railroad have invested in rail infrastructure improvements to support Pennsylvania's paper and packaging industry. Pennsylvania's special hauling permit for pulpwood and wood chips diverts rail shipments to truck, diminishing the impacts of these investments (see sidebar).

  The same Class II regional railroad has also invested in rail infrastructure in Southwest Pennsylvania along the Ohio and Monongahela rivers to facilitate the export of Pennsylvania anthracite coal via barge. Pennsylvania's special hauling permit for raw coal allows motor carriers to transport up to 95,000 pounds on one truck. Diverting the transport of raw coal from rail to truck would reduce the movement of coal cars by 1,400 per year and reduce the shortline's economic return on investment at its facilities.

- **Not all origins and destinations are readily accessible by rail; therefore, overweight permitting in many cases is not posing a competitive disadvantage to rail.**

  While this finding documents instances where permitting overweight truck movements negatively impacts railroads, it is important to note that rail lines are often not located where businesses move or receive goods or commodities. Rail stakeholders challenge this point to an extent indicating, for example, that Class 1 railroads can partner with heavier

Diverting pulpwood and woodchips from rail to truck diminishes private- and public-sector investments made in Philadelphia and northeast Pennsylvania. The Commonwealth has invested in rail infrastructure improvements at **PhilaPort's Tioga Marine Terminal** which imports a diverse mix of cargo including forest products, perishables, and roll-on/roll-off vehicles. Investments at PhilaPort improve Pennsylvania's competitive port position, shifting new import/export business from the Port of Baltimore.

The Commonwealth has also invested in several manufacturing facilities in northeast Pennsylvania that use wood pulp imported via PhilaPort. Likewise, a Class II regional railroad has made infrastructure and facility investments to facilitate the movement of pulpwood via rail. These investments were needed to support efficient and effective shipping for paper and packaging manufacturers in northeast Pennsylvania. Modal choices are left to out-of-state or out-of-country shippers; therefore, heavier truck weights impact both the manufacturers as well as the railroads.

truck carriers for in-region moves that otherwise might be made by shortline railroads.

Because a railroad's footprint is fixed along a narrow corridor(s), it cannot readily serve every location throughout Pennsylvania. Truck movements will always be required and advantageous at locations not served by rail. In addition, unless a business has a rail siding or is located on a main rail line, truck movements will be essential for last-mile connections to rail.

FINDING 8

Enforcement of truck weight limits is likely inconsistent across Pennsylvania's municipalities.

Overview

While truck weight limits are being examined at the state and federal levels, it is also important to consider local aspects of this issue. TAC became aware of one concern related to local truck weight enforcement issues and by extension public safety. Every community is different—with varying resources, capabilities, and budgets—which contributes to uneven enforcement when oversize and overweight commercial vehicles travel on their local networks.

Analysis

- **Varied local policing capacities across the Commonwealth is an important consideration in addressing truck weight exemption policy, management, and safety.**

  Enforcement of motor carrier regulations is through the Motor Carrier Safety Assistance Program (MCSAP). Certified truck safety inspectors from the Pennsylvania State Police (PSP), the Public Utility Commission (PUC), and municipal police officers "conduct systematic roadside safety inspections of commercial vehicles and drivers to determine their level of compliance with the safety regulation requirements."[35]

  According to the Pennsylvania Chiefs of Police Association, some local enforcement officers have been placed on a waiting list to participate in the PSP's commercial vehicle safety inspection training—in some cases, waiting up to five years. This training is conducted by the PSP's Commercial Safety Division and is a prerequisite for becoming a certified commercial vehicle safety truck inspector in the Commonwealth of Pennsylvania. Only a small percentage of municipal officers are currently able to conduct truck safety inspections.[36] While one community may have strict restrictions and enforcement protocols in place, the same restrictions and/or level of enforcement may not carry into adjacent communities.

[35] Pennsylvania Department of Transportation, *Trucker's Handbook,* PennDOT Publication 194, page 45.
[36] Interview with Coalition Against Bigger Trucks, PA Chiefs of Police Association, and PA Sheriffs Association, May 8, 2020.

While most populous municipalities within the Commonwealth have their own municipal police departments, many rural municipalities rely on the Pennsylvania State Police, who may have limited availability for truck weight enforcement.

- **Local Public Safety's Connection to Enforcement**

  USDOT found in its 2016 report to Congress that heavier trucks had anywhere from 47 percent to 400 percent higher crash rates than regular-weight trucks, in limited state testing.[37] It should also be noted that trucks require greater stopping distances than automobiles—with stopping distances increasing as truck weight increases, posing potential safety risks. While accountability for overall motorist safety cannot be placed solely on the shoulders of enforcement officials, strict and equal enforcement of federal, state, and local truck size and weight regulations is a contributor to ensuring the safety of all who use the transportation system.

Ridgway, Elk County

[37] U.S. Department of Transportation, Federal Highway Administration, *Comprehensive Truck Size and Weight Study, Final Report to Congress* (2016).

FINDING 9

Experiences of other states can help inform PA's further evaluation of truck weight exemptions.

The analytical processes used in other states can inform future research in Pennsylvania, but the data used for those other efforts may not translate well to PA.

Overview

Several other states have completed detailed studies to assess the impact of overweight trucks on bridge and pavement infrastructure and on modal diversions from rail to truck. These studies were reviewed and are cited throughout this report. The analytical processes used in other states can inform future research in Pennsylvania, but the data used for those other efforts may not translate well to PA.

The other state studies were generally conducted for specific roadways handling overweight trucks hauling commodities that were of particular importance to those states. A comparable effort in Pennsylvania would ideally focus on Pennsylvania roads and commodities that are of interest to PennDOT, either for loads and routes currently used by trucks operating with special permits or for analyzing additional commodities under consideration for special permits. This points to the possibility of conducting more regional or corridor-level analyses of truck weight impacts in the future if deemed beneficial.

Analysis

- **Other states' studies suggest that allowing higher truck weight limits may actually reduce infrastructure impacts and other systemwide costs overall, with the exception of bridges.**

  A truck size and weight study completed by the Minnesota Department of Transportation in 2006 listed the following conclusions:

  - The combination of heavier truck weights and fewer truck trips would lower transport costs significantly.
  - Pavement wear would be reduced in the long term with additional axles and fewer truck trips.
  - Heavier trucks have slightly higher crash rates than those operating under existing load limits, but overall safety would likely improve due to a reduction in truck trips with higher weight limits in place.
  - Bridge deterioration under heavier loads is the one area where heavier trucks will have some impacts even with heavier trucks offset by a reduction in truck trips. These impacts grow substantially under heavier loads in excess of 90,000-95,000 pounds. A Louisiana study published in 2005 analyzed the bridge impacts of various axle load combinations for trucks

hauling certain commodities on the state's highway system with a maximum tandem axle weight of 48,000 pounds.[38] The study determined that the average bridge fatigue cost per truck trip under this weight/axle combination was as high as $8.90.[39]

A sixth axle significantly reduces the burden on infrastructure

- **Roadway functional classifications and traffic volumes have major implications on overweight truck infrastructure impacts.**

  A recent study of overweight truck impacts associated with shale gas activity in Louisiana estimated per-mile costs of overweight truck traffic by roadway type and functional class. The study listed the following unit costs of overweight truck travel by roadway type:[40]

  - Interstate: $0.29 per lane-mile
  - US Highway: $0.58 per lane-mile
  - LA State Roadway (2,000+ ADT): $2.93 per lane-mile
  - LA State Roadway (up to 2,000 ADT): $5.87 per lane-mile

  The wide gap between the highest cost figure and the lowest cost figure is entirely attributed to the level of utilization of the roadways by vehicles other than the overweight trucks. The reconstruction cost figure for the lowest-volume roadway listed above is only $275,000 per lane-mile, while the cost for the Interstate Highway is $3 million per lane-mile. And yet the cost allocated to overweight trucks on the lightly used state road

[38] The current maximum weight under federal truck weight standards is 20,000 pounds for a single axle and 34,000 pounds for a tandem axle.
[39] Freddy L. Roberts; Aziz Saber; Abhijeet Ranadhir; and Xiang Zhou, *Effects of Hauling Timber, Lignite Coal, and Coke Fuel on Louisiana Highways and Bridges,* Louisiana Department of Transportation and Development and Louisiana Transportation Research Center, Report No. 398 (March 2005), Appendix E.
[40] "Impact of Overweight Traffic from Shale Gas Development on Pavement Damage Costs: Case Study in Louisiana," *Journal of Infrastructure Systems,* Volume 26, Issue 1 (March 2020).

A methodology similar to Ohio DOT's 2009 study of overweight truck impacts could be applicable to a more detailed future study in Pennsylvania.

is more than 20 times higher because there are so few other users sharing the cost of the road.

- **A methodology similar to the one used by Ohio DOT in its 2009 study of overweight truck impacts[41] on bridge and pavement infrastructure may be well suited to analyses for large geographic areas. This approach might be especially applicable where gross estimates are needed in lieu of detailed data for vehicle types and infrastructure conditions.**

  The underlying question in assessing infrastructure costs associated with overweight trucks can be stated in this manner: "What is the unit cost (per mile, for example) of a single truck operating at a gross vehicle weight of X pounds along a route?" Ideally, this resulting figure would then be multiplied by the number of trucks in this category, and then adjusted accordingly for various weights and axle configurations. The Ohio study developed a combination of two factors for estimating infrastructure impacts of overweight trucks, with one factor computed per equivalent single-axle load (ESAL)-mile and the other computed per vehicle-mile. The ODOT study developed general factors of $0.05 per ESAL-mile and $0.008 per mile for each overweight truck trip on the state's highway system. An approach like this would be feasible in Pennsylvania if detailed information about axle configurations and total overweight truck trips were available or could be derived with some additional data collection.

- **Impacts of single-unit trucks on local roads may be substantial in some areas.**

  As indicated in a federal webinar[42] on pavement damage analysis, the recurring use of heavy garbage trucks and dump trucks on local roads has a substantial impact on pavement and bridge costs. This is largely due to a combination of excessive truck weight in areas where weight enforcement is difficult to accomplish and a high allocation of costs to truck activity due to low auto volumes.

[41] Ohio Department of Transportation, *Impacts of Permitted Trucking on Ohio's Transportation System and Economy* (January 2009).
[42] U.S. Department of Transportation, Federal Highway Administration, "Pavement Damage Analysis Tool (PaveDAT) for Overweight Truck Permit Calculation," *Talking Freight* seminar, June 12, 2012.

SECTION 3 – CONSIDERATIONS GOING FORWARD

The costs and benefits of overweight trucks are not clear-cut or simple to quantify.

The costs and benefits of overweight trucks are not clear-cut or simple to quantify. There are numerous variables and interconnected impacts to infrastructure, the economy, safety, and community issues that warrant further examination. It is TAC's opinion that with the range of issues and impacts now better defined there is a foundation for conversations among decision-makers and stakeholders and for setting an agenda for improvement. To support this informed, balanced decision-making, Pennsylvania state government needs to address the following considerations to ensure that overweight truck exemptions are being approached in a balanced and comprehensive manner:

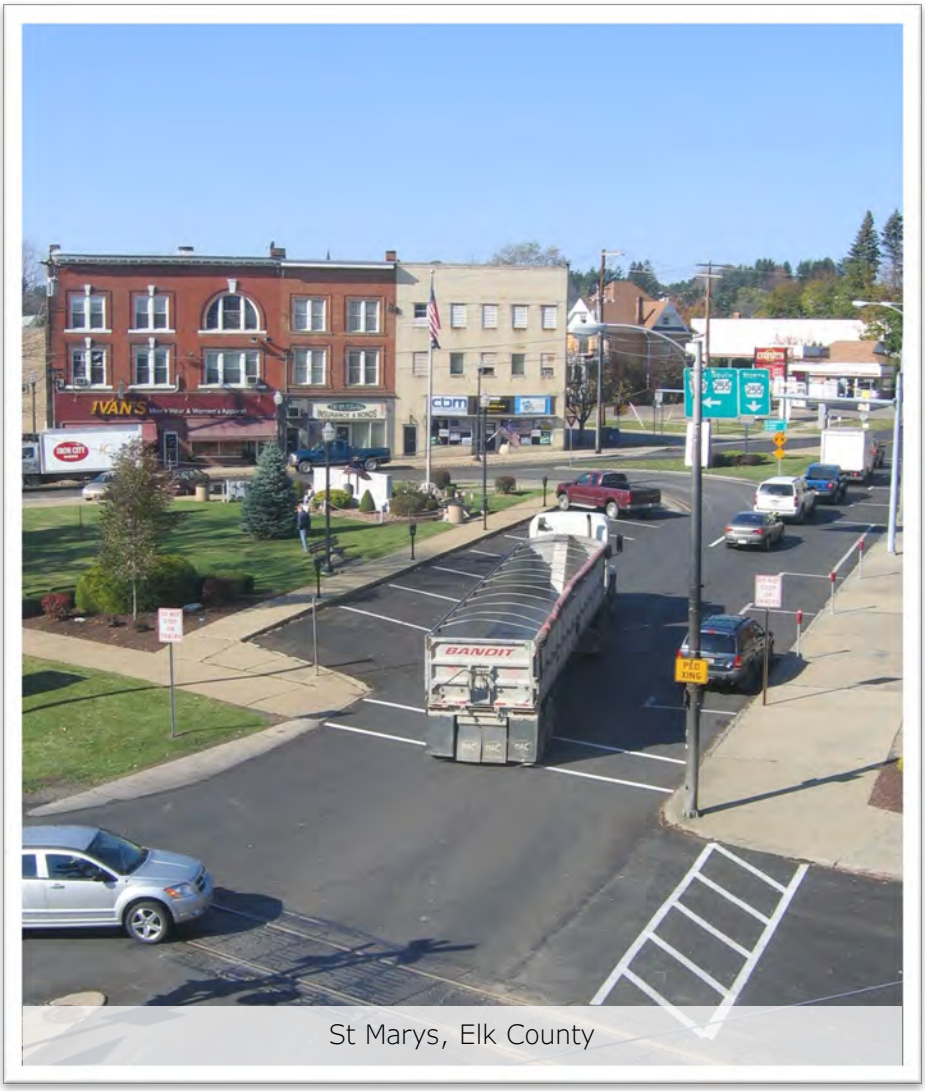
Consideration 1: Better data on costs to infrastructure, including cumulative impacts.

Because heavier trucks cause greater wear and tear to highways and bridges, more data is needed to estimate and understand that impact. This is recognized nationally as a bona fide analytical need. For Pennsylvania, however, especially with the growing number of truck commodity weight exemptions, there is a clear and compelling need for data and analyses to understand the cumulative impacts of this expanding state policy.

Allocating costs of highway pavement and bridge assets among different users and vehicle types is a complex undertaking, subject to a wide range of variables. Bridge and pavement deterioration is a function of not only the total weight of overweight trucks, but also axle spacing and repetitive loading under alternative scenarios (e.g., the impact of 10 80,000-pound trucks vs. the impact eight 100,000-pound trucks).

Another complexity of cost allocation among various users is that the allocation of these costs changes as the numbers of user types changes over time. A 100,000-pound truck operating on a low-volume rural road, for example, has a greater impact on bridge and pavement deterioration than the same truck operating on a high-volume Interstate highway simply because the costs of repairs and maintenance are "shared" among fewer users. Ohio has developed a methodology for improved analysis that might have applicability to Pennsylvania (see sidebar).

The Ohio Department of Transportation conducted a study in 2009 to assess the costs and impacts of overweight trucks on its highway system. One of the methodologies used in that study involved the development of factors to calculate the excessive wear caused by heavy trucks on highway infrastructure on a per-mile basis for different axle configurations. This approach could offer some guidance for further study in Pennsylvania, especially if it can be refined and applied to specific routes currently used by overweight trucks or under consideration for future weight exemptions.



St Marys, Elk County

Consideration 2: A broader understanding of the total positive and negative impacts of truck weight exemptions—particularly the economic impacts across industries and modes and the adverse impacts that cannot readily be quantified in dollar terms.

Costs occasioned to infrastructure by heavier trucks is clearly of primary importance. However, in order to comprehensively determine impacts in both quantitative and qualitative terms, other areas of impact need to be considered in terms of positives and negatives as well:

- **Economic impacts** – These include benefits to shippers and customers resultant from truck weight exemptions, employment, and costs / adverse impacts to railroads and shippers who rely on rail transport. Economic impact assessment of truck weight exemptions could also include the analysis of impacts to smaller trucking operations.

- **Environmental and community impacts** – Trucking in many ways supports and adds to our quality of life as the pandemic has underscored, but larger trucks, particularly in smaller communities, can be impacting in adverse ways. Rail has been shown to have environmental benefits compared to trucking—mainly air quality—although in general trains, trucks, and cars continue to become less polluting. Advances in modeling air quality and other environmental impacts could prove helpful for future proposed exemptions or more in-depth evaluations of the exemptions granted to date. The issue of noise and vibration impacts on communities where trucks travel through downtown centers and on local roads is also a known concern (although trains also produce noise and vibration, albeit on a predictable corridor). Noise and vibration impacts could be assessed going forward, especially when a correlation can be established as to a proposed commodity exemption and the communities that might be most impacted.

- **Safety considerations** – Larger trucks having longer stopping distances might pose important safety considerations. While this was largely beyond the scope of this study and its initial identification of impacts, several stakeholders emphasized that the concern is reflected by the lack of uniform enforcement capacity among Pennsylvania's many local municipalities. This appears to be a legitimate concern as weight-exempted trucks are typically not moving on the Interstate Highway System, but on lower-volume roads.

Consideration 3: More rigorous examination of overweight truck exemptions in light of other Commonwealth responsibilities and initiatives.

The study process shed some light on the possibility that truck weight exemptions should likely be carefully considered in relation to other policies and priorities, asset management, and multimodal investment.

- **Asset Management** – Pennsylvania's state and local road and bridge assets are extensive, aging, and overall, in need of extensive investment for improvement and maintenance. Going forward, it would be prudent and reasonable to establish a practical connection between truck weight exemption statutory authorizations and the federal and state asset management emphasis. At minimum, this "connection" should be communication between the General Assembly and PennDOT focused on how expanded exemptions might possibly work against the department's asset management priority. The gap between the transportation asset conditions and the needed resources for their improvement cannot be overstated as context for more rigorous evaluation of future truck weight exemptions.

- **Multimodal Investments / Balanced Transportation System** – Pennsylvania has an extensive rail freight network. The General Assembly and PennDOT have made substantial investments in rail freight improvements through the Capital Budget and Rail Freight

Improvement Programs typically included in the state budget as an annual appropriation. The rationale for Commonwealth investment has included economic development, enhanced freight access and mobility, and congestion reduction. Decision-makers need to consider whether and the extent to which truck weight exemptions may be at odds with the rationale for public funding for rail freight.

Closing

Achieving progress may depend, in part, on a legislative process that facilitates a more thorough review of proposed exemptions.

Achieving progress around the considerations above may depend, in part, on a legislative process that facilitates a more thorough or systematic review of proposed exemptions. This could be accomplished around ideas such as those that follow:

- A procedural requirement that future truck weight exemptions be in stand-alone bills to help promote a greater focus on the full extent of pros and cons as well as impacts and costs. Truck weight exemptions as provisions on larger bills might work against the degree of analysis and debate that is warranted.
- Expanded engagement of all key stakeholders, including but not limited to trucking companies—large and small, freight railroads, shippers and receivers of goods, law enforcement, and municipal government.
- Policy requiring statutory authorization is obviously a General Assembly responsibility, however it should be much further informed by PennDOT technical and analytical input than appears to have been the case. One record of previous legislative discussion on truck weight indicated an apparent misunderstanding. The record of that meeting suggested that a member believed that the PennDOT permitting process is the backstop or primary means for ensuring effective accommodation of weight-exempted vehicles. That perception, however, is not accurate. PennDOT's responsibility, of course, is to implement what is authorized legislatively—not to set the broader exemption policy. As such, permitting does not evaluate the impacts, benefits, costs, etc., of the commodity exemption but ensures that the legislative intent is followed, and primarily to ensure safety. This is a circular or "chicken-and-egg" issue that could be easily remedied or clarified through legislative–executive information-sharing and education around truck weight and associated policy and regulatory frameworks.
- Establishing a basic framework as to what would constitute an appropriate level of analysis in order to effectively and objectively evaluate any future proposed truck weight exemptions. A basic template could be established that considers costs, benefits, impacts, and stakeholder input.

The study's completion coincides with the COVID-19 pandemic and the Commonwealth's response to associated goods movement challenges. An emergency exemption (see page v) was made in the interest of public safety and wellbeing—demonstrating the need for flexibility in overseeing Pennsylvania's transportation system.

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