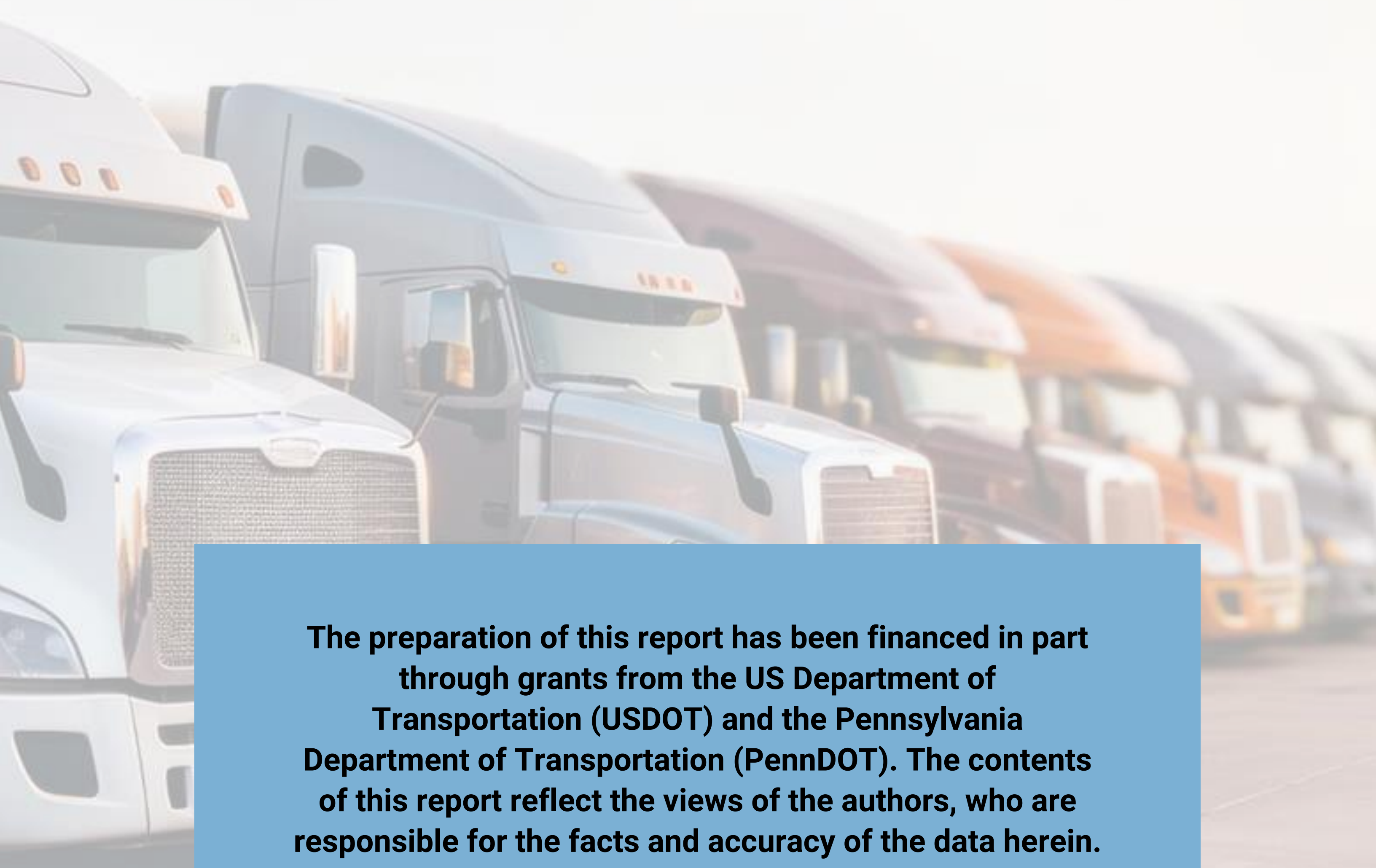
Eastern Pennsylvania Freight Alliance

EASTERN PENNSYLVANIA FREIGHT INFRASTRUCTURE PLAN

REGIONAL FREIGHT PROFILE



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AADTT – Annual Average Daily Truck Traffic
AAR – Allentown and Auburn Railway
AASHTO – American Association of State Highway and Transportation Officials
ABE – Lehigh Valley International Airport
ACE – Alternative and Clean Energy
ADAS – Advanced Driver Assistance Systems
AEB – Autonomous Emergency Braking
AFIG – Alternative Fuels Incentive Grant
AFV – Alternative Fuel Vehicle
AFW – Perot Field Fort Worth Alliance Airport
AI – Artificial Intelligence
AID – Accelerated Innovation Deployment
ALO – Waterloo Regional Airport
ASRS – Automated Storage and Retrieval Systems
ATTIMD – Advanced Transportation Technologies and Innovative Mobility Deployment
AVP – Wilkes Barre–Scranton International Airport
BMS – Bridge Management System
BOMO – Bureau of Maintenance and Operations
BOPAC – Buy Online, Pickup at Curb
BOPIS – Buy Online, Pay in Store
BTS – Bureau of Transportation Statistics
CAGR – Compound Annual Growth Rate
CCRC - Carbon County Railroad Commission
CCS – Combined Charging System
CFI - Charging and Fueling Infrastructure
CLE - Cleveland Hopkins International Airport
CLT – Charlotte Douglas International Airport
CMAQ – Congestion Mitigation and Air Quality
CMP – Congestion Management Process
CNG – Compressed Natural Gas
CO2 – Carbon Dioxide
COLTS – County of Lackawanna Transit System
CPRS – Canadian Pacific Railway
CV – Connected Vehicle
CVG – Cincinnati/Northern Kentucky International Airport
DC – Distribution Center
DCED – Pennsylvania Department of Community and Economic Development
DEP – Pennsylvania Department of Environmental Protection
DOE – US Department of Energy
DRJTBC – Delaware River Joint Toll Bridge Commission
DRT – Del Rio International Airport
DSM – Des Moines International Airport
DVMT – Daily Vehicle Miles Traveled
EBG – Eastern Berks Gateway
ECTX – Electric City Trolley Museum
ELP – El Paso International Airport
EOP – Emergency Operations Plan
EPFA – Eastern Pennsylvania Freight Alliance
ESC – Electronic Stability Control
EV – Electric Vehicle
EVSE – Electric Vehicle Supply Equipment
FAK – Freight of All Kinds
FAST – Fixing America's Surface Transportation
FCW – Forward Collision Warning
FDOT – Florida Department of Transportation
FHWA – Federal Highway Administration
FMCSA – Federal Motor Carrier Safety Administration
FRA – Federal Railroad Administration
FY – Fiscal Year
GHG – Greenhouse Gas
GIS – Geographic Information Systems
GPS – Global Positioning System
HOS – Hours of Service
IIJA – Infrastructure Investment and Jobs Act
ILN – Wilmington (Ohio) Air Park
INFRA – Nationally Significant Multimodal Freight & Highway Projects
IRI – International Roughness Index
ITS – Intelligent Transportation Systems

kW – Kilowatt
LANTA – Lehigh and Northampton Transportation Authority
LAX – Los Angeles International Airport
LCTA – Luzerne County Transportation Authority
LEBCO – Lebanon County Metropolitan Planning Organization
LLTS – Lackawanna/Luzerne Transportation Study
LNG – Liquified Natural Gas
LPG – Liquefied Petroleum Gas
LRTP – Long Range Transportation Plan
LVPC – Lehigh Valley Planning Commission
LVTS – Lehigh Valley Transportation Study
MDT – Harrisburg International Airport
MEGA – National Infrastructure Project Assistance Grant Program
MEM – Memphis International Airport
MIT – Massachusetts Institute of Technology
MLB – Melbourne Orlando International Airport
MOU – Memorandum of Understanding
MPDG – Multimodal Project Discretionary Grant
MPO – Metropolitan Planning Organization
MSP – Minneapolis–Saint Paul International Airport
NCHRP – National Cooperative Highway Research Program
NDCR – N.D.C. Railroad
NEPA – Northeastern Pennsylvania Alliance
NESCAUM – Northeast States for Coordinated Air Use Management
NEVI – National Electric Vehicle Infrastructure
NHFN – National Highway Freight Network
NHFP – National Highway Freight Program
NHS – National Highway System
NHTSA – National Highway Traffic Safety Administration
NPMRDS – National Performance Management Research Data Set
NRF – National Response Framework
NS – Norfolk Southern
NYMTC – New York Metropolitan Transportation Council
OPI – Overall Pavement Index
ORD – Chicago O'Hare International Airport
ORF – Norfolk International Airport
PA – Pennsylvania
PASDA – Pennsylvania Spatial Data Access
PBOT – Portland Bureau of Transportation
PCIT – Pennsylvania Crash Information Tool
PEMA – Pennsylvania Emergency Management Agency
PennDOT – Pennsylvania Department of Transportation
PennTIME – Pennsylvania Traffic Incident Management Enhancement
PEV – Plug–in Electric Vehicle
PHL – Philadelphia International Airport
PIT – Pittsburgh International Airport
PPP – Power Projection Platform
PROTECT – Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation
RAISE – Rebuilding American Infrastructure with Sustainability and Equity
RATS – Reading Area Transportation Study
RBA – Rentable Building Area
RBMN – Reading Blue Mountain & Northern Railroad
RDG – Reading Regional Airport
RFD – Chicago Rockford International Airport
ROP – Regional Operations Plan
RPO – Rural Planning Organization
RSC – Roll Stability Control
RTMC – Regional Traffic Management Center
SAE – Society of Automobile Engineers
SBD – San Bernardino International Airport
SBRR – Stourbridge Railroad
SF – Square Feet
SKU – Stock Keeping Unit
SMART – Strengthening Mobility and Revolutionizing Transportation
SMF – Sacramento International Airport
SPW – Spencer Municipal Airport
SS4A – Safe Streets and Roads for All
STB – Surface Transportation Board
STBG – Surface Transportation Block Grants
STIP – PennDOT Statewide Transportation Improvement Program

STL – St. Louis Lambert International Airport
STRAHNET – Strategic Highway Network
TCI – Transportation and Climate Initiative
TCI–P – Transportation and Climate Initiative Program
TDM – Transportation Demand Management
TIM – Traffic Incident Management
TIP – Transportation Improvement Program
TMC – Traffic Message Channel
TPA – Tampa International Airport
TSMO – Transportation Systems Management and Operations
US – United States
USDOT – United States Department of Transportation
USG – United States Gypsum
USPS – United States Postal Service
V2I – Vehicle to Infrastructure
V2V – Vehicle to Vehicle
V2X – Vehicle to Everything
VHET – Vehicle Hours of Excess Travel
VHU – Vehicle Hours of Unreliability
VMT – Vehicle Miles Traveled
WKSR – Wanamaker, Kempton and Southern
ZEV – Zero-Emission Vehicles

Regional Freight Profile

LAND USE

INFRASTRUCTURE

TRUCK CRASHES

TRANSIT DEMAND

FREIGHT MOVEMENT

RAIL FREIGHT INFRASTRUCTURE

AIR CARGO

The Regional Freight Profile is a companion document to the Eastern Pennsylvania Freight Infrastructure Plan (the Plan). This document summarizes the baseline analyses that define the study area and illustrate the existing conditions for transportation, land use, safety, and congestion.

The following sections outline the comprehensive nature of the plan analyses. They are grouped into summary sections for specific focus areas, including:

- **Land Use** – Current and future developments, regional zoning, key industrial clusters, and intermodal facilities
- **Infrastructure** – Roadways, traffic volumes, bridges, and pavement
- **Truck Crashes** – Locations, severity, types, and crashes involving non-motorized users
- **Transit Demand** – Identification of opportunities to address unmet demand withing EPFA freight clusters
- **Freight Movement** – Commodity flows, bottlenecks, and truck parking
- **Rail Freight Infrastructure** – Infrastructure and cargo types
- **Air Cargo** – Cargo at EPFA airports

The profile illustrates each of the key datasets that outline and define the challenges and opportunities that ultimately inform and support many of the recommendations outlined in Section 5 of the Plan.

Geographic Information Systems

This document includes Geographic Information Systems (GIS) analyses of shapefile data collected from multiple sources, detailed below. These datasets have been combined into a geodatabase used to produce maps throughout the document to contextualize and visualize additional information and analyses. Table 1 includes a compilation of the sources leveraged to support the analyses included throughout this effort.

Table 1: GIS Data Sources

Pennsylvania Spatial Data Access (PASDA)
Pennsylvania State, County, and Municipality boundaries (2022)
State Roads
Local Roads
Roads with Posted Weight Restrictions
Parking Areas
At-Grade Intersections
Railroad
Rail Crossings
Transportation Improvement Projects
Airport
Local Park
Water Body
Wild Natural Areas
Bike Routes and Appalachian Trail

Berks County
Tax Parcels
Building Footprints
Land Use/Zoning

Bureau of Transportation Statistics (BTS)
Air Carrier Statistics Database (T-100 data bank)

Carbon County
Land Use/Zoning

Federal Highway Administration (FHWA)
National Highway Freight Network (2020)
National Performance Research Data Set (NPMRDS)

Geotab
Altitude Commercial Origin/Destination Data

IHS Markit
Transearch Commodity Flow Data

Lackawanna County
Land Use/Zoning

Lebanon County
Land Use/Zoning

Lehigh Valley Planning Commission
Land Use/Zoning

Luzerne County
Land Use/Zoning

Monroe County
Land Use/Zoning

PennShare Open Data Portal
Traffic Counts
Bridges - Condition and Clearances
Freight Generators
Major Intermodal Facilities

Pennsylvania Crash Information Tool (PCIT)
Crash records (2019-2021)

Pike County
Land Use/Zoning

Schuylkill County
Land Use/Zoning

Surface Transportation Board (STB)
Confidential Carload Rail Waybill Sample (2021)

1.1 Land Use

This analysis focuses on existing and future industrial development within the EPFA region. All data in this market analysis was sourced from CoStar[1] in Q1 2023. It should be noted that CoStar data may not be representative of total inventory, but it is the most comprehensive dataset available to define and analyze real estate development trends. CoStar defines different industrial property uses as follows.[2]

- **Refrigeration/Cold Storage:** 25,000 square feet (SF) or greater rentable building area (RBA)[3] with one loading dock for every 15,000 SF of RBA. Up to 50% site coverage and office area up to 20%. Must have refrigeration and cross docks.
- **Distribution:** These are typically large buildings, both single and multi-tenant, used for the warehousing and distribution of inventory. Buildings are typically 200,000 SF or more, with clear heights 28 feet plus, up to 5% office space and the balance being warehouse/storage space. These buildings typically have one loading door for every 10,000 SF of RBA and site coverage up to 40%. These buildings are often cross-docked with trailer parking.
- **Manufacturing:** A sub-type of an industrial building primarily used for manufacturing products. May also include warehousing or distribution areas. These buildings are typically 300,000 SF or greater with one loading dock for every 15,000 SF.
- **Truck Terminal:** A type of industrial building that is long and narrow with multiple cross-docks that facilitate simultaneous incoming and outgoing inventory. If an industrial building has many cross-docks, it may be a truck terminal. This facility varies from 25,000 to 150,000 SF and they are typically very narrow (approximately 60' to 80' wide). Site coverage up to 30% with office areas up to 10%. The building is lined along the outside (usually opposite sides) with cross-docks, usually one loading dock for every 3,000 SF of RBA. These buildings are material/freight transfer points for trucking companies or distribution companies like UPS or FedEx.
- **Service:** Industrial zoned building designed for vehicle repair. It may include cranes for moving engine blocks, electric or hydraulic lifts, and numerous drive-in doors.
- **Warehouses:** A type of industrial building generally used for storage and/or distribution. They are typically 25,000 SF or greater in size, box shape, with one loading dock for every 15,000 SF of RBA. Up to 20% office area with clear heights of 22 feet or greater. Site coverage is typically up to 50%.
- **Food Processing:** A facility used for the processing of and packaging of food products or beverages. These buildings may or may not have cold storage or freezer space. Typically uses include bottling plants (soft drinks, fruit juices), breweries, dairies, bakeries, canneries, frozen foods, and dry foods.

[1] CoStar is a commercial real estate database that collects information on different commercial property uses from brokers and building managers.
[2] https://www.costar.com/about/costar-glossary
[3] Expressed in square feet, this area includes the usable area and its associated share of the common areas. Typically, rents are based on this area. It is the space the tenant will occupy in addition to the associated common areas of the building such as the lobby, hallways, bathrooms, equipment rooms, etc. There is no real difference between RBA and GLA (Gross Leasable Area) except that GLA is used when referring to retail properties while RBA is used for other commercial properties.

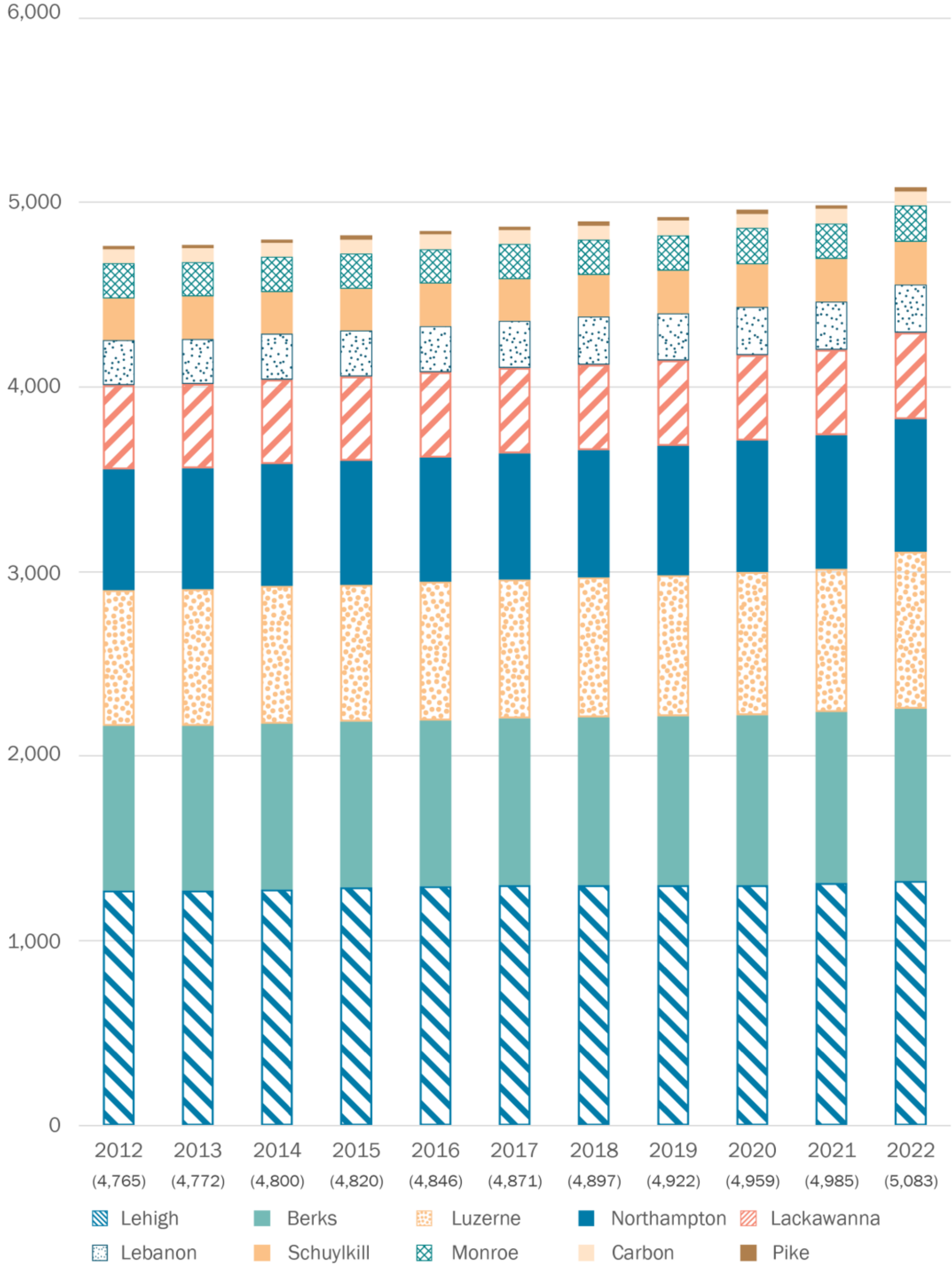
- **Showroom:** 25,000 to 150,000 SF with up to 50% site coverage and office areas up to 30%. Clear height from 14 feet and up. A building where merchandise is exhibited for sale or where samples are displayed. Examples would be furniture, or clothing and apparel.
- **Flex:** A type of building(s) designed to be versatile, which may be used in combination with office (corporate headquarters), research and development, quasi-retail sales, and including but not limited to industrial, warehouse, and distribution uses. At least half of the rentable area of the building must be used as office space. Flex buildings typically have ceiling heights under 18', with light industrial zoning. Flex buildings have also been called Incubator, Tech and Showroom buildings in markets throughout the country.
- **Telecom Hotel/Data Hosting:** Telecom Hotel is exclusively used for telecommunications companies to house switching equipment and computers that route/process the communications that go through their lines. Telecom Hotel typically are occupied by many "telcos". These facilities often appear in old downtown office/industrial buildings that were purchased and converted to the new use. Data Hosting, also known as Switching Center, Cyber Center, and Web Hosting Facility, is a type of building or build-out that is exclusively for the housing of telecommunications equipment for outside companies. Space is generally industrial or flex oriented but has very little need for office space. What it does have are floors that can handle heavy loads, extremely heavy power that can run large amounts of electrical equipment, backup generators, and air conditioners. It may also feature suite amenities such as high-speed internet and raised floors, which allow for cooling and the safe storage of cabling.

In addition to the categories noted above, properties where a current use could not be confirmed are classified as "No Use Data Available." Given current development trends within the EPFA region, many of these properties are likely classified as distribution or warehousing, but that cannot be confirmed within the current dataset.

1.1.1 Existing Industrial Property Supply

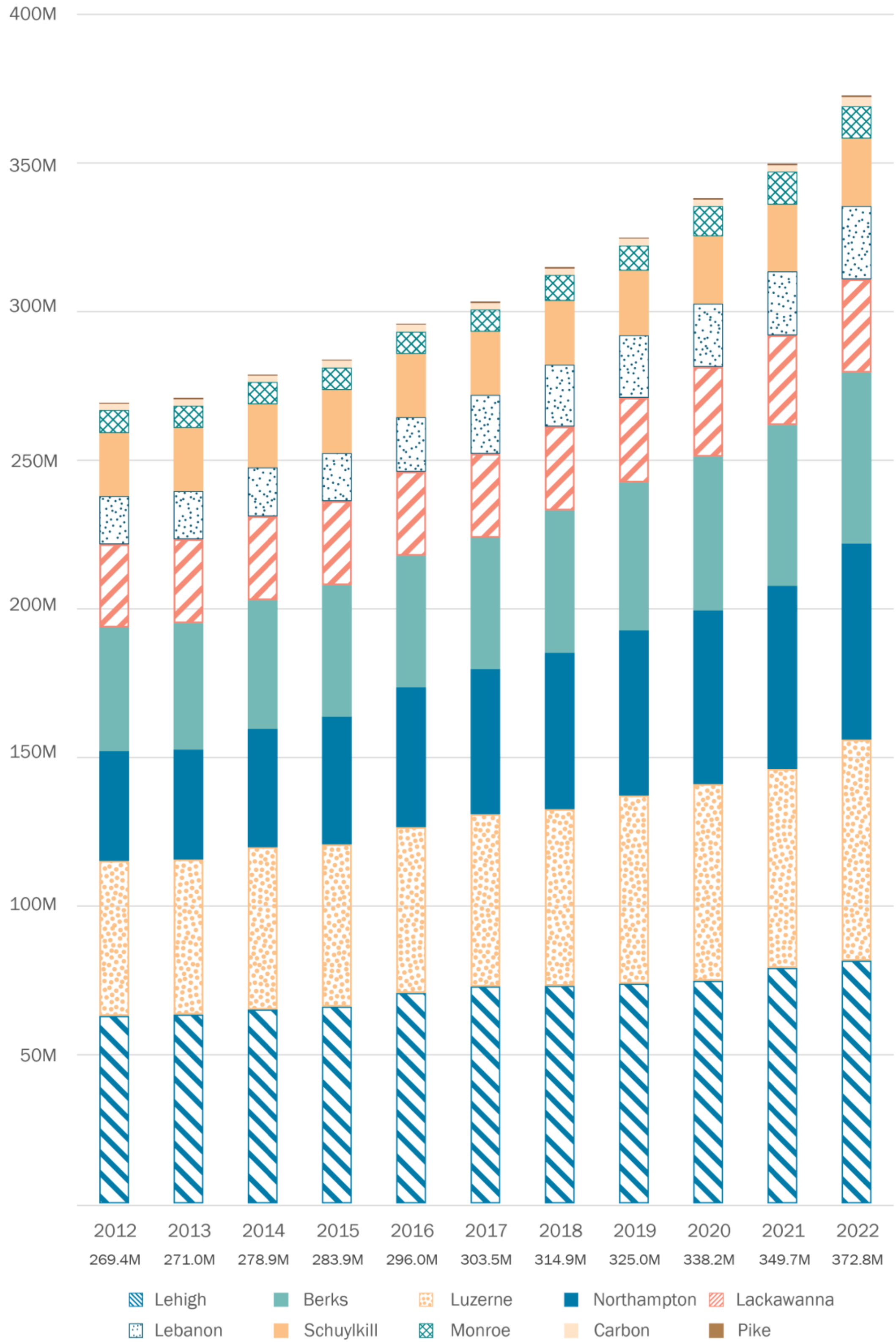
As of 2022, there are over 5,000 industrial developments with over 370 million SF in the EPFA region, illustrated by county in Figure 1 (number of buildings) and Figure 2 (SF). Prior to 2015, Lehigh, Luzerne, and Berks were the top three counties in the Study Area with the largest industrial supply. However, in the past six years, Northampton has emerged as a hotspot for industrial development, and since then, it has become the third-largest industrial market in the Study Area. While the Study Area is made up of ten counties, industrial properties in the top four counties (Lehigh, Luzerne, Northampton, and Berks) account for about 75% of the total supply. In contrast, Pike has the smallest number of industrial developments and square footage among all the counties.

Figure 1: Total Industrial Supply by County (Number of Buildings), Study Area, 2012 - 2022



Source: CoStar, 2023

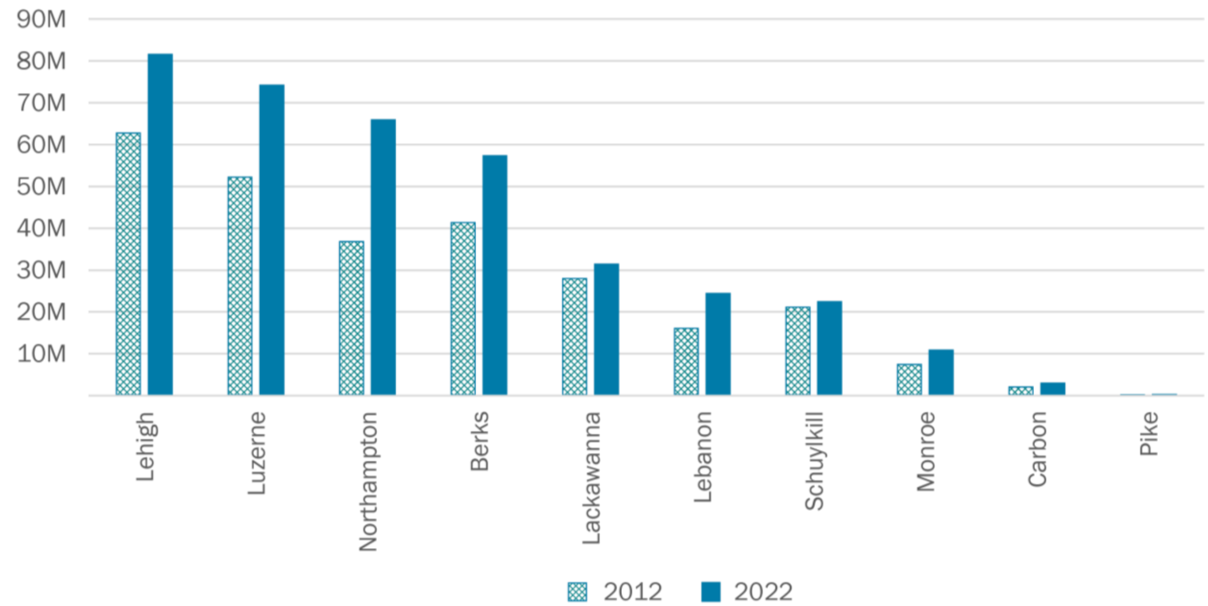
Figure 2: Total Industrial Supply by County (SF), Study Area, 2012 - 2022



Source: CoStar, 2023

The industrial square footage in the Study Area grew by 38% over the last ten years, which was a much faster rate than Pennsylvania's overall industrial market growth over the same period (12%). As Figure 3 and Table 2 illustrate, all counties in the Study Area experienced growth in their industrial space, with the highest increase in Northampton (79%) and the lowest increase in Schuylkill (6%). In addition to Northampton, the growth of industrial properties in Lebanon, Monroe, Luzerne, and Carbon have outpaced the Study Area's overall growth over the last decade.

Figure 3: Total Industrial Supply by County (SF), Study Area, 2012 - 2022



Source: CoStar, 2023

Table 2: Total Industrial Supply by County (SF), Study Area, 2012 - 2022

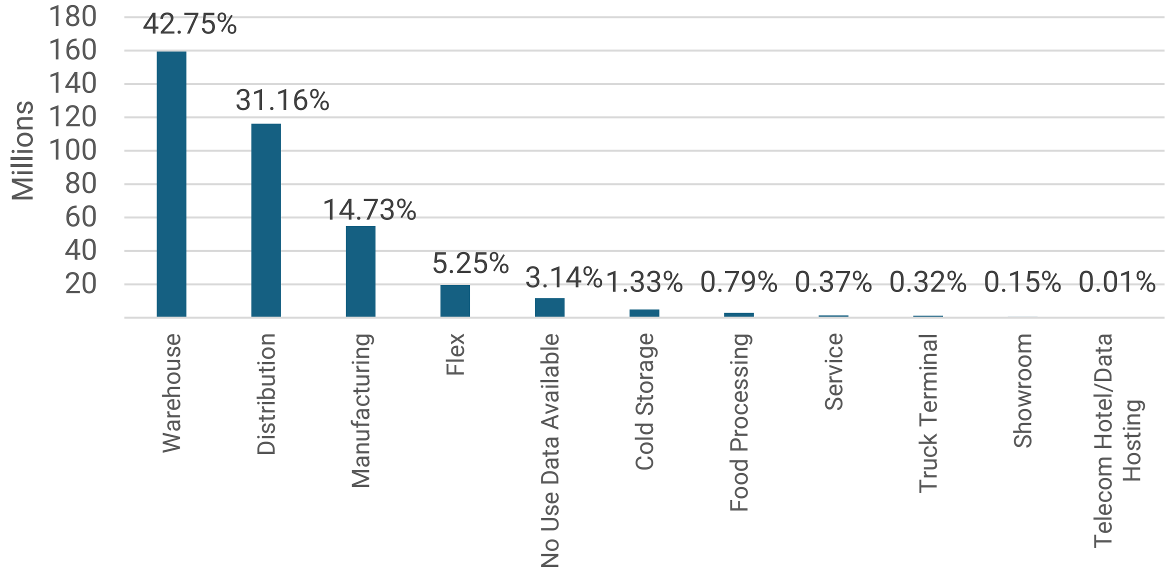
County	2012	2022	% Change
Northampton	36,950,000	66,070,000	78.80%
Lebanon	16,230,000	24,580,000	51.42%
Monroe	7,590,000	11,040,000	45.48%
Luzerne	52,390,000	74,320,000	41.87%
Carbon	2,210,000	3,130,000	41.70%
Berks	41,510,000	57,480,000	38.48%
Lehigh	62,890,000	81,710,000	29.92%
Pike	320,000	400,000	25.96%
Lackawanna	28,100,000	31,530,000	12.20%
Schuylkill	21,270,000	22,610,000	6.30%
Study Area	**269,460,000**	**372,860,000**	**38.38%**
Pennsylvania	**1,273,060,000**	**1,424,130,000**	**11.87%**

Source: CoStar, 2023

1.1.1.1 Industrial Use Category

Figure 4 details the total square footage by category within the EPFA Study Area. As of 2022, the top three industrial uses in the Study Area are warehouse, distribution, and manufacturing. Warehouses make up 43% of the total industrial supply in the Study Area while distribution and manufacturing facilities account for 31% and 15% of the total supply, respectively.

Figure 4: Use Category (SF) by Percentage of Study Area, 2022



Source: CoStar, 2023

Among all industrial uses, distribution saw the strongest growth of 94% over the past decade, mainly driven by the rising e-commerce market, as shown in Table 3. This was followed by general industrial supply with no use data available (71%), warehouse (27%) and flex (23%). The development of other industrial uses have been relatively flat over the same period.

Table 3: Total Industrial Supply by Use Category (SF), Study Area, 2012 - 2022

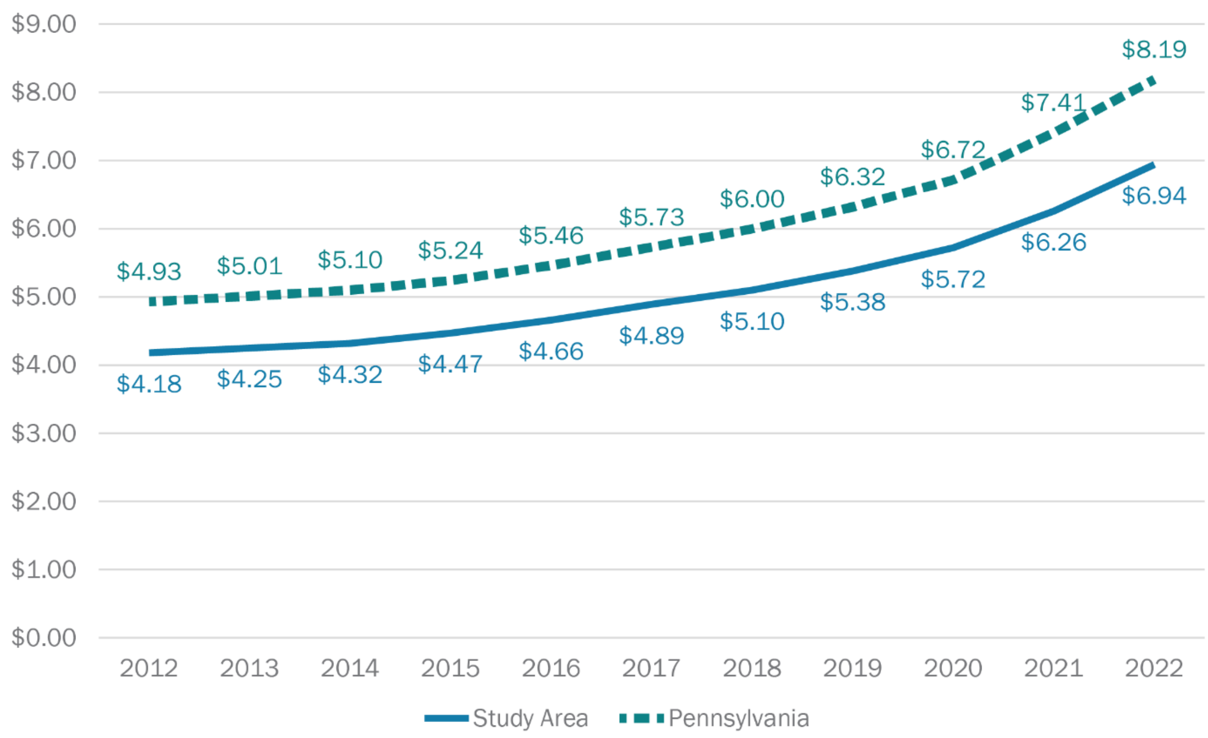
Uses	2012	2022	% Change
Distribution	59,900,000	116,180,000	93.96%
No Use Data Available	6,840,000	11,710,000	71.05%
Warehouse	125,600,000	159,380,000	26.90%
Flex	15,870,000	19,570,000	23.28%
Manufacturing	50,350,000	54,920,000	9.08%
Service	1,310,000	1,390,000	6.10%
Truck Terminal	1,170,000	1,210,000	3.69%
Food Processing	2,830,000	2,930,000	3.37%
Cold Storage	4,980,000	4,980,000	0.00%
Showroom	550,000	550,000	0.00%
Telecom Hotel/Data Hosting	50,000	50,000	0.00%
Total	**269,460,000**	**372,860,000**	**38.38%**

Source: CoStar, 2023

1.1.1.2 Average Market Rent

In 2022, the average market rent in the Study Area was $6.94 per SF, which was approximately 15% lower than Pennsylvania's average industrial market rent of $8.19 (Figure 5). This represented a 66% increase over the past ten years, which was similar to the industrial rate of rent growth in Pennsylvania. The top three counties with the highest percent change in rent (shown in Table 4) include Pike at 110%, Monroe at 72%, and Schuylkill at 69%. Even though Pike County has the smallest amount of industrial SF in the Study Area, the average market rent per SF of industrial properties in Pike has consistently been higher than other regions. In 2022, Pike recorded the average market rent per SF at $14.45, approximately two times higher than the average market rents in other regions. The average market rents in other regions ranged from $5.52 - $7.91 per SF in 2022, as shown in Figure 6.

Figure 5: Average Market Rent Per SF, Study Area, and Pennsylvania, 2012 - 2022



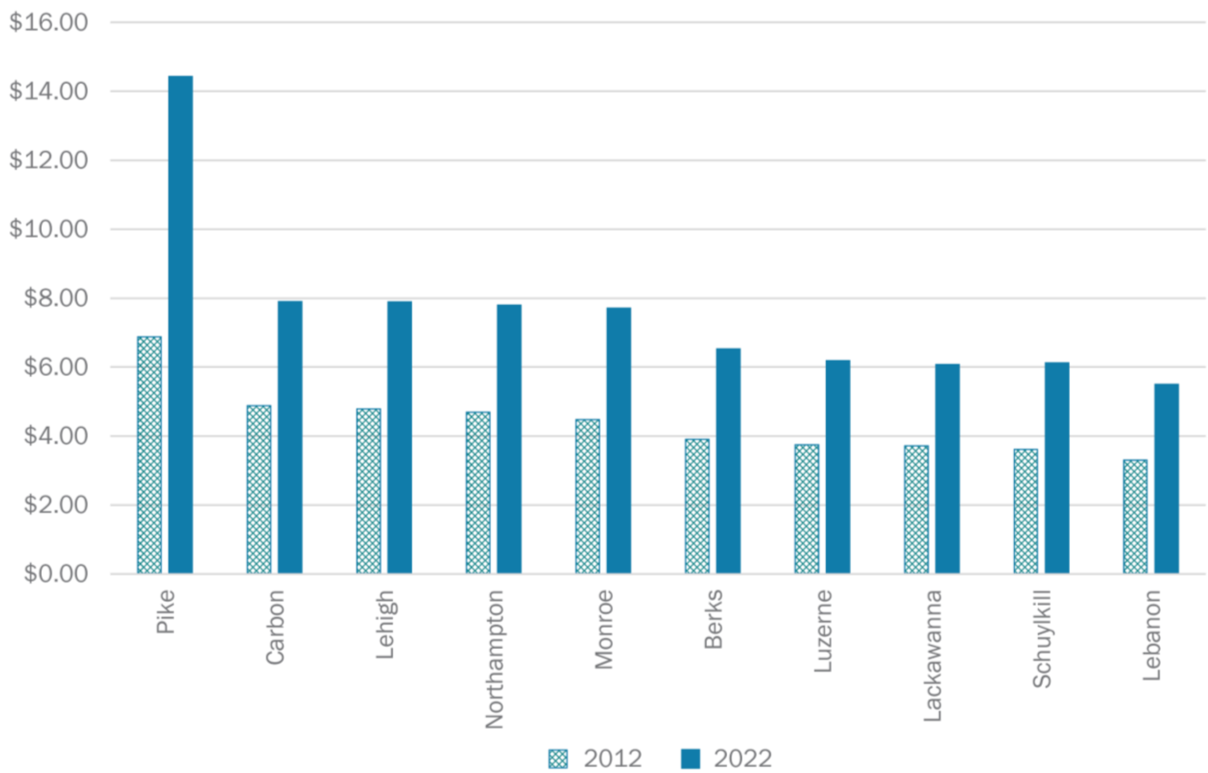
Source: CoStar, 2023

Table 4: Average Market Rent Per SF by County, Study Area, 2012 – 2022

County	2012	2022	% Change
Pike	$6.89	$14.45	109.72%
Monroe	$4.49	$7.73	72.16%
Schuylkill	$3.63	$6.14	69.15%
Berks	$3.92	$6.54	66.84%
Lebanon	$3.32	$5.52	66.27%
Northampton	$4.71	$7.81	65.82%
Luzerne	$3.76	$6.20	64.89%
Lehigh	$4.80	$7.91	64.79%
Lackawanna	$3.73	$6.09	63.27%
Carbon	$4.90	$7.92	61.63%
Study Area	**$4.18**	**$6.94**	**66.03%**
Pennsylvania	**$4.93**	**$8.19**	**66.13%**

Source: CoStar, 2023

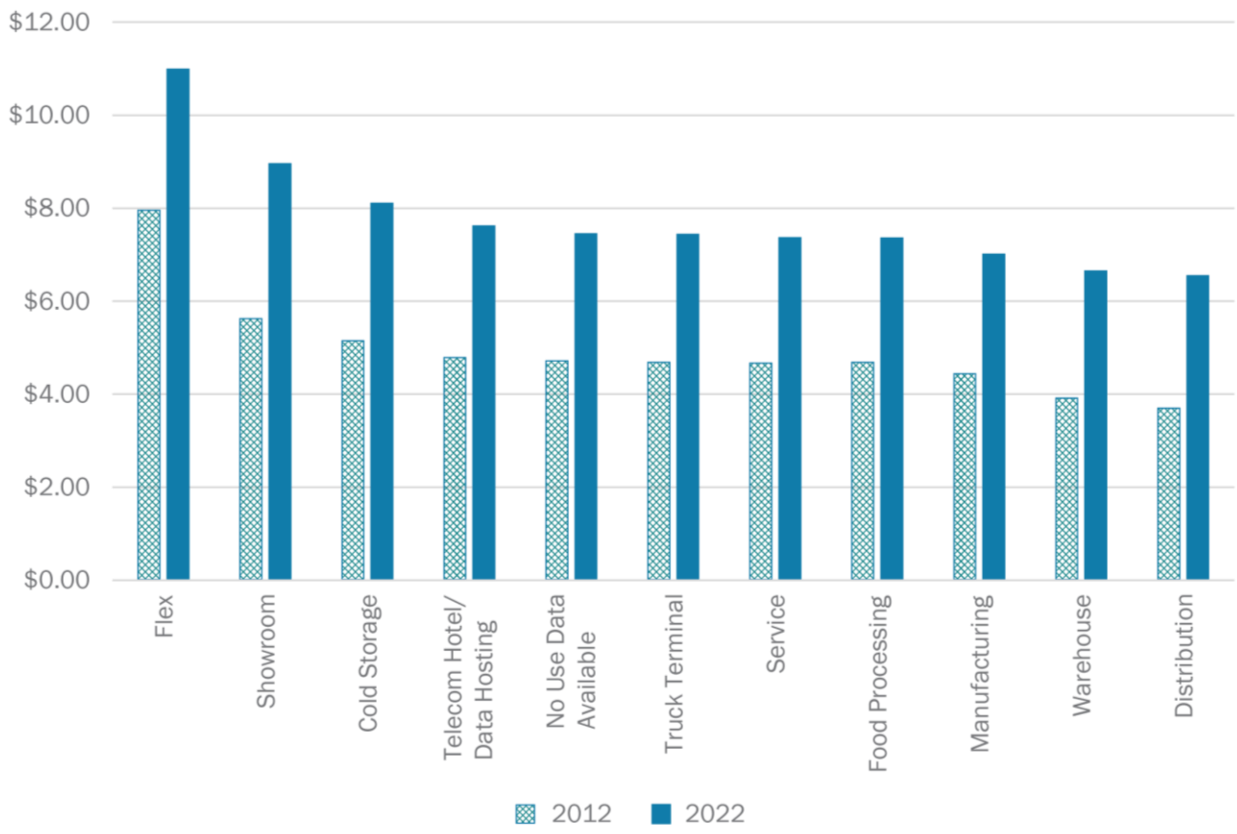
Figure 6: Average Market Rent Per SF by County, Study Area, 2012 - 2022



Source: CoStar, 2023

Figure 7 illustrates the average rate per SF by industrial use type. Among all uses, flex spaces commanded the highest market rent per SF of $11 in 2022. This was followed by showroom at $8.97 per SF and cold storage at $8.12 per SF. Despite having the lowest market rent per square foot in 2022, distribution experienced a significant surge in rental rates over the past decade, with a 77% change, illustrated in Table 5. Average market rents for warehouses and showrooms also saw strong increases of 69% and 59%, respectively.

Figure 7: Average Market Rent Per SF by Use, Study Area, 2012 - 2022



Source: CoStar, 2023

Table 5: Average Market Rent Per SF Growth by Use, Study Area, 2012 - 2022

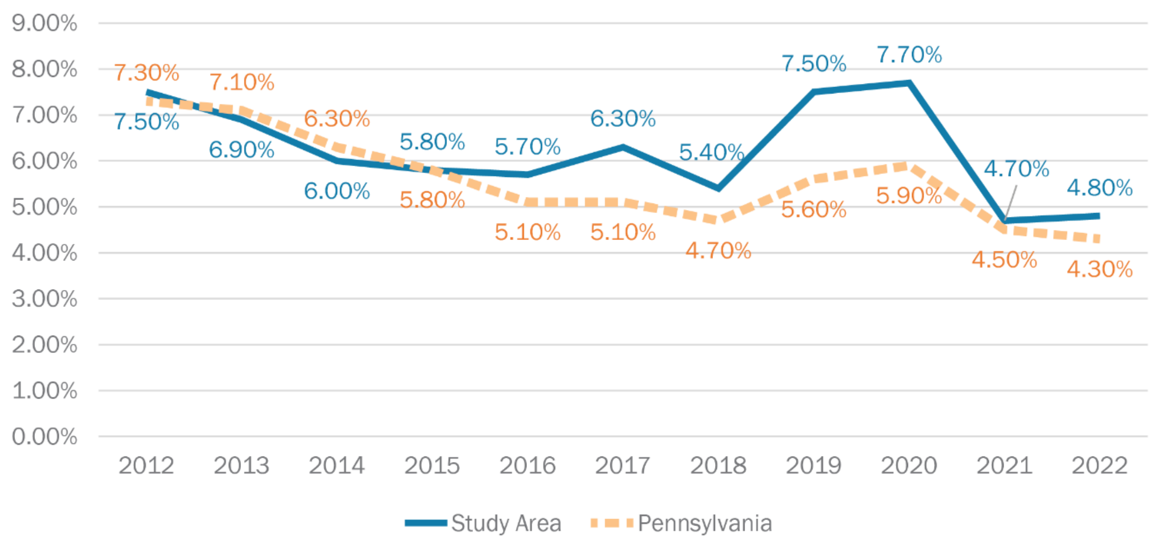
Uses	2012	2022	% Change
Distribution	$3.71	$6.56	76.82%
Warehouse	$3.93	$6.66	69.47%
Showroom	$5.64	$8.97	59.04%
Telecom Hotel/Data Hosting	$4.80	$7.63	58.96%
Truck Terminal	$4.70	$7.45	58.51%
Manufacturing	$4.45	$7.02	57.75%
No Use Data Available	$4.73	$7.46	57.72%
Service	$4.68	$7.38	57.69%
Food Processing	$4.70	$7.37	56.81%
Cold Storage	$5.16	$8.12	57.36%
Flex	$7.97	$11.00	38.02%

Source: CoStar, 2023

1.1.1.3 Vacancy

Over the last decade, the Study Area has been following the overall market trend within the Commonwealth, where the industrial sector has tightened due to the growth in e-commerce, as shown in Figure 8. As of 2022, the Study Area recorded an overall vacancy of 4.8%, slightly higher than Pennsylvania's rate of 4.3%. The spike of vacancy rates in 2019 and 2020 could have been driven by an influx of new industrial spaces coming on to the market in those years in response to previous demand.

Figure 8: Industrial Vacancy Rate, Study Area, 2012 - 2022



Source: CoStar, 2023

Table 6 illustrates the change in vacancy rates, by county, between 2012 and 2022. Vacancy has decreased across the Study Area except in Monroe and Carbon Counties. Notably, Pike County had 100% its industrial developments occupied in 2022, making it the only county in the Study Area to achieve full occupancy, according to the data recorded in CoStar. In contrast, Carbon County had the highest vacancy rate of 31%, followed by Monroe County with the second-highest vacancy of 14%.

Table 6: Industrial Vacancy Rate by County, Study Area, 2012 - 2022

County	2012	2022	% Change
Northampton	10.00%	4.20%	-5.80%
Lebanon	6.20%	1.20%	-5.00%
Lackawanna	11.20%	7.00%	-4.20%
Lehigh	6.10%	2.50%	-3.60%
Berks	9.30%	6.90%	-2.40%
Schuylkill	5.10%	2.70%	-2.40%
Luzerne	5.20%	4.70%	-0.50%
Pike	0.00%	0.00%	0.00%
Monroe	12.50%	14.40%	1.90%
Carbon	2.80%	31.00%	28.20%
Study Area	**7.50%**	**4.80%**	**-2.70%**
Pennsylvania	**7.30%**	**4.30%**	**-3.00%**

Source: CoStar, 2023

Table 7 summarizes the change in vacancy rates, by use, between 2012 and 2022. Vacancy decreased across all industrial use categories. Among all uses, cold storage had the greatest decrease in vacancies losing about 6%. Distribution is the only use that did not experience any change in vacancy, even though it added the most SF of any use.

Table 7: Vacancy Rate by Use, 2012-2022

Uses	2012	2022	% Change
Cold Storage	6.90%	1.00%	-5.90%
Manufacturing	9.40%	3.90%	-5.50%
Warehouse	8.80%	3.60%	-5.20%
Truck Terminal	7.00%	2.00%	-5.00%
Showroom	3.70%	0.00%	-3.70%
Food Processing	4.40%	0.70%	-3.70%
Service	4.80%	1.20%	-3.60%
Flex	6.80%	3.40%	-3.40%
Telecom Hotel/Data Hosting	1.80%	0.00%	-1.80%
Distribution	7.10%	7.10%	0.00%
No Use Data Available	9.60%	10.50%	0.90%

Source: CoStar, 2023

1.1.1.4 Industrial Property County Profiles

As a supplement to the analyses included in the preceding sections, county-level industrial property profiles have been developed using 2023 CoStar data as well. These profiles are included as in Appendix C.

1.1.2 Future Development (Build-Out/ Proposed)

To understand future industrial development and potential future growth trends in the Study Area, the team examined under construction and proposed projects included within the CoStar database and information obtained from EPFA members, as illustrated in Table 8. Based on the data, the industrial market in the Study Area will continue to grow through 2026 with 33 projects (12 million SF) currently under construction and an additional 168 projects (83 million SF) proposed. This represents a 26% projected growth in the total industrial supply within the Study Area. Among all counties, Luzerne is anticipated to add the largest number of projects (53) as well as the largest amount of industrial supply SF (20.3 million SF), followed by Northampton (52 projects – 18.3 million SF) and Berks (30 projects – 17.8 million SF).

According to the projections, Pike and Carbon Counties exhibit robust growth in the industrial market over the next few years, with anticipated growth of 108% and 88%, respectively, if all under construction and proposed projects come online. While these two counties currently experience substantially lower existing industrial development SF than other EPFA region counties, the scale of growth in Pike and Carbon Counites illustrates the pressures of growth throughout the region. Although Northampton and Lebanon were the fastest-growing counties from 2012 to 2022, their growth rates are projected to slow in the coming years. Lebanon County, in particular, is ranked second-to-last county in terms of the expected future supply growth, with only two projects (2 million SF) proposed.

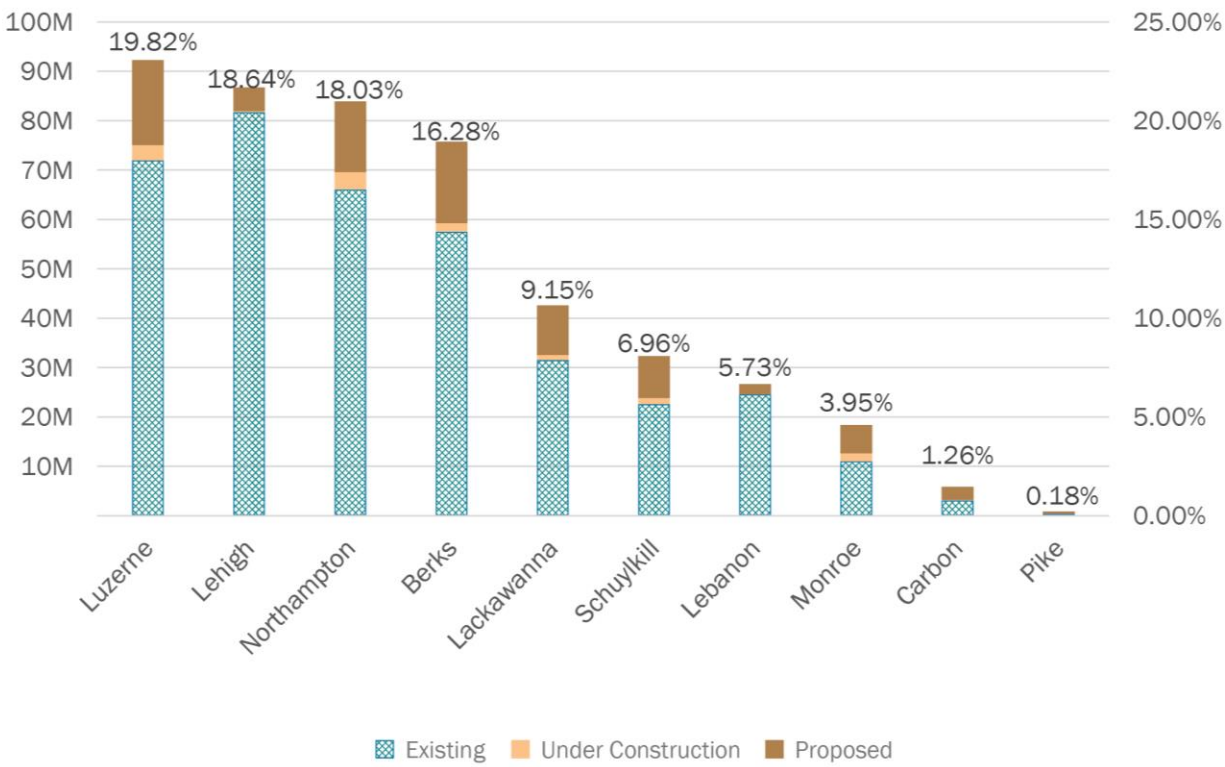
Table 8: Future Supply Projection by County, Study Area

	Existing Supply		Future Supply		
County	No. of Projects	SF	No. of Projects	SF	% Change (SF)
Pike	21	400,000	1	430,000	107.50%
Carbon	78	3,130,000	3	2,750,000	87.86%
Schuylkill	232	22,610,000	9	9,770,000	43.21%
Luzerne	851	71,960,000	16	7,360,000	66.67%
Northampton	720	66,070,000	12	11,080,000	35.14%
Lackawanna	467	31,530,000	30	18,310,000	31.85%
Monroe	195	11,040,000	53	20,290,000	28.20%
Berks	933	57,480,000	52	17,840,000	27.00%
Lebanon	264	24,580,000	2	2,100,000	8.54%
Lehigh	1,322	81,710,000	23	5,080,000	6.22%
Total	**5,083**	**370,510,000**	**201**	**95,010,000**	**25.64%**

Source: CoStar, 2023, Berks County Planning Commission, Monroe County Planning Commission, and Lackawanna County Department of Planning and Economic Development

With all under-construction and planned industrial supply (Figure 9), Luzerne will become the county with the most industrial space in future years with 95 million SF, followed by Lehigh with 87 million SF and Northampton with 84 million SF. Luzerne, Lehigh, Northampton, and Berks Counties will continue to dominate the industrial real estate market in the Study Area with a total combined supply of 339 million SF, accounting for 73% of the total industrial supply in the EPFA region.

Figure 9: Total Industrial Supply Projection by County, Study Area



Source: CoStar, 2023, Berks County Planning Commission, Monroe County Planning Commission, and Lackawanna County Department of Planning and Economic Development

Table 9 illustrates the pace of future growth within the EPFA region. By the end of 2023, an estimated 13 million SF of new industrial space is projected to be completed. This growth is expected to continue in 2024, with an anticipated completion of approximately 34 million SF. In 2025, an additional 3 million SF of industrial space is expected to be completed.

Further, there are plans for an additional 45 million SF of industrial space, either currently under construction or in the planning stages, with no specific completion date currently available.

Table 9: Future Supply Projection by County and Expected Completion (SF), Study Area

County	Existing	2023	2024	2025	Date Unavailable
Luzerne	71,960,000	4,300,000	14,480,000	830,000	680,000
Lehigh	81,710,000	330,000	3,150,000	0	1,600,000
Northampton	66,070,000	3,010,000	10,030,000	1,110,000	3,700,000
Berks	57,480,000	1,660,000	1,960,000	830,000	13,860,000
Lackawanna	31,530,000	1,000,000	750,000	150,000	9,180,000
Schuylkill	22,610,000	1,230,000	1,770,000	0	6,770,000
Lebanon	24,580,000	1,100,000	0	0	1,000,000
Monroe	11,040,000	400,000	1,410,000	0	5,550,000
Carbon	3,130,000	10,000	740,000	0	2,000,000
Pike	400,000	0	0	0	430,000
Total	**370,500,000**	**13,040,000**	**34,290,000**	**2,920,000**	**44,770,000**

Source: CoStar, 2023, Berks County Planning Commission, Monroe County Planning Commission, and Lackawanna County Department of Planning and Economic Development

1.1.2.1 Industrial Use Category

This section summarizes industrial use square footage. As of 2022, warehousing makes up the largest industrial supply in the Study Area, followed by distribution and manufacturing, as shown in Table 10. Combined, those two uses account for approximately 75 percent of all industrial square footage within the EPFA region. Among all uses, general industrial supply with no use data available is expected to add the largest supply to the Study Area (56 million SF), followed by distribution (19 million SF) and warehouse (17 million SF). The distribution and warehouse sectors are expected to sustain their growth momentum, fueled by the increasing demand from e-commerce. There are no service, showroom, or telecom hotel/data hosting facilities under construction or proposed as of Q1 2023.

Across all use categories, the general industrial supply with no use data available is expected to see the strongest growth in supply at 475%, indicating that specific uses associated with proposed new facilities may not yet be determined.

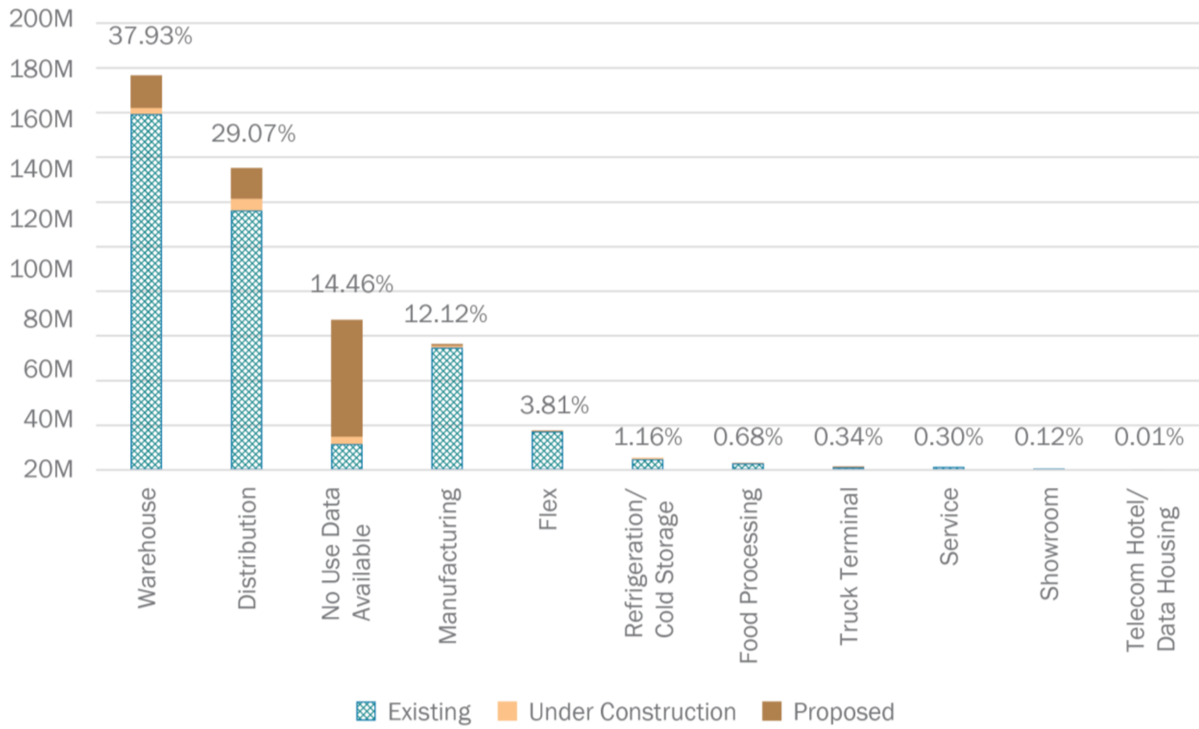
Table 10: Future Supply Projection by Use Category (SF), Study Area

Property Type	Existing	Under Construction	Proposed	Total Future Supply	Expected Growth
No Use Data Available	11,710,000	3,230,000	52,360,000	55,590,000	474.72%
Truck Terminal	1,210,000	0	390,000	390,000	32.23%
Distribution	116,180,000	5,210,000	13,920,000	19,130,000	16.47%
Warehouse	159,380,000	2,830,000	14,360,000	17,190,000	10.79%
Food Processing	2,930,000	0	260,000	260,000	8.87%
Refrigeration/Cold Storage	4,980,000	430,000	0	430,000	8.63%
Manufacturing	54,920,000	740,000	770,000	1,510,000	2.75%
Flex	17,200,000	10,000	500,000	510,000	2.97%
Service	1,390,000	0	0	0	0.00%
Showroom	550,000	0	0	0	0.00%
Telecom Hotel/Data Hosting	50,000	0	0	0	0.00%
Total	**370,500,000**	**12,450,000**	**82,560,000**	**95,010,000**	**25.64%**

Source: CoStar, 2023, Berks County Planning Commission, Monroe County Planning Commission, and Lackawanna County Department of Planning and Economic Development

After the completion of all planned and under-construction projects, warehouses, distribution centers, general industrial with no use available, and manufacturing facilities are expected to remain the primary industrial land uses in the Study Area (Figure 10), with an estimated total of 177 million SF, 135 million SF, 67 million SF, and 56 million SF, respectively. Warehouses and distribution centers will make up 67% of the total industrial supply in the Study Area while general industrial supply with no use data available and manufacturing will account for 14% and 12%, respectively.

Figure 10: Total Industrial Supply Projection by Use Category (SF), Percent of Study Area

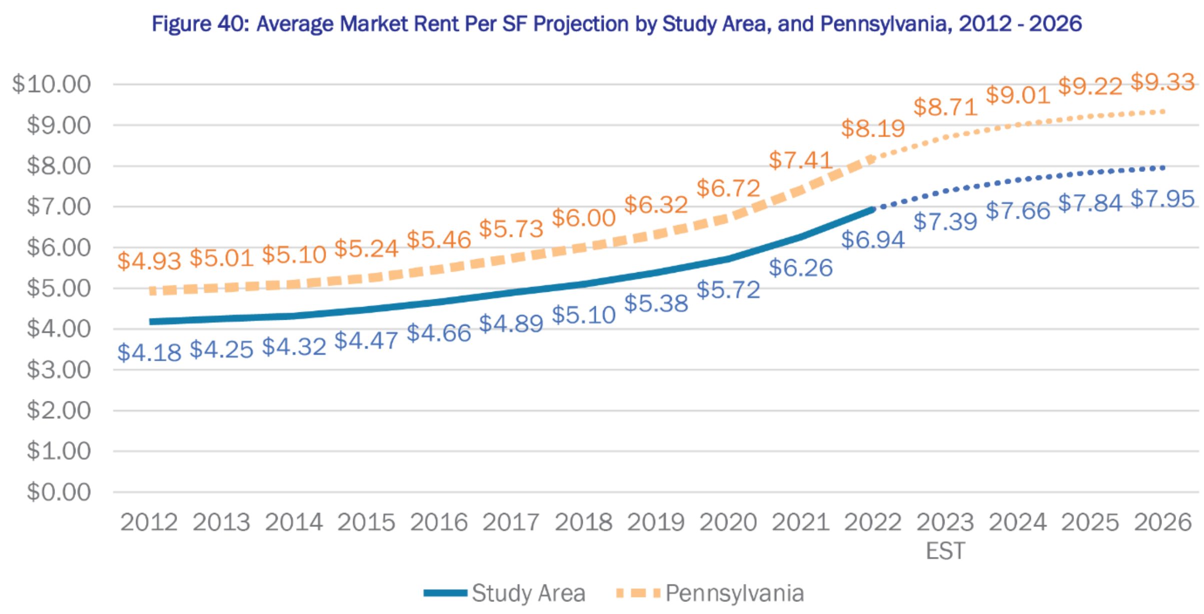


Source: CoStar, 2023, Berks County Planning Commission, Monroe County Planning Commission, and Lackawanna County Department of Planning and Economic Development

1.1.2.2 Average Market Rent

As Figure 11 illustrates, the overall rate of rent increases in the near term is expected to slow down relative to the average annual rent growth rate of 5.20% over the last decade. In the Study Area, the average market rent per SF is projected to grow by 16.77% between 2022 and 2026, which reflects an average growth rate of approximately 3.46% per year. This rental growth rate is comparable with the expected industrial rent growth in wider Pennsylvania, which is anticipated to be 3.31% per year.

Figure 11: Average Market Rent Per SF Projection by Study Area, and Pennsylvania, 2012 - 2026



Source: CoStar, 2023

Amongst all counties, Pike County is anticipated to see the strongest rise in rent (26% by 2026 or 5.85% per year), as shown in Table 11, while the remaining counties within the region are expected to experience smaller but similarly scaled rent increases with compound annual growth rates (CAGR) of 3.39% to 3.65% per year.

Table 11: Average Market Rent Per SF Projection by County, Study Area, 2012 – 2026

County	2012	2022	2026	2012-2022 CAGR	2022-2026 CAGR
Pike	$6.89	$14.45	$18.14	7.69%	5.85%
Lebanon	$3.32	$5.52	$6.37	5.22%	3.65%
Carbon	$4.90	$7.92	$9.12	4.92%	3.65%
Northampton	$4.71	$7.81	$8.97	5.19%	3.52%
Lehigh	$4.80	$7.91	$9.07	5.12%	3.48%
Schuylkill	$3.63	$6.14	$7.04	5.40%	3.48%
Berks	$3.92	$6.54	$7.49	5.25%	3.45%
Luzerne	$3.76	$6.20	$7.10	5.13%	3.45%
Monroe	$4.49	$7.73	$8.85	5.58%	3.44%
Lackawanna	$3.73	$6.09	$6.96	5.02%	3.39%
Study Area	**$4.18**	**$6.94**	**$7.95**	**5.20%**	**3.46%**
Pennsylvania	**$4.93**	**$8.19**	**$9.33**	**5.21%**	**3.31%**

Source: CoStar, 2023

In terms of growth by use type, Table 12 illustrates that showroom facilities are anticipated to see the strongest rent increase of 4.14% per year during 2022 – 2026, followed by cold storage at 3.95% per year, and food processing at 3.87% per year. Flex is expected to have the highest market rent per SF in 2026 at $12.65, followed by showroom at $10.55 and cold storage at $9.48.

Table 12: Average Market Rent Per SF Projection by Use Category, Study Area, 2012 – 2026

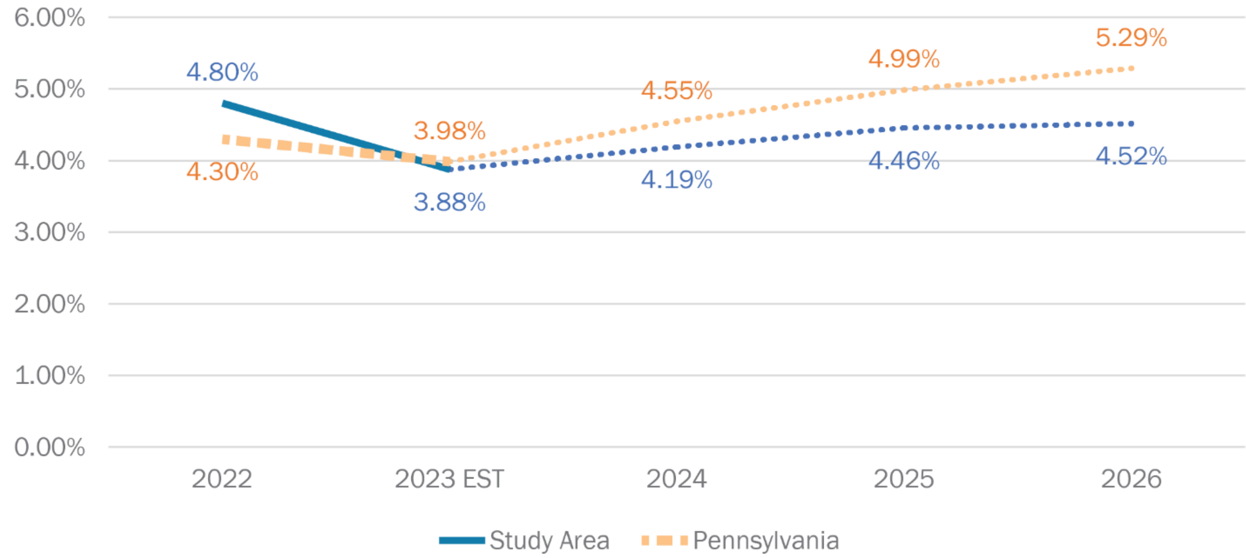
Uses	2012	2022	2026	2012-2022 CAGR	2022-2026 CAGR
Showroom	$5.64	$8.97	$10.55	4.75%	4.14%
Cold Storage	$5.16	$8.12	$9.48	4.64%	3.95%
Food Processing	$4.70	$7.37	$8.58	4.60%	3.87%
Service	$4.68	$7.38	$8.58	4.66%	3.84%
Truck Terminal	$4.70	$7.45	$8.61	4.71%	3.68%
Manufacturing	$4.45	$7.02	$8.11	4.66%	3.67%
Flex	$7.97	$11.00	$12.65	3.27%	3.56%
No Use Data Available	$4.73	$7.46	$8.53	4.66%	3.41%
Distribution	$3.71	$6.56	$7.50	5.87%	3.40%
Warehouse	$3.93	$6.66	$7.58	5.42%	3.29%
Telecom Hotel/ Data Hosting	$4.80	$7.63	N/A	4.74%	N/A
Overall Industrial/Flex	$4.18	$6.94	$7.95	5.20%	3.46%

Source: CoStar, 2023

1.1.2.3 Vacancy

In 2022, the Study Area recorded an industrial vacancy rate of 4.80%, which was slightly higher than Pennsylvania's average vacancy rate of 4.30% (Figure 12). However, it is projected that the industrial real estate market in the Study Area will improve over the next few years, outperforming Pennsylvania's overall industrial market. The industrial vacancy rates both in the Study Area and Pennsylvania are expected to decrease in 2023, and then gradually increase between 2024 and 2026 as new development projects come online.

Figure 12: Industrial Vacancy Rate Projection, Study Area, and Pennsylvania, 2022 – 2026



Source: CoStar, 2023

Table 7 illustrates current and project industrial vacancy rates, by county, within the EPFA study area. Among all counties, Carbon is expected to see a substantial improvement in its industrial vacancy rate. As of 2022, Carbon had the highest industrial vacancy rate of 31% due to its recently completed large distribution center that had not yet been filled by tenants as of December 2022. However, the overall industrial market in Carbon is relatively healthy. By the end of 2026, Carbon is expected to have the lowest industrial vacancy rate in the Study Area (less than 1%). The projected industrial vacancy rates in other counties in 2026 range from 2.28% to 6.47%.

Table 13: Industrial Vacancy Rate Projection by County, Study Area, 2022 – 2026

County	2022	2026	% Change
Carbon	31.00%	0.96%	-30.04%
Monroe	14.40%	5.01%	-9.39%
Berks	6.90%	4.42%	-2.49%
Lackawanna	7.00%	5.44%	-1.56%
Northampton	4.20%	3.43%	-0.77%
Lehigh	2.50%	3.42%	0.92%
Luzerne	4.70%	6.47%	1.77%
Pike	0.00%	2.28%	2.28%
Lebanon	1.20%	3.56%	2.36%
Schuylkill	2.70%	5.83%	3.13%
Study Area	**4.80%**	**4.52%**	**-0.29%**
Pennsylvania	**4.30%**	**5.29%**	**0.99%**

Source: CoStar, 2023

Table 14 illustrates current and project industrial vacancy rates, by use type, within the EPFA study area. The general industrial supply with no use data available is anticipated to experience the largest decline in its vacancy rate, decreasing from 10.50% in 2022 to 6.65% by 2026. Distribution centers are also expected to see significant improvement in occupancy, with the vacancy rate declining from 7.10% in 2022 to 3.68% by 2026. These two use categories represent the fourth- and second-largest industrial uses in the Study Area, and their anticipated improvement in vacancy rates will contribute to the overall decline of the Study Area's vacancy rate. Among all uses, demand for telecom hotel/data hosting facilities is projected to remain strong with full occupancy projected in 2026.

Table 14: Industrial Vacancy Rate Projection by Use Category, Study Area, 2022 – 2026

Use Category	2022	2026	% Change
No Use Data Available	10.50%	6.65%	-3.85%
Distribution	7.10%	3.68%	-3.42%
Cold Storage	1.00%	0.47%	-0.53%
Telecom Hotel/Data Hosting	0.00%	0.00%	0.00%
Service	1.20%	1.66%	0.46%
Flex	3.40%	4.09%	0.69%
Showroom	0.00%	0.50%	0.50%
Warehouse	3.60%	4.63%	1.03%
Food Processing	0.70%	1.89%	1.19%
Manufacturing	3.90%	6.39%	2.49%
Truck Terminal	2.00%	4.49%	2.49%

Source: CoStar, 2023

1.1.2.4 Future Industrial Property Development County Profiles

As a supplement to the analyses included in the preceding sections, county-level future industrial development property profiles have been developed using current CoStar data as well. These profiles are included in Appendix D.

1.1.3 Regional Zoning

Existing zoning data within the EPFA region were compiled from several existing sources, including municipal, county, and MPO databases. These sources were combined into a single geodatabase where zoning categories were normalized into general zoning categories that depict broad zoning patterns within the region. These categories are intentionally broad and do not reflect density nor municipal-specific zoning codes. The general zoning categories depicted in Figure 13 are:

- Open Space/Conservation
- Residential
- Commercial
- Agricultural
- Industrial/Manufacturing
- Transportation/Utilities
- Business Park/District
- Mixed Use
- Institutional

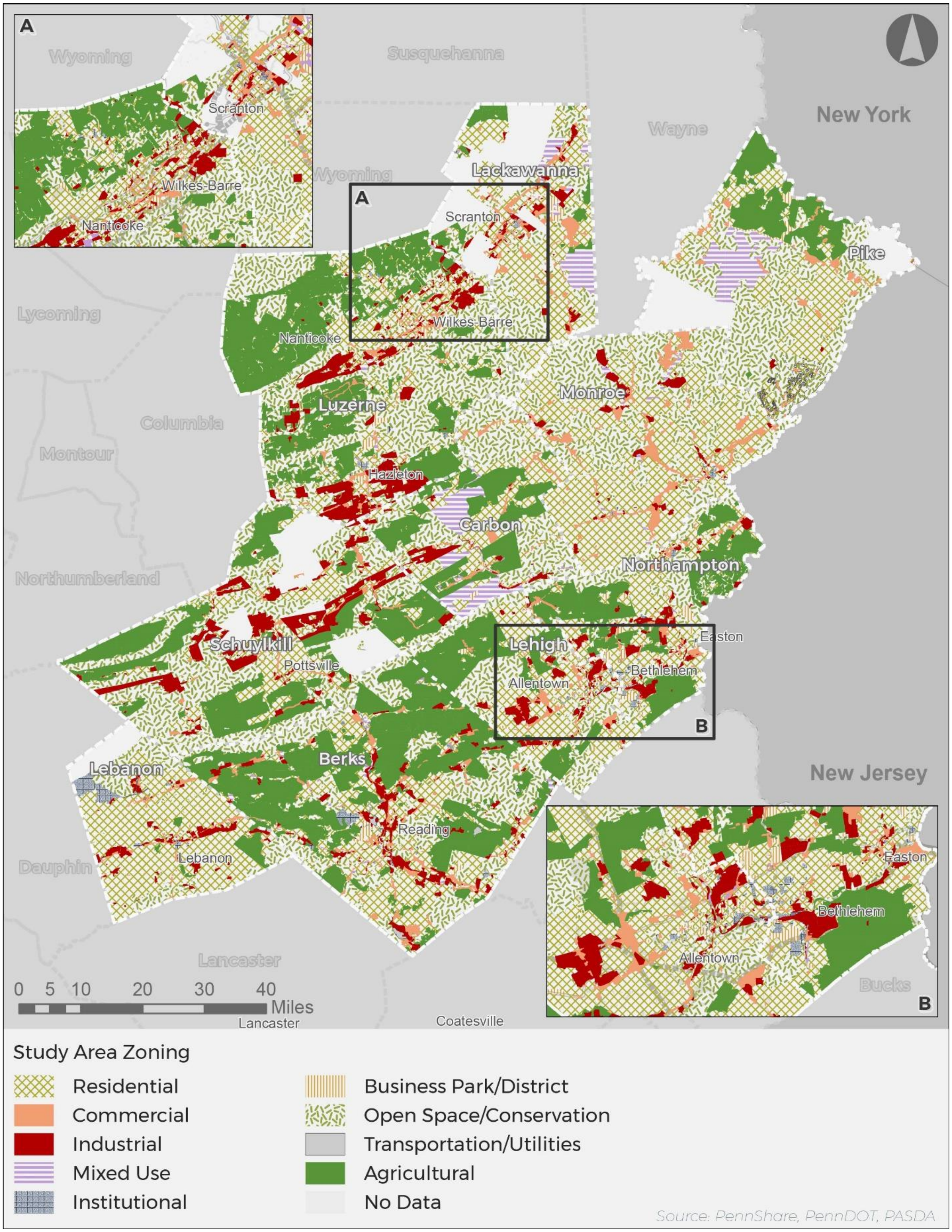
Areas where current zoning data was not available or where zoning is not currently present have been compiled as well. A summary of zoning category area (square miles) for each of the EPFA Study Area counties is included in Table 15.

Table 15: Zoning Categories (square miles) by County

Zoning Category	EPFA Study Area	Pike	Monroe	Schuylkill	Berks	Lebanon	Northampton	Luzerne	Lehigh	Lackawanna	Carbon
Agricultural	**1298.88**	82.21	0	198.65	357.13	11.61	134.75	309.21	86.84	22.71	95.76
Business Park/District	**46.66**	5.19	0.45	0.85	6.03	0	10.54	13.81	4.63	3.67	1.5
Commercial	**187.66**	13.66	42.79	12.77	30.18	8.27	14.11	17.09	12.93	25	10.86
Conservation/Recreation/ Open Space	**1683.78**	199.66	214.37	285.99	212.87	51.51	79.04	330.12	87.44	90.66	132.12
Industrial/Manufacturing	**308.62**	0.78	16.62	74.56	44.69	16.74	25.46	81.85	21.28	14.97	11.68
Institutional	**29.28**	0	1.12	0.01	6.83	10.7	3.81	2.84	2.31	1.52	0.14
Mixed Use	**123.62**	37.31	5.84	0.42	5.27	0.05	0.4	1.97	0.32	27.52	44.52
Residential	**1659.45**	127.85	335.7	115.93	200.91	237.92	108.98	148.81	133.11	158.99	91.24
Transportation/Utilities	**5.45**	1.99	0	0	2.89	0.57	0	0	0	0	0
No Zoning/Data Unavailable	**338.52**	99.34	0	94.48	0	25.71	0	0	0	120.1	0
Total Square Miles	**5681.92**	**568**	**615.55**	**783.66**	**865.66**	**363.08**	**377.57**	**906.26**	**348.38**	**465.13**	**388.63**

Source: PennDOT, PASDA, PennShare

Figure 13: EPFA Study Area Zoning, by Category



Note that locations marked as "No Data" are municipalities that either have no zoning, or are locations for which geocoded zoning data is not currently available.

Industrial, Manufacturing, and Commercial zoning is present throughout the study area, generally aligning with the regional highway network. Many of these areas reflect the current proliferation of warehousing and distribution centers within the region. Further growth within these industrial segments is likely within the region. Particular focus should be placed on rural agricultural areas, where current zoning code language may allow for ambiguous definitions of industrial uses that permit modern warehouses. While individual zoning laws vary within each municipality and/or county within the region, these areas, particularly those adjacent to existing industrial developments, are likely the most vulnerable for future growth.

1.1.4 Identification of Regional Industrial Employers

The top 10 employers within each county are displayed in Table 16.[4] These top employers illustrate a diversity of uses throughout the region, but also highlight the prominence of the freight and logistics industry, with a majority of these employers playing a direct or indirect role in freight (highlighted in red). Wal-Mart is a top employer in nine of ten EPFA counties, with the exception of Lehigh County. Amazon is a top employer in four counties: Berks, Lehigh, Lackawanna, Luzerne. Other key employers include East Penn Manufacturing in Berks County, the world's largest single-site, lead-acid battery facility. Sapa Extrusions Inc., a top employer in Schuylkill County, is an established mining and metal business, supplying aluminum for the construction, transportation, and other industries. C&S Wholesale Grocers, Inc, a top employer in Northampton County, is a nationally prominent wholesale grocery supply serving local and national grocery chains. Additional freight-focused employers are highlighted in red within Table 16. In addition to freight-centric employers, a government agency (County, State or Federal) is a top employer in each county, and, with the exception of Pike County, all counties contain a top employer in the medical industry.

[4] "Pennsylvania Top 50 Employers and Industries," Pennsylvania Center for Workforce Information and Analysis: https://www.workstats.dli.pa.gov/Products/Top50/Pages/default.aspx

Table 16: Top 10 Employers by County, 2022

	Berks		Luzerne
1	**East Penn Manufacturing Company**	**1**	**Amazon.com Services Inc**
2	Reading Hospital	**2**	Federal Government
3	**Amazon.com Services Inc**	**3**	Geisinger Wyoming Valley Medical Center
4	**Carpenter Technology Corporation**	**4**	State Government
5	**Penske Truck Leasing Co LP**	**5**	**TJ Maxx Distribution Center**
6	**Wal-Mart Associates Inc**	**6**	**Chewy Inc**
7	County of Berks	**7**	**Wal-Mart Associates Inc**
8	Reading School District	**8**	Luzerne County Government
9	State Government	**9**	Hazleton Area School District
10	Saint Joseph Medical Center	**10**	**Lowe's Home Centers LLC**
	Carbon		**Monroe**
1	Saint Luke's Hospital	**1**	Federal Government
2	Carbon County	**2**	**Aventis Pasteur Inc**
3	Blue Mountain Resort	**3**	**Wal-Mart Associates Inc**
4	**Wal-Mart Associates Inc**	**4**	Pocono Medical Center
5	State Government	**5**	Pocono Mountain School District
6	Jim Thorpe Area School District	**6**	Kalahari Resorts & Conventions
7	Lehighton Area School District	**7**	Mount Airy Casino Resort
8	Palmerton Area School District	**8**	Saint Luke's Hospital
9	Blue Ridge Cable Technologies Inc	**9**	Stroudsburg Area School District
10	Behavioral Health Associates Inc	**10**	East Stroudsburg Area School District
	Lackawanna		**Northampton**
1	State Government	**1**	**Wal-Mart Associates Inc**
2	Allied Services Foundation	**2**	**United Parcel Service Inc**
3	Community Medical Center	**3**	Lehigh University
4	**Amazon.com Services Inc**	**4**	Northampton County
5	**Chewy Inc**	**5**	Bethlehem Area School District
6	Scranton School District	**6**	**FedEx Ground Package System Inc**
7	Lackawanna County	**7**	Wind Creek – Bethlehem PA
8	University of Scranton	**8**	**C&S Wholesale Grocers Inc**
9	**Wal-Mart Associates Inc**	**9**	**Victaulic Company**
10	Federal Government	**10**	St. Luke's University Health Network
	Lebanon		**Pike**
1	Federal Government	**1**	Delaware Valley School District
2	**Farmers Pride Inc**	**2**	Woodloch Pines Inc
3	The Good Samaritan Hospital	**3**	Wallenpaupack Area School District
4	State Government	**4**	**Wal-Mart Associates Inc**
5	**Wal-Mart Associates Inc**	**5**	Pike County
6	Cornwall-Lebanon School District	**6**	The Lodge at Woodloch
7	**Bayer US LLC**	**7**	**ShopRite of Westfall Town Center**
8	Lebanon School District	**8**	East Stroudsburg Area School District
9	**TE Connectivity Corporation**	**9**	Federal Government
10	**Ace Hardware Distribution Center**	**10**	**Weis Markets Inc**
	Lehigh		**Schuylkill**
1	Lehigh Valley Health Network	**1**	**Wal-Mart Associates Inc**
2	St. Luke's University Health Network	**2**	State Government
3	**Amazon.com Services Inc**	**3**	**Sapa Extrusions Inc**
4	Lehigh Valley Physician Group	**4**	Schuylkill Medical Center-South Jackson St.
5	**Mack Trucks Inc**	**5**	**Jeld-Wen Inc**
6	St. Luke's Physician Group Inc	**6**	**Cargill Meat Solutions Corporation**
7	Allentown School District	**7**	**Lowe's Home Centers LLC**
8	Dorney Park & Wildwater Kingdom	**8**	**Wegmans Food Markets Inc**
9	**Air Products and Chemicals Inc**	**9**	County of Schuylkill
10	Lehigh County	**10**	Federal Government

1.1.5 Intermodal Facilities

There are several intermodal facilities (facilities that provide for the transfer of freight from one mode to another) located within the study area. These facilities are predominantly located in the Allentown-Bethlehem and Scranton-Wilkes Barre regions, as shown in Table 17. While each of these intermodal facilities includes truck connections (air-truck, rail-truck, truck-port-rail, or truck-truck), these facilities predominantly fulfill rail-truck movements.

Table 17: Intermodal Facilities

Facility	Type	Municipality	Modes Served
Lehigh Valley International Airport	Air	Hanover	
Norfolk Southern - Taylor-PA	Rail	Taylor	
Lehigh Valley Rail Management - Bethlehem-PA	Rail	Bethlehem	
Valley Distributing & Storage Company	Rail	Wilkes-Barre	
Warehouse Specialists, Incorporated	Rail	Allentown	
Gress Public Refrigerated Services	Rail	Scranton	
Norfolk Southern - Independent Bulk Transfer Terminal-Reading-PA	Rail	Reading	
Norfolk Southern - Independent Bulk Transfer Terminal-Palmyra-PA	Rail	Palmyra	
Former Yellow Freight - Allentown-PA Terminal (inactive)	Truck	Allentown	
Former Yellow Freight - Scranton-PA Terminal (inactive)	Truck	Pittston	
USPS Processing and Distribution Center Scranton-PA	Truck	Scranton	
USPS Processing and Distribution Center Wilkes Barre-PA	Truck	Wilkes Barre	

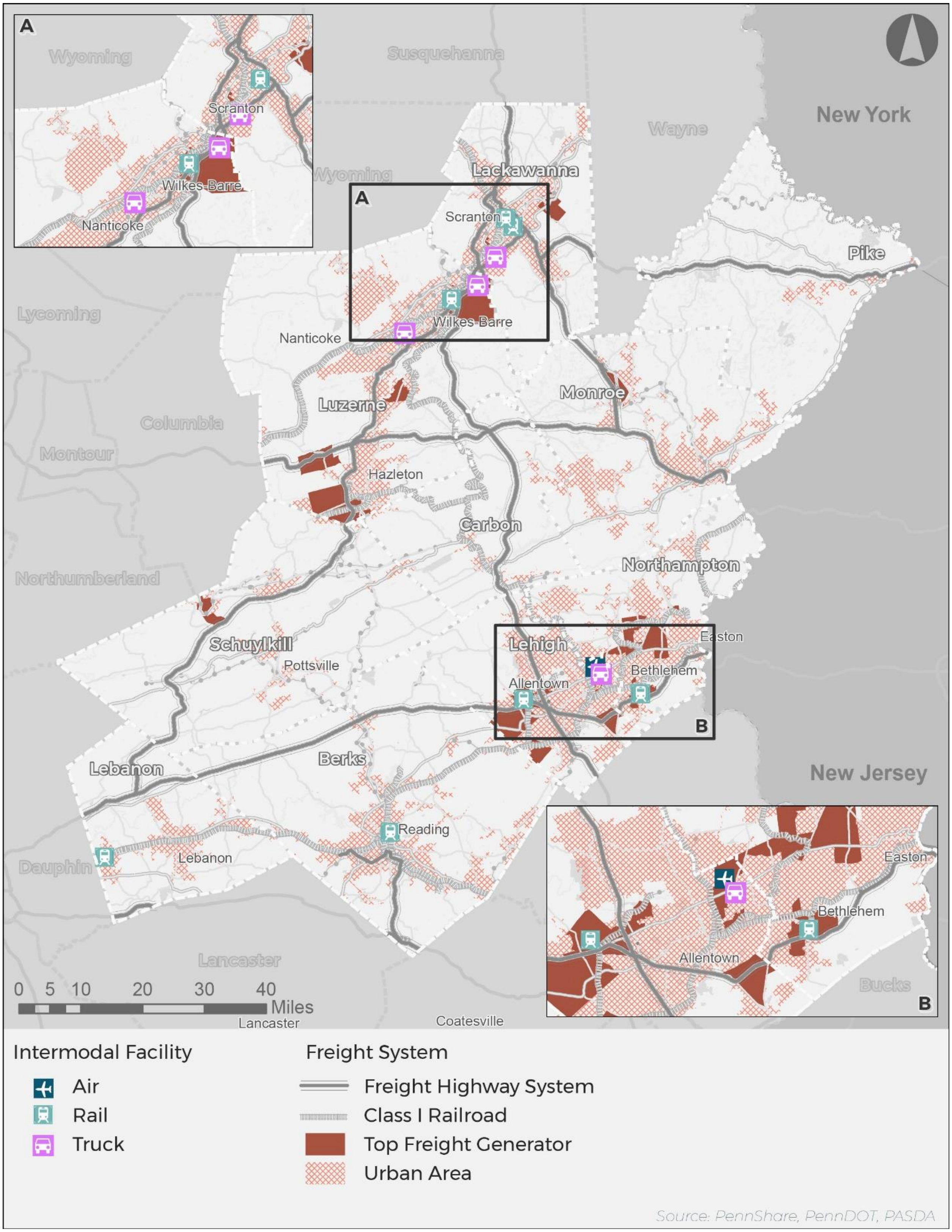
Source: PASDA

1.2 Infrastructure

This section documents the existing conditions of the multimodal transportation infrastructure that goods movement relies upon within the EPFA study area. The inventory of the network includes highways, railroads, and aviation assets.

The region's freight system, intermodal facilities, and primary freight generating clusters are shown in Figure 14. The area's highway network consists of urban and rural roads linked to the regional highway system and interstate routes. Lehigh Valley International Airport (ABE) is the second busiest air cargo (by tonnage) airport in Pennsylvania and predominant air cargo node in the region, having experienced substantial air cargo growth, serving a regional hub for Amazon Air. Additionally, several freight railroads traverse the region, primarily consisting of Norfolk Southern and short line operations. Existing conditions for each mode are detailed individually within the following sections.

Figure 14: EPFA Study Area Freight Infrastructure and Clusters



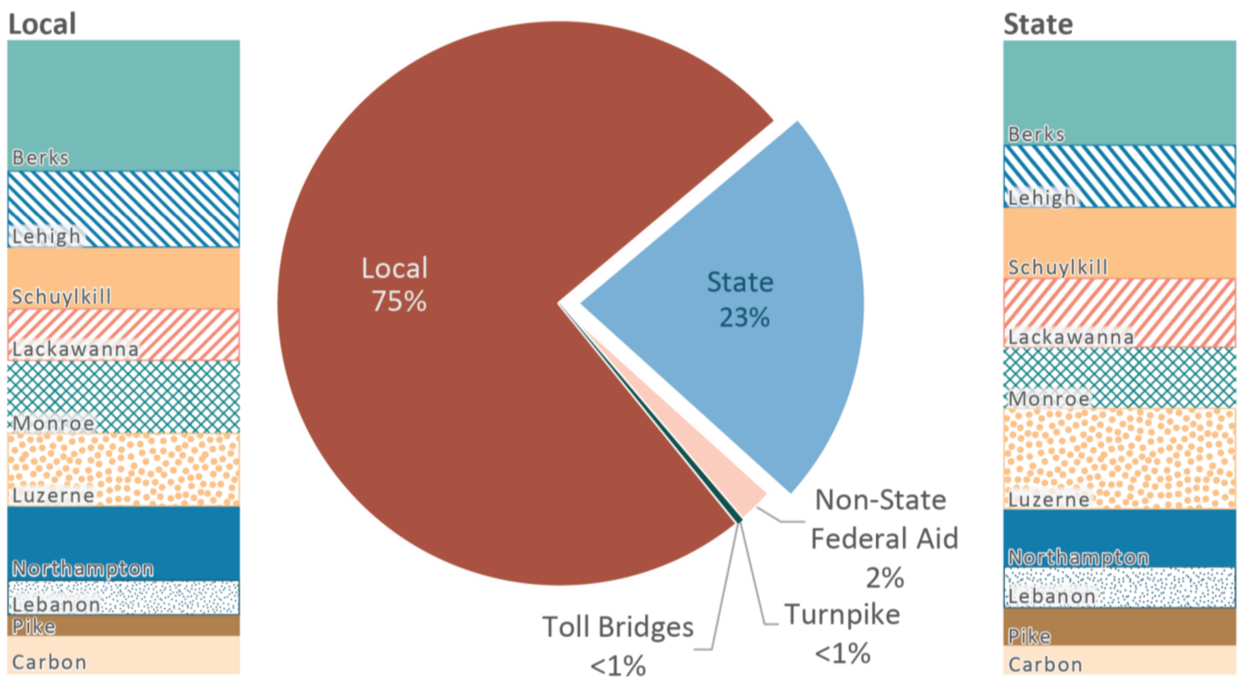
1.2.1 Roadway Network

PennDOT geospatial data obtained from the Pennsylvania Spatial Data Access (PASDA) clearinghouse was used to highlight the EPFA study area highway freight network, a crucial element supporting the study area's economy. This profile takes a holistic look at the study area's highway network, encompassing key interstate, US, state, and local roadways, many of which are critical local or regional freight routes. The study area is connected by six interstate routes that traverse the region. Interstates 78, 80, and 81 are primary freight corridors that provide connections to major freight nodes in New Jersey (Newark/Elizabeth) and Pennsylvania (Carlisle, Chambersburg), while the Pennsylvania Turnpike Northeast Extension (I-476) provides an indirect link to Philadelphia. Major US routes (including US 22, 209, 222, and 422) link the region's primary population centers providing local and regional connections. Additionally, the study area includes numerous state routes which provide local connections to the regional highway network. Figure 14 illustrates the study area's roadway network along with connections to key regional and national freight corridors.

There are over 30,000 miles of roadways in the EPFA study area. As Figure 15 illustrates, this is predominantly comprised of locally (75%) or state (23%) owned roadways, with the remainder (approximately 2%) comprised of non-state Federal Aid Roads, or toll authority (Pennsylvania Turnpike or Delaware River Joint Toll Bridge Commission) owned roadways.

Roadway ownership (mileage) is further broken down by county, illustrated in Figure 15. Berks and Luzerne Counties together contain nearly one third of the state roads in the study area. Table 18 also illustrates the substantial representation of roadways under local jurisdiction within each county, with five counties having nearly three-fourths of their roadway network locally owned.

Figure 15: Roadway by Ownership (miles)



Source: PennDOT

Table 18: Roadway Mileage by Ownership Within Each County (by mileage and percentage, by county)

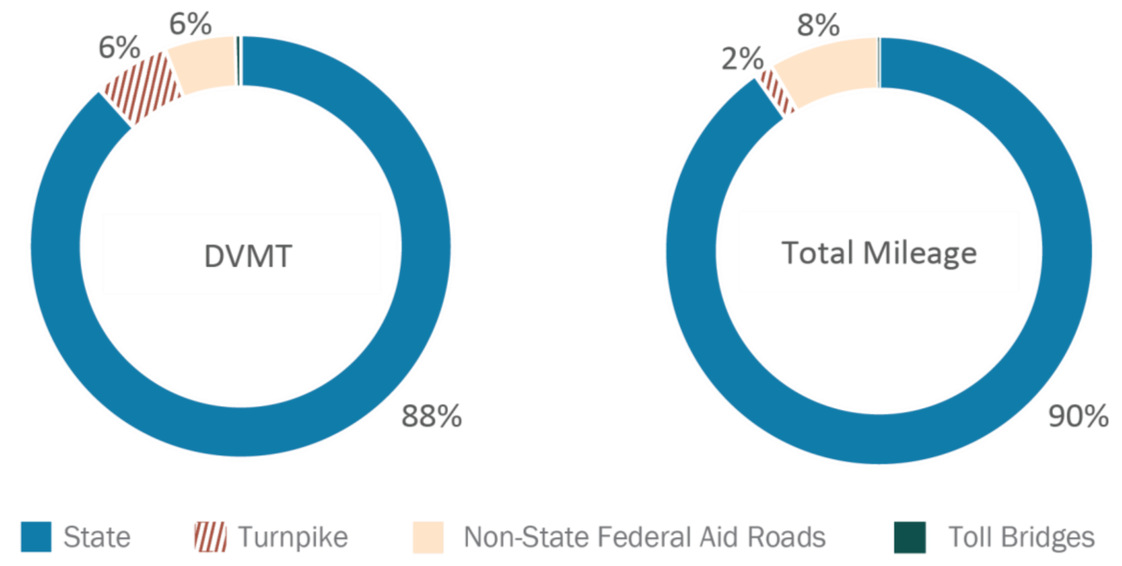
	State		Turnpike		Non-State Federal Aid		Toll Bridges		Local		Total
County	**Miles**	**%**	**Miles**	**%**	**Miles**	**%**	**Miles**	**%**	**Miles**	**%**	**Miles**
Berks	1,033	18.9%	5	0.1%	164	3.0%	-	0.0%	4,275	78.1%	**5,477**
Carbon	291	18.7%	27	1.7%	2	0.1%	-	0.0%	1,236	79.4%	**1,555**
Lackawanna	699	28.0%	13	0.5%	53	2.1%	-	0.0%	1,727	69.3%	**2,492**
Lebanon	425	25.8%	6	0.4%	47	2.8%	-	0.0%	1,168	71.0%	**1,645**
Lehigh	635	19.2%	26	0.8%	109	3.3%	-	0.0%	2,531	76.7%	**3,301**
Luzerne	1,020	28.7%	20	0.6%	99	2.8%	-	0.0%	2,417	68.0%	**3,555**
Monroe	597	20.2%	-	0.0%	4	0.1%	<1	0.0%	2,360	79.7%	**2,962**
Northampton	568	18.6%	-	0.0%	87	2.9%	3	0.1%	2,397	78.4%	**3,055**
Pike	370	34.7%	-	0.0%	20	1.9%	1	0.1%	676	63.4%	**1,066**
Schuylkill	700	26.0%	-	0.0%	2	0.1%	-	0.0%	1,988	73.9%	**2,689**
Total	**6,337**	**22.8%**	**96**	**0.3%**	**587**	**2.1%**	**4**	**0.0%**	**20,773**	**74.7%**	**27,797**

Source: PennDOT

When local roadways are removed, the majority of the highway network mileage is predominantly made up of state and non-state federal aid roads, as illustrated in Figure 16. State-owned roadways account for nearly 90 percent of roadway mileage, while non-state Federal aid roadways account for 8 percent. The remaining two percent are comprised of roadways under Turnpike or Toll Bridge authority jurisdiction. Daily Vehicle Miles Traveled (DVMT) follows a similar distribution with majority occurring on state roads (88%). Turnpike and non-state federal aid roads comprise the bulk of the remainder (6% each). Truck DVMT on state roads represents 12 percent of DVMT for all vehicles, while truck DVMT on non-state federal aid roads represents 0.2 percent of DVMT for all vehicles.

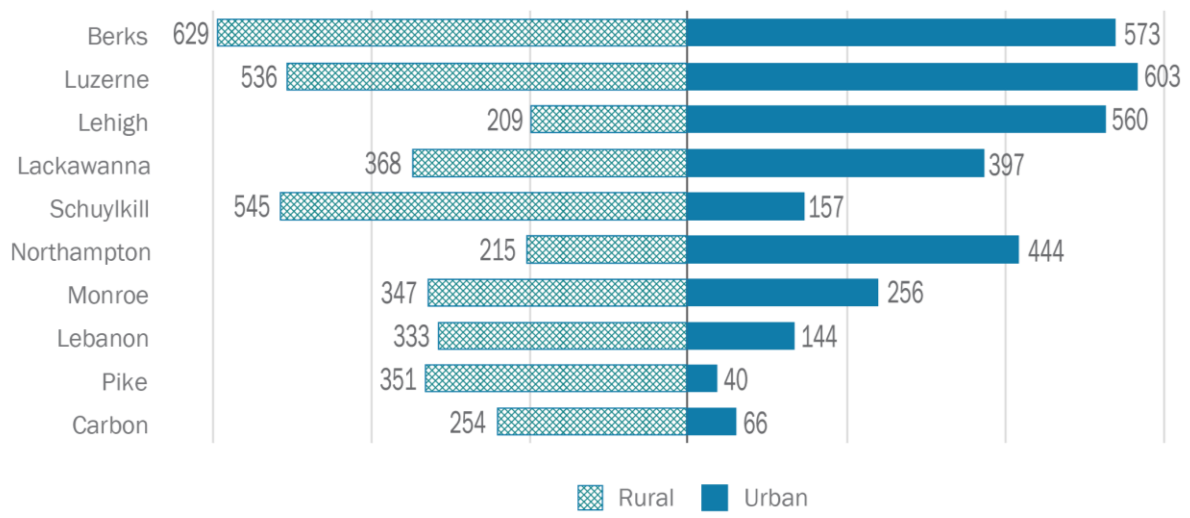
There are 7,025 miles of roadway (non-local roadways) in the study area with a relatively balanced distribution of urban (3,238 miles) and rural (3,786 miles), representing 46% and 54% of the total mileage, respectively, as shown in Figure 17. These roadways represent almost one quarter of all roads within the study area. This illustrates the general character of the transportation network within each of the EPFA partner counties, with primarily urban (Lehigh, Northampton), primarily rural (Carbon, Pike, Lebanon, Schuylkill), and balanced (Berks, Luzerne, Lackawanna, Monroe) counties.

Figure 16: DVMT and Total Mileage, by Roadway Ownership



Source: PennDOT

Figure 17: Rural and Urban Roads by Mileage (and by County)

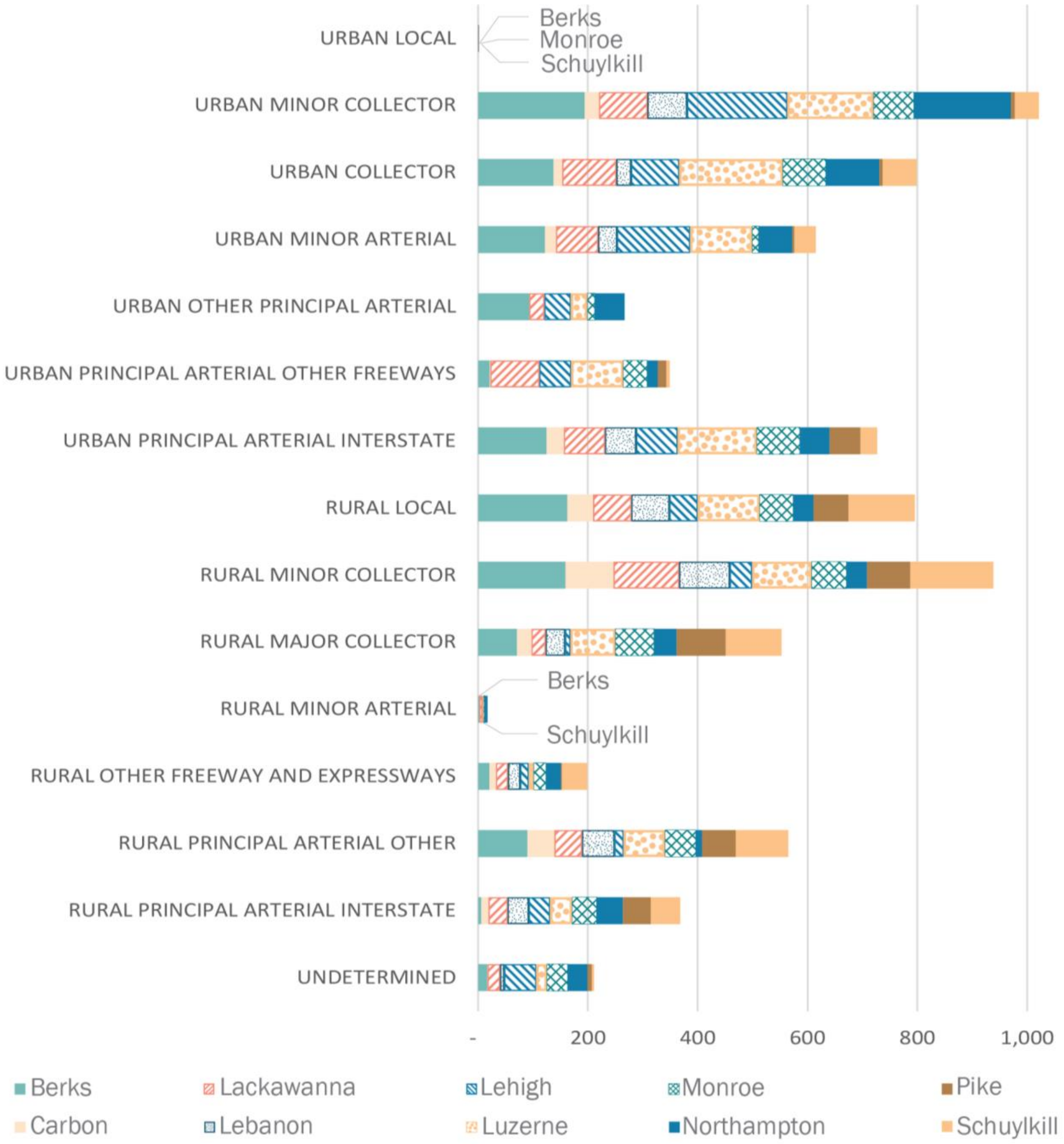


Source: PennDOT

The functional classification of the EPFA regional highway freight network is summarized in Figure 18 and Table 19 and illustrated in Figure 19, This displays the variety of roadway types carrying freight trips throughout the region, as each functional classification category exhibits specific characteristics that may or may not be conducive to heavy vehicle trips. Each functional class is detailed individually below:

- **Interstate Highways:** The highest classification of roadways, these limited-access facilities are designed for longer-distance, higher-speed travel. Interstate highways offer a high level of mobility and link major urban areas.
- **Other Freeways and Expressways:** These roadways operate in a similar fashion to Interstate highways. They are also characterized by limited access with no abutting land uses, though occasional at-grade intersections may exist.
- **Other Principal Arterials:** These roadways serve major centers of metropolitan areas and offer a high degree of mobility. Unlike Interstate highways, these roadways may serve abutting land uses directly. At-grade intersections and driveways to specific parcels are characteristic of these roadways.
- **Minor Arterial:** These roadways provide service for trips of moderate length, serve smaller geographic areas than principal arterials, and offer connectivity to principal arterials and Interstate highways from collectors and local roadways. Minor arterials in rural settings are typically spaced on intervals based on population density and help connect small rural communities to larger towns.
- **Major Collector:** Major collector roadways provide intra-county travel at lower speeds than arterial roadways. Major collectors gather traffic from local roads and funnel vehicles to the arterial network. Major collectors offer direct access to large residential neighborhoods, industrial areas, and agricultural facilities.
- **Minor Collector:** Minor collectors are typically shorter than major collectors, have lower travel speeds, are spaced closer to each other, have lower annual average traffic volumes, and have fewer travel lanes. Minor collectors serve smaller neighborhoods and developments than major collectors.
- **Local:** Local roads provide direct access to individual properties and land uses. They are not designed for through traffic, so they are typically the slowest and narrowest roadways. Local roadways are classified by default in that any federally classified roads that have not been classified as arterials or collectors are automatically considered local roadways. The term “local” in functional classification does not imply local government ownership of the roadway; it refers to the features and functions of the roadway only.

Figure 18: Highway Freight Network: Roadway Mileage by Classification and County



Source: PennDOT

Table 19: Highway Freight Network: Roadway Mileage by Classification and County

Roadway Classification	Berks	Carbon	Lackawanna	Lebanon	Lehigh	Luzerne	Monroe	Northampton	Pike	Schuylkill	Total
Urban Local	1			1							**2**
Urban Minor Collector	194	27	88	72	182	157	73	177	8	43	**1,021**
Urban Collector	137	16	98	27	88	189	78	98	5	62	**799**
Urban Principal Arterial Other Freeways	21	1	90		58	95	44	20	15	7	**349**
Urban Principal Arterial Interstate	125	32	75	57	76	144	78	54	56	31	**727**
Rural Local	163	47	69	69	52	112	61	37	63	121	**795**
Rural Minor Collector	159	88	120	92	41	108	64	37	79	151	**938**
Rural Major Collector	71	26	26	36	9	82	70	41	89	102	**553**
Rural Minor Arterial	2		6			2	2	5			**17**
Rural Other Freeway and Expressways	21	12	21	23	15	9	22	27	2	46	**199**
Rural Principal Arterial Other	90	49	50	59	17	76	56	12	61	96	**565**
Rural Principal Arterial Interstate	6	13	35	38	39	40	45	48	51	53	**368**
Undetermined	17	1	23	7	59	19	38	37	7	4	**211**
Total	**1,205**	**331**	**783**	**507**	**757**	**1,158**	**618**	**672**	**433**	**750**	**7,215**

Source: PennDOT

Figure 19: Existing Roadway Network

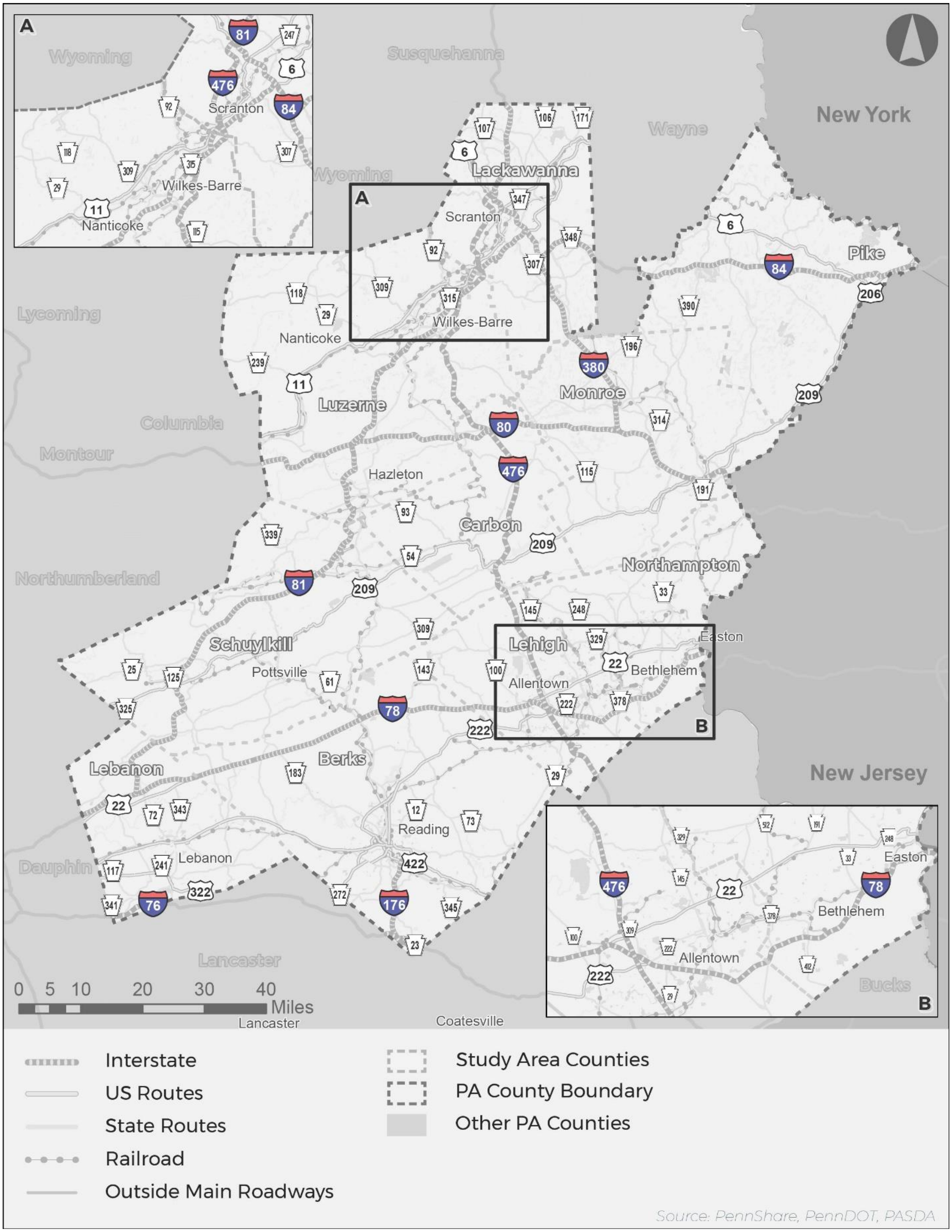
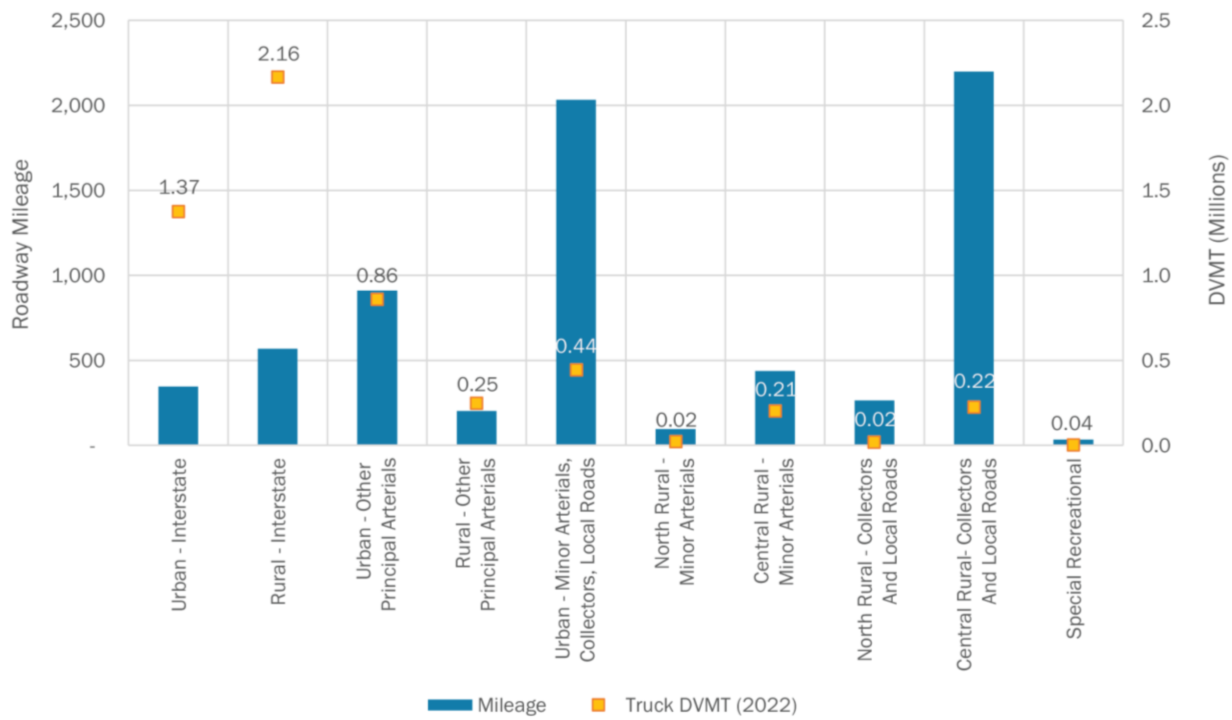


Figure 20 illustrates the relationship between roadway PennDOT functional classification groups and truck vehicle miles traveled (VMT). While Interstate routes support the majority of truck VMT within the region, a substantial amount of truck VMT is evident on all roadway types, particularly rural roadways.

Figure 20: Truck VMT vs Roadway Classification Mileage (2022)



Source: PennDOT

1.2.2 Traffic Conditions

1.2.2.1 Annual Average Daily Truck Traffic and Vehicle Miles of Travel

Annual Average Daily Truck Traffic (AADTT) metric is an annualized measure of traffic normalized by averaging daily traffic volumes over a twelve-month period. PennDOT estimates this metric using the traffic count data collected for the Traffic Information Repository (TIRE) program.

Figure 21 illustrates AADTT on all roadways within the EPFA study area. This map highlights the critical importance of the Interstate network for freight trips, with Interstates 78, 80, and 81 (each of which is a nationally significant highway freight corridor) exhibiting the most substantial AADTT in the region.

While the heaviest AADTT volumes are found on Interstate highways, Figure 22 illustrates AADTT on non-Interstate roadways, which confirms where the heaviest local and regional AADTT exist. This illustrates the importance of the PA 33/US 22/US 322 corridor as the most significant non-Interstate freight corridor in the region. However, numerous other roadways within the region exhibit substantial AADTT, including numerous roadways that connect to the PA 33/US 22/US 322 corridor. Other non-Interstate roadway corridors with notable truck flows are mostly concentrated around three urban areas: Bethlehem, Allentown, and Reading. Other corridors with high AADTT are highlighted in Table 20.

Figure 23 displays truck traffic as a percentage of overall traffic on roadways within the EPFA region. This illustrates the heavy truck percentages along the primary Interstates within the region, including I-78, I-80, and I-81. Notably, truck percentages are higher in the western portion of the study area, where land uses are generally less dense than those within the eastern portion of the study area.

When Interstates are removed (Figure 24), roadways with truck percentages at or above 20 percent are evident throughout the study area. This includes clusters along and connecting to the PA 33/US 22/US 222 corridor.

Table 20: Top High AADTT Corridors (Non-Interstate) in Addition to PA 33/US 22/US 222

Route	Start Point	End Point	County	Municipality
Ramp A/Ramp F to/from US11 (PA 8033)	US 6	US 11	Lackawanna	Scranton
PA K100 (Keystone Ave/Centerpoint Blvd)	PA 315	Municipal Line	Luzerne	Jenkins
US 422	Township Line Rd (PA 2002)	Riga Lane	Berks	Amity
PA 100 and PA 29	Buckeye Rd (PA 2021)	Spring Garden	Berks, Lehigh	Bally, Colebrookdale, Hereford, Upper Milford, Washington
PA 309	I-78	Bucks County Line	Lehigh	Upper Saucon, Coopersburg
Ramps to/from US 6 (PA 8030)	PA 247	US 6	Lackawanna	Jessup
PA 309	PA 54	Schuylkill Avenue	Schuylkill	Rush, Tamaqua
PA 183	New Schaefferstown Rd (PA 4016)	Penn Municipal Line	Berks	Bernville, Jefferson, Penn
PA 901	I-81	Deep Creek Rd (PA 4020)	Schuylkill	Barry, Foster
PA 72	PA 419	State Line	Lebanon	West Cornwall, Cornwall
Minsi Trail Bridge (PA A012/PA 3007), Daly Ave (PA A064)	Market St (PA A094)	PA 378	Northampton	Bethlehem
PA 61	West Brunswick Municipal Line	US 222	Berks, Schuylkill	Hamburg, Leesport, Ontelaunee, Perry, Port Clinton, Shoemakersville, Tilden, West Brunswick, Deer Lake,
PA 209	PA 115	Frable Road	Monroe	Chestnuthill
PA 73	Friedensburg Rd (PA 2023)	Municipal Line	Berks	Oley
PA 307	Keyser Ave (PA 3011)	US 11	Lackawanna	Scranton
PA 315	I-81 (PA 8017)	Ramps to I-476	Luzerne	Pittston
US 6	Lackawanna Ave	I-84	Lackawanna	Dunmore, Olyphant, Throop
PA 61	PA 443		Schuylkill	North Manheim, Orwigsburg
PA 412	Commerce Center Blvd.	I-78	Northampton	Bethlehem
PA 309	Ramps to/from Wilkes Barre Blvd (PA K072)	I-81	Luzerne	Plains, Wilkes-Barre

Source: PennDOT

Figure 21: Base (2022) Annual Average Daily Truck Traffic

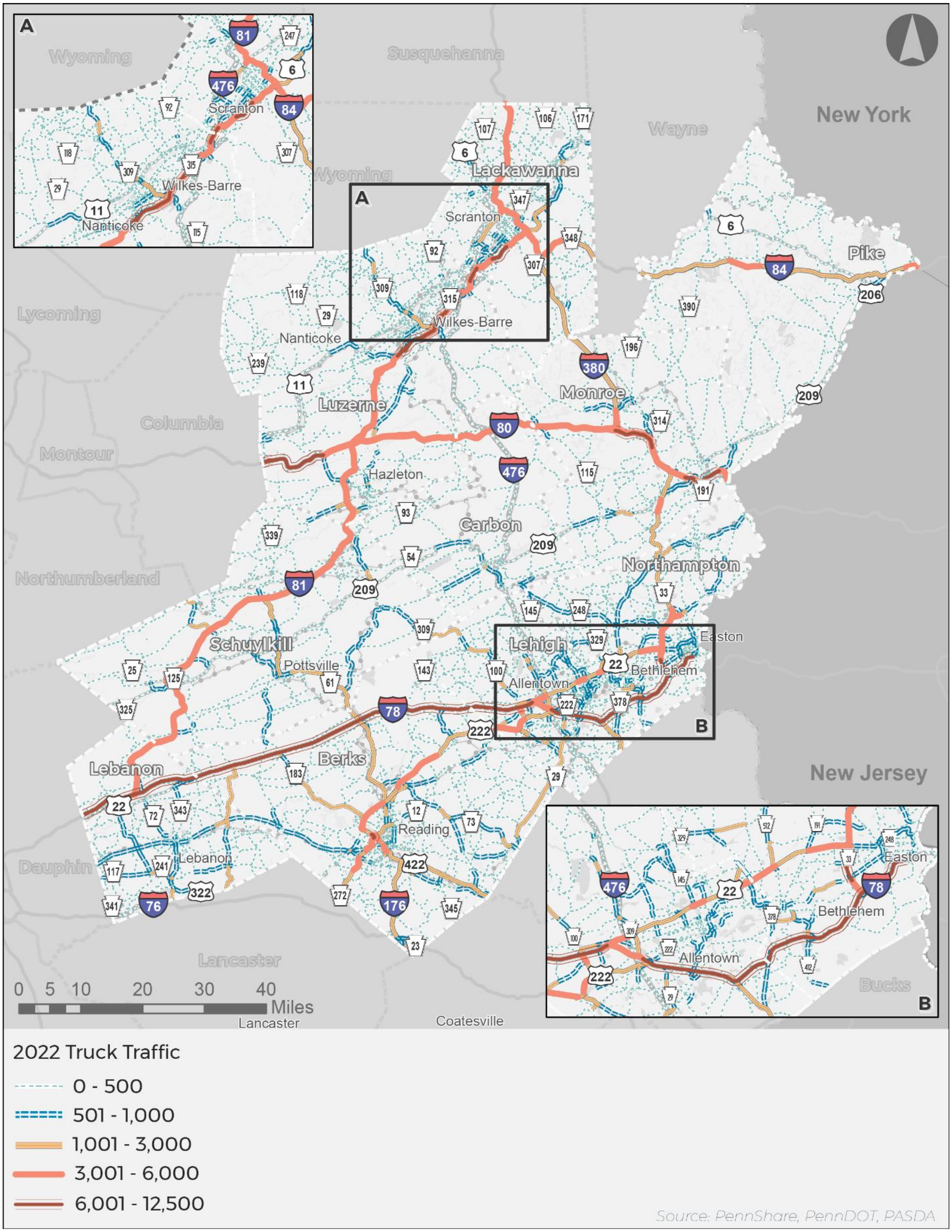


Figure 22: 2022 Annual Average Daily Truck Traffic (Non-Interstate Routes)

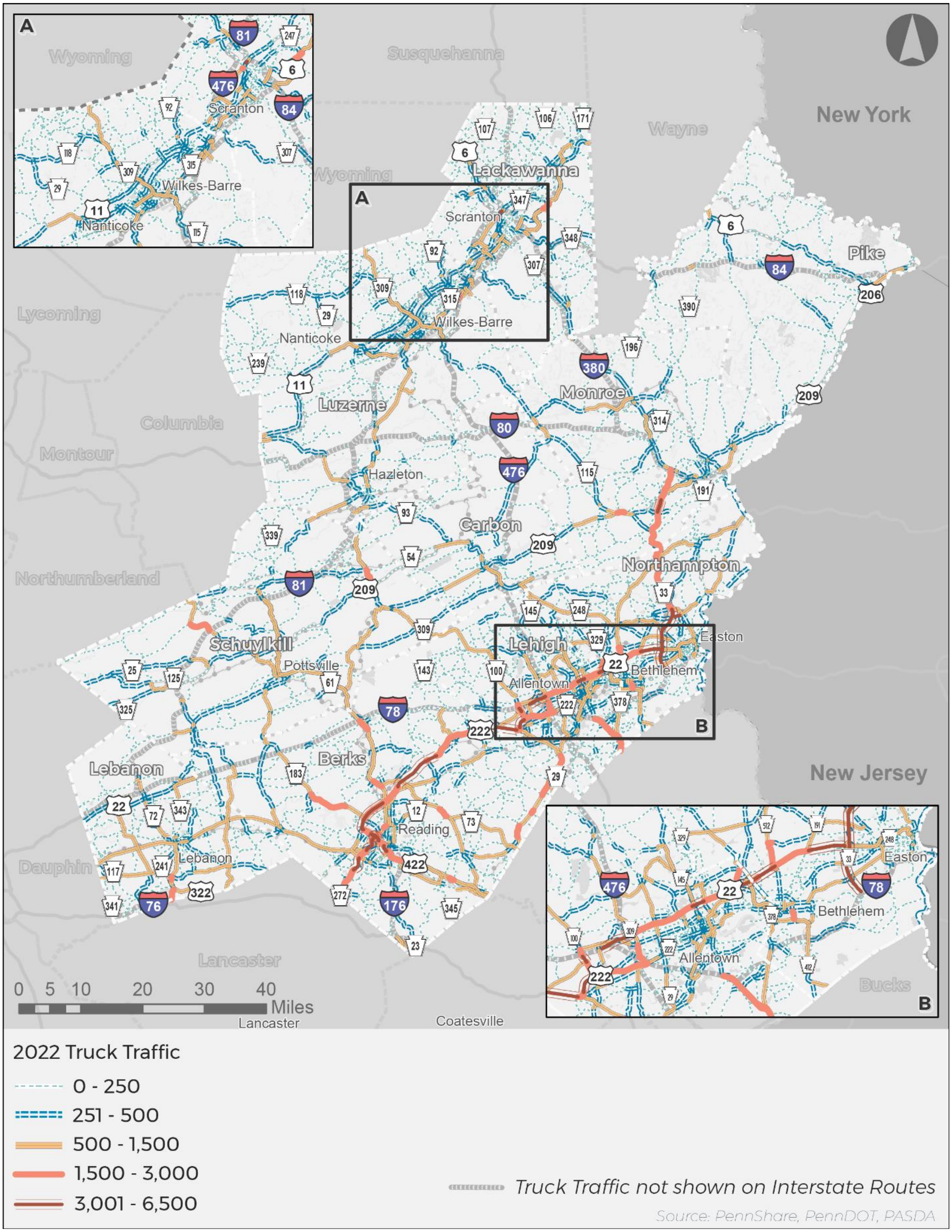


Figure 23: 2022 Annual Average Daily Truck Traffic with Truck Percentage

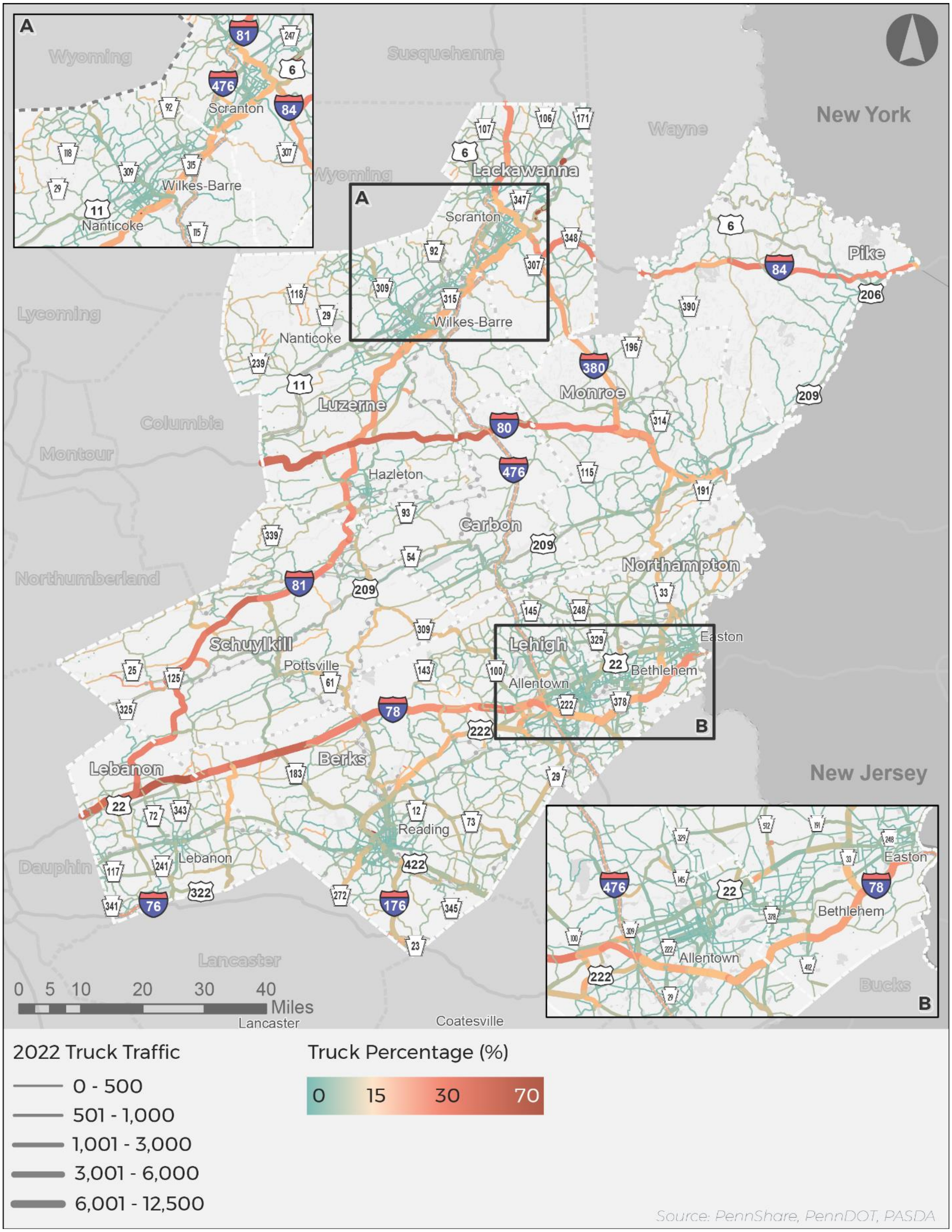
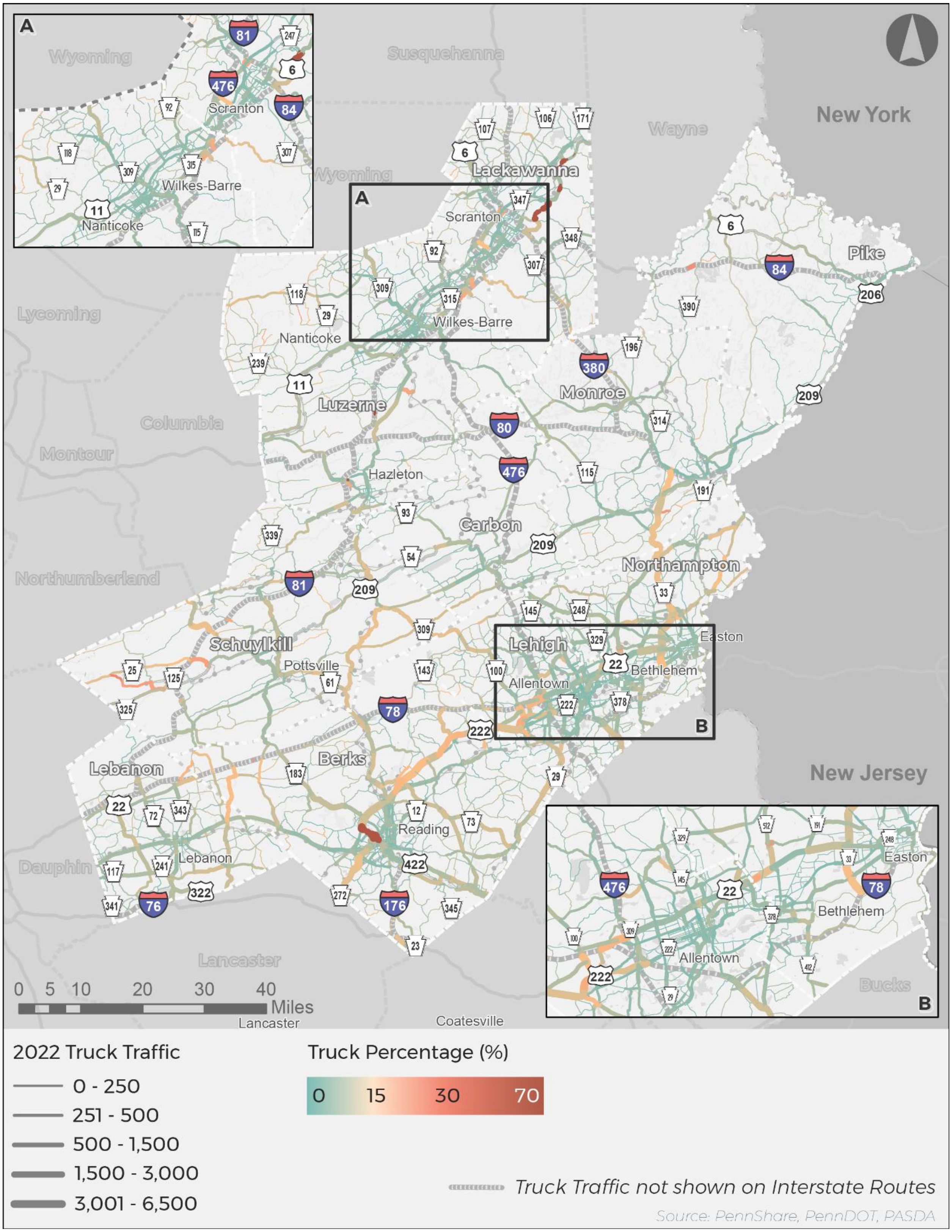


Figure 24: 2022 Annual Average Daily Truck Traffic with Truck Percentage (Non-Interstate Routes)



1.2.3 Bridge Conditions

The PennDOT Bridge Management System (BMS) includes state bridges at least 8 feet long and local bridges at least 20 feet long. Federal legislation (Surface Transportation Assistance Act of 1978) requires that all bridges 20 feet or longer must be inspected every two years.

PennDOT calculates a sufficiency rating to quantify the physical condition of BMS bridges and help prioritize repairs. Several components are inspected, including the bridge deck, superstructure, and substructure. In 2018, PennDOT began to phase out the legacy bridge condition terminology "Structurally Deficient" and "Functionally Obsolete." Bridge conditions are classified as "Good," "Fair," or "Poor."[5] The term "Poor" to describe a bridge is equivalent to a Structurally Deficient bridge.

The project team identified the location of bridges classified in poor condition within the study area as well as the presence of weight limits for overpasses, and substandard vertical clearances for underpasses or bridges. These bridges are identified in Table 21 and mapped in Figure 26. This data was used to determine if any structural and/or operational constraints exist along or near existing or potential future truck routes that may limit the movement of freight.

Table 21: Jurisdiction of Bridges in Poor Condition by Sufficiency Ratings

	Bridge Eligibility (Sufficiency Rating <80)		
Ownership	**Rehab/ Refurb**	**Replacement**	**Total**
PennDOT	236	201	**437**
County		1	**1**
Municipal	7	7	**14**
Total	**243**	**208**	**452**

Source: PennDOT

Of the 3,535 bridges included in PennDOT's BMS within the EPFA study area, approximately 450 bridges are classified in poor condition, in need of rehabilitation/refurbishment or replacement. A bridge in poor condition is reflective of a sufficiency rating below 80, indicative of eligibility for Federal bridge funding to improve or replace a structure.

Nearly 97 percent of all bridges in poor condition within the EPFA Study Area are under the jurisdiction of PennDOT. The remaining 14 bridges in poor condition in need of rehabilitation/refurbishment or replacement are either under county or municipal jurisdiction

The functional classification of bridges in poor condition with sufficiency ratings less than 80 are shown in Table 22 and Figure 25. More than half of the identified bridges are located on local or collector roadways, with only ten percent of bridges located on Interstates or freeways.

Bridges in poor condition and in need of replacement or rehabilitation are located throughout the region as shown in Figure 26. Poor condition bridges located along key freight routes experience heavy usage leading to wear and tear deterioration. Structures along key freight corridors should be prioritized for improvement or replacement.

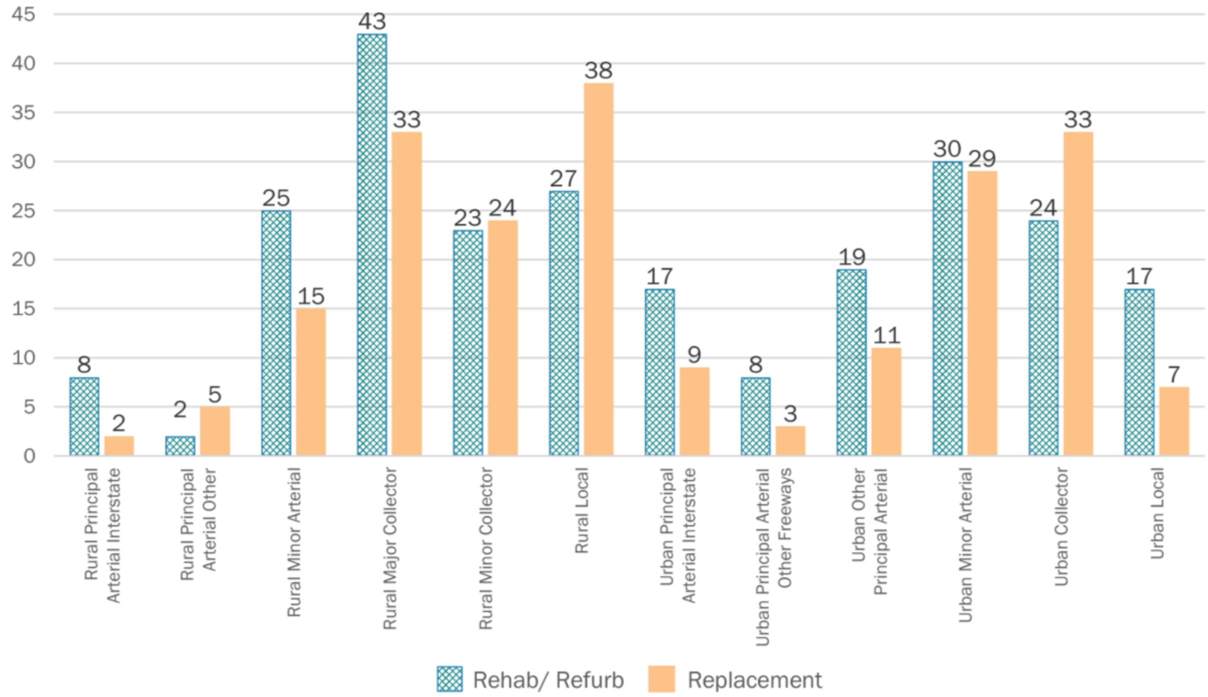
[5] Bridge condition is determined by the lowest condition rating of the primary components of a bridge or culvert. The lowest condition rating of the deck, superstructure, substructure, or culvert. If the lowest rating is greater than or equal to 7, the bridge is classified as Good; if it is less than or equal to 4, the classification is Poor. Bridges rated 5 or 6 are classified as Fair.

Table 22: Functional Classification of Bridges in Poor Condition by Sufficiency Ratings

	Bridge Eligibility (Sufficiency Rating <80)		
Functional Classification	**Rehab/Refurb**	**Replacement**	**Total**
Rural Principal Arterial Interstate	8	2	**10**
Rural Principal Arterial Other	2	5	**7**
Rural Minor Arterial	25	15	**40**
Rural Major Collector	43	33	**76**
Rural Minor Collector	23	24	**47**
Rural Local	27	38	**65**
Urban Principal Arterial Interstate	17	9	**26**
Urban Principal Arterial Other Freeways	8	3	**11**
Urban Other Principal Arterial	19	11	**30**
Urban Minor Arterial	30	29	**59**
Urban Collector	24	33	**57**
Urban Local	17	7	**24**
Total	**243**	**209**	**452**

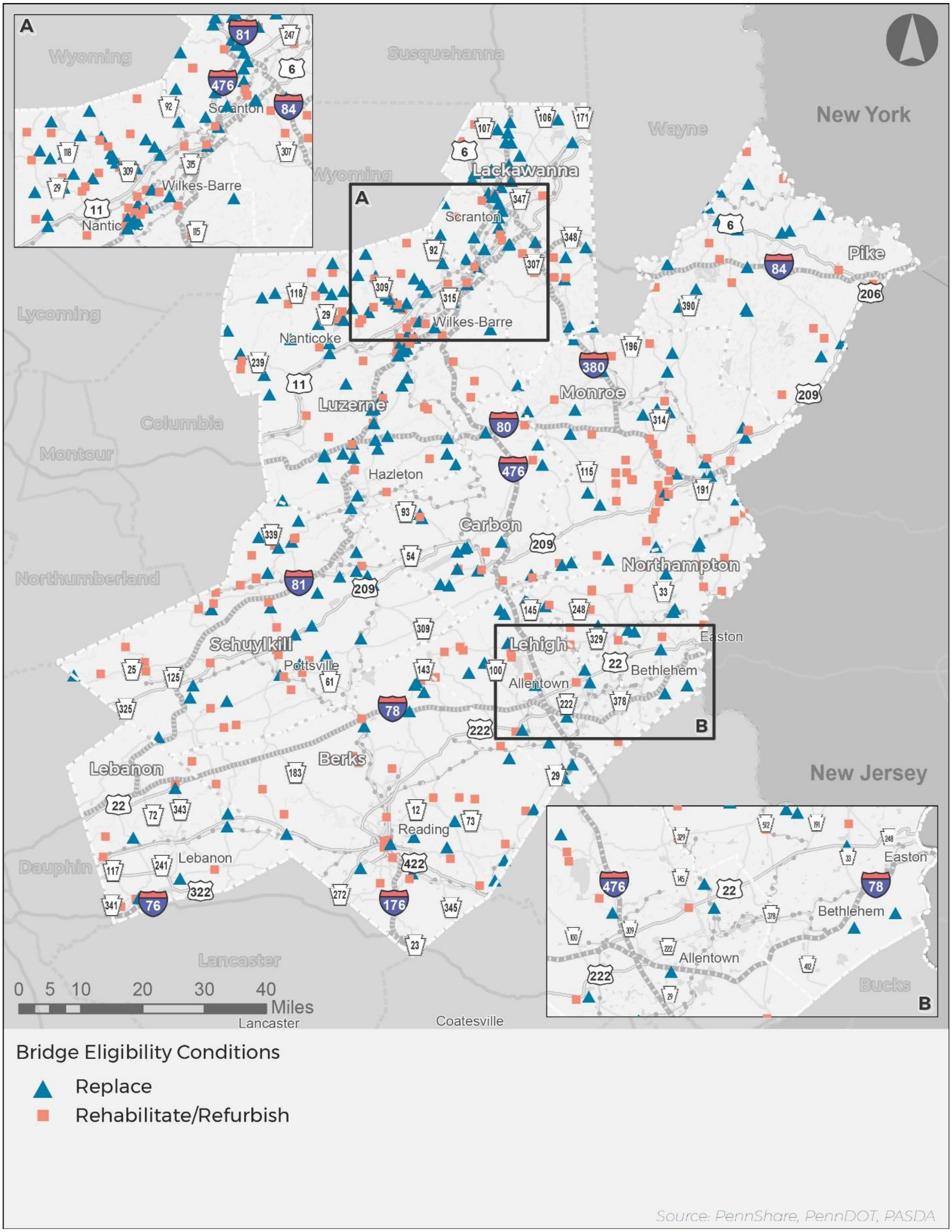
Source: PennDOT

Figure 25: Distribution of Bridges in Need of Rehabilitation/Refurbishment or Replacement, by Functional Class



Source: PennDOT

Figure 26: Bridges in Poor Condition



Bridges with posted weight restrictions are mapped in Figure 27. Weight restrictions limit circulation of heavy vehicles and reduce redundancy. Bridges with posted weight restrictions may be due to inspection, condition, or for historic reasons. While load restricted structures exist throughout the EPFA study area, notable clusters exist within the region, including those in Hamilton Township (Monroe County) near PA 33.

Bridges with substandard physical restrictions are mapped in Figure 28. Physical restrictions may include substandard vertical and/or horizontal clearances. A review of clearance issues along known freight routes will help identify and prioritize improvements, understanding that these projects (particularly for those involving a railroad or interstate crossing) may require a substantial investment to address existing clearance issues.

Secondary to this is a need to identify locations where improved wayfinding signage is needed to limit potential strikes or traffic interruptions caused by large vehicles being “trapped” at locations where they cannot traverse or where U-turn movements are most challenging.

Figure 27: Bridges with Posted Weight Restrictions

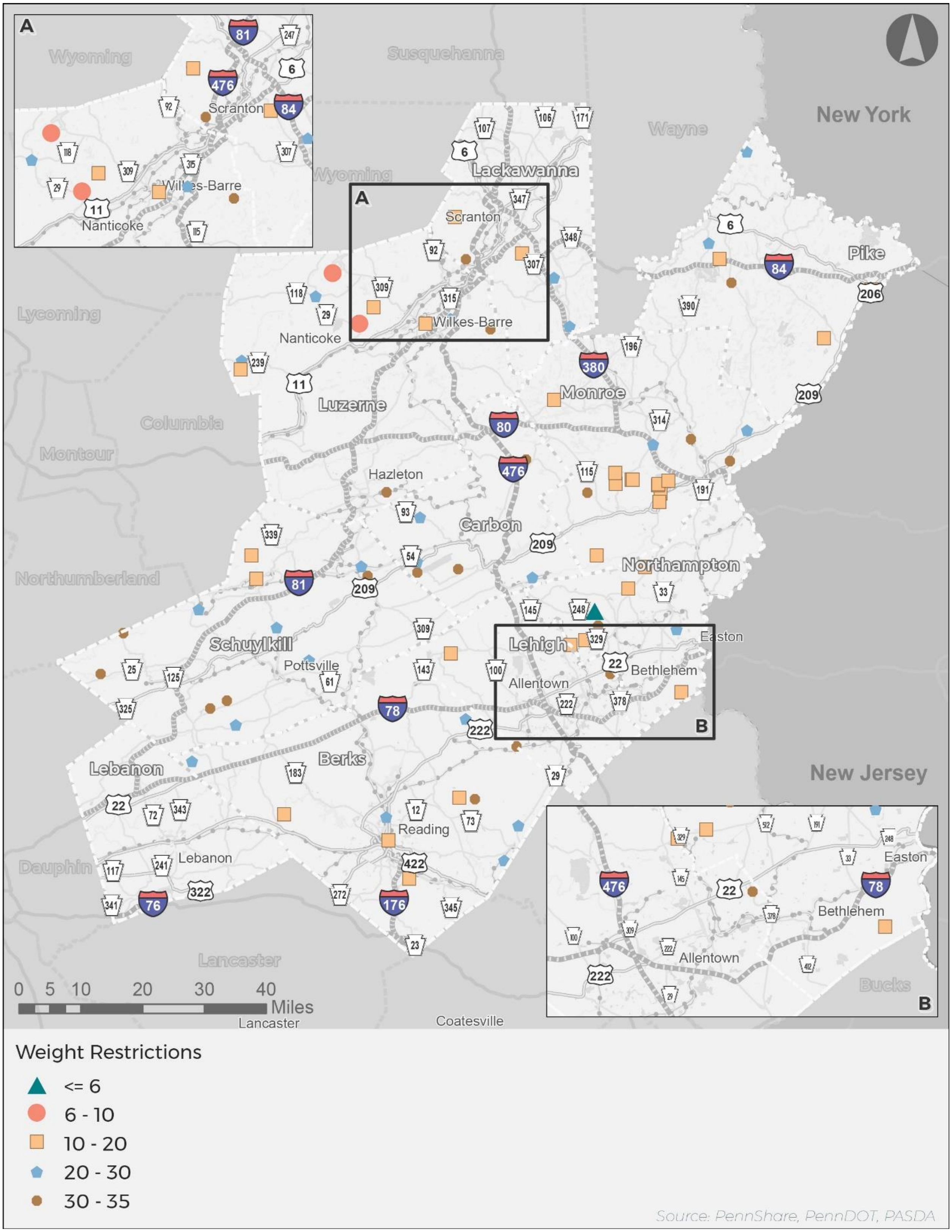
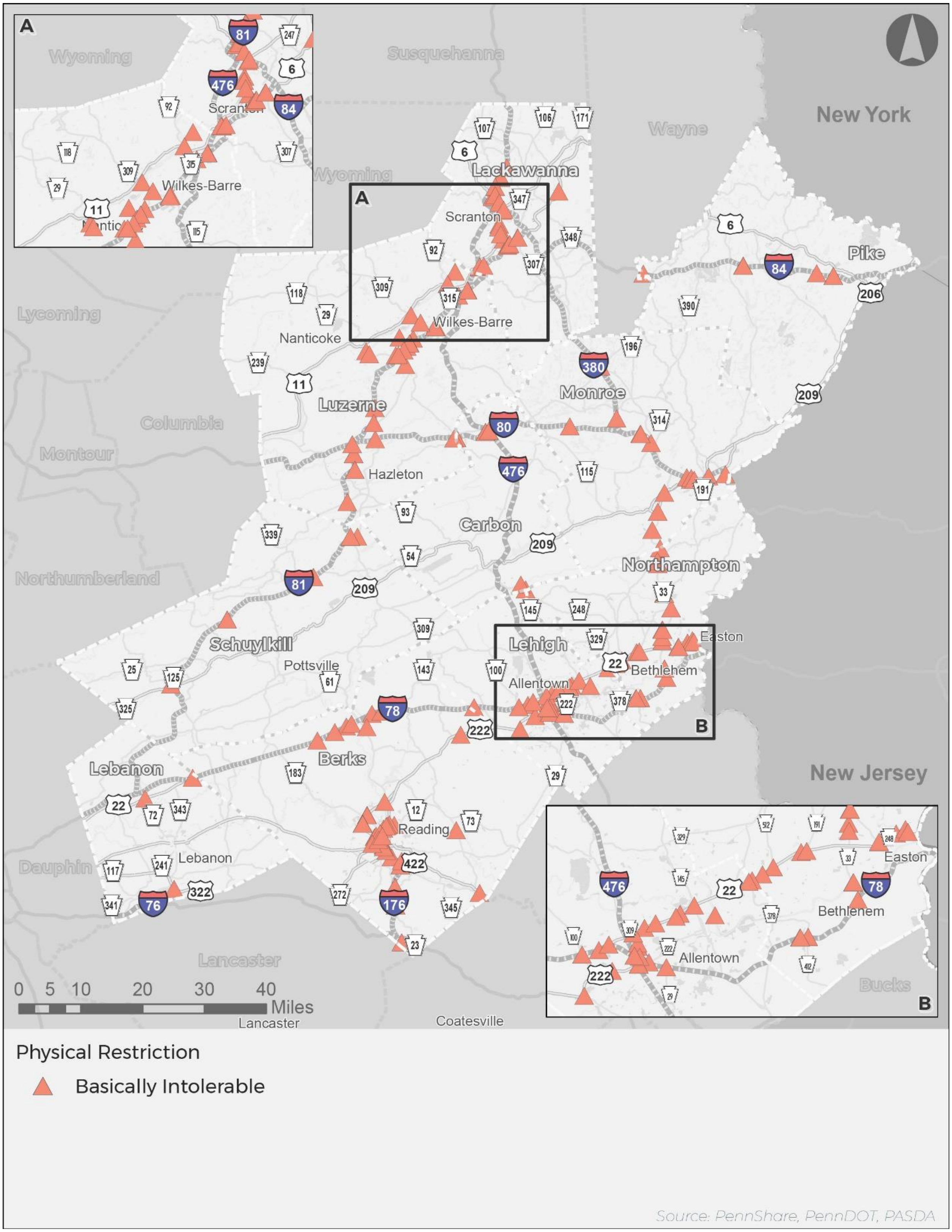


Figure 28: Bridges with Substandard Physical Restrictions



1.2.4 Pavement

PennDOT evaluates pavement condition using the International Roughness Index (IRI), a global standard for measuring pavement smoothness. IRI measures pavement roughness by the number of inches per mile that a laser (mounted in a special vehicle) moves vertically as it is driven down the road. The lower the IRI number, the smoother the ride and the better the pavement condition. PennDOT uses a calculation to determine a comprehensive and holistic assessment of pavement condition called the Overall Pavement Index (OPI). This calculates existing pavement performance using inputs that include the IRI and other pavement distresses, including cracking, edge deterioration, rutting, or other signs of deterioration. Similar to IRI, OPI pavement conditions are classified as excellent, good, fair or poor.

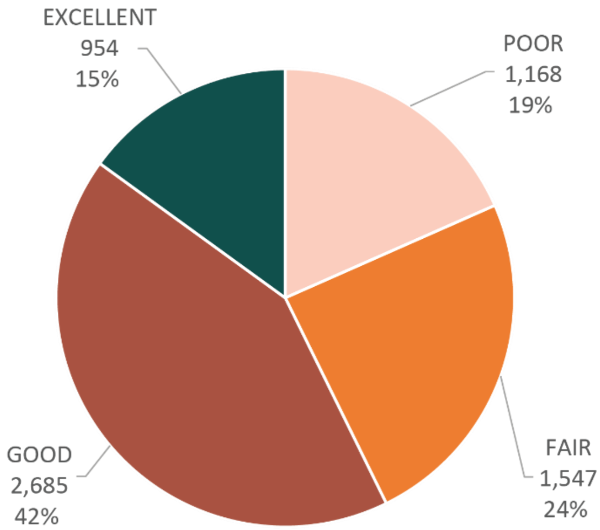
The roadway mileage by jurisdiction and pavement condition is shown in Table 23. The pavement condition database includes all non-local roadways within the EPFA study area (9,363 miles), primarily comprised of state roads (8,500 miles), with a small portion of non-state federal aid roads (775 miles) and toll authorities (132 miles). More than 80 percent of surveyed pavement within the study area is in fair or better condition, indicating that the majority of roadways are well maintained. 17% of surveyed roadways are identified as being in poor condition, as shown in Figure 29, highlighting the need for state of good repair investments to maintain the region's assets.

Table 23: Roadway Mileage by Jurisdiction and Pavement Conditions

OPI Rating	State	Turnpike	Non-State Federal Aid	Toll Bridges	Total
Poor	1,165				**1,165**
Fair	1,544				**1,544**
Good	2,678				**2,678**
Excellent	951				**951**
No Data	0	96	587	4	**687**
Total	**6,337**	**96**	**587**	**4**	**7,025**

Source: PennDOT

Figure 29: EPFA Study Area Pavement Conditions



Source: PennDOT

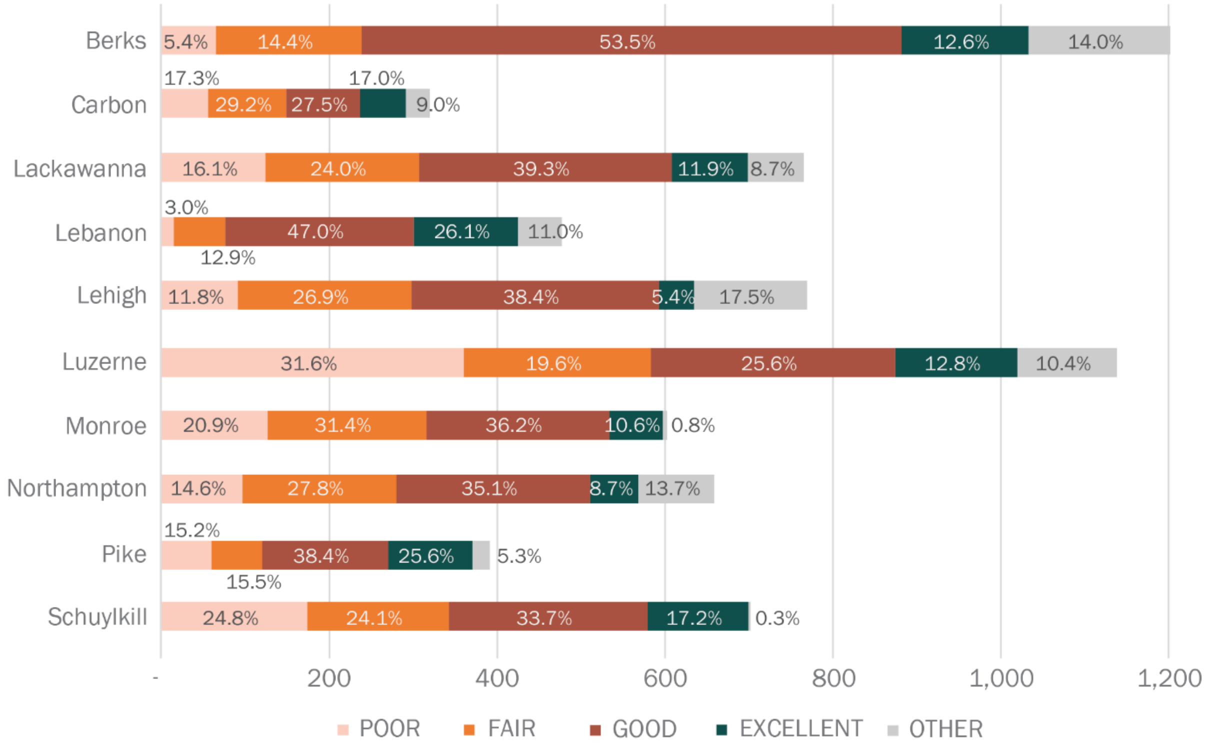
Roadway mileage by county and pavement condition is shown in Table 24 and Figure 30 and illustrated in Figure 31. In general, the southern portion of the study area exhibits better condition pavement than the central or northern portion of the study area. Luzerne County has nearly one-third of all poor pavement (491 miles) within the study area. Additionally, in terms of percentage, Luzerne County also exhibits the most substantial percentage of poor pavement within a study area county, with more than 30 percent of its pavement identified as poor condition.

Table 24: Roadway Mileage by County and Pavement Conditions

County	Pavement Condition					
	Poor	Fair	Good	Excellent	Other	Total
Berks	65	174	643	152	169	**1,202**
Carbon	55	93	88	54	29	**320**
Lackawanna	124	183	301	91	66	**765**
Lebanon	14	62	224	124	53	**477**
Lehigh	91	207	295	42	135	**769**
Luzerne	360	223	291	146	119	**1,139**
Monroe	126	189	218	64	5	**602**
Northampton	96	183	231	57	90	**658**
Pike	59	60	150	100	21	**391**
Schuylkill	174	169	237	120	2	**702**
Total	**1,165**	**1,544**	**2,678**	**951**	**687**	**7,025**
%	**16.6%**	**22.0%**	**38.1%**	**13.5%**	**9.8%**	

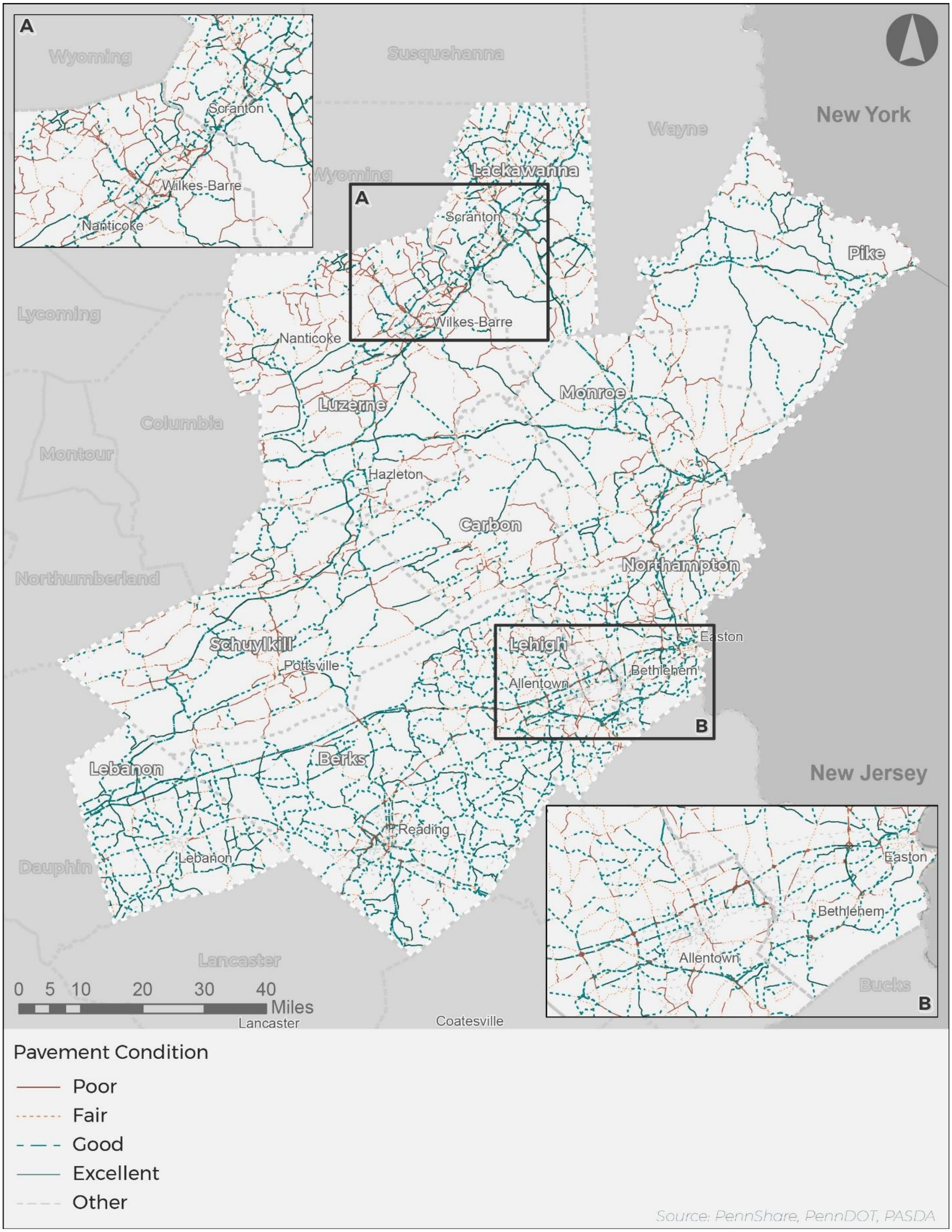
Source: PennDOT

Figure 30: Roadway Mileage by County and Pavement Conditions



Source: PennDOT

Figure 31: Pavement Condition



1.3 Truck Crashes

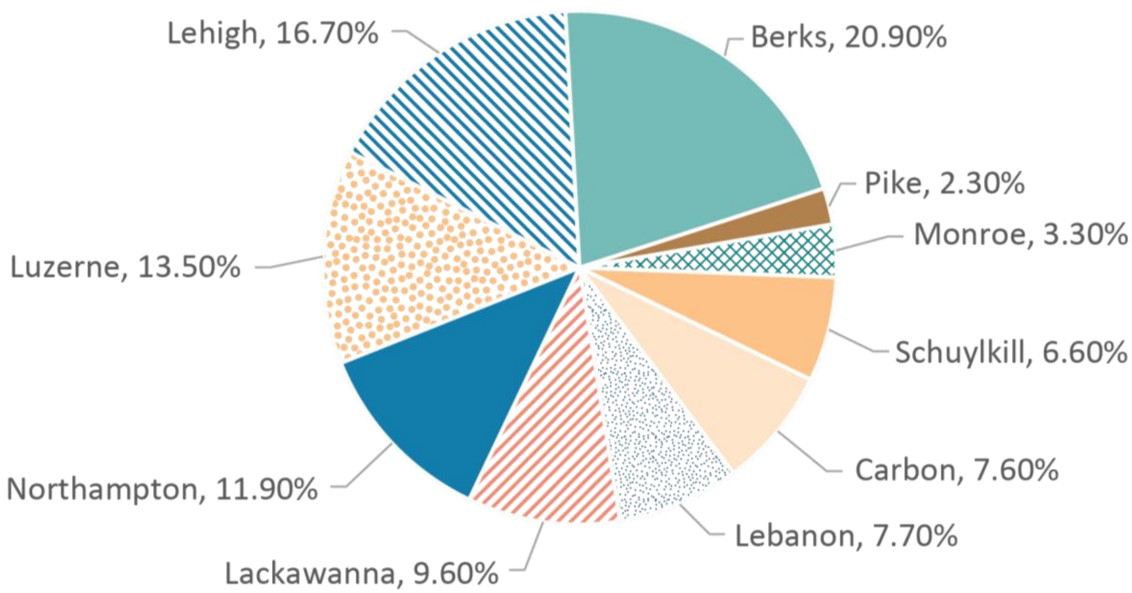
An analysis of truck crash data was completed using motor vehicle traffic crash data (2019-2021) obtained from the Pennsylvania Crash Information Tool (PCIT). A motor vehicle traffic crash is defined as an incident that involved one or more motor vehicles in transport that originated on a public trafficway, such as a road or highway. This analysis focused on crashes involving trucks. For the purpose of this analysis, trucks include small and large trucks (Vehicle Types 4 and 5, respectively)[6]. Between 2019 and 2021 there were a total of 71,926 crashes within the EPFA study area, including 14,586 crashes involving trucks, accounting for 20% of all motor vehicle traffic crashes. The following sections focus on crashes involving trucks within the EPFA study area.

1.3.1 Crashes by Jurisdiction

Crashes and fatalities by county are summarized in Figure 32 and further broken down by roadway type in Table 25.

Within the study area, nearly two-thirds of all truck crashes occurred on state roads, while more than one-third of all crashes occurred on local roadways.

Figure 32: Truck Crashes by County



Source: PCIT

[6] PennDOT Open Data Portal Crash Data Dictionary and Field Constraints Tables: https://tinyurl.com/5xf8fbwd. A Small Truck is defined as a "truck designed for personal or light use such as pick-ups, below 10,000 GVW" while a large truck is defined as a "truck designed for heavy use such as a wrecker, box truck, cement mixer, car hauler, or larger commercial trucks, greater than 10,001 GVW."

Table 25: Percentage of Truck Crashes by Roadway Type and County

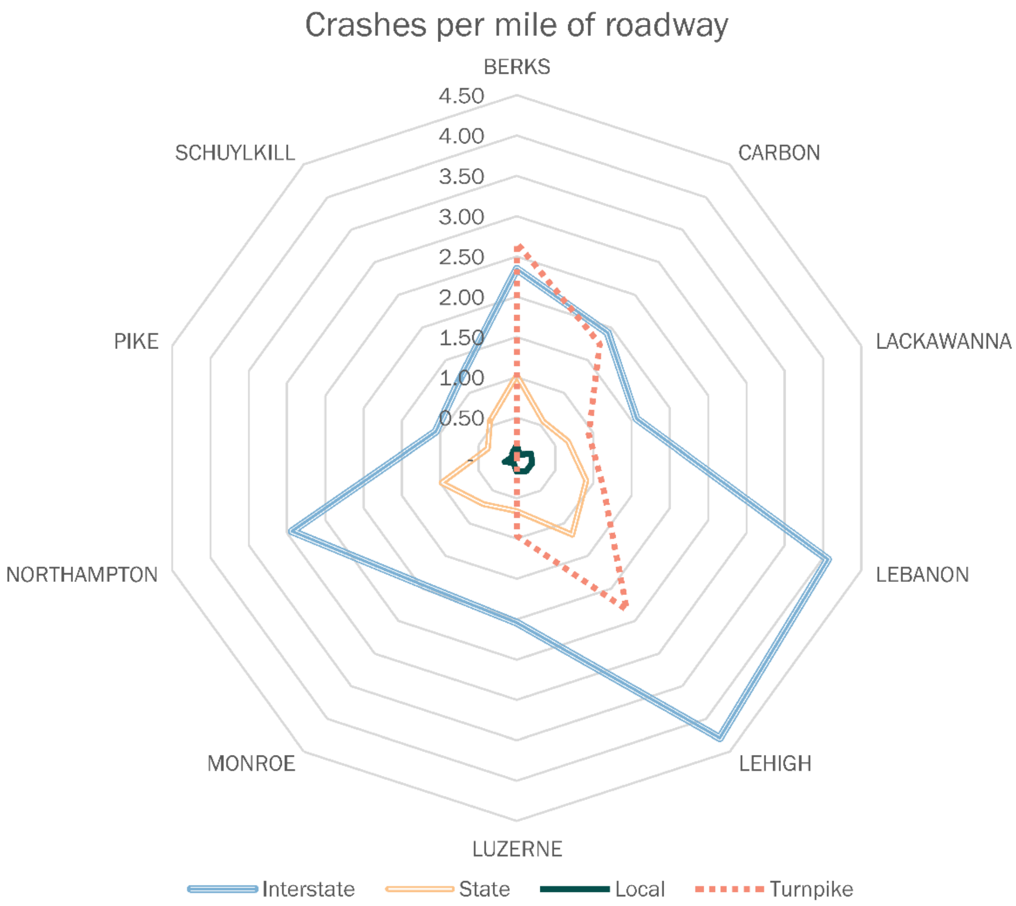
County	All Truck Crashes	% of County Crashes			
		Interstate	State Road	Local Road	Turnpike
Lehigh	2,437	10%	63%	42%	5%
Northampton	1,729	7%	73%	43%	0%
Lackawanna	1,398	18%	61%	40%	1%
Luzerne	1,970	21%	58%	38%	2%
Berks	3,055	11%	69%	40%	1%
Lebanon	1,122	22%	52%	43%	1%
Monroe	479	10%	59%	24%	19%
Carbon	1,110	24%	65%	25%	0%
Pike	329	33%	60%	17%	0%
Schuylkill	957	15%	73%	27%	0%
Total	**14,586**	**15%**	**64%**	**38%**	**2%**

Source: PCIT

Note: Roadway Jurisdictions represent all roadway types involved in a crash. As crashes at intersections can be associated with more than one roadway type, roadway percentages do not add up to 100% for a County.

A review of truck crashes per mile, by roadway type and county, is included in Figure 33. This analysis highlights where truck crash occurrence is most prevalent, with crashes on Interstate highways within Lehigh, Lebanon, and Northampton Counties exhibiting the highest crash rates (per mile) within the EPFA region. Crashes occurring on state and local roadways are generally consistent throughout the EPFA region counties. A review of crashes within the six counties within the region that include facilities owned by the Pennsylvania Turnpike indicates crash rates equal to or lower than those found for Interstates within the same county.

Figure 33: Truck Crashes, Per Mile, by Roadway Type and County



Source: PCIT

1.3.2 Hotspot Analysis

A hotspot analysis was performed using crash records for all incidents occurring between 2019-2021 on Interstate, US, State, and County routes obtained from the PCIT. A density threshold was used to identify above average locations where crashes involving trucks[7] have occurred. Multiple roadway segments with a high crash density over a long corridor were flagged as hotspot corridors. A summary of hotspot corridors or intersections for truck crashes is shown in Figure 34, Figure 35, and Table 26.

Urban areas, particularly, downtown areas of Allentown, Reading, Scranton, Wilkes-Barre, and Pittstown have the highest concentration of truck crashes. Several corridors within the region exhibit significant truck crash clusters, including US 22 between Easton and Allentown and I-78 between Upper Saucon and PA-100 (Exit 49) in Upper Macungie. Additionally, I-81 west of I-78 also has a significant crash concentration.

The hotspot analysis identified several locations where truck crashes are most prevalent, as shown in the following corridor/regional focus maps:

- Figure 36– US 22/I-78/Allentown
- Figure 37 – US 22/PA 33 – Easton/Bethlehem
- Figure 38 – US 11/I-81/Scranton
- Figure 39 – I-81/PA 309 – Wilkes-Barre
- Figure 40 – Reading
- Figure 41 – Stroudsburg

Many of these locations are located along key freight corridors or at the intersection/interchange of multiple key freight corridors. The methodology for identifying the truck crash concentration and severity was based on several factors such as the total number of crashes, number of trucks involved in the crashes, number of fatalities and Injuries, crash rate for all vehicles, truck rate for trucks involved in crashes, and the length of each corridor.

[7] A truck crash is defined as a crash involving a vehicle defined by FHWA as Class X or higher.

Figure 34: Truck Crash Hotspot Analysis

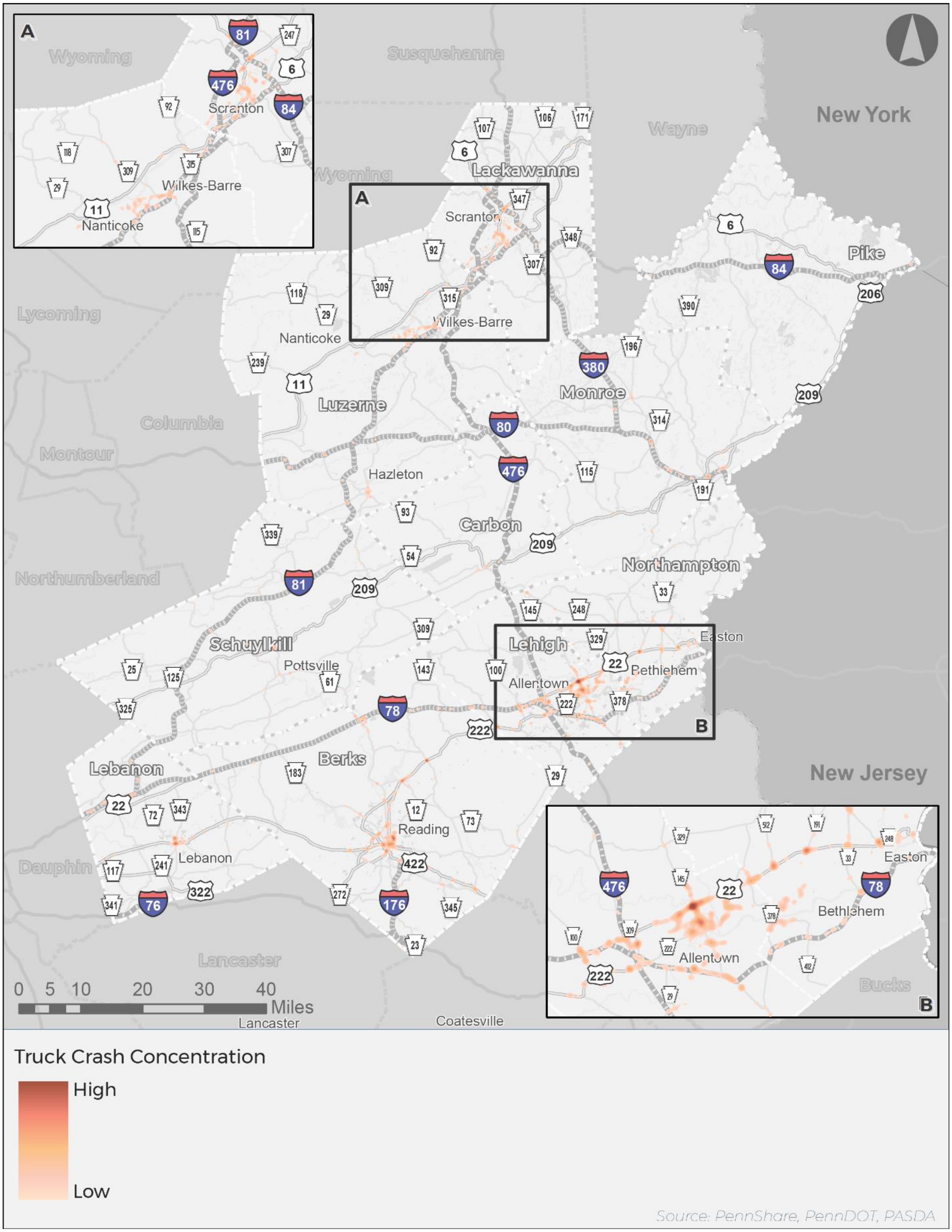


Figure 35: Truck Crash Hotspot Analysis – Allentown, Reading, Scranton, and Wilkes-Barre

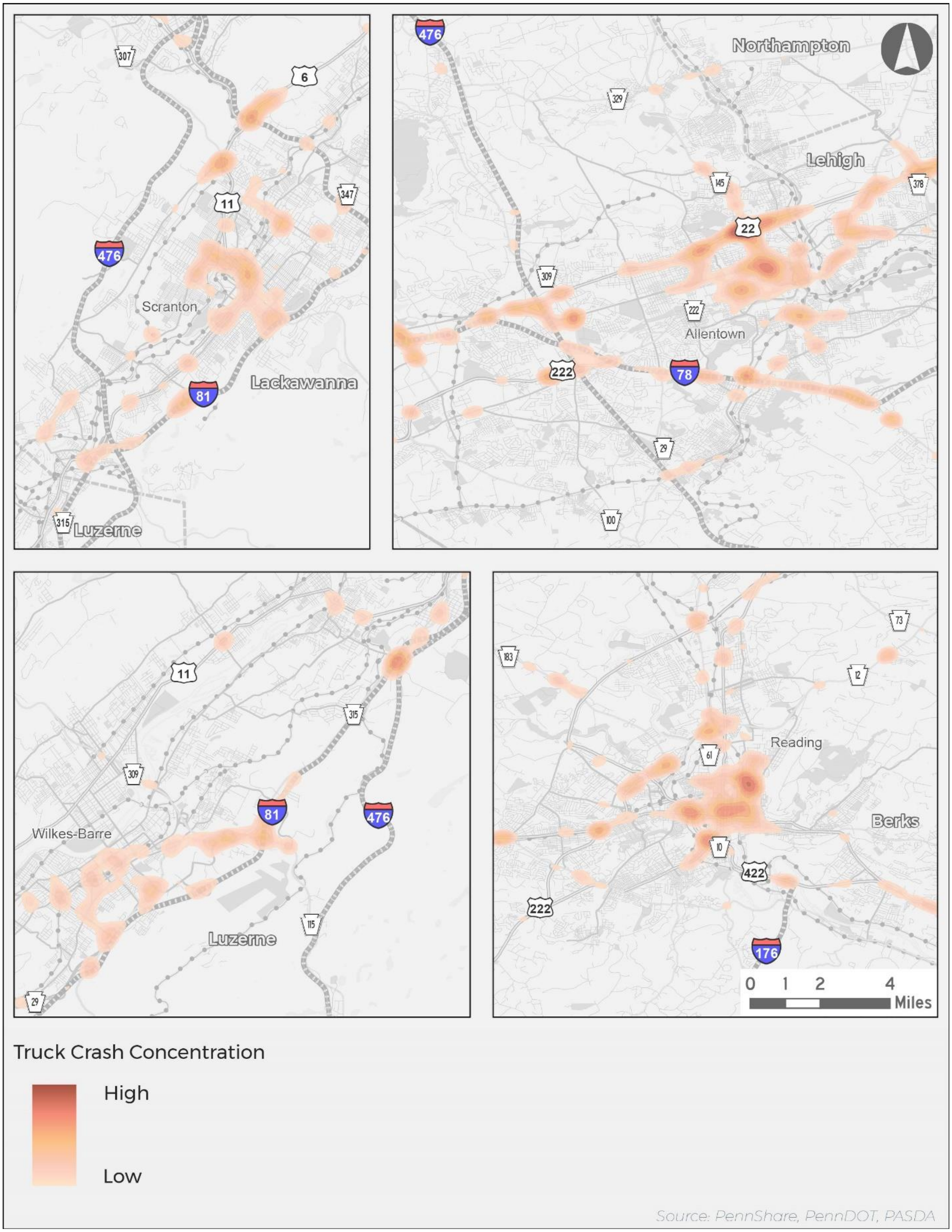


Table 26: Truck Crash Clusters – Corridors and Intersections

Corridor/ Intersection	Truck Crashes	Fatalities	Serious Injuries	Municipality	County
I 78/ PA 309 from PA 145 to US 222	192	3	7	Allentown, Lower Macungie, Salisbury, S Whitehall, Upper Saucon	Lehigh
US 22 near PA 145/ Mauch Chunk Rd	178		1	Hanover, South Whitehall, Whitehall	Lehigh
Downtown	149		1	Allentown	Lehigh
US 22/PA 309/Tilghman St (PA 1002) area	114	1	2	S Whitehall, Upper Macungie	Lehigh
Downtown	111		2	Reading	Berks
PA 12 near US 222/PA 183 and PA 61	108		3	Muhlenberg, Reading	Berks
Downtown	93	1	2	Lebanon	Lebanon
I 81/PA 309/PA 115	89		3	Plains, Wilkes-Barre	Luzerne
I 78 Near I 81	83	4	2	East Hanover, Union	Lebanon
US 422 at US 422 Bus/US 222 Bus	71	1	1	Reading, West Reading	Berks
I 78/PA 100	62			Upper Macungie	Lehigh
US 22 at PA 378/Schoenersville Rd (PA 1009)	58		1	Bethlehem, Hanover	Lehigh, Northampton
US 222 at PA 73	53	2	7	Maidencreek	Berks
Downtown	52			Scranton	Lackawanna
I 81/PA 315	52		2	Jenkins, Pittston	Luzerne
I 81/US 11/US 6B	50	1		Scranton	Lackawanna
US 22/PA 191	46	1		Bethlehem	Northampton
US 22/PA 33	44			Bethlehem	Northampton
I 78/PA 61	42	1	7	Hamburg, Tilden	Berks
US 22/PA 512	40			Hanover	Northampton
US 222/PA 662	39			Richmond	Berks
US 422 at PA 662	35		2	Amity	Berks
US 11/PA 307/ Keyser Ave (PA 3011)	35			Scranton	Lackawanna
US 222 at Krocks Road and US 222 at I-78	35	1		Lower Macungie	Lehigh
US 22/PA 248	31		1	Palmer, Wilson	Northampton
US 222/PA 863/Shantz Road	26			Upper Macungie	Lehigh
I 80 near PA 611	25			Pocono	Monroe
I 80 between PA 191 and Prospect St (PA 2017)	24			East Stroudsburg, Stroudsburg	Monroe
US 6/Grove St (PA 4026)	22		1	Clarks Summit	Lackawanna
US 422 at PA 724	18			Sinking Spring	Berks
US 422 at US 222	13	1	1	Wyomissing	Berks

Source: PCIT

Figure 36: Truck Crash Clusters, Allentown

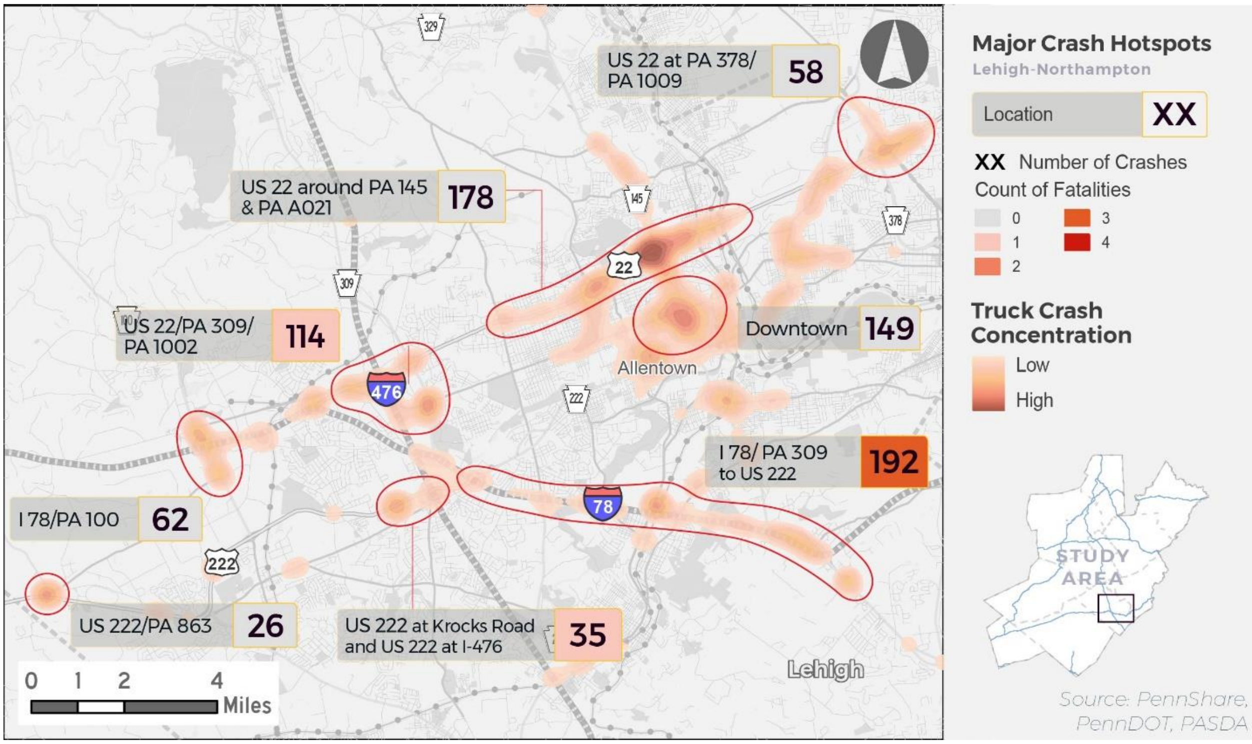


Figure 37: Truck Crash Clusters, Easton/Bethlehem

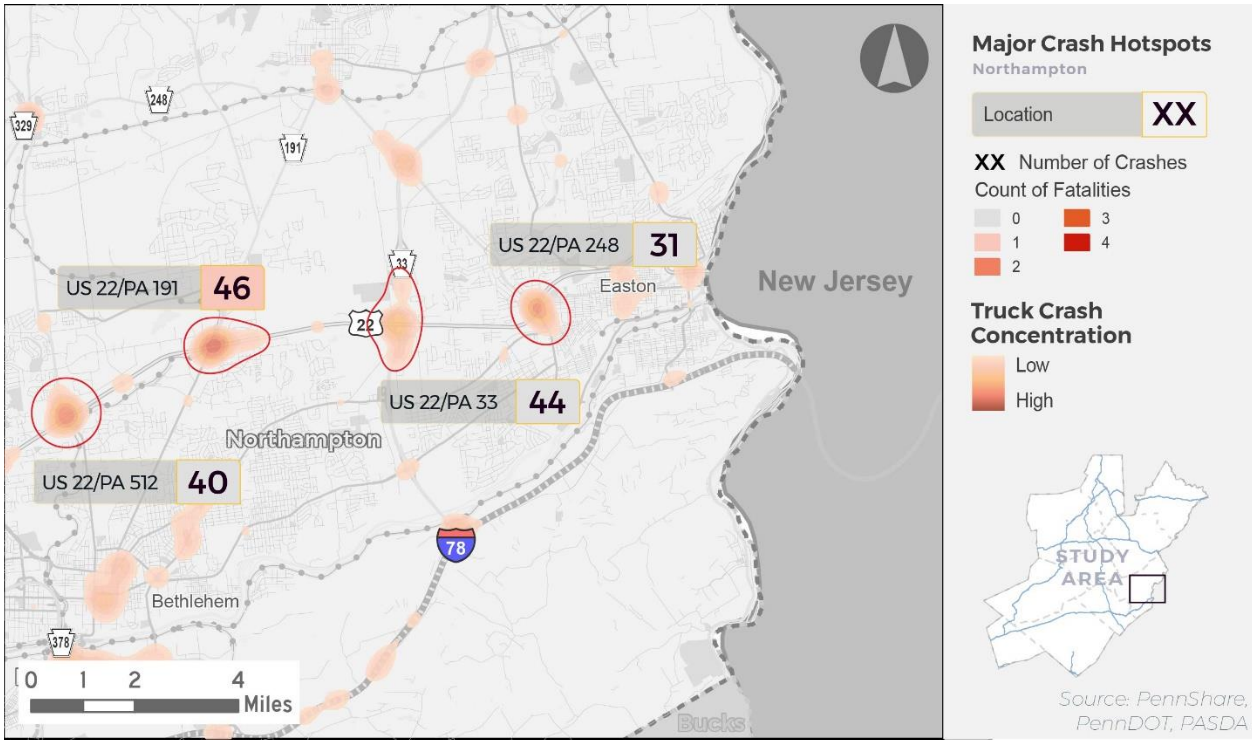


Figure 38: Truck Crash Clusters, Scranton

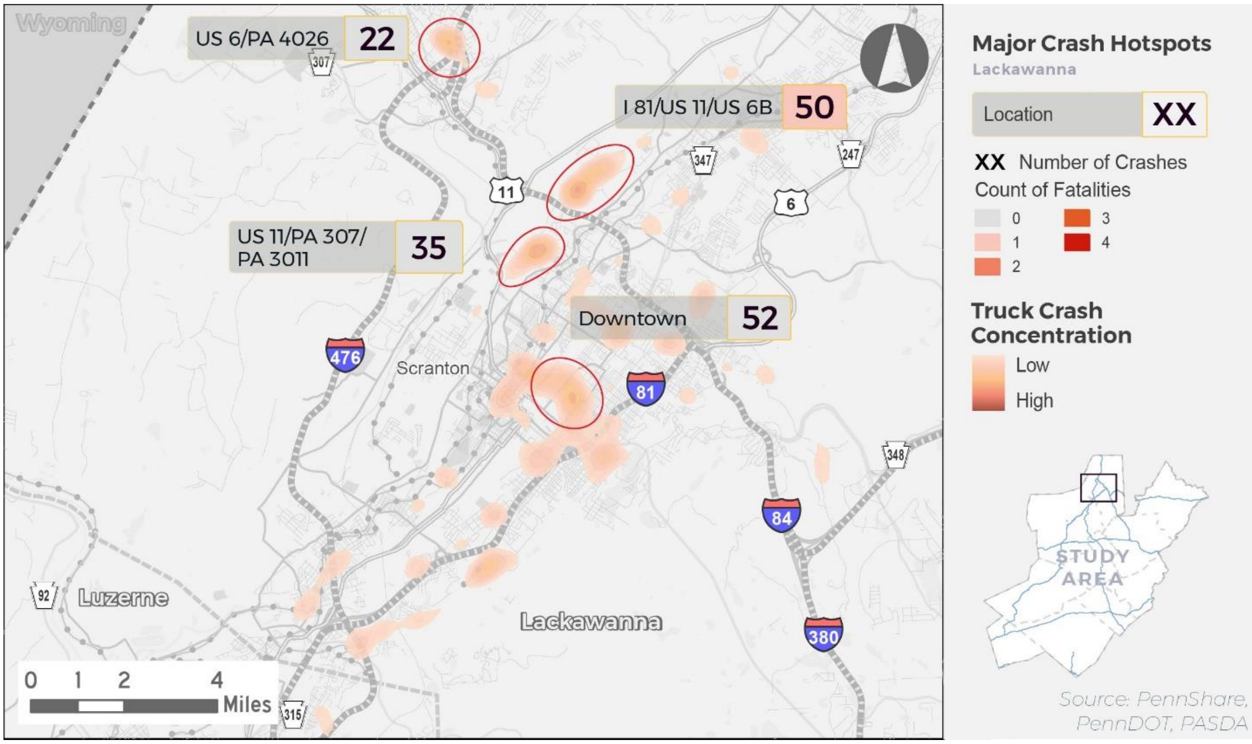


Figure 39: Truck Crash Clusters, Wilkes-Barre

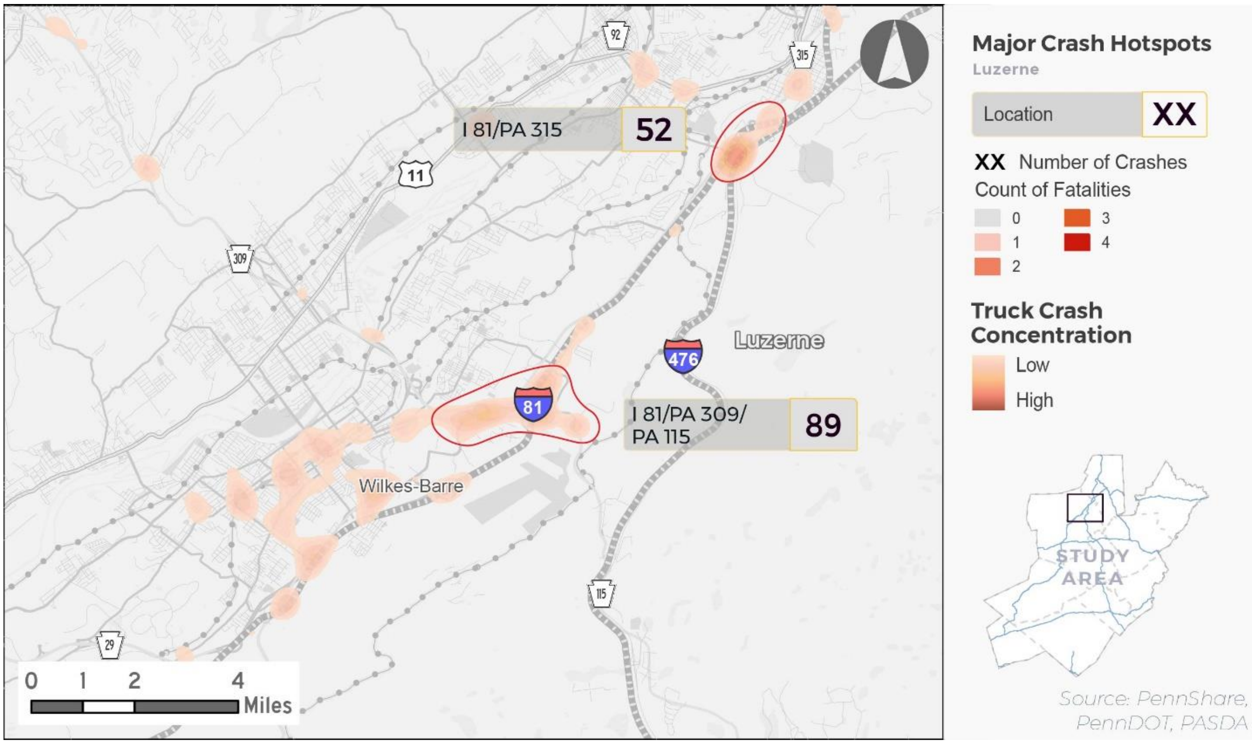


Figure 40: Truck Crash Clusters, Reading

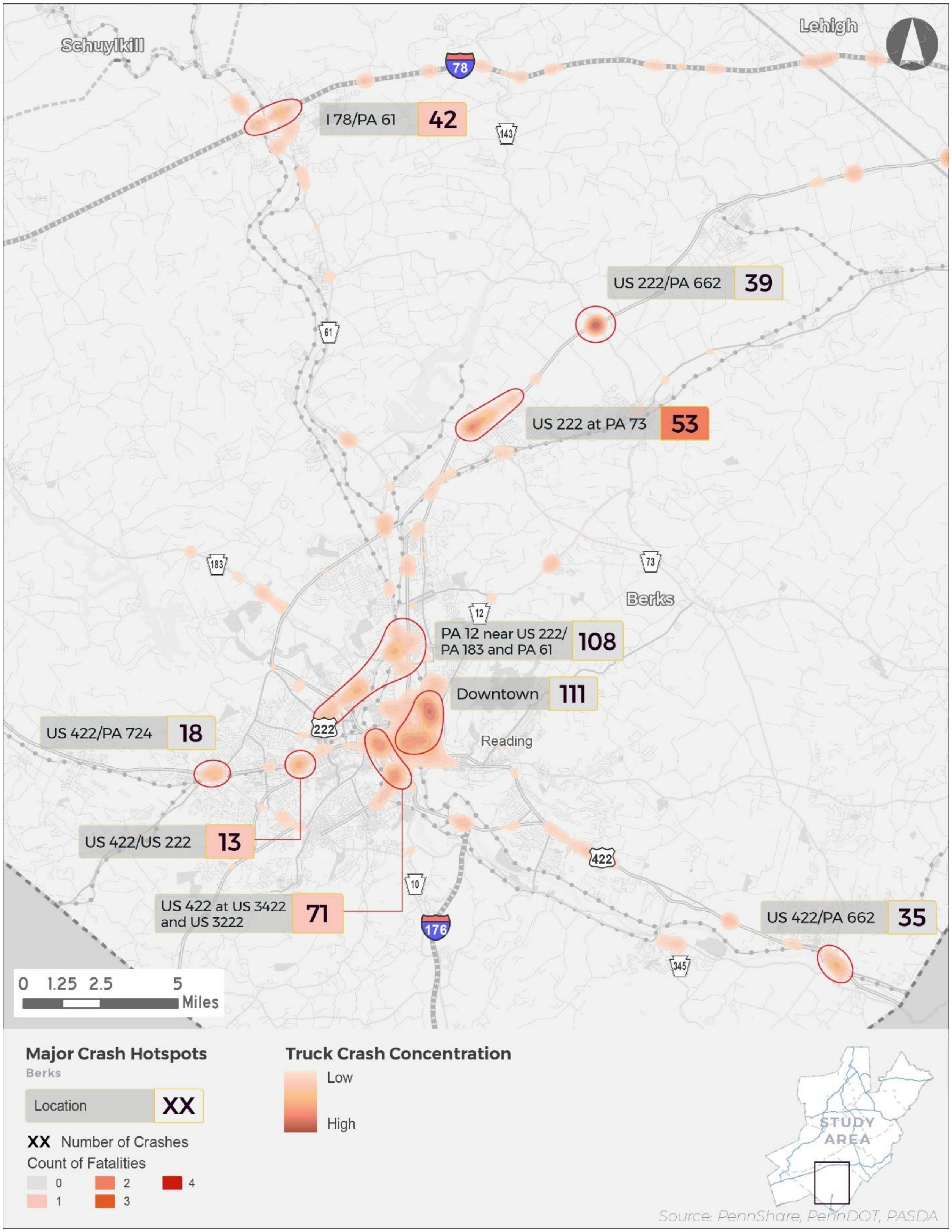
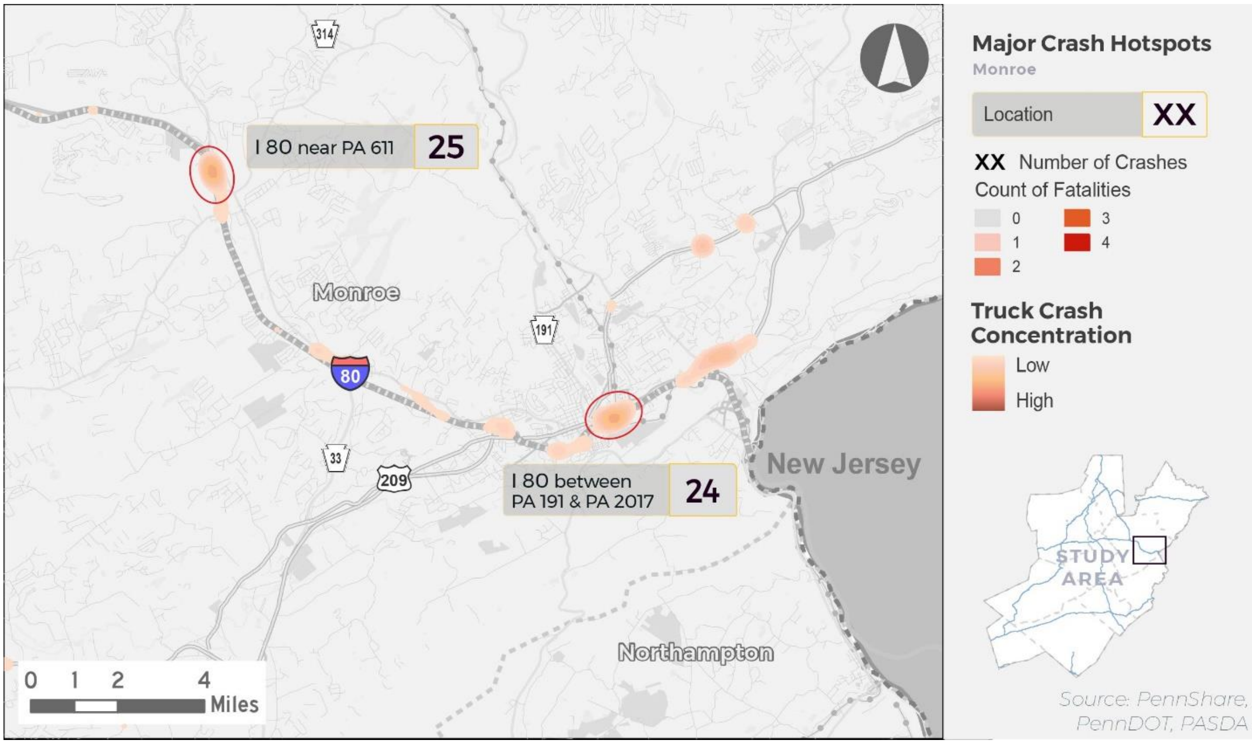


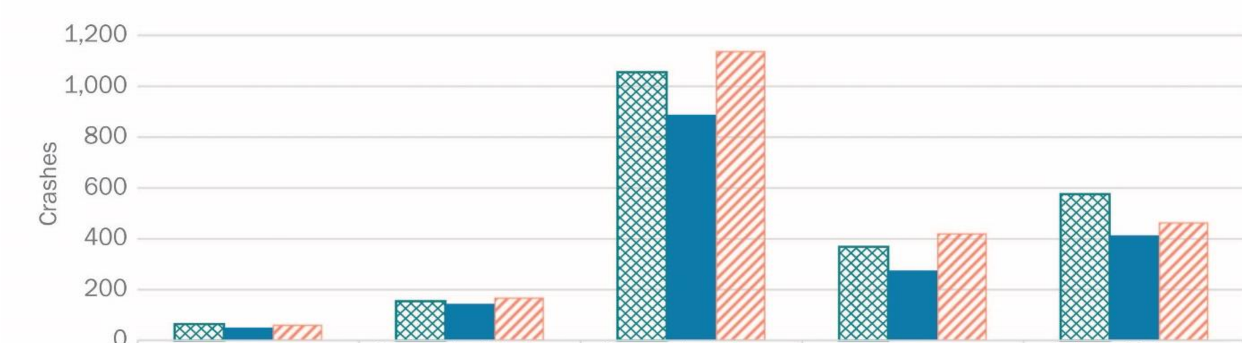
Figure 41: Truck Crash Clusters, Stroudsburg



1.3.3 *Truck Crash Severity*

A summary of crash severity for all truck-involved crashes is included in Figure 42. Overall, reportable crashes (those involving a fatality or injury) increased slightly from 2019 to 2021.While the number of crashes (by severity) decreased for each severity type in 2020 (likely due to changes in travel patterns associated with the COVID-19 pandemic), several crash severity types (Suspected Serious, Suspected Minor, Possible Injury) increased from 2019 to 2021. A slight decline in fatal crashes from 2019 to 2021 is evident, while a significant decline over the same period is present in crashes involving an unknown injury, which is likely indicative of more consistent or improved crash reporting and tracking.

Figure 42: Truck Crash Severity by Year



	Fatal	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Injury - Unknown Severity
2019	64	154	1,056	368	575
2020	49	144	887	275	413
2021	61	168	1,138	421	464

Source: PCIT

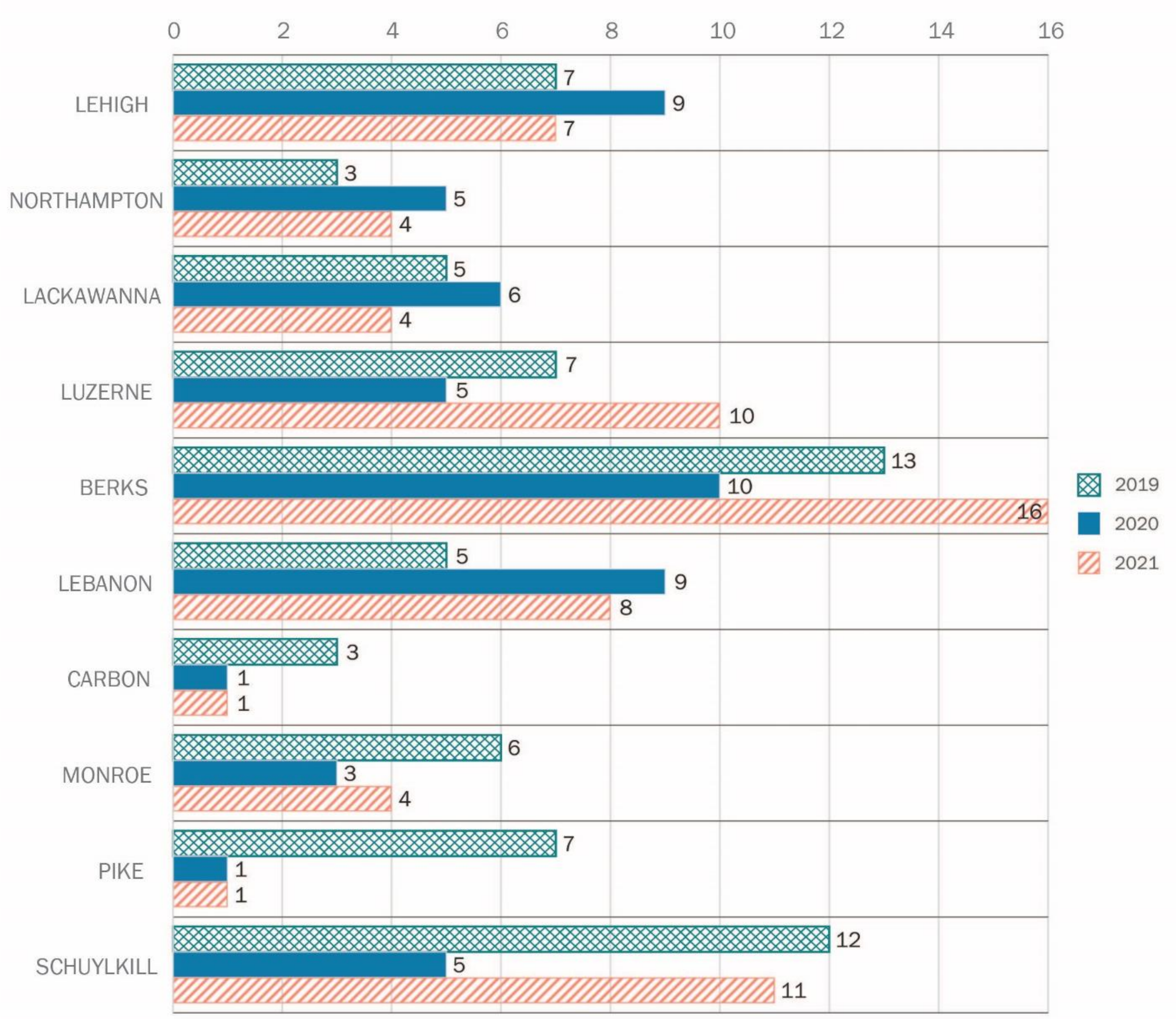
1.3.3.1 Fatalities in Truck-involved Crashes

Figure 43 summarizes the number of fatalities associated with truck-involved crashes, by county for the three-year analysis period (2019-2021, inclusive). While the total number of fatalities in truck-involved crashes within the study area declined from 2019 to 2020, the number of fatalities in truck-involved crashes increased in 2021, returned nearly to 2019 numbers. The substantial decline of fatalities in 2020 is likely due to changes in travel patterns associated with the COVID-19 pandemic and subsequent shutdowns.

A review of county data indicates that fatalities in truck-involved crashes have increased significantly in Berks Lebanon, and Luzerne Counties, while fatalities in truck-involved crashes have declined significantly in Carbon and Pike Counties. The remaining counties exhibit generally consistent numbers of fatalities in truck-involved crashes.

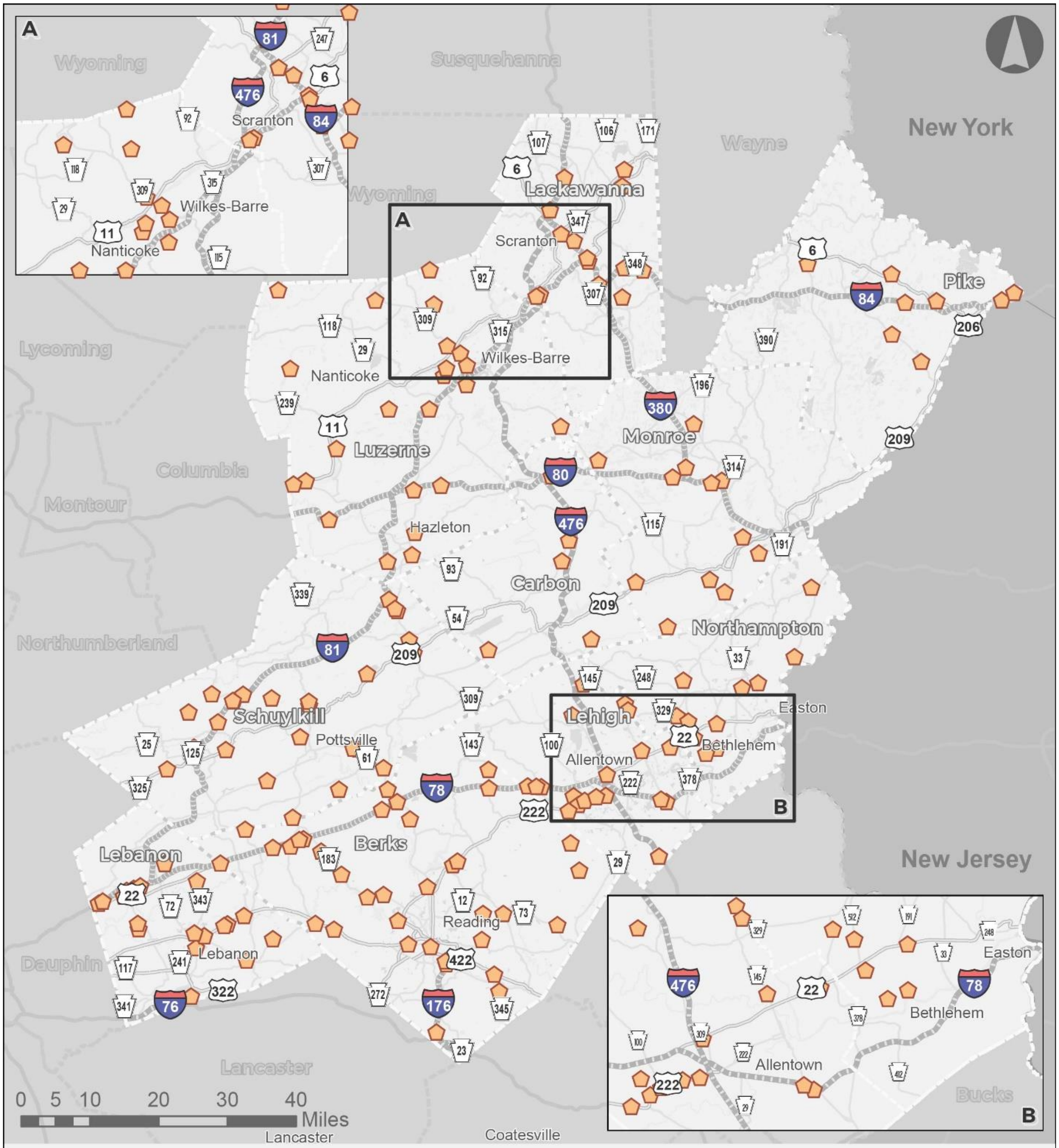
Figure 44 highlights the location of truck crashes involving fatalities. While these crashes are generally dispersed throughout the study area, clusters of crashes are evident on some of the heaviest traveled truck corridors within the region, including I-78, US 222, US 422, and PA 309, amongst others.

Figure 43: Truck Crash Fatalities by County



Source: PCIT

Figure 44: Truck Crashes with Fatalities



Truck Crashes Involving Fatalities

Source: PennShare, PennDOT, PASDA

1.3.4 Crashes by Time of Day

Crashes and fatalities by time of day are summarized in Table 27. Truck crashes occur most commonly between 6:00am and 6:00pm, with a notable peak in the afternoon/evening between 2:00pm and 6:00pm. Fatalities in truck-involved crashes are more sporadic throughout the day, with a notable peak occurring between 3:00pm and 4:00pm.

Table 27: Truck Crashes by Time of Day

			Roadway Jurisdictions Involved			
Time (Hour)	**All Truck Crashes**	**Fatalities**	**Interstate**	**State Road**	**Local Road**	**Turnpike**
12:00 AM	252	5	54	142	72	5
1:00 AM	225	3	43	114	81	3
2:00 AM	203	7	38	97	77	6
3:00 AM	183	6	50	82	52	8
4:00 AM	208	8	52	107	62	8
5:00 AM	385	4	75	239	109	8
6:00 AM	642	9	95	432	206	19
7:00 AM	749	5	90	518	269	16
8:00 AM	710	7	97	491	240	13
9:00 AM	669	6	110	431	270	13
10:00 AM	770	10	103	523	289	20
11:00 AM	851	6	109	559	341	14
12:00 PM	948	6	159	603	358	24
1:00 PM	923	12	121	601	372	23
2:00 PM	983	10	135	661	386	21
3:00 PM	1,185	20	145	798	470	23
4:00 PM	1,051	8	153	697	383	24
5:00 PM	1,034	9	136	690	408	15
6:00 PM	668	10	84	452	262	9
7:00 PM	527	7	72	343	214	3
8:00 PM	433	8	93	249	160	6
9:00 PM	412	5	64	237	180	11
10:00 PM	315	7	58	166	127	7
11:00 PM	245	10	34	138	85	9
Unknown	15	0	2	9	9	1
Total	**14,586**	**188**	**2,172**	**9,379**	**5,482**	**309**

Source: PCIT

Note: Roadway Jurisdictions represent all the roadway types involved in a crash. As crashes can be related to more than one roadway types, roadway counts do not add up to the total number of truck crashes.

Hourly crash totals by time of day for each county (Table 28) were similar to the study area distribution, except for Lackawanna County and Carbon County, where notable peaks are present in early afternoon (Lackawanna) and late morning (Carbon). Berks County has the highest percentage of crashes (21%) among all counties, followed by Lehigh County (15.7%) and Luzerne County (13.5%). Lehigh Valley region comprising of Lehigh and Northampton Counties along with Berks County account for almost half (47.7%) of all crashes in the region.

Table 28: Truck Crashes by Time of Day and County Heatmap

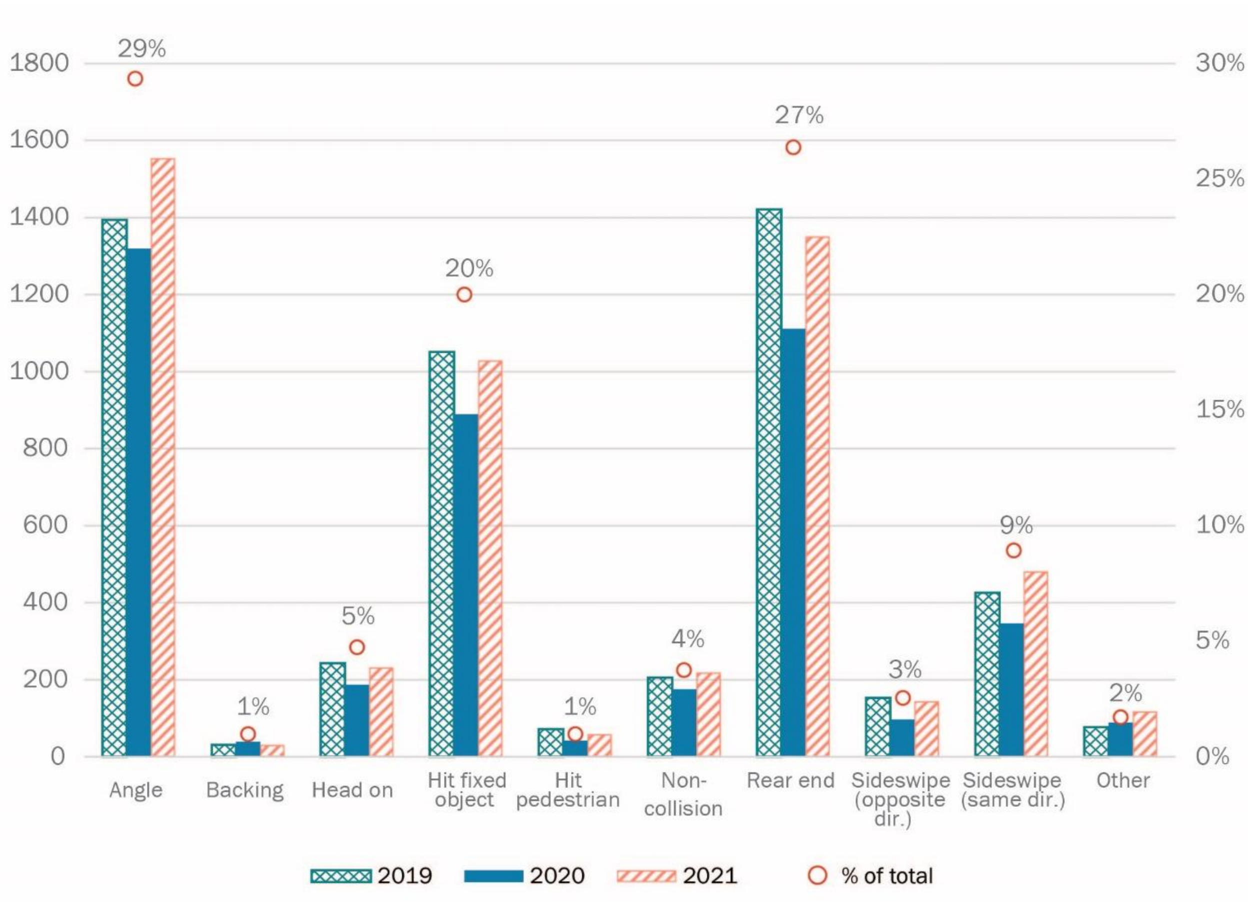
Time (Hour)	Lehigh	Northampton	Lackawanna	Luzerne	Berks	Lebanon	Monroe	Carbon	Pike	Schuylkill	Total
12:00 AM	33	15	29	40	54	19	21	14	9	18	**252**
1:00 AM	41	24	22	26	57	17	12	8	2	16	**225**
2:00 AM	26	19	29	37	46	11	11	4	7	13	**203**
3:00 AM	26	14	24	32	37	12	12	8	5	13	**183**
4:00 AM	36	23	16	29	51	9	7	11	7	19	**208**
5:00 AM	54	36	26	57	99	28	24	10	7	44	**385**
6:00 AM	128	73	45	73	144	54	38	29	16	42	**642**
7:00 AM	126	106	57	99	169	62	48	24	13	45	**749**
8:00 AM	127	91	77	104	133	44	46	22	14	52	**710**
9:00 AM	131	79	69	87	119	59	53	19	11	42	**669**
10:00 AM	132	88	84	93	164	51	59	38	20	41	**770**
11:00 AM	144	119	70	105	170	64	80	24	23	52	**851**
12:00 PM	151	109	101	123	194	75	77	37	20	61	**948**
1:00 PM	152	94	123	135	184	65	67	35	17	51	**923**
2:00 PM	171	122	85	115	226	82	77	26	17	62	**983**
3:00 PM	195	150	105	177	242	88	104	30	22	72	**1,185**
4:00 PM	174	137	101	143	211	84	83	34	21	63	**1,051**
5:00 PM	184	150	95	123	195	86	83	23	30	65	**1,034**
6:00 PM	88	83	59	93	148	56	57	23	17	44	**668**
7:00 PM	73	44	59	77	115	49	43	11	16	40	**527**
8:00 PM	72	50	26	61	92	29	41	15	15	32	**433**
9:00 PM	65	42	40	60	84	35	30	14	8	34	**412**
10:00 PM	63	36	25	38	68	25	22	9	7	22	**315**
11:00 PM	41	25	30	40	51	13	15	11	5	14	**245**
Unknown	4	0	1	3	2	5	0	0	0	0	**15**
Total	2,437	1,729	1,398	1,970	3,055	1,122	1,110	479	329	957	**14,586**

Source: PCIT

1.3.5 Collision Type

A summary of truck crashes by collision type is included in Figure 45. Over the three-year analysis period, fixed object, rear end, and angle crashes account for more than 75 percent of all collisions. A notable increase in angle crashes from 2019 to 2021 is evident, while nearly all other crash types declined or remained stagnant.

Figure 45: Study Area Truck Crashes, by Collision Type

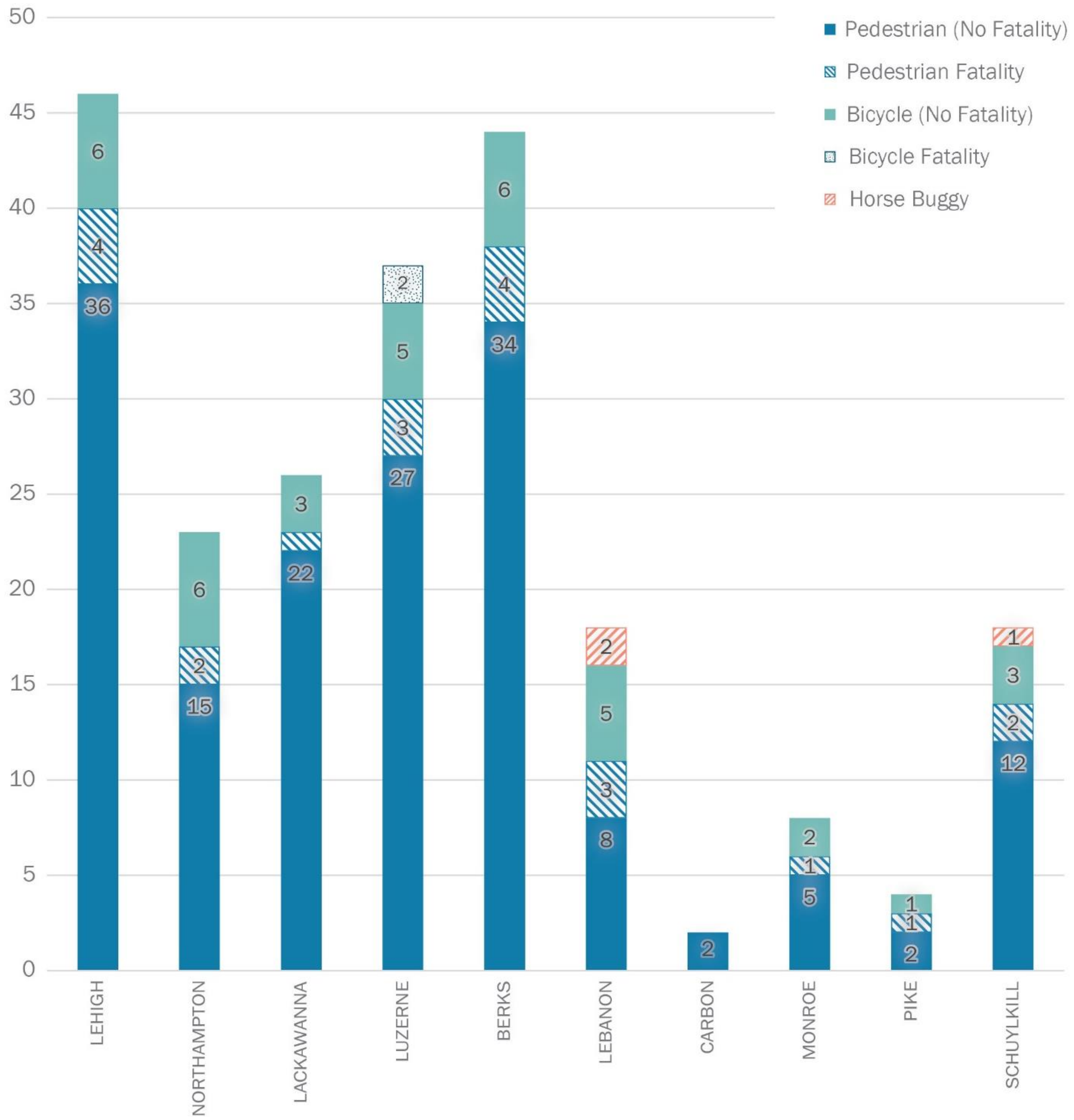


Source: PCIT

1.3.6 Truck Crashes with Non-Motorized modes

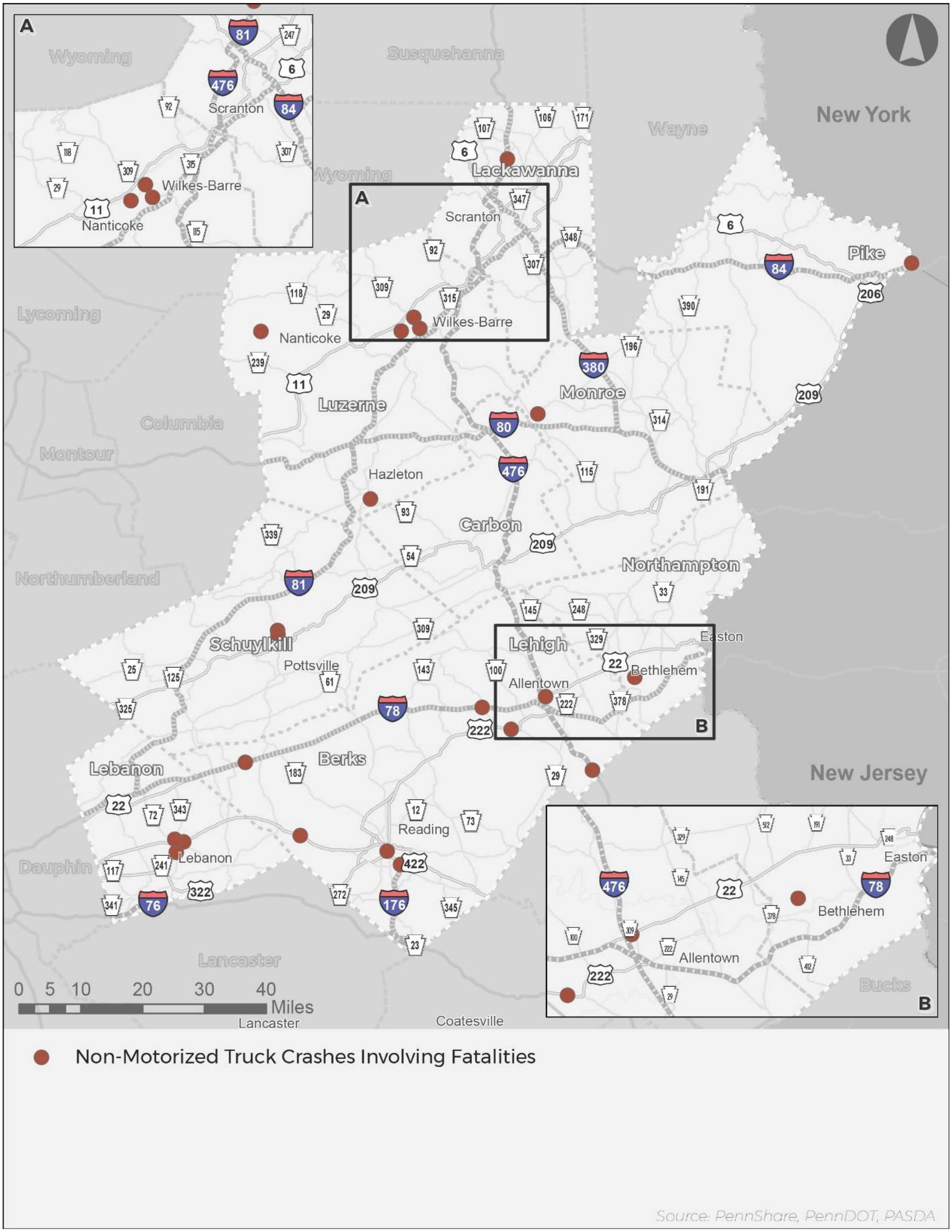
In addition to the review of all truck crashes, a secondary review was performed to identify clusters of truck crashes involving non-motorized traffic, including pedestrians, cyclists, or horse and buggy. This analysis, summarized in Figure 46 indicates crashes by mode, segmenting crashes by those involving injuries or fatalities. This analysis indicates that Lehigh County (46) has the highest number of truck crashes involving non-motorized modes, followed by Berks County (44) and Luzerne County (37). While the majority of truck crashes involving non-motorized modes are non-fatal, a total of 23 pedestrian or cyclist fatalities were identified within the study area, as shown in Figure 47

Figure 46: Truck Crashes with Non-Motorized Modes (2019- 2021)



Source: PCIT

Figure 47: Location of Truck Crashes Involving Non-Motorized Modes and Fatalities



1.3.6.1 Hotspot Analysis – Non-Motorized Crashes

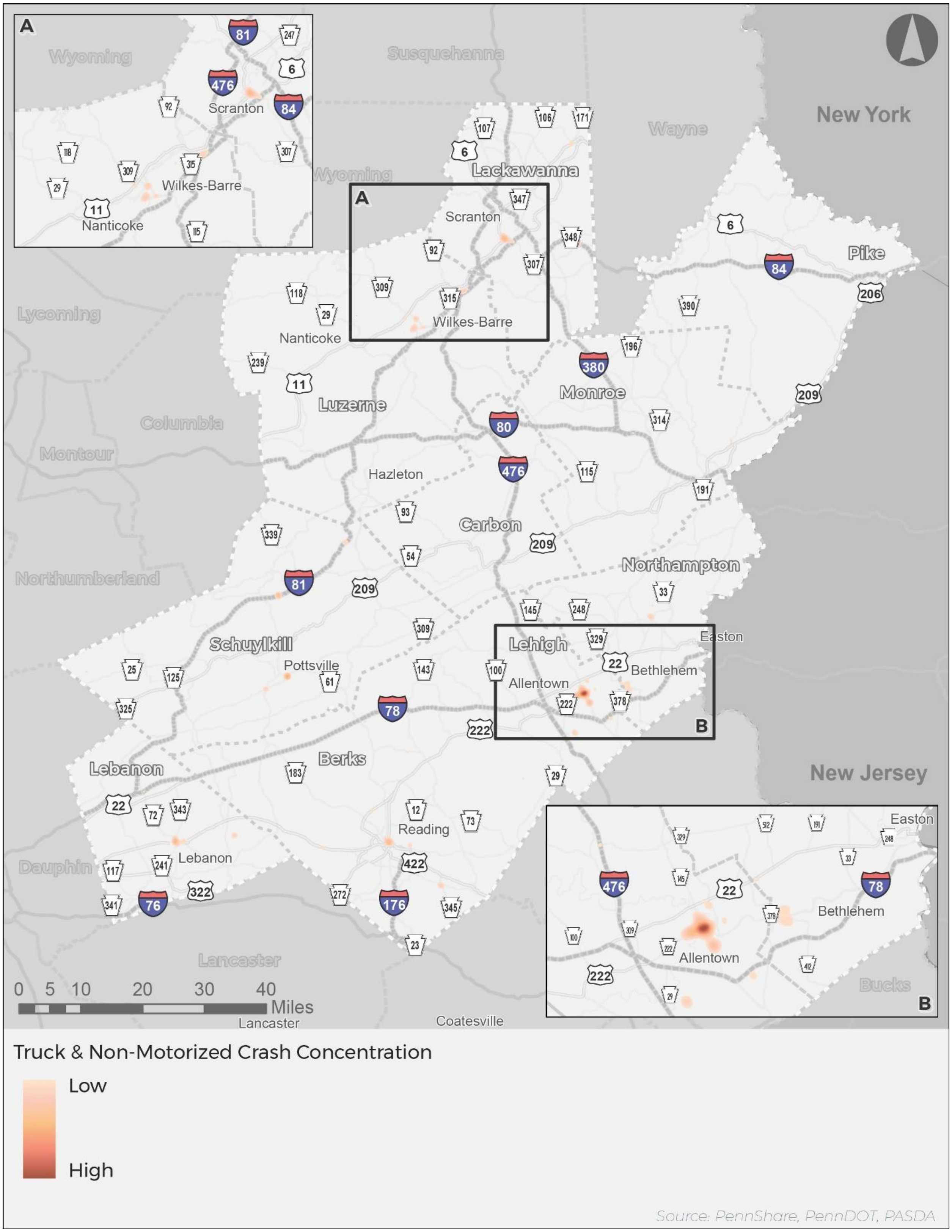
A summary of hotspot corridors or intersections for truck crashes involving non-motorized modes is shown in Figure 48 and Table 29. The locations are based on a density threshold to identify above average locations where crashes involving trucks and non-motorized modes have occurred. Notable clusters are evident in downtown areas, including Allentown, Scranton, Reading, and Lebanon. As Table 29 indicates, additional clusters are evident in Schuylkill County.

Table 29: Concentrations of Truck Crashes Involving Non-Motorized Modes

Major Corridors/Intersections	Municipality	County
Downtown	Reading	Berks
Downtown	Scranton	Lackawanna
Downtown	Lebanon	Lebanon
Downtown	Allentown	Lehigh
PA 443 near PA 61	North Manheim, Schuylkill Haven	Schuylkill
I 81 near PA 61	Ryan	Schuylkill

Source: PCIT

Figure 48: Hotspot Analysis of Truck Crashes Involving Non-Motorized Modes



1.4 Transit Demand and Opportunities within EPFA Freight Clusters

A review of existing transit demand and access at key freight nodes within the EPFA region was completed to identify opportunities to enhance existing service, provide additional services, or meet other potential unmet transit demands.

Freight generating clusters were obtained from PennShare's Freight Analysis Tool dataset. Land uses generating the highest freight activities in terms of road traffic were aggregated to establish Pennsylvania's Top Freight Generators. These areas as referred to in this analysis as "Major Freight Generating Clusters."

Journey to work trips to major freight generating clusters within the EPFA region were analyzed individually in the *Replica* data platform at the Census Block Group level to obtain the trip origination locations and general commuter demographics.

Existing transit routes within the EPFA region operating within or proximate to major freight generating clusters were mapped from readily available route information provided by respective transit agencies. Block Groups within one mile of identified transit routes connecting the major freight generating cluster (to which work trips were analyzed) were considered transit accessible. An overall summary of total daily work trips to each cluster and transit accessibility to that cluster are presented in Table 30.

Table 30: Transit Accessible Trips to Major Freight Generating Clusters

				Transit Accessible (1-mile)	
Cluster	Location	Transit System	Total Daily Work Trips	From Home	To Work
1	Macungie – Fogelsville	LANTA	35,928	67%	100%
2	Bethlehem – Allentown	LANTA	45,513	79%	100%
3	Ashland – Butler	Schuylkill Transportation System	297	0%	0%
4	Hazel Township – Hazelton	Hazelton Public Transit	8,208	67%	96%
5	Fairview – Wright	Hazelton Public Transit	4,138	64%	100%
6	Pittston – Pittston Township	COLTS	10,151	77%	100%
7	Tobyhanna – Coolbaugh Township	Pocono Pony	3,135	53%	100%
8	Scranton	COLTS	1,918	78%	100%
9	Jessup	COLTS	1,899	69%	100%

Source: Replica

Within the EPFA region, the size of Block Groups varies considerably and in many cases, only portions of the Block Group are accessible to transit routes. In these cases, the entire Block Group was considered to be transit accessible to streamline the analysis.

1.4.1 Cluster 1: Macungie – Fogelsville

Existing coverage by the Lehigh and Northampton Transportation Authority (LANTA) Bus system connects the major freight generating cluster in the Macungie – Fogelsville area to Northampton and Carbon Counties as well as parts of Lehigh County. However, the bus network mostly extends to the north and northeast of Allentown and does not provide connections for commuters elsewhere in Lehigh County and further west or south of the area.

All routes within this cluster have multiple buses running daily, as outlined in Table 31, with no fewer than 5 per route in the AM and at least 6-8 per route in the PM. Several routes have service frequencies higher than 10 buses daily in each direction.

Approximately two-thirds of work trips originate in Block Groups that are served by the LANTA bus network. Current commuting demographics within this cluster indicate that:

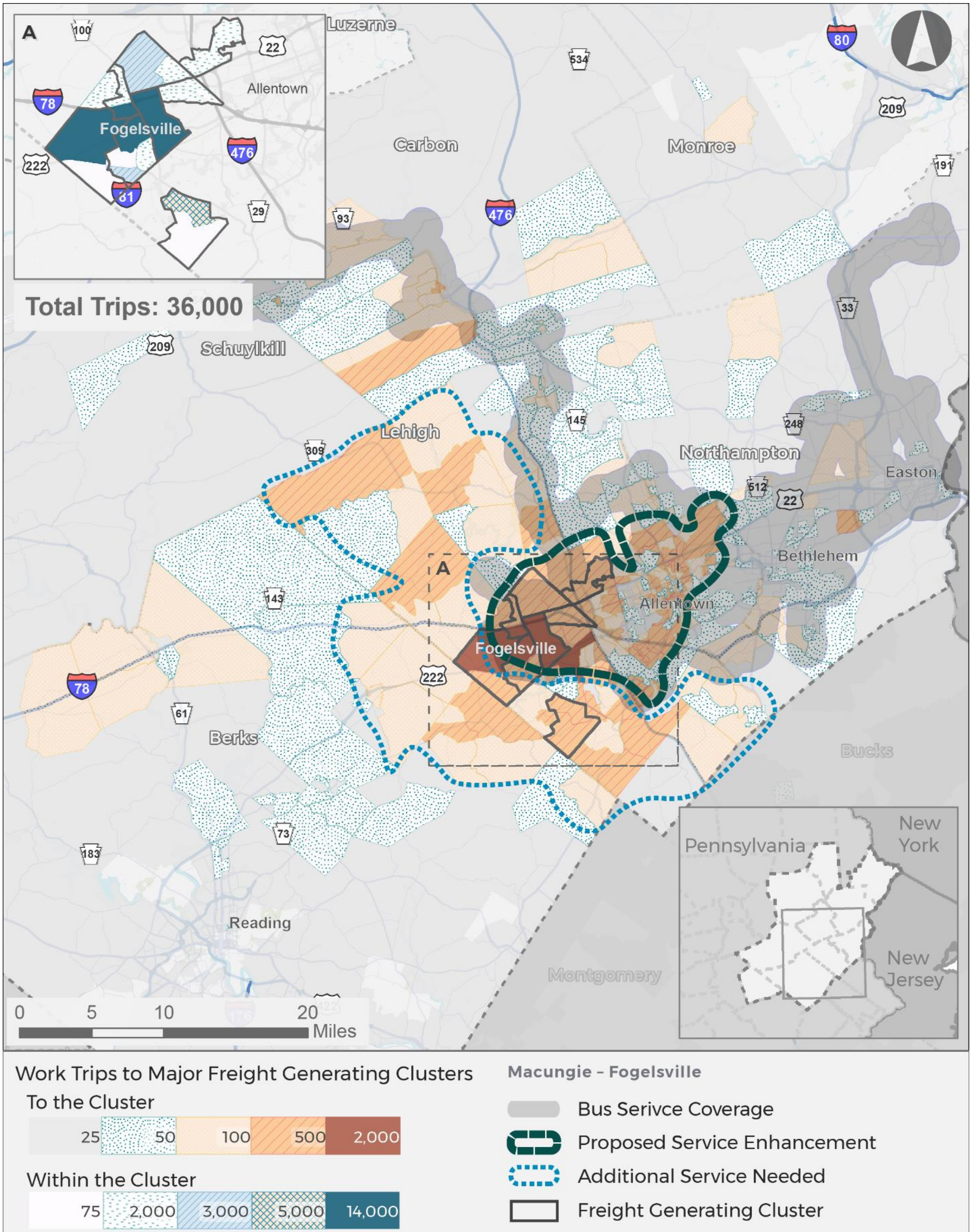
- The median age of commuters in the clusters is 45, which is higher than the Median Age in Pennsylvania (40.9)
- The median Income of commuters in the cluster is $91,700 which is considerably higher than both County ($82,201) and State ($73,170).
- Public Transit (1.5%) usage among commuters in this cluster is slightly higher than that of Lehigh County (1.3%)
- The number of households without a vehicle (3.57%) among commuters to this cluster is lower than that of the County (4.0%)

Within this cluster, nearly 36,000 total daily work trips are present. Of these trips, 67% are transit accessible (within 1-mile) of commuter home locations. Thus there is high potential for expanding bus services to include areas further west and south of the cluster – areas currently lacking coverage (as shown in Figure 49). There is also the potential to enhance existing services with expanded frequency or coverage.

Table 31: Service Frequency of Bus Routes Connecting to the Freight Generating Cluster in Macungie – Fogelsville

Route Number - Name	Frequency		Headway
	AM	PM	
101 - Blue Line - Bethlehem - Easton	14	22	30 mins
107 - Hanover Ave	9	12	60 mins
209 - Walbert Ave	6	6	60 mins
218 - Breinigsville - LV West	5	5	60 mins
508 - Fogelsville	Flex	Flex	On Demand
613 - Trexlertown Breinigsville Circulator	12	16	30 mins

Figure 49: Work Trips from Home Location (Census Block) and Transit Needs in Macungie – Fogelsville Cluster



Source: Replica (*High Certainty), PennShare, PennDOT, PASDA

1.4.2 Cluster 2: Bethlehem – Allentown

Transit coverage is provided within this cluster by the LANTA bus system that connects the freight generating cluster in the Bethlehem – Allentown area to the home locations of the people who commute there. More than 20 routes serve the Cluster, with frequencies outlined in Table 32, indicating the most substantial transit access within the region.

Current commuting demographics within this cluster indicate that:

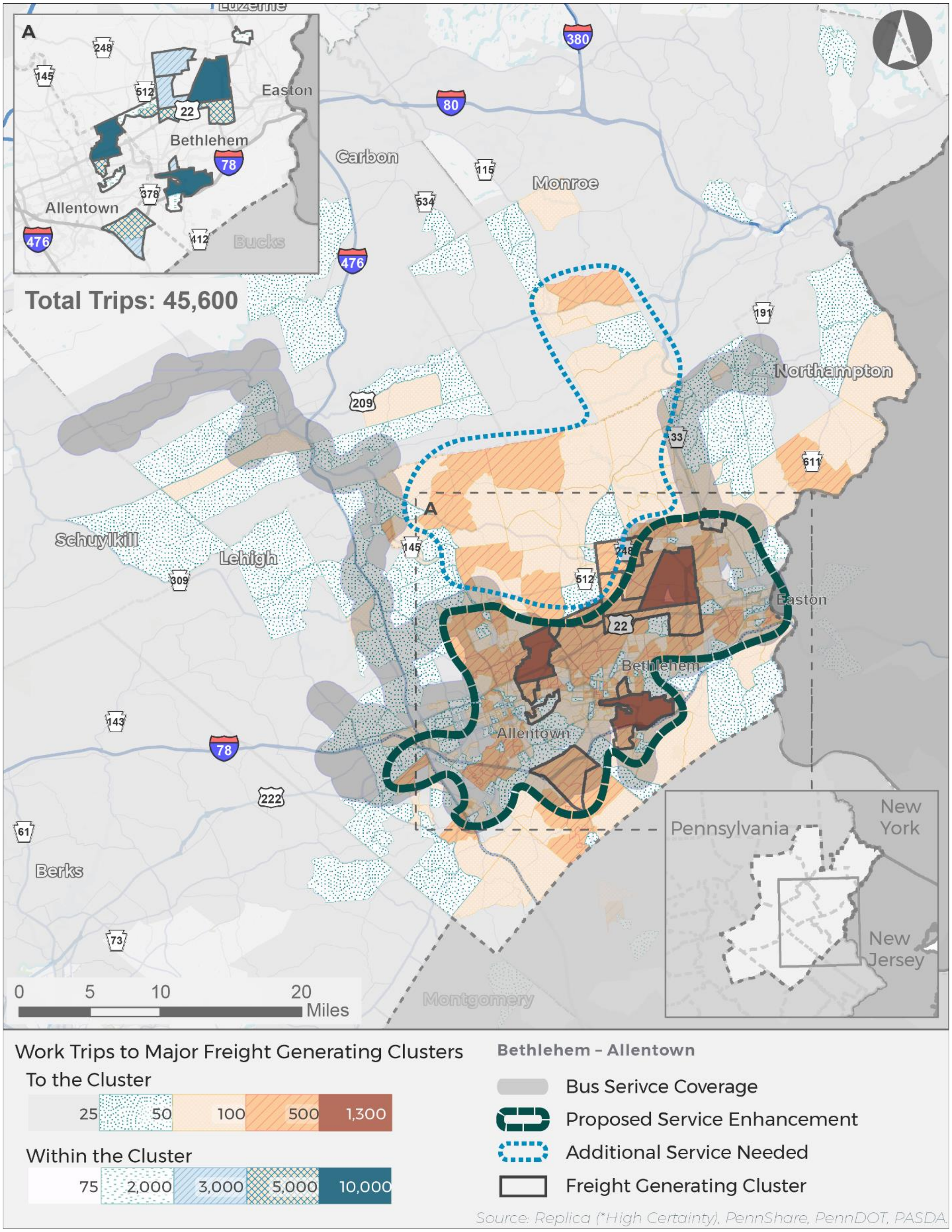
- The median age of commuters in the clusters is 45, which is higher than the Median Age in Pennsylvania (40.9)
- Median Income of commuters in the cluster is $89,600 which is higher than the County ($82,201) and State ($73,170).
- Public Transit (2%) usage among commuters to this cluster is slightly higher than that of Northampton County (1.6%)
- The number of households without a vehicle (4.11%) among commuters to this cluster is higher than that of the County (2.5%)

Within this cluster, nearly 45,000 total daily work trips are present. Of these trips, 79% are transit accessible (within 1-mile) of commuter home locations. Thus, there is high potential for expanding bus services to include areas west and south of the cluster that currently lack coverage (as shown in Figure 50). There is also the potential to enhance existing services with expanded frequency or coverage.

Table 32: Service Frequency of Bus Routes Connecting to the Freight Generating Cluster in Bethlehem – Allentown

Route Number - Name	Frequency		Headway
	AM	PM	
100 - Green Line	11	20	30 mins
101 - Blue Line - Bethlehem - Easton	14	22	30 mins
102 - Union Blvd - LV Hosp CC	6	11	60 mins
103 - Susquehanna - Northampton	8	11	60 mins
105 - Hellertown	6	10	60 mins
106 - Easton - Palmer	6	10	60 mins
107 - Hanover Ave	9	12	60 mins
108 - Fountain Hill - Bethlehem Square	7	9	60 mins
216 - Easton - Nazareth	6	8	60 mins
217 - Slate Belt	3	3	180 mins
220 - Bethlehem - Easton	8	8	60 mins
312 - Bethlehem - Nazareth	4	7	95 mins
319 - LV Mall - Bethlehem Sq	8	8	60 mins
323 - Stabler Center - PSU LV	4	5	60 mins
324 - Airport	6	7	60 mins
327 - Fountain Hill - LVIP IV	5	6	90 mins
410 - Dieruff HS - Emmaus Ave	3	3	30 mins
413 - Dieruff HS - Dixon St	2	1	5 mins
441 - H Morton MS - Hanover Av	1	1	-
605 - Bethlehem Circulator	6	11	60 mins

Figure 50: Work Trips from Home Location (Census Block) and Transit Needs in Bethlehem – Allentown Cluster



Source: Replica (*High Certainty), PennShare, PennDOT, PASDA

1.4.3 Cluster 3: Ashland – Butler

There are existing transit services within the general vicinity of this cluster provided by the Schuylkill Transportation System, but these services do not serve the major freight generating cluster in the Ashland area. Only three buses run daily on the one route most closely located to the cluster with no return commute option.

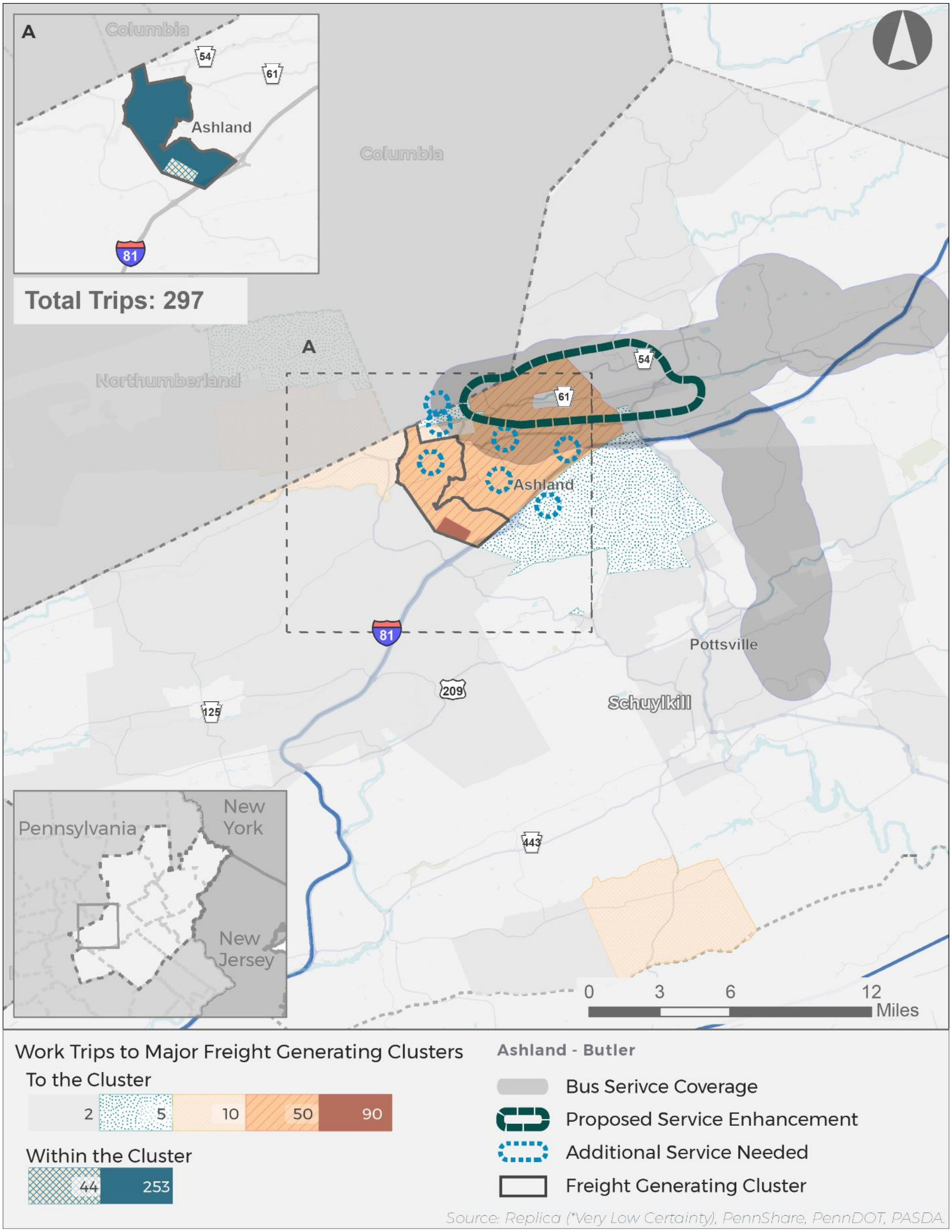
Current commuting demographics within this cluster indicate that:

- The median age of commuters to the cluster (46) is higher than the Median Age in Pennsylvania (40.9)
- The median Income of commuters to this cluster is $24,600 which is significantly lower than the County ($63,574) and State ($73,170)
- Public transit usage for Schuylkill County is much lower (0.5%) compared to that of the State (3.4%)
- The number of households without a vehicle (2.8%) among commuters to this cluster is lower than that of the County (3.2%)

The daily total number of commute trips (297) to the cluster is low, with the majority of the trips connecting the cluster in Ashland to places north and east, including Giradville, Gilberton, and Englewood.

Considering the low volume daily work trips to this cluster (as shown in Figure 51) it would not be feasible to increase the current service extensively. However, coordinating bus services with employers within the cluster to include a more direct work destination trip and adding a return trip option in the evening may increase transit usage.

Figure 51: Work Trips from Home Location (Census Block) and Transit Needs in Ashland – Butler Cluster



1.4.4 Cluster 4: Hazel Township – Hazelton

There are existing transit services within this cluster provided by Hazelton Public Transit connecting the clusters (Humboldt Industrial area) in Hazel Township and Hazelton City with the home locations of the commuters within Luzerne County as well as Schuylkill and Carbon Counties as well.

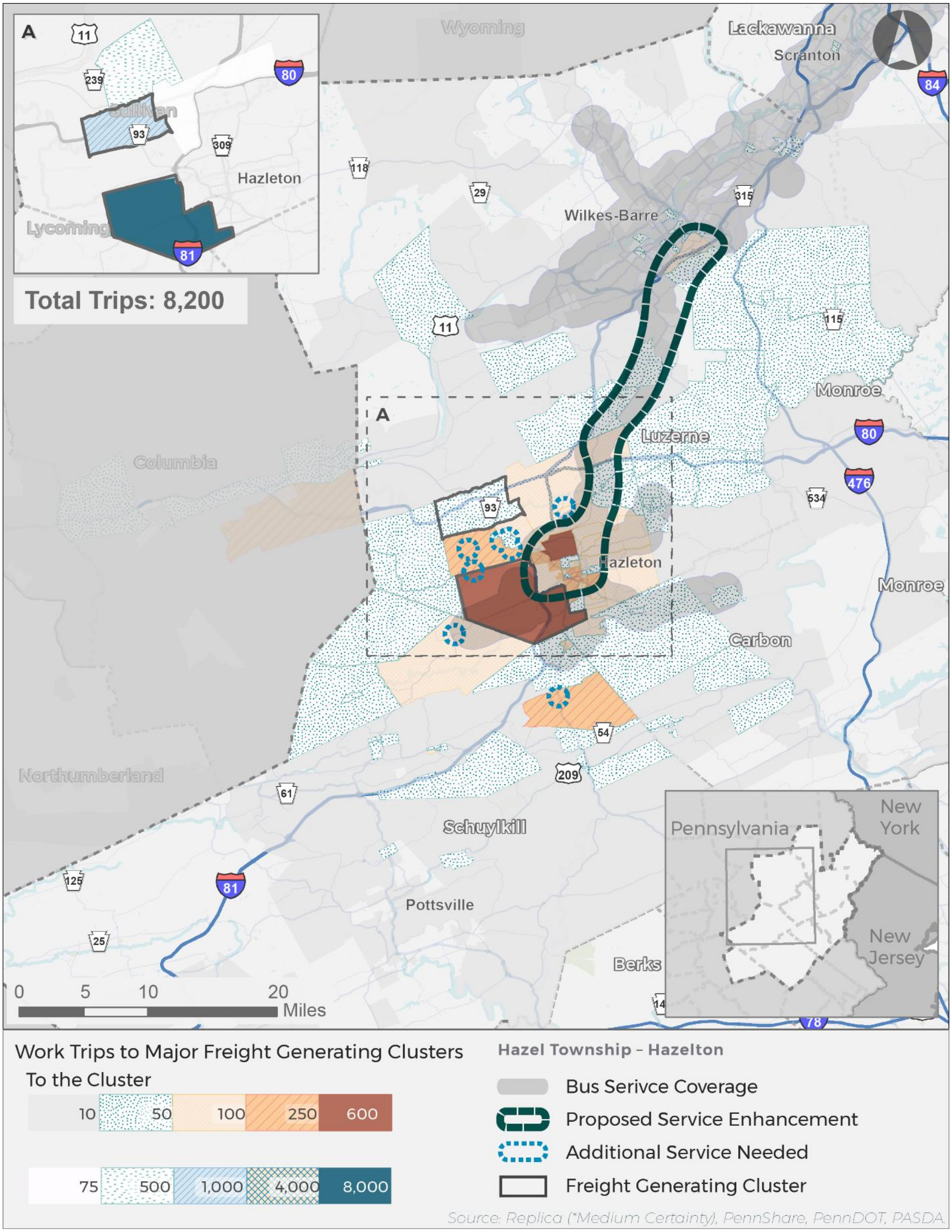
Route 5 to Humbolt is the only bus route that connects Hazelton and Hazel to the Humboldt Industrial area with 13 buses operating daily. The other routes (Route 70, Route 90, Route 10, Route 15, Route 20, and Route 40S) connecting the industrial area or connecting to Route 5 t have lower operating frequencies, with 3 or 4 buses running daily in each direction.

Current commuting demographics within this cluster indicate that:

- The median age of commuters to the cluster (45) is higher than the Median Age in Pennsylvania (40.9) and County (42.3)
- Median Income of commuters to this cluster is $72,100 which is higher than the County ($60,836) but lower than the State ($73,170).
- Public transit usage for Luzerne County is much lower (1%) compared to that of the State (3.4%)
- The number of households without a vehicle (5.6%) among commuters to this cluster is higher than that of the County (5.0%)

Within this cluster, nearly 8,000 total daily work trips are present. Of these trips, 67% are transit accessible (within 1-mile) of commuter home locations. Thus there is a potential for expanding bus services to include areas further north and southwest of the cluster that currently lack coverage (as shown in Figure 52). There is also the potential to enhance existing services with expanded frequency or coverage.

Figure 52: Work Trips from Home Location (Census Block) and Transit Needs in Hazel Township/Hazelton Cluster



1.4.5 Cluster 5: Fairview – Wright

There are existing transit services within this cluster provided by Hazelton Public Transit connecting the clusters in Fairview and Wright Townships with the home locations of the commuters, primarily within Luzerne County.

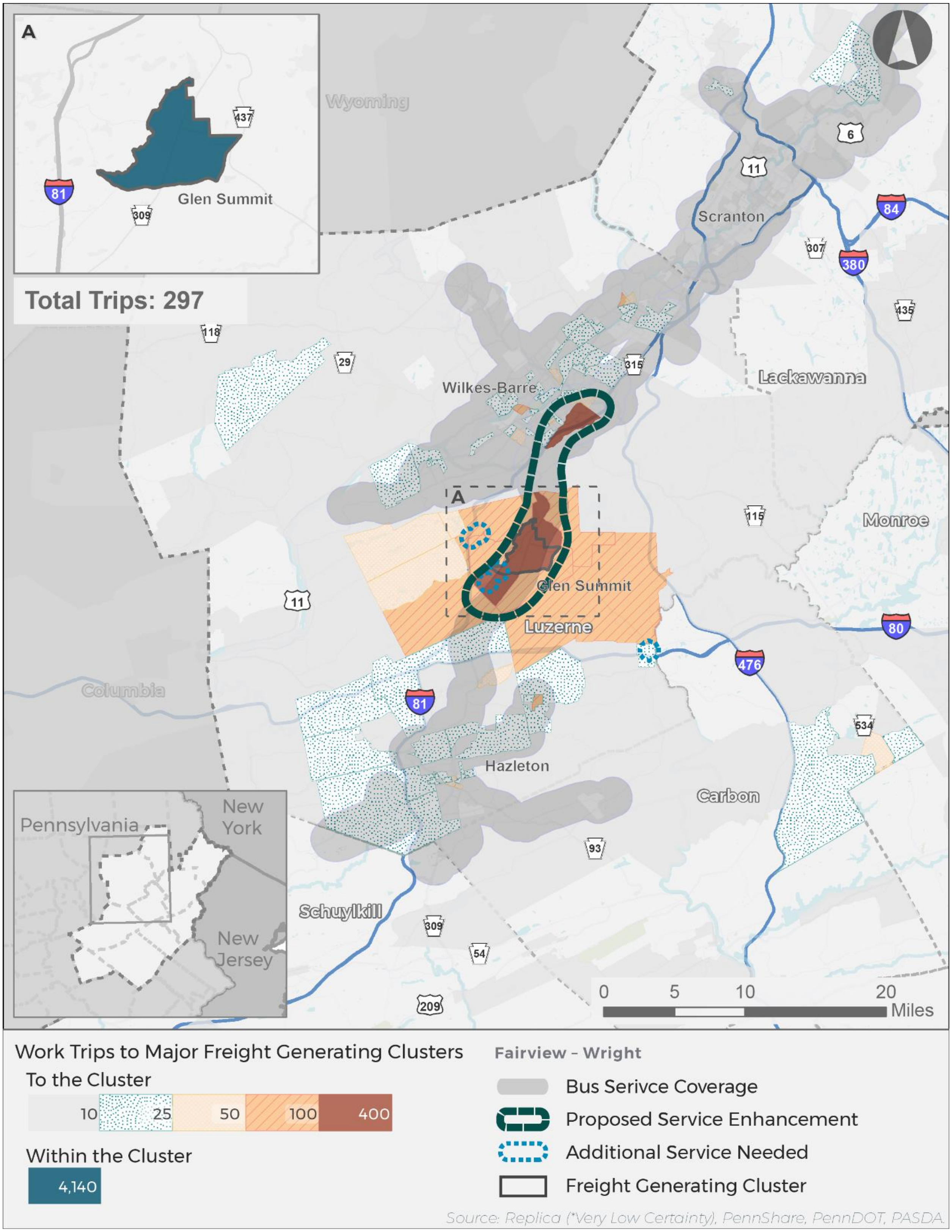
One bus route, Route 15 to Wilkes-Barre, operates through this cluster between Hazelton and Wilkes-Barre with only 3 buses daily in each direction however no service is provided during the evening return commute from this cluster.

Current commuting demographics within this cluster indicate that:

- Median age of commuters to the cluster (47) is higher than the Median Age in Pennsylvania (40.9) and County (42.3)
- Median Income of commuters to this cluster is $85,900 which is higher than the County ($60,836) but lower than the State ($73,170).
- Public transit usage for Luzerne County is much lower (1%) compared to that of the State (3.4%)
- The number of households without a vehicle (3.2%) among commuters to this cluster is lower than that of the County (5.0%)

Within this cluster, nearly 4,000 total daily work trips are present. Of these trips, 64% are transit accessible (within 1-mile) of commuter home locations. While the number of work trips within this cluster is low, there is some potential for expanding bus services further south-east and west of this cluster as shown in Figure 53. Further, an increase in frequency of service and providing return commute trip services to existing transit service in the evening may also be effective in improving transit usage in the area.

Figure 53: Work Trips from Home Location (Census Block) and Transit Needs in Fairview – Wright Cluster



1.4.6 Cluster 6: Pittston – Pittston Township

Within the Pittston Cluster, there are five existing bus routes, Route 26 and Route 28 provided by the County of Lackawanna Transit System (COLTS), Route 5 and Route 19 provided by Luzerne County Transportation Authority (LCTA), and Route 15 provided by Hazelton Public Transit. These services connect the clusters in Pittston and Pittston Township to the home locations of cluster-bound commuters. These routes directly connect the cluster to Scranton (north), Wilkes-Barre (south), and Hazelton (south).

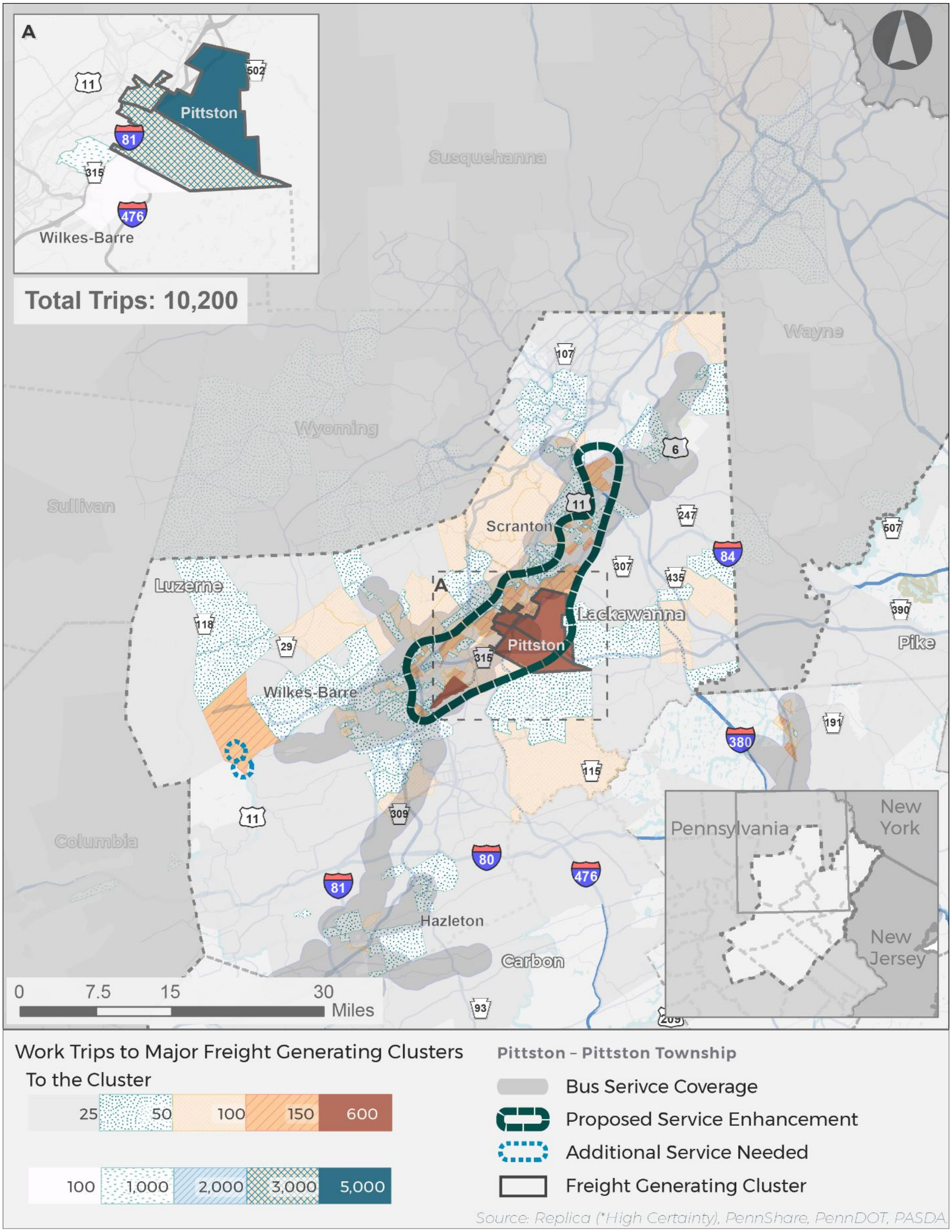
The most frequent service (13 daily) operates on Route 5 and Route 13. Service is more limited on other routes: five buses operating daily on Route 19 of LCTA, and three buses running daily on Route 26. On Route 15 of Hazelton Public Transit, there are only three buses running daily (per direction), however evening return commute service is not currently available.

Current commuting demographics within this cluster indicate that:

- Median age of commuters to the cluster (45) is higher than the Median Age in Pennsylvania (40.9) and County (41.7)
- Median Income of commuters to this cluster is $80,100 which is higher than the County ($63,739) and the State ($73,170).
- Public transit usage for Lackawanna County is much lower (0.7%) compared to that of the State (3.4%)
- The number of households without a vehicle (4.74%) among commuters to this cluster is higher than that of the County (3.8%)

Within this cluster, more than 10,000 total daily work trips are present. Of these trips, 77% are transit accessible (within 1-mile) of commuter home locations. There is potential for expanding bus services further south-west of where existing service ends to include home locations of commuters to this cluster as shown in Figure 54. There is also potential to enhance existing services to improve frequency and coverage along Route 19 of LCTA, Route 26 of COLTS, and Route 15 of Hazelton Public Transit. Expanding service coverage further south along Route 15 of Hazelton Public Transit would also support work trips to the major freight generating clusters in Hazel Township and Hazelton detailed in Cluster 4.

Figure 54: Work Trips from Home Location (Census Block) and Transit Needs in Pittston Cluster



1.4.7 Cluster 7: Tobyhanna, Coolbaugh Township

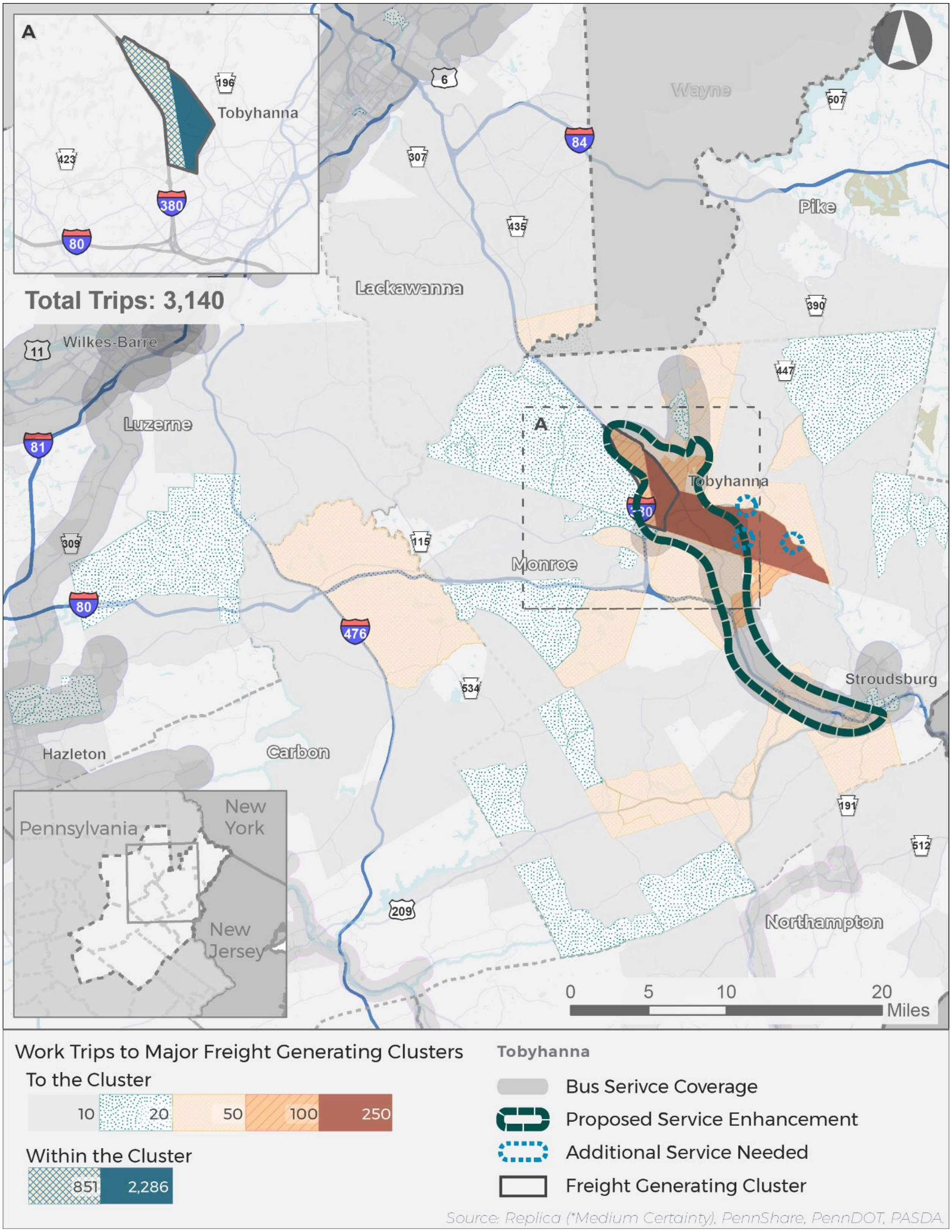
Within Cluster 7, there are existing transit services provided by Monroe County Transportation Authority (Pocono Pony) that connect the clusters in Tobyhanna, Coolbaugh Township to the home locations of the commuters. Transit service coverage is however limited to one direct bus route (with 12 buses daily) that connects the cluster to the rest of the transit system, with additional connections to Pocono Summit and East Stroudsburg.

Current commuting demographics within this cluster indicate that:

- Median age of commuters to the cluster (49.5) is higher than the Median Age in Pennsylvania (40.9) and County (44.1)
- Median Income of commuters to this cluster is $87,100 which is higher than the County ($80,656) and the State ($73,170).
- Public transit usage for Monroe County is lower (2.9%) compared to that of the State (3.4%)
- The number of households without a vehicle (2.98%) among commuters to this cluster is lower than that of the County (3.1%)

Within this cluster, approximately 3,000 total daily work trips are present. Of these trips, 53% are transit accessible (within 1-mile) of commuter home locations. While these numbers are lower than those found in several of the other clusters detailed within this section, there may be limited potential for expanding bus services further east of this cluster as shown in Figure 55.

Figure 55: Work Trips from Home Location (Census Block) and Transit Needs in Tobyhanna Cluster



1.4.8 Cluster 8: Scranton

Within this cluster, there are existing transit services provided by COLTS that extensively connect clusters in Scranton area to the home locations of the commuters between Carbondale (north) and Wilkes-Barre (south).

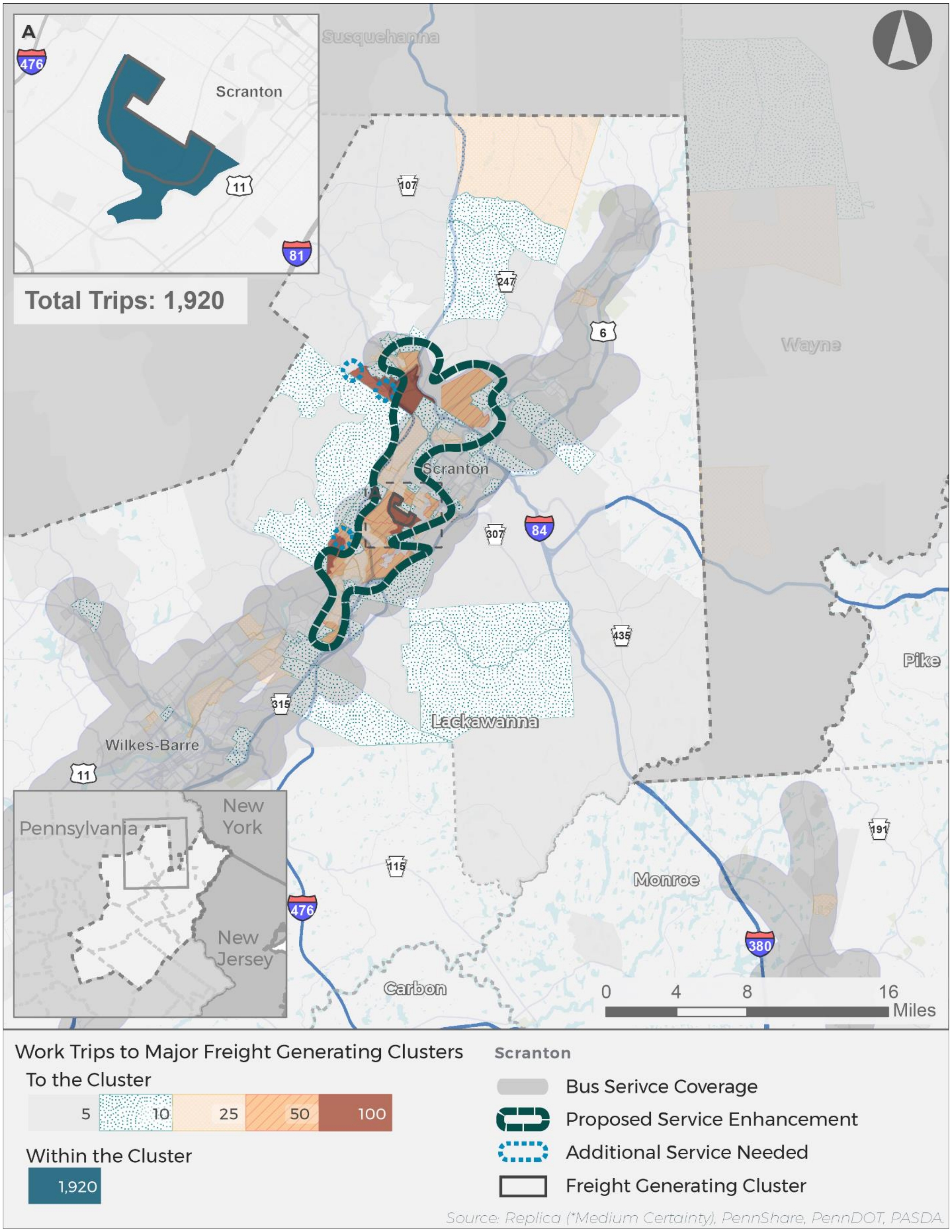
Within this cluster there is significant transit access, with 8 bus routes operating approximately 12-13 buses daily on each route (per direction).

Current commuting demographics within this cluster indicate that:

- Median age of commuters to the cluster (48) is higher than the Median Age in Pennsylvania (40.9) and County (41.7)
- Median Income of commuters to this cluster is $80,600 which is higher than the County ($63,739) and the State ($73,170).
- Public transit usage for Lackawanna County is much lower (0.7%) compared to that of the State (3.4%)
- The number of households without a vehicle (5.15%) among commuters to this cluster is lower than that of the County (3.8%)
- County-wide usage of public transportation for commuting is low (less than one percent).

Within this cluster, approximately 2,000 total daily work trips are present. Of these trips, 78% are transit accessible (within 1-mile) of commuter home locations. While these numbers are lower than those found in several of the other clusters detailed within this section, there is limited potential for expanding bus services further south-west and north-west of this cluster as shown in Figure 56.

Figure 56: Work Trips from Home Location (Census Block) and Transit Needs in Scranton Cluster



1.4.9 Cluster 9: Jessup

Within this cluster, there is one direct bus route (Route 11) provided by COLTS that serves the cluster in the Jessup area. While Route 11 operates 12 buses daily to this cluster, Route 11 only serves a small portion of the workers' home locations along I-380, south of Jessup, in the townships of Spring Brook, Covington, and Clifton. Route 11 connects directly to Route 12 and Route 52 (each of which operates 14 buses daily) on the COLTS system but outside of the cluster and the combination together covers around 43 percent of the block groups originating the work trips to this cluster.

Current commuting demographics within this cluster indicate that:

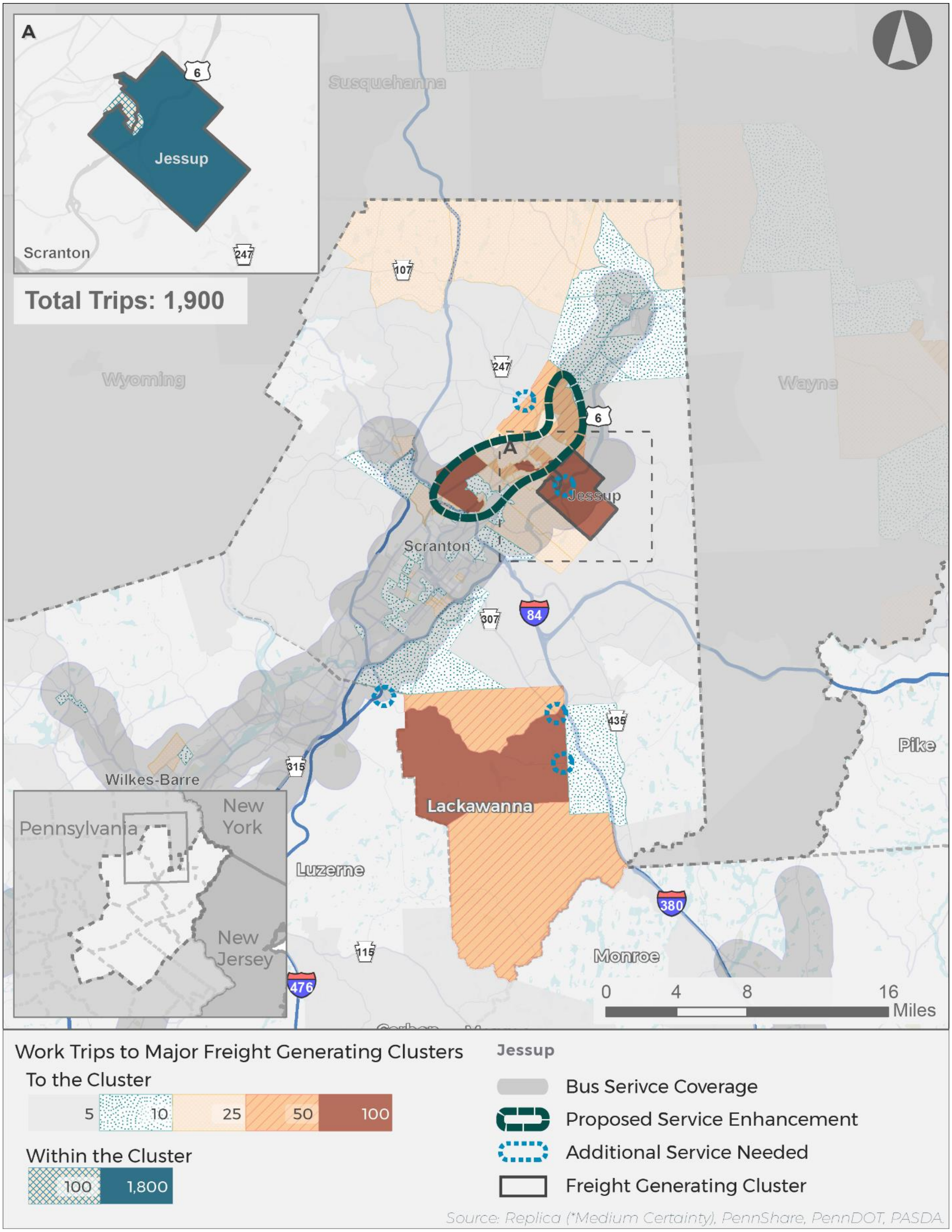
- Median age of commuters to the cluster (50) is higher than the Median Age in Pennsylvania (40.9) and County (41.7)
- Median Income of commuters to this cluster is $79,700 which is higher than the County ($63,739) and the State ($73,170).
- Public transit usage for Lackawanna County is much lower (0.7%) compared to that of the State (3.4%)
- The number of households without a vehicle (5.39%) among commuters to this cluster is lower than that of the County (3.8%)
- County-wide usage of public transportation for commute is low (less than one percent).

Within this cluster, approximately 2,000 total daily work trips are present. Of these trips, 69% are transit accessible (within 1-mile) of commuter home locations. While these numbers are lower than those found in several of the other clusters detailed within this section, there is some potential for expanding bus services mostly further south and one are in the north of this cluster as shown in Figure 57.

1.4.10 Transit Access Conclusions

Current access to adequate transit services is limited to and from many of the key freight nodes within the EPFA region, making it challenging for commuting workers to rely on transit as their primary mode of choice. A combination of high travel time cost and inadequate or incompatible service frequency or quality are likely causes for existing low transit usage in these areas. There are a considerable number of potential transit users among the workers within these nodes based on the commuter demographics. Thus, further investigation on transit demand and service improvements within several of these nodes may be warranted.

Figure 57: Work Trips from Home Location (Census Block) and Transit Needs in Jessup Cluster



1.5 Freight Movement

1.5.1 Commodity Flows

The Transearch Commodity Flow dataset, produced by IHS, is a nationwide multimodal commodity flow assessment that integrates data from a variety of public and non-public sources and estimates to create a comprehensive picture of freight movement across states and within major metropolitan areas. The dataset provides estimates for tonnage and value by regions of origin and destination, commodity type, and mode for base year 2019 and forecast year 2045, representing three different economic growth scenarios, by various modes of transportation.

Overall, the freight system in the EPFA region moved over 123 million tons of goods worth over $124B in 2019 (Table 33). Inbound and outbound freight movements accounted for over 90% of the tonnage transported, with a slight tilt in outbound shipments. Incorporating economic and demographic forecasts, IHS Transearch estimates significant increases in total freight traffic in the EPFA region, with an aggregate growth of 33% in freight tonnage and 59% in freight value by 2045.

Table 33: EPFA Region Freight Tons and Value, All Modes (2019 and 2045)

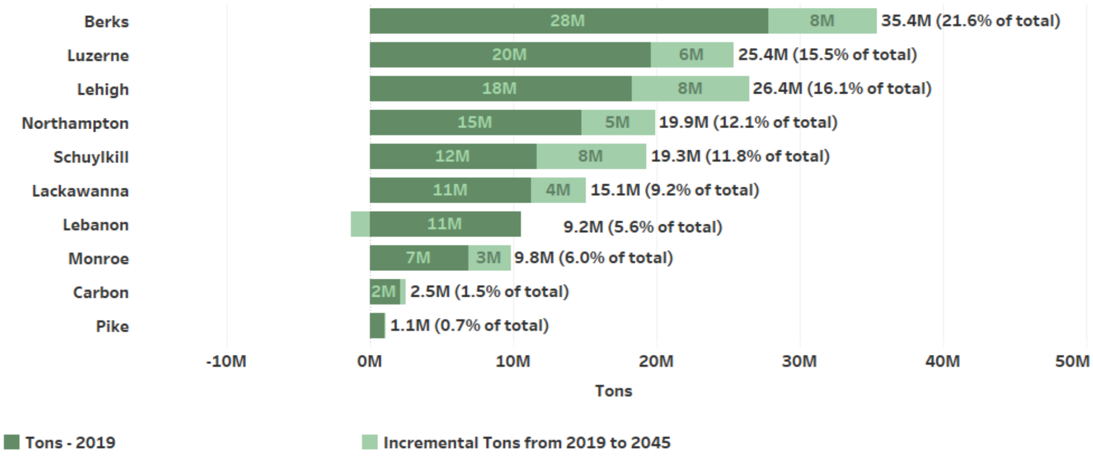
Direction of Flow (10-County Region)	Tons - 2019	Tons - 2045	Tons Growth	Tons Growth CAGR	Value ($) - 2019	Value ($) - 2045	Value ($) Growth	Value ($) Growth CAGR
Inbound to 10-County Region	52.61M	71.15M	35.3%	1.2%	$55.85B	$90.64B	62.3%	1.9%
Outbound from 10-County Region	59.56M	79.71M	33.8%	1.1%	$59.63B	$93.06B	56.0%	1.7%
Within 10-County Region	11.45M	13.09M	14.4%	0.5%	$9.34B	$14.43B	54.5%	1.7%
Grand Total	123.62M	163.96M	32.6%	1.1%	$124.83B	$198.12B	58.7%	1.8%

Source: IHS Transearch
Note: Table does not include commodities traveling through EPFA Region, without a EPFA Region origin or destination.

Table 33 shows that the amount of freight terminating in the EPFA region is expected to remain lower than the amount of freight originating in the EPFA region through 2045. Inbound tonnages however will grow faster, with a 1.9% CAGR between 2019 and 2045, compared to 1.7% for outbound and internal movements.

Figure 58 and Figure 59 illustrate the breakdown of freight movements and projected growth for each county in the region by tonnages and freight value respectively. Berks County accounted for the largest share of movements by tonnage in 2019, with about 22% of total tons transported to, from and within the region. Construction materials, food and agricultural products and other miscellaneous freight movements contribute the majority of tonnages transported to, from and within Berks County.

Figure 58: Freight Tonnages by County - Inbound, Outbound, Within - 2019 and 2045

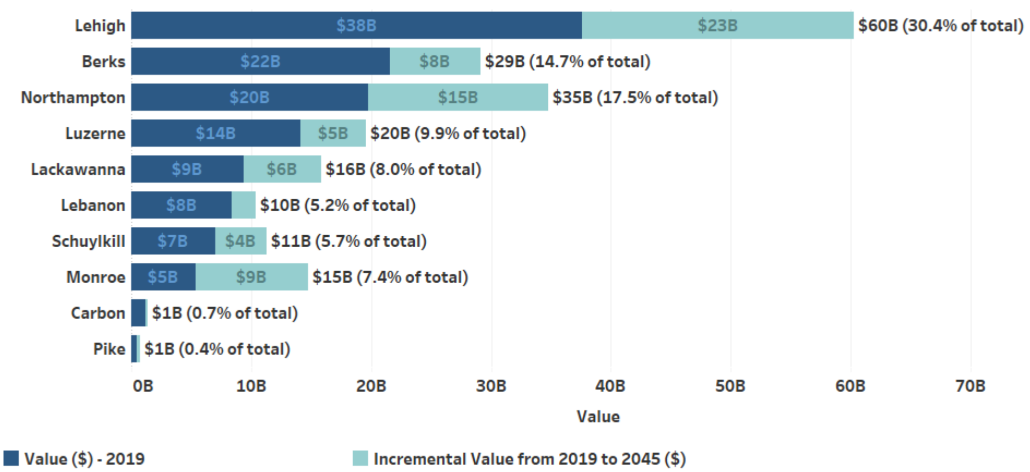


Source: IHS Transearch
Note: Table does not include commodities traveling through EPFA Region, without a EPFA Region origin or destination.

However, Lehigh and Schuylkill Counties are expected to see the highest increases in freight tonnage by 2045, with approximately 8 million tonnage growth within each county through 2045. Lehigh County tonnages are expected to grow primarily in distribution traffic and miscellaneous movements, while Schuylkill County is expected to see an increase of over 7 million tons in construction materials (over 150% growth) by 2045. Lebanon County is the only county expected to see negative tonnage growth by 2045, due to projected reductions in construction material shipments.

Lehigh County accounts for the largest share of freight by value, carrying nearly one-third of all freight (by value) within the EPFA region. Automotive, distribution and electronics shipments account for high shares in both current and projected traffic in Lehigh County. Northampton and Monroe County are also expected to see high freight value growth, largely in distribution traffic (Northampton County) and pharmaceutical products (Monroe County).

Figure 59: Freight Value by County - Inbound, Outbound, Within - 2019 and 2045

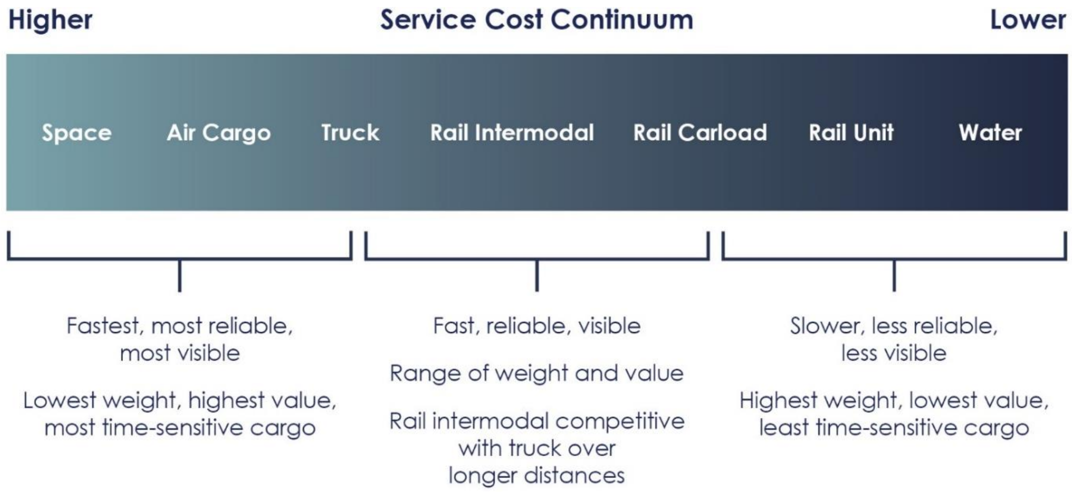


Source: IHS Transearch
Note: Table does not include commodities traveling through EPFA Region, without a EPFA Region origin or destination.

1.5.1.1 Freight Demand by Mode

Several factors influence mode selection by industry and commodity, including cost of transporting goods, timelines, pattern of freight generation and end-demand location and accessibility. Figure 60 shows the type of cargo that certain modes tend to transport. For instance, water and non-intermodal rail modes tend to ship high-weight, lower-value products that are not time sensitive. Heavy commodities such as gravel sometimes uses barge and lumber sometimes uses rail. Therefore, businesses that require lower-cost transportation service and can deal with slower shipments may shift to barge or rail carload or unit trains. Conversely, trucks generally ship lighter goods that are of higher value and more time sensitive. Truck and intermodal rail are faster and more reliable than options with lower service costs. Finally, air cargo is used to ship the most time-sensitive and highest-value cargo. The air mode represents a small (in terms of tonnage) but increasingly important share of total freight movements, with the highest value per ton of all modes.

Figure 60: Freight Transportation Service Spectrum



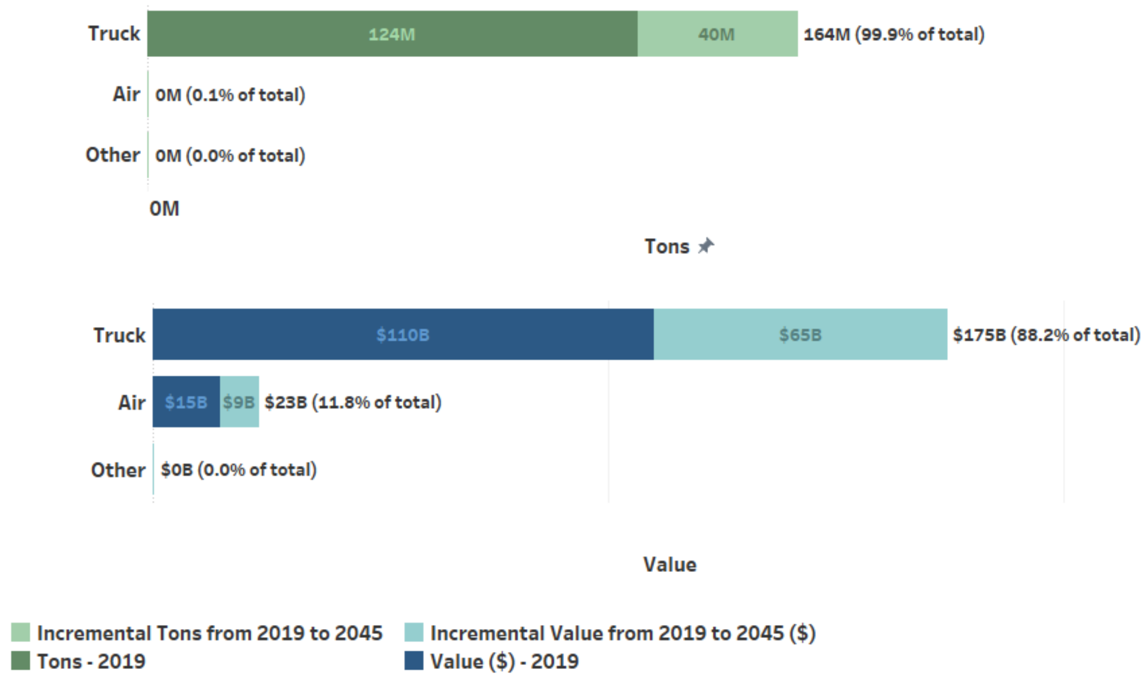
Source: AASHTO. 2018. Freight Rail Bottom Line Report.

As shown in Figure 61, two major transportation modes—air and truck—are primarily utilized for moving freight into, out of, and within the EPFA Region. Trucking is by far the most dominant mode of freight transportation in the region, with 99.9% mode share by tonnage and 88% mode share by value. Further, truck tonnages will continue to increase the most in absolute terms (total tonnage and value).

Table 33 illustrates the dominance of truck freight within the region but notes that the value of freight movements shows a steeper increase than tonnage by 2045. The increase in higher-value commodities on the freight system implies the reliance on truck and air cargo will only grow higher, as evidenced by the growing importance of reliability, urban mobility, and access to airports and international cargo handling facilities in today's national supply chains.

Figure 61 also shows that air demand will increase at a more rapid rate than trucking. Air freight movements in the EPFA Region are expected to increase sharply as a result of projected increases in high-value commodity groups, including electrical and electronics products as well as pharmaceuticals. The expected ~60% increase in airfreight tonnage between 2019 and 2045 will highlight needs for access to airports as freight demand grows.

Figure 61: Summary of Freight Movements by Mode (2019 and 2045)



Source: IHS Transearch

Note: Table does not include commodities traveling through EPFA Region, without a EPFA Region origin or destination.

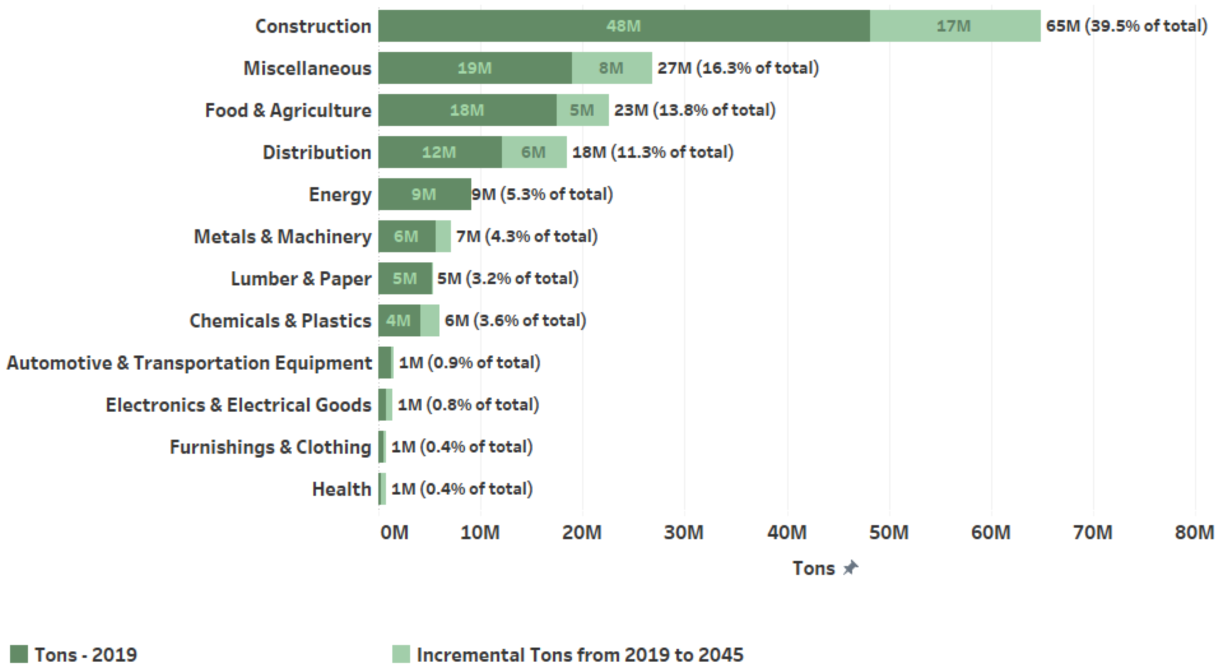
1.5.1.2 Commodity Movements and Freight Demand

Figure 62 highlights the major commodity categories carried into, out of, and within the EPFA Region by mode in 2019 and 2045 by tonnage, while Figure 63 highlights the major commodity categories carried into, out of, and within the EPFA Region by mode in 2019 and 2045 by value.

Construction materials, such as concrete and stone or riprap, is the biggest generator of freight demand (by tonnage), accounting for nearly 40% of total tons transported within the EPFA Region. The presence of large distribution centers in Northampton, Lehigh and neighboring counties, particularly around Allentown, explains how distribution traffic to and from warehouses and fulfilment centers comprises the largest share of freight movements in the EPFA Region by value (23%). Further, intermodal drayage to and from distribution centers constituted over $28 billion by freight value in 2019 (Figure 64).

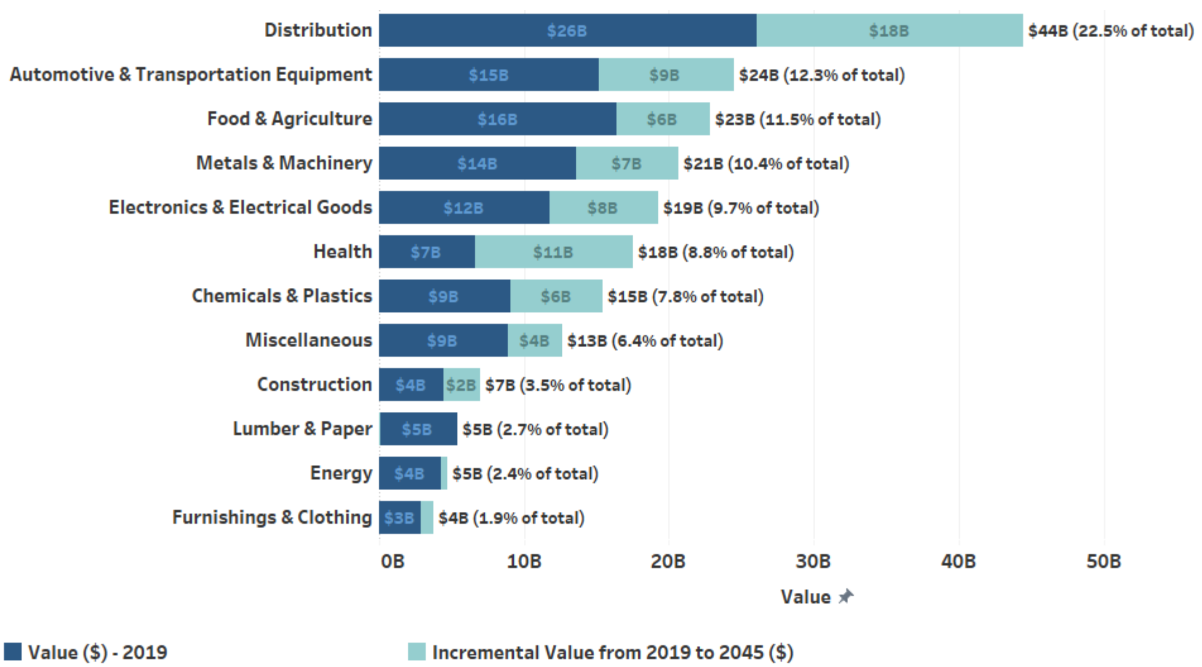
Figure 65 highlights the top commodities by tons and value moving into, out of, and within the EPFA Region in 2019 and growth through 2045. Automotive and Transportation Equipment comprises the largest category of inbound shipments by value, while distribution traffic captures the greatest share of outbound and within movements. Goods produced by the food and agriculture industries are a major generator of inbound and outbound freight demand in the region.

Figure 62: Freight Movements (tons) by Commodity Categories - Inbound/Outbound/Within EPFA Region



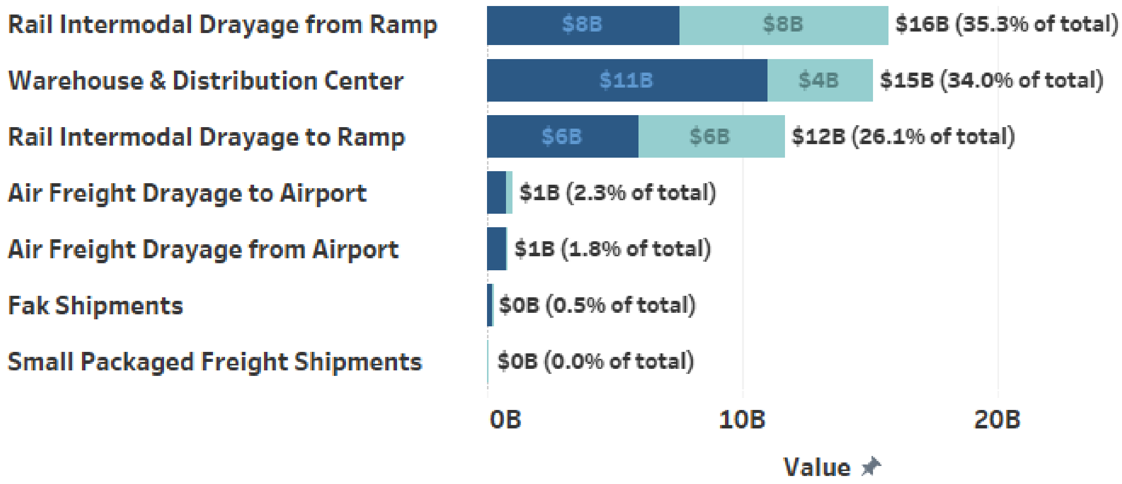
Source: IHS Transearch
Note: Table does not include commodities traveling through EPFA Region, without a EPFA Region origin or destination.

Figure 63: Freight Movements (value) by Commodity Categories - Inbound/Outbound/Within EPFA Region



Source: IHS Transearch
Note: Table does not include commodities traveling through EPFA Region, without a EPFA Region origin or destination.

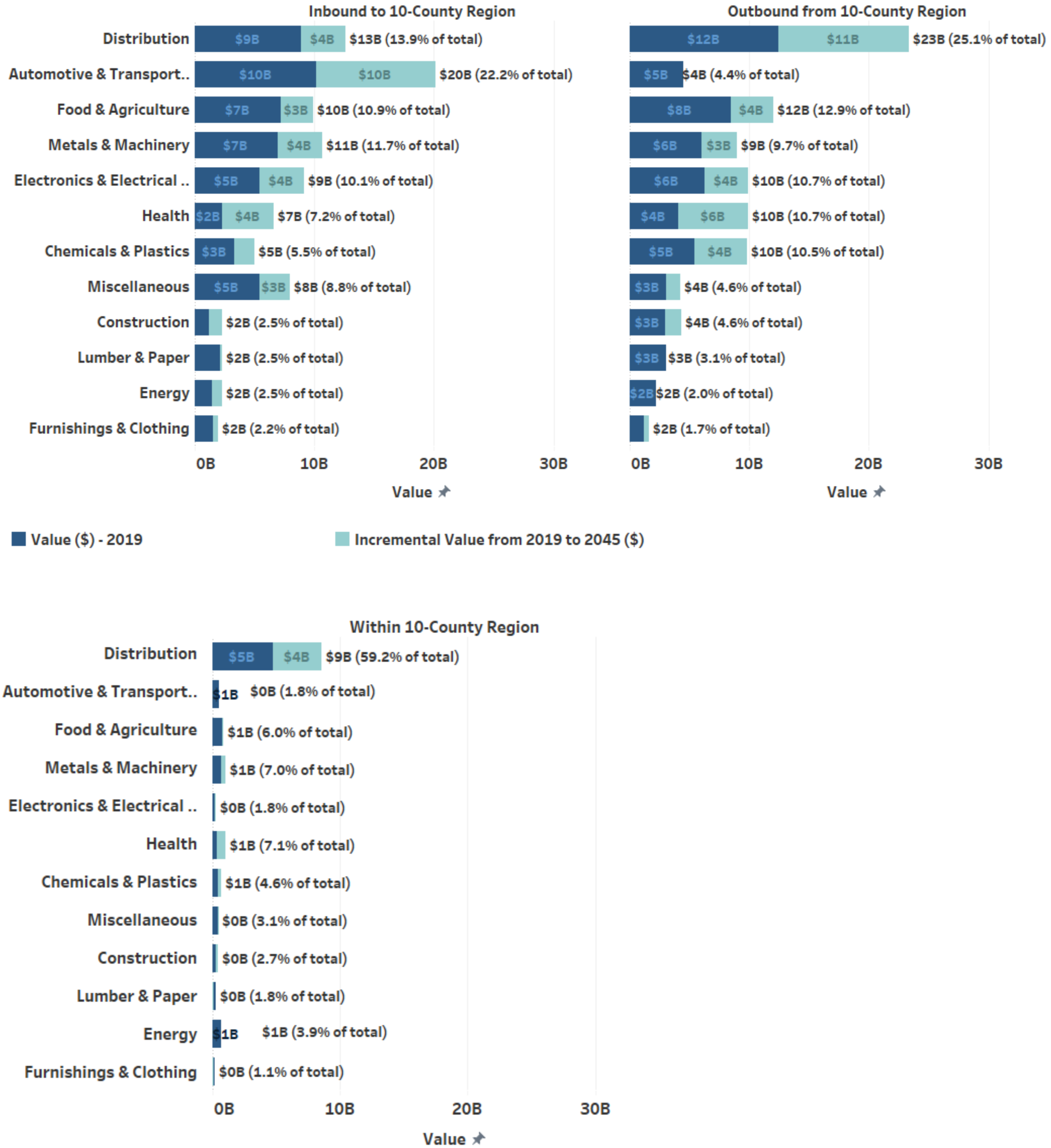
Figure 64: Distribution Traffic Breakdown – EPFA Region



Source: IHS Transearch

Note: Table does not include commodities traveling through EPFA Region, without a EPFA Region origin or destination. "FAK Shipments" refer to "Freight of all Kinds"- reflective of consolidated palleted shipments.

Figure 65: Commodity Movements by Direction of Flow - 2019 and 2045



Source: IHS Transearch

Note: Table does not include commodities traveling through EPFA Region, without a EPFA Region origin or destination.

1.5.2 EPFA Region Rail Commodity Flow Profile

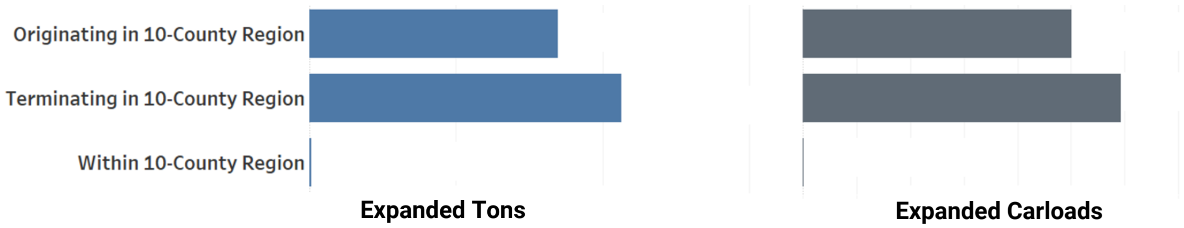
This section describes rail demand within the EPFA study region, including commodity flows, based on Confidential Carload Waybill Sample rail waybill data obtained from the Surface Transportation Board (STB) for 2022 for the region of Pennsylvania.

The STB has instituted updated guidance for using the Carload Waybill Sample requiring a high level of aggregation to protect confidentiality. Thus, figures and presentation of data in this analysis may be limited to percentages, distributions, or maps that cannot be tied to specific tonnage numbers.

1.5.2.1 Summary of Flows by Direction

Figure 66 outlines tonnage flow percentages to, from, and within the EPFA Region by rail. The region receives more rail tonnage than it originates, with only a minority of rail flows both originating and terminating within the region.

Figure 66: EPFA Region Rail Traffic Tonnages by Direction of Flow



Source: WSP analysis of 2021 STB Waybill data

1.5.2.2 Summary of Flows by Commodity - Originating

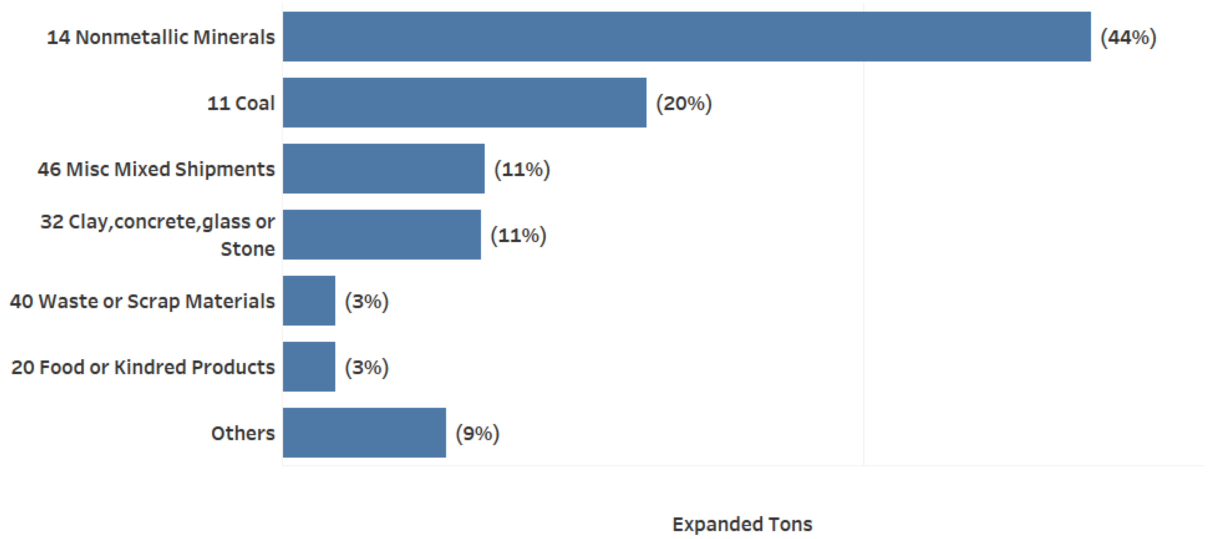
The top commodities originating in the EPFA Region include:

- **Nonmetallic minerals (44% of originating tonnage):** Nonmetallic minerals originating in the region refer primarily to broken stone and rip rap. Berks and Lebanon Counties account for most of the stone and riprap originations in the region.
- **Coal (20% of originating tonnage):** All of the coal shipments within the EPFA region are anthracite coal. These shipments originate in Schuylkill and Luzerne Counties.
- **Miscellaneous mixed shipments (11% of originating tonnage):** These goods originate in Northampton and Lackawanna Counties, and terminate in Cook County in Illinois, which is the largest rail hub in the country. These Freight of all Kinds (FAK) shipments do not refer to specific commodities in particular and may instead be referring to distribution/intermodal traffic.
- **Clay, concrete, glass or stone products (11% of originating tonnage):** These products are primarily used in the construction industry, amongst others. The main products originating in the EPFA Region in this category are Portland cement (~95%) and glassware (~5%). These products primarily originate in Northampton and Berks Counties.
- **Waste or Scrap Material (3% of originating tonnage):** Metal scrap constitutes a majority of this category (~94%) and originates in Berks County.

- **Food or Kindred Products (3% of originating tonnage):** A variety of products constitute the food or kindred products category originating in the region. Prepared or canned feed and alcohol products such as wine and brandy are the top food products originating in the region.

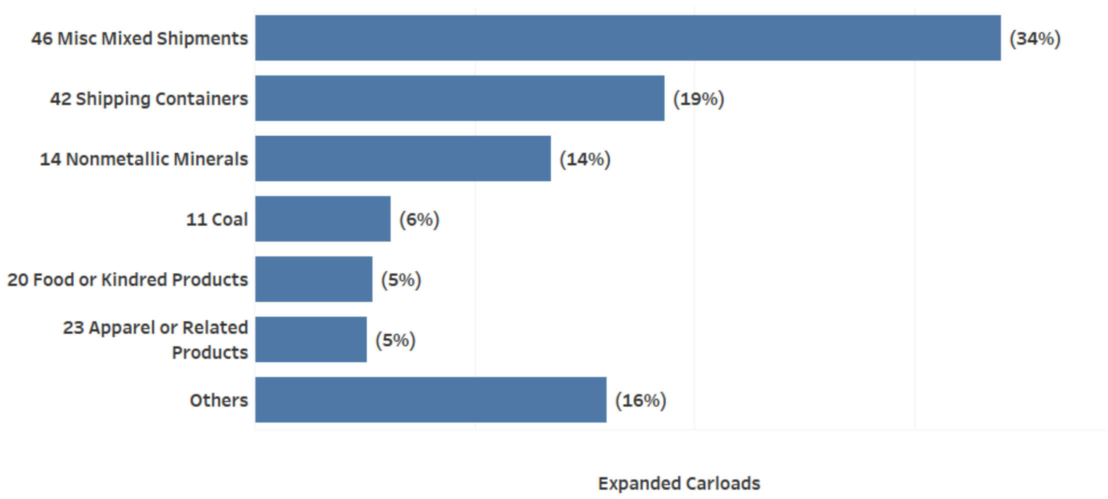
Figure 67 illustrates the top originating commodities by tonnage and Figure 68 illustrates the top originating commodities by carload.

Figure 67: Top Originating Commodities in EPFA Region by Tonnage



Source: WSP analysis of 2021 STB Waybill data

Figure 68: Top Originating commodities in EPFA Region by Carload



Source: WSP analysis of 2021 STB Waybill data

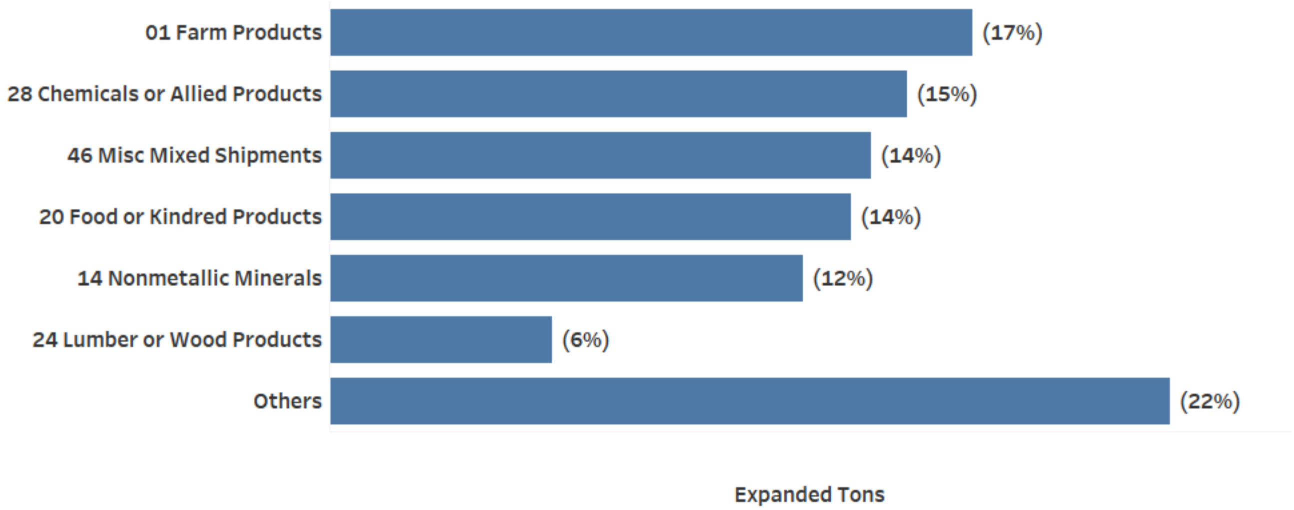
1.5.2.3 Summary of Flows by Commodity - Terminating

The top commodities terminating in the EPFA Region include:

- **Farm products (17% of terminating tonnage)**: The main farm products terminating in EPFA Region are primarily grain (97%) and oil kernels, nuts and seeds (3%). Monroe and Northampton Counties account for 95% of all terminating farm product tonnage.
- **Chemical or allied products (15% of terminating tonnage)**: Chemical products terminating in the region refer to plastic, organic and inorganic chemicals used in industry as well as potassium and sodium compounds. These terminations are distributed across the region, with Northampton, Luzerne and Lehigh Counties accounting for a total of 72% of all terminating chemical product tonnage.
- **Miscellaneous mixed shipments (14% of terminating tonnage)**: These goods terminate in Northampton and Lackawanna Counties, and refer primarily to distribution/intermodal traffic and Freight of all Kinds (FAK) shipments.
- **Food or Kindred Products (14% of terminating tonnage)**: A variety of products constitute the food or kindred products category terminating in the region. Corn milling products, flour and other grains, frozen fruits and vegetables as well as malt are the top food products terminating in the region, accounting for over 65% of total food product terminations. Lehigh County accounts for 47% of food product terminations, while Northampton County (37%) is the second largest recipient in the region. In general, county distribution of food product terminations follow the general population distribution across the region.
- **Nonmetallic minerals (12% of terminating tonnage)**: Nonmetallic minerals originating in the region refer primarily to fertilizer and other chemical minerals (85%), as well as stone and rip rap. Berks, Lackawanna and Lebanon counties account for most of the fertilizer and chemical mineral terminating tonnage within the region (96%).
- **Lumber or Wood products (6% of terminating tonnage)**: Lumber and treated wood products constitute the majority of tonnage in this category. These shipments terminate throughout the region, with Northampton, Monroe and Luzerne Counties being the top 3 recipients of these products.

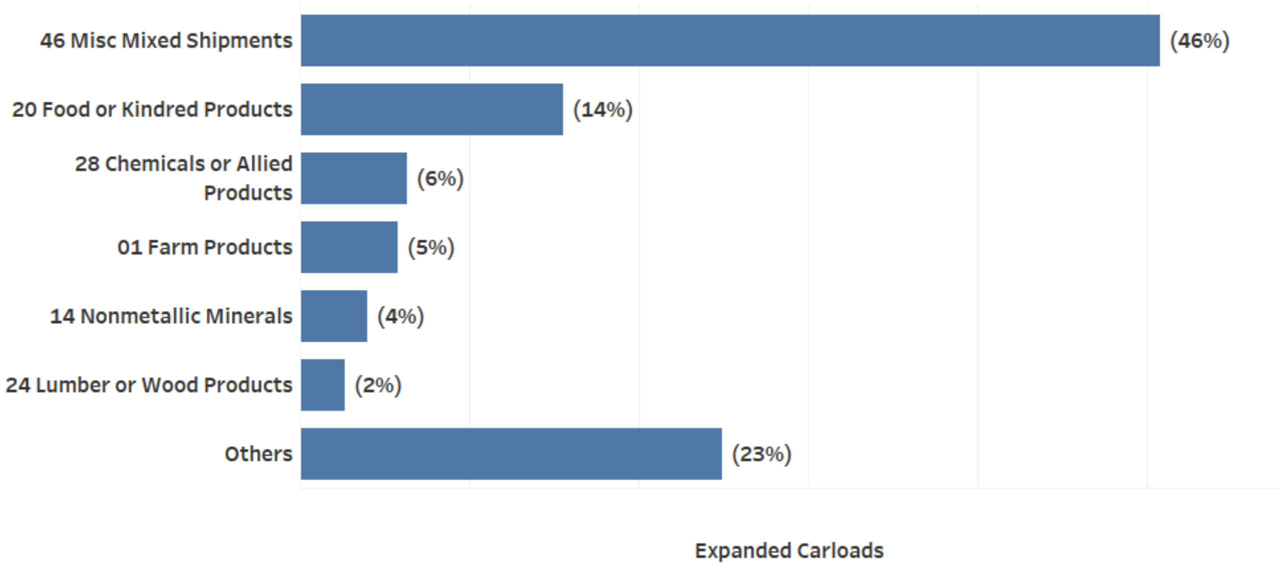
Figure 69 illustrates the top terminating commodities by tonnage and Figure 70 illustrates the top terminating commodities by carload.

Figure 69: Top Terminating Commodities in EPFA Region by Tonnage



Source: WSP analysis of 2021 STB Waybill data

Figure 70: Top Terminating Commodities in EPFA Region by Carload

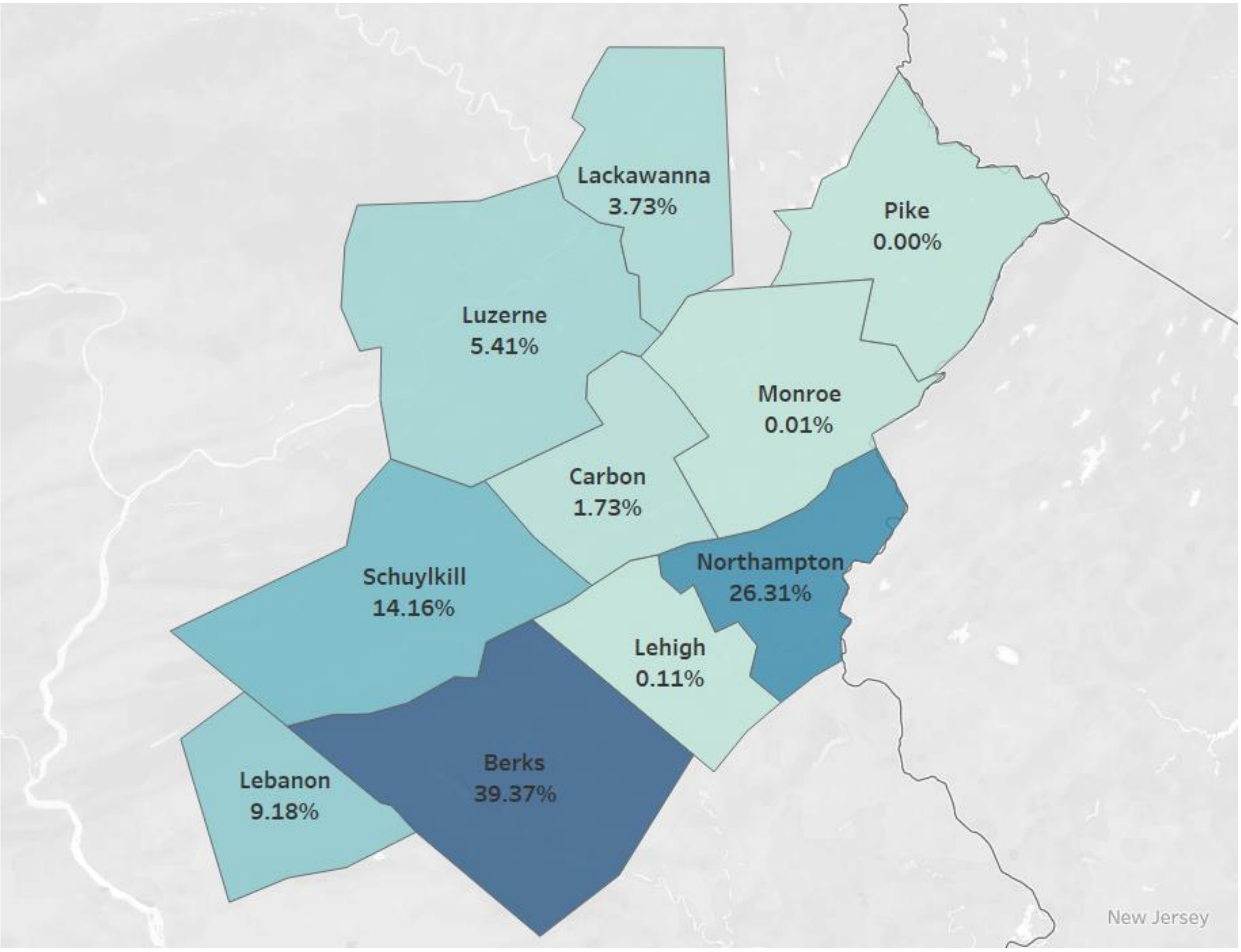


Source: WSP analysis of 2021 STB Waybill data

1.5.2.4 Geography of Freight Flows – Origins/Destinations

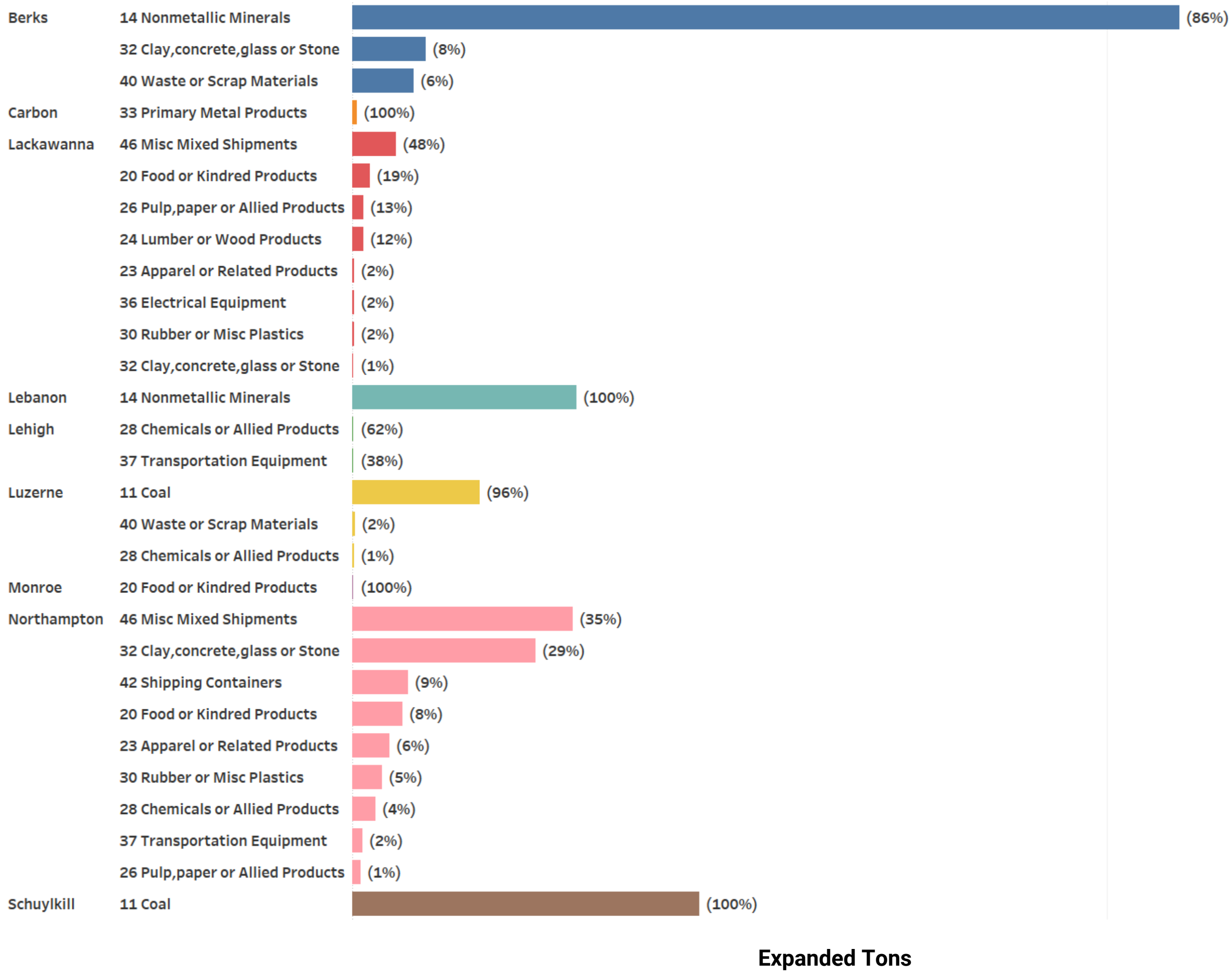
The top originating counties in the region are Berks (39%), Northampton (26%), Schuylkill (14%) and Lebanon (9%) Counties (Figure 71). Berks and Lebanon Counties primarily ship nonmetallic minerals, while Northampton and Lackawanna Counties ship intermodal and distribution/intermodal traffic, and Schuylkill County ships coal (Figure 72).

Figure 71: Originating Rail Tonnages by County



Source: WSP analysis of 2021 STB Waybill data

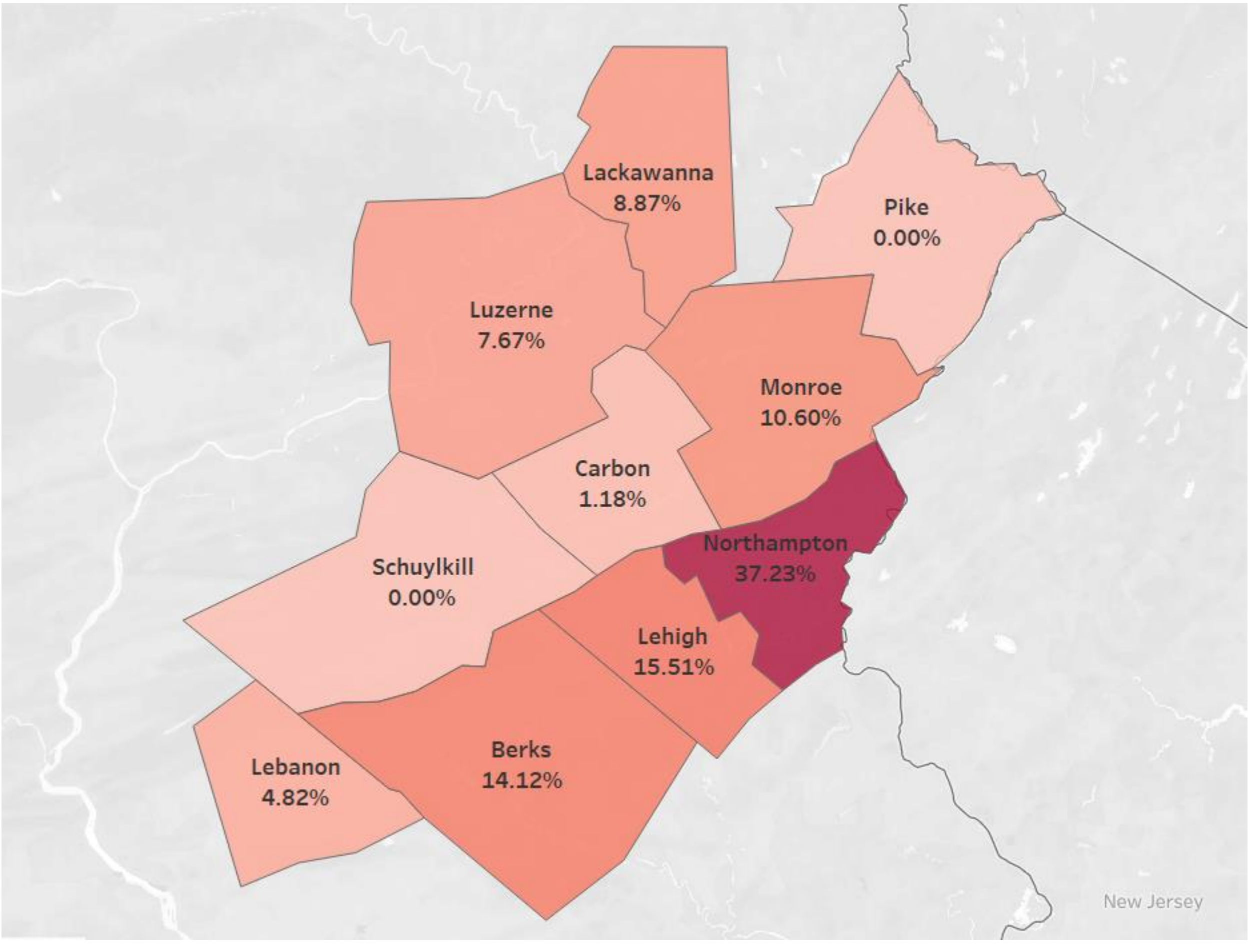
Figure 72: Originating Rail Tonnages by County and Commodity



Source: WSP analysis of 2021 STB Waybill data

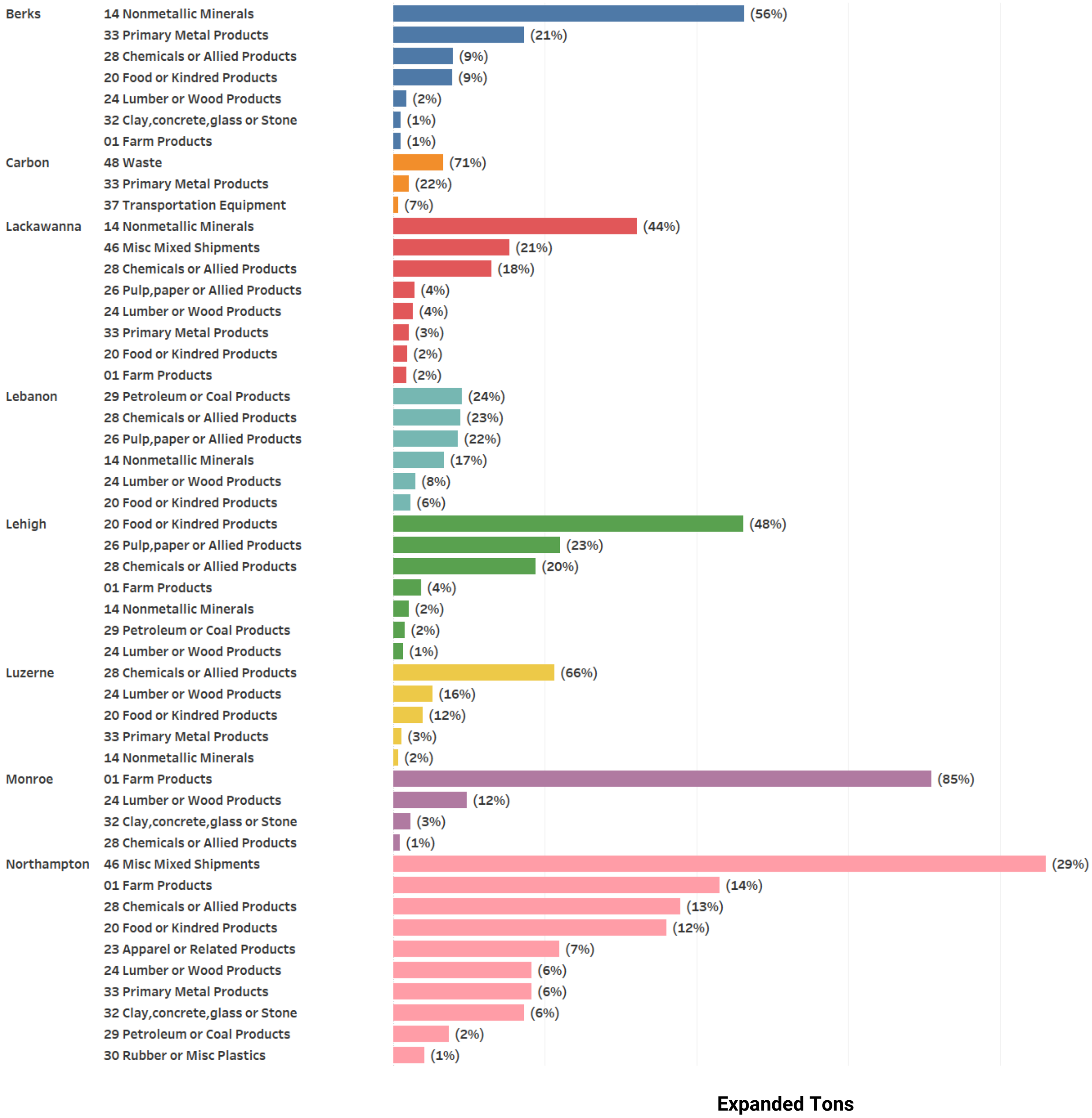
The top terminating counties in the region are Northampton (37%), Lehigh (16%), Berks (14%), and Monroe (11%) (Figure 73). Terminating traffic generally is impacted not just by industrial presence but also population counts. Northampton County received a variety of shipments, including distribution/intermodal traffic, farm products, chemicals, food and others. Berks County received nonmetallic minerals and metal products, while Lehigh received food products as well as paper (Figure 74).

Figure 73: Terminating Rail Tonnages by County



Source: WSP analysis of 2021 STB Waybill data

Figure 74: Terminating Rail Tonnages by County and Commodity

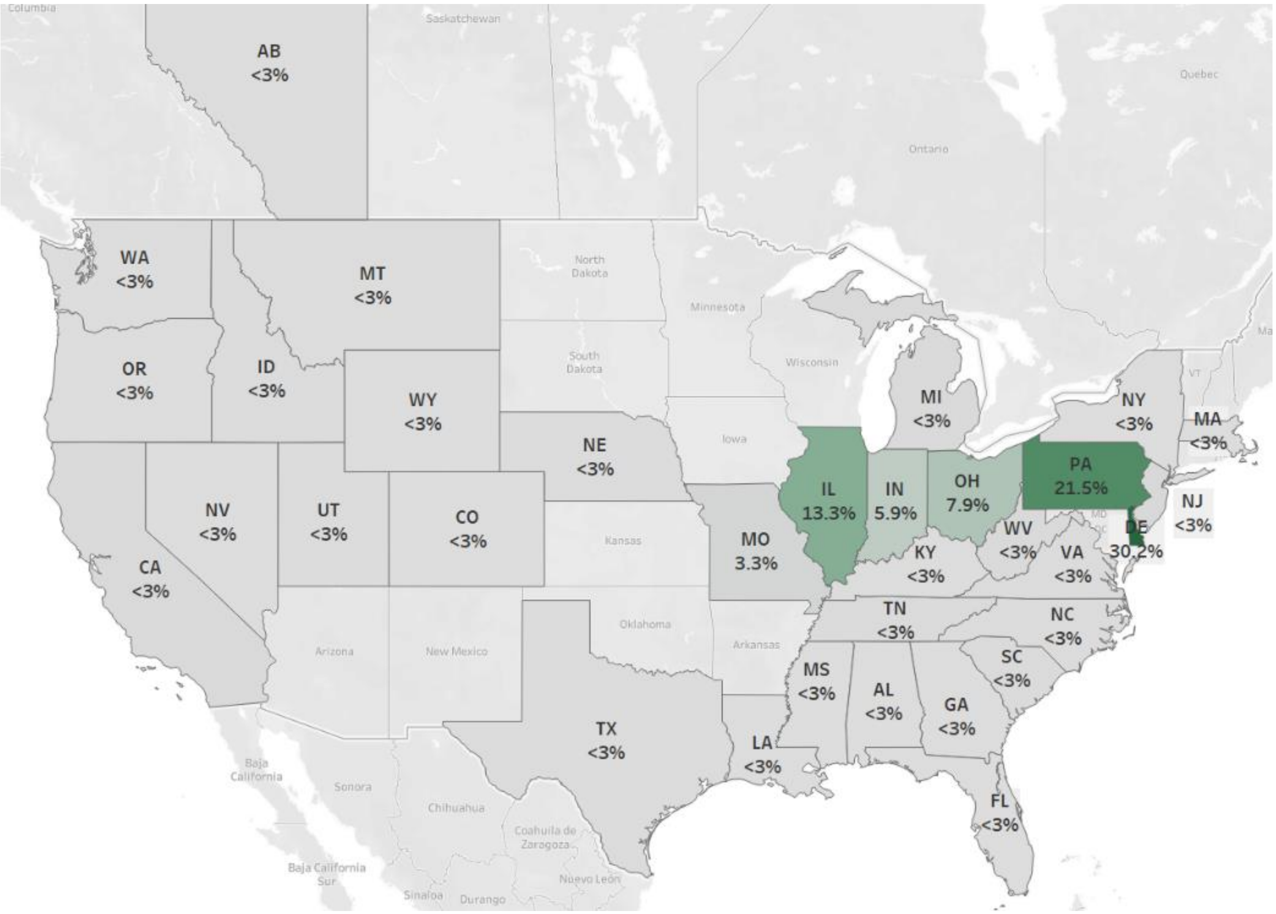


Source: WSP analysis of 2021 STB Waybill data

1.5.2.5 Geography of Freight Flows – Top Trading Partners

Outbound traffic from the region moves primarily to locations in the Midwest (Figure 75). The top 5 destinations for tonnage originating in the EPFA region are Delaware (30%), other counties in Pennsylvania (22%), Illinois (13%), Ohio (8%), and Indiana (6%). Traffic to Delaware primarily consists of the broken stone and riprap produced in Berks and Lebanon counties, while the remainder of Pennsylvania received both coal and stone/riprap. Traffic to Illinois is primarily comprised of intermodal movements (Chicago is the biggest rail hub in the country) and that traffic is not necessarily terminating in Illinois. Ohio received cement produced in Northampton and Berks Counties.

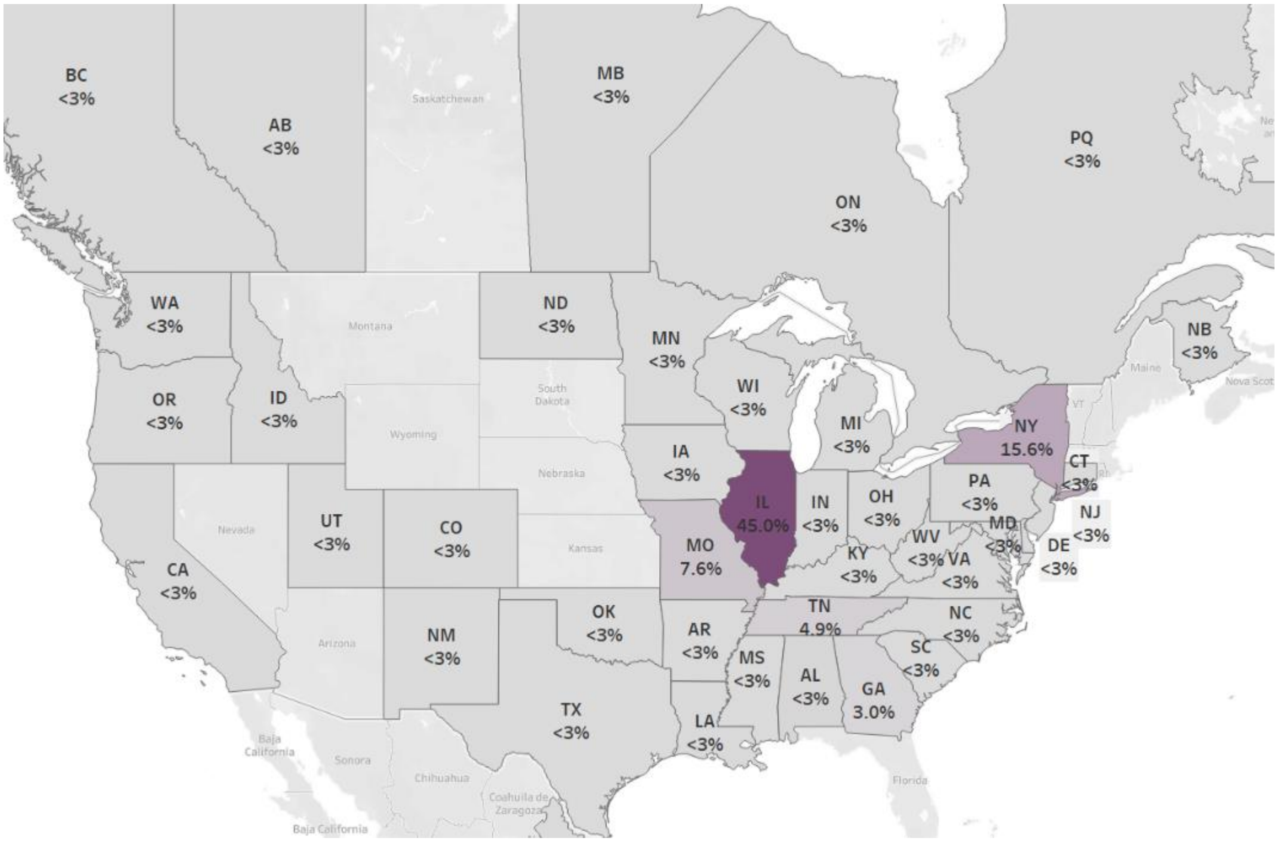
Figure 75: Outbound Rail Trade Partners



Source: WSP analysis of 2021 STB Waybill data

Inbound traffic to the region moves from regions across the country, with no specific regional patterns discernible (Figure 76). The top 5 regions for which the region is a termination point or acts as a gateway to rail traffic are Illinois (45%), New York (16%), Missouri (8%), Tennessee (5%), and Georgia (3%). Traffic from Illinois consists of intermodal movements, grain shipments, corn products and plastic, and that traffic is not necessarily originating in Illinois. Traffic from New York primarily consists of fertilizer and chemical minerals bound for Berks, Lebanon and Lackawanna counties. Traffic from Missouri includes mixed shipments, grain, textile and canned feed, while traffic from Tennessee is similar to traffic from Illinois, with mixed shipments and corn making up a bigger proportion of inbound traffic. Georgia primarily sends lumber and asphalt to the region.

Figure 76: Inbound Rail Trade Partners



Source: WSP analysis of 2021 STB Waybill data

1.5.3 Congestion Bottleneck Analysis

A data-driven analysis was used to identify truck bottlenecks in the EPFA region. The analysis used findings from the NCHRP Report 925[8] to estimate the costs that congestion generates for trucking companies and businesses that use trucking services. This assessment identifies bottlenecks through a more complete estimation of congestion costs to supply chains and the broader economy, which is critical for prioritizing and right-sizing solutions.

Figure 77 lists the steps in the analysis. First, 2021 travel-time data from the National Performance Management Research Data Set (NPMRDS) published by the Federal Highway Administration (FHWA) was combined with hourly truck volume data to calculate the two congestion metrics NCHRP Report 925 recommends: Vehicle Hours of Excess Travel (VHET) and Vehicle Hours of Unreliability (VHU). The first metric quantified the impact of recurring congestion (the number of hours of travel above free flow conditions, estimated by comparing average travel times to free flow travel times) while the later metric quantified non-recurring congestion (a measure of unreliability estimated by difference between the 95th percentile travel time and the average travel time). The monetization parameters from NCHRP Report 925 were used to estimate the user costs incurred by trucks as they face recurring and non-recurring congestion. Specifically, VHET was monetized at $66/hour, which is the cost of operating a truck for one hour based on American Transportation Research Institute Operational Cost of Trucking Report, and VHU was monetized at $160/hour, which is the estimated cost incurred for each hour of unreliability.

The estimated user costs were used to evaluate delay at congested locations, generating significant costs to the movement of freight and representing bottlenecks for truck operations. The roadway network was broken up into "Urban Lehigh," and "Other" categories, so that congested roads are prioritized relative to other roads of the same type. Otherwise, urban bottlenecks in Lehigh County would dominate the regionwide analysis. The thresholds used to identify bottlenecks were set at the 90th percentile user costs per mile (top 10 percent of segments generating congestion costs).

[8] Guerrero, S. E., Hirschman, I., Bryan, J., Noland, R., Hsieh, S., Schrank, D., and Guo, S. 2019. NCHRP Research Report 925: Estimating the Value of Truck Travel Time Reliability, Transportation Research Board, National Academies of Science, Engineering and Medicine.

Figure 77: Bottleneck Identification Overview

Objective	Steps
Calculation of Congestion Metrics 	Processed National Performance Management Research Data Set
	Approximated hourly truck volumes
	Estimated recurring congestion and non-recurring congestion metrics
	Estimated user costs
Bottleneck Identification 	Categorize by Urban Lehigh, and Other
	Set bottleneck thresholds

Source: NCHRP Report 925 and WSP Methodology

1.5.3.1 Travel Time Data

Data from NPMRDS were acquired that report the travel times of trucks in the EPFA region every 15 minutes of 2021, resulting in 42 million travel time observations. INRIX compiled this data set from providers of location services for truck fleets.

NPMRDS reports only travel times on the National Highway System (NHS), which in the EPFA region includes 2,561 segments, summing 2,313 centerline miles of roadway. The FHWA defines the NHS as "roadways important to the nation's economy, defense, and mobility," including interstates, other principal arterials, the Strategic Highway Network, major strategic highway network connectors, and intermodal connectors. Therefore, this network is likely to consider many of the roads that are important for freight operations in the state. NPMRDS segments tend to be shorter in urban areas—where there is a higher density of intersections and interchanges—but longer in rural areas. Opposite directions of travel are treated separately in this data.

Several steps were taken to process the NPMRDS following guidance from NCHRP Report 925 so that the congestion metrics could be calculated accurately and consistently: Travel time records were excluded from the analysis if they took place on weekends or during major holidays.[9] Unique traffic operations are common during these days.

Travel time records were averaged at the 15-minute level to reduce the influence of idiosyncratic variation on congestion estimates (this helps exclude the fact that different people tend to drive at different speeds when estimating roadway congestion and reliability). Roadway segments that had less than 100 records per direction were excluded.

Further, the congestion metrics considered how truck volumes vary throughout the network and for different hours of the day. It is possible, and even likely, that roads with poor speeds and reliability see few trucks, because truck drivers avoid known bottlenecks. Truck drivers also avoid driving during congested hours of the day if they can. The congestion metrics therefore considered truck volumes at the hourly level, so that the bottlenecks identified reflect where trucks are traveling and not just where congestion occurs on the roadway network.

There is no data that describes how truck volumes vary on the NHS throughout the day. However, these volumes were approximated using historical national data.

Figure 78 illustrates the pattern of user congestion costs concentrated in urban Lehigh while Figure 79 illustrates a pattern of user congestion costs and bottlenecks in all other parts of the region.

[9] For the purpose of this analysis, "major holidays" include New Year's Day, Martin Luther King Jr. Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving, and Christmas

Figure 78: Urban Lehigh User Congestion Costs

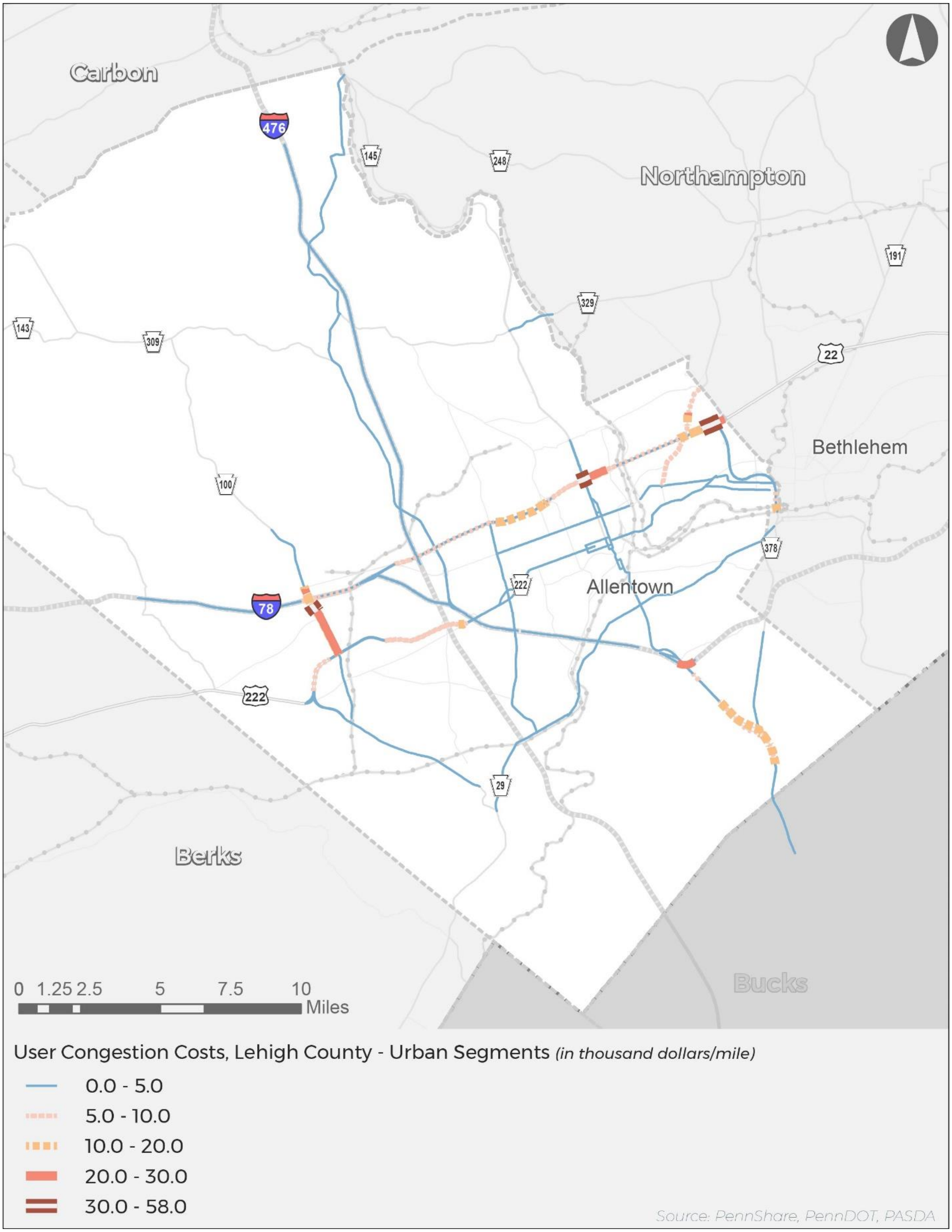
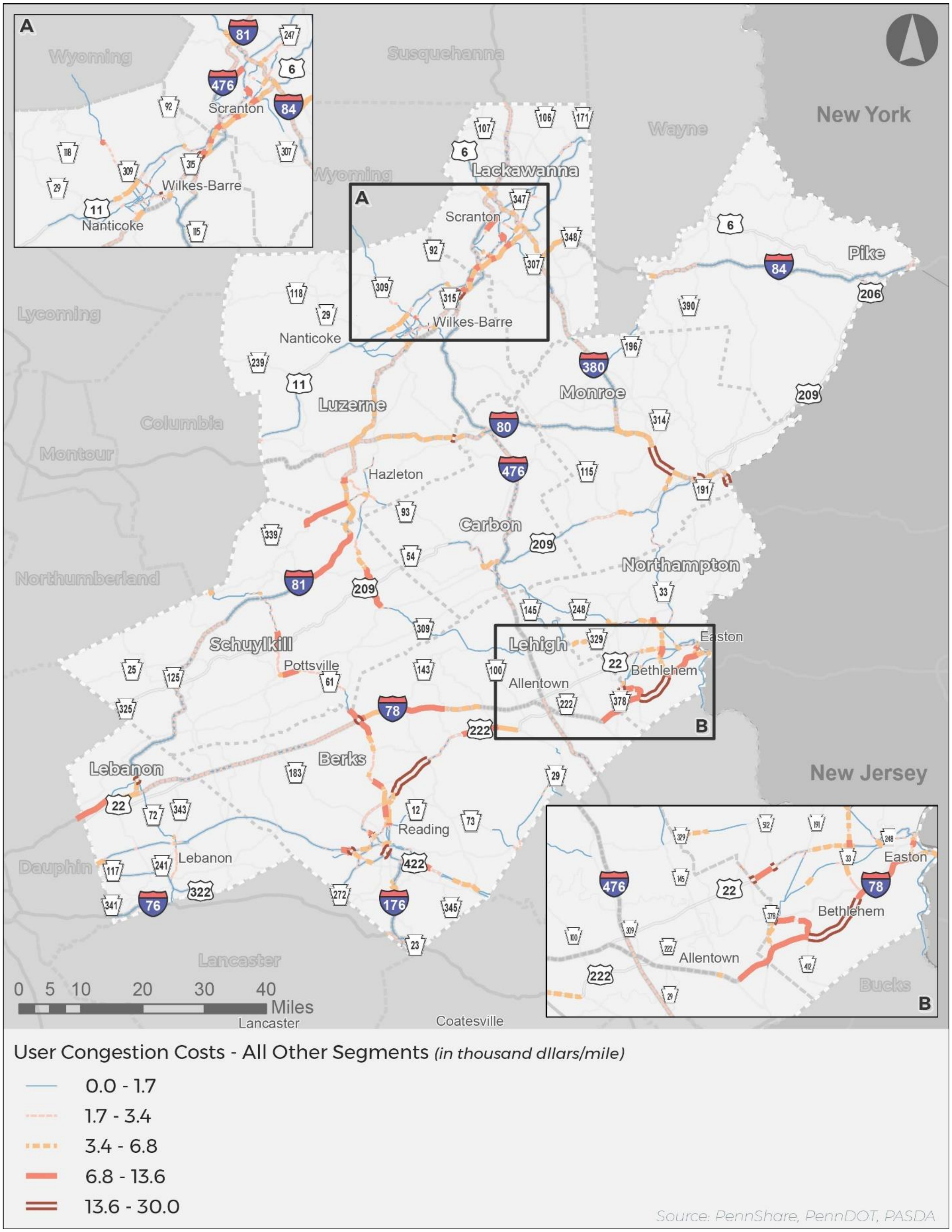


Figure 79: User Congestion Costs (Counties Other Than Lehigh)



1.5.3.2 Bottleneck Identification

The thresholds used to identify bottlenecks were set at the top 10 percent of user costs per mile for each bottleneck type (Urban Lehigh, and Other). Bottlenecks in urban metropolitan areas typically have different magnitude and characteristics than bottlenecks in other areas. If the same threshold was used throughout the region, the highly congested roads in metropolitan areas would dominate the results. Within the EPFA region, bottlenecks in Lehigh County would dominate the results with higher freight movements to/from distribution centers in the county creating higher likelihood for truck congestion. Table 34 shows these thresholds. Roads were classified as being Urban based on the distinction made in NPMRDS (based on US Census Bureau designations). "Urban Lehigh" is defined as urban roads in Lehigh County while the "Other" category includes all other segments in the EPFA region.

There were 40 roadway segments in Urban Lehigh with user costs higher than the threshold (in the NPMRDS each segment is defined by a unique Traffic Message Channel/TMC), totaling 16 centerline miles of roadway. In the Other category, 217 roadway segments were above the threshold, reflecting 199 centerline miles of roadway. Figure 80 displays a map of the bottlenecks, showing thorough coverage throughout the region. Table 35 and Table 36 detail the top 20 Urban Lehigh and Other bottlenecks respectively.

Table 34: Truck Bottleneck Thresholds and Totals

Bottleneck Type	User Cost Threshold ($/mile-day)	Bottleneck Centerline Roadway Miles	Number of Bottleneck Segments (TMCs)
Urban Lehigh	$9,202	16	40
Other	$5,276	199	217
	Total	**215**	**257**

Source: NPMRDS and NCHRP Report 925

Figure 80: Urban Lehigh and Other Bottlenecks

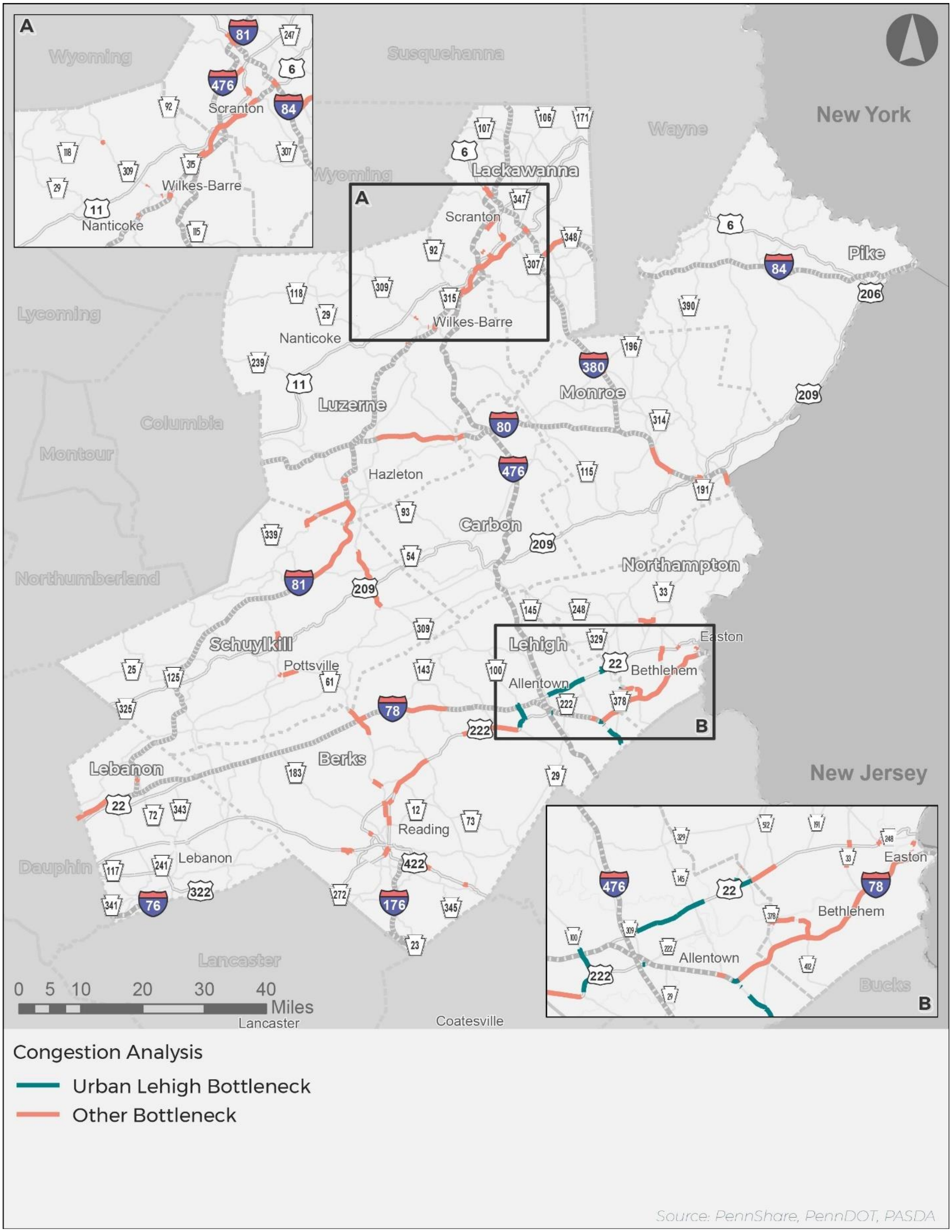


Table 35: Top 20 Urban Lehigh Bottleneck Segments

Rank	County	Road Name	Direction	Location	Length (Miles)	Avg. User Cost per mile	Avg. Daily Truck Volume
1	Lehigh	PA-100	SB	S. of Penn Drive	0.02	$57,627	3,326
2	Lehigh	PA-100	SB	Between I-78 and Penn Drive	0.22	$45,360	3,077
3	Lehigh	US-22	WB	W of PA 378	0.53	$31,839	4,045
4	Lehigh	US-22	WB	At PA 145	0.34	$31,506	3,992
5	Lehigh	PA-100	NB	Between Penn Drive and I-78	0.16	$26,845	3,326
6	Lehigh	US-22	WB	W of Schoenersville Rd	0.12	$26,196	4,403
7	Lehigh	PA-100	NB	US 222 to Penn Drive	1.26	$24,726	1,796
8	Lehigh	PA-100	NB	I-78 to Tilghman Street	0.12	$24,277	1,554
9	Lehigh	US-22	WB	Fullerton Avenue to PA 145	0.49	$23,739	4,171
10	Lehigh	I-78	EB	At PA 309 Exit	0.47	$22,537	7,349
11	Lehigh	PA 987	SB	City Line Road to Postal Road	0.07	$21,103	1,180
12	Lehigh	PA-100	SB	At US 222	0.05	$20,991	1,457
13	Lehigh	US-22	WB	E of Airport Road	0.17	$18,759	3,341
14	Lehigh	PA-100	SB	Tilghman Street to I-78	0.1	$17,944	1,554
15	Lehigh	PA-100	NB	At Tilghman Street	0.07	$17,880	1,189
16	Lehigh	US-22	EB	At PA 145 Exit	0.35	$16,322	3,982
17	Lehigh	PA 987	SB	Postal Road to US 22	0.28	$15,857	1,180
18	Lehigh	PA-100	SB	At Tilghman Street	0.06	$15,775	1,123
19	Lehigh	PA-100	SB	Penn Drive to US 222	1.23	$15,408	1,768
20	Lehigh	PA-100	NB	At US 222	0.05	$14,979	1,457
				Total:	**6.16**		

Table 36: Top 20 Other Bottleneck Segments

Rank	County	Road Name	Direction	Location	Length (Miles)	Avg. User Cost per mile	Avg. Daily Truck Volume
1	Berks	Allentown Pike	NB	US 222 BUS to PA 73	1.15	$30,036	2,230
2	Berks	Allentown Pike	NB	at US 222 BUS Exit	0.46	$29,362	1,919
3	Monroe	Del. Water Gap Toll Br	EB	I-80 Bridge	0.07	$25,216	4,437
4	Monroe	I-80	EB	Approaching I-80 Bridge	0.34	$24,767	4,437
5	Luzerne	PA-315	NB	I-81 to I-476	0.3	$24,644	1,238
6	Carbon	State Rd	WB	At US 209	0.02	$23,977	840
7	Monroe	Del. Water Gap Toll Br	WB	I-80 Bridge	0.06	$22,664	4,437
8	Monroe	I-80	EB	Approaching I-80 Bridge	0.07	$22,548	4,444
9	Northampton	US-22	WB	at PA 378 Exit	0.28	$20,139	4,403
10	Monroe	I-80	EB	Approaching I-80 Bridge	0.23	$19,329	4,455
11	Berks	Lancaster Ave	NB	PA 625 to US 422	0.6	$19,229	869
12	Berks	S 4TH St	SB	US 422 to Pine Street	0.49	$18,435	1,019
13	Berks	Allentown Pike	SB	at US 222 BUS Exit	0.23	$18,390	1,756
14	Berks	Kutztown Rd	SB	PA 73 to PA 662	4.07	$18,162	2,292
15	Berks	PA-61	SB	at I-78 Exit	0.4	$17,560	1,341
16	Berks	PA-61	NB	at I-78 Exit	0.44	$17,551	1,339
17	Berks	US-222-BR	NB	at US 422 Exit	0.01	$17,509	1,019
18	Lebanon	Fisher Ave	NB	at I-81 Exit	0.36	$17,362	496
19	Northampton	I-78	WB	at PA 412 Exit	0.48	$16,790	7,491
20	Monroe	I-80	WB	at PA 33 Exit	0.62	$16,631	4,349
				Total:	**10.68**		

1.5.4 Truck Parking Analysis

The inability to find safe parking is one of the top issues for truck drivers around the country and is especially magnified in freight intensive regions such as the EPFA study area. Truck drivers have to park for several reasons, as shown in Figure 81. These include:

- **Overnight/Long-Term:** Hours of Service (HOS) requires drivers to have 10 consecutive hours off duty after driving for 11 hours. There are other limits on the number of hours that can be driven per week carrying cargo. To meet these rest requirements, truck drivers need to park along their trip route, typically overnight. Consequently, the demand for long-term parking is highest in the evening, and especially high along national freight corridors such as I-80, I-81, and I-78.
- **30-minute Break:** Truck drivers need to take short breaks to access amenities, such as food services and restrooms, and to meet HOS requirements. The 30-minute rule requires that drivers do not drive more than eight hours before taking an off-duty or sleeper-berth rest for at least 30 minutes. While this rule was relaxed during the COVID-19 pandemic, truck drivers still need to park for short rests and meals. This type of parking typically occurs roadside, during daytime hours.
- **Staging:** Truck drivers also need to park near the termination of their trip for staging purposes. Truck drivers want to arrive early and park outside or near their destination to meet delivery appointment windows. Because it is unlikely for parking facilities to be available nearby, they often park in undesignated locations along roads or in vacant lots. This staging parking occurs in different locations than long-term parking and has different motivations. The schedules of receivers and their on-time performance requirements dictate how much buffer truck drivers build into their schedule, and how early they arrive at the destination. Staging parking is also common after making a delivery and searching for a new load to pick up, or when making a delivery to a commercial establishment, such as a retail store or restaurant.
- **Emergency:** Unexpected events can cause truck drivers to need to park roadside. This can involve a mechanical issue, a health emergency, or anything that requires the driver to make an unexpected stop. Adverse weather, such as a snowstorm or fog, can also force truck drivers to pull over for safety reasons. Because these types of parking needs are difficult to anticipate, parking availability throughout key freight corridors is critical to ensure that drivers can stop in safe locations when managing an emergency.
- **Time Off:** Drivers need parking spaces when off duty. Trucks that are part of fleets can park at terminals or private parking facilities for extended periods of time, but independent owner-operators do not have access to these facilities. Parking a truck at home is common in rural areas, but in urbanized areas such as much of Eastern PA it is often impossible and generally undesirable.

Figure 81: Primary Types of Truck Parking

Overnight/Long Term	Staging	30-minute break	Emergency	Time off
Long-haul drivers stop overnight for rest as they travel across the country. Need amenities, food services, and a safe and secure place to rest. Typically, the least availability overnight.	Truck drivers picking up and delivering freight at industrial and commercial establishments need a place to park as they wait for their delivery appointment or for next load to be assigned.	Truck drivers often must make short stops to meet federal rest requirements, or access amenities and food services. Typically, during the day.	Truck drivers might need to stop for mechanical issues with the truck or unexpected events, such as severe weather.	Independent drivers don't have a company facility to provide parking during time off. They are done with their work week and need a place to park their truck while off-duty.

Source: Adapted from FHWA

Understanding the main reasons truck drivers need to park is critical to ensuring the right type of parking spaces are available at appropriate locations. Long-term parking concentrations adjacent to freight corridors experience overnight demand peaks, while staging parking concentrates in commercial/industrial areas and often in the morning when most deliveries are scheduled. Short-break or emergency parking can occur at any time of the day, but typically concentrates along freight corridors and where amenities are available. Demand for time-off parking depends on the concentration of independent owner-operators and availability of alternatives.

1.5.4.1 Benefits of Ensuring Truck Parking Availability

Ensuring that trucks can find a safe parking space when needed has numerous benefits, as shown in Figure 82. The framework provided in this section expands on the recently published FHWA Truck Parking Development Handbook.[10] Limited availability of parking spaces on or near their route forces truck drivers to spend more time searching for parking and taking longer detours to find open space. This increases the Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) required to move freight. Drivers might have specific parking requirements related to truck size, cargo content, or services needed, which makes it even more difficult to find a suitable space. Projects that make it easier for truck drivers to find a spot and avoid lengthy detours can result in significant benefits nearby communities by reducing pollution and emissions, decreasing the crash risk on roads, decreasing pavement deterioration, or reducing trucking costs.

When detours needed to find a spot are too long, especially in situations where drivers may run out of HOS, drivers may park in undesignated locations along their route such as on highway shoulders, interchanges, ramps, or vacant lots. Research has connected difficulties in finding parking spaces with the frequency of undesignated parking:[11] A recent survey found that 90% of truck drivers park in

[10] https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/docs/Truck_Parking_Development_Handbook.pdf
[11] Cherry, C.R., Boggs, A., Franceschetti, N., Ling, Z., and Nambisan, S. 2016. *Truck Parking Facilities and Ramp Parking: Role of Supply Demand, and Ramp Characteristics*. Research Report RES2016-07.

undesignated locations at least once per week, and that the most important factors driving this decision were the lack of parking and proximity to the route and destination.[12]

Parking in undesignated locations is undesirable and potentially create hazards or safety risks for all roadway users, including the truck and driver. Undesignated parking on roadway shoulders presents a crash risk with through traffic because of large speed differentials. Because highway shoulders are considered part of the roadside safety clear zone, a truck parked in this area becomes a roadside hazard. Some shoulders are not wide enough to fully accommodate trucks and separate them from other moving vehicles. Trucks also have to decelerate or accelerate in the traffic stream to park on the shoulder, which poses an additional safety risk—especially when the truck is loaded. Some shoulders have a higher cross slope than the mainline, or are not paved to the same standards, which can exacerbate safety risks. Undesignated parking on the shoulders can also prevent other vehicles from using the shoulders, which poses additional safety risks—particularly during emergency situations. Undesignated parking in urban areas can obstruct line-of-sight, making it harder for other drivers to make safe decisions, and can also obstruct through lanes or bike lanes.

Difficulty finding parking reduces the efficiency of truck operations by increasing transportation costs for businesses in the region. Over time, this will make those businesses less competitive and hurt economic growth. Trucking costs may be increased by drivers stopping to secure parking earlier in the day than they would prefer to. Surveys in statewide truck parking studies show that drivers often stop 30 minutes to one hour before the end of their HOS due to low parking availability. This translates into lost productivity for the sector and higher costs for consumers. Additionally, detours to find parking spaces are costly to vehicle operations (fuel, wear and tear, or other expenses).

Projects, policies, and strategies that improve the availability of truck parking will reduce these negative impacts and costs and make trucking sector operations more efficient and reliable. And equally important, as inadequate and potentially dangerous accommodations are distracting and make an already challenging job even harder, adequate parking considerably improves the quality of life of truck drivers. Timely access to amenities and a safe, secure place to rest for the night are critical to ensuring drivers get ample rest and are fully alert and focused on the task at hand once they are back on the road. Access to amenities and a secure place to park is critical to addressing the driver shortage and enhancing retention.

[12] Boris, C. and Brewster, R. 2018. "A Comparative Analysis of Truck Parking Travel Diary Data," *Transportation Research Record*, 2672(9).

Figure 82: Benefits of Truck Parking Availability

Reduced Undesignated Parking

- Improved highway safety
  - Shoulder crash risk
  - Blocked shoulders
- Improved urban safety
  - Line of sight obstruction
  - Blocking travel lane
- Reduced pavement/ shoulder damage
- Reduced cleanup
- Less theft

Avoided Detours Searching for a Spot

- Fewer miles and hours driving to find parking
- Decreased trucking costs
- Reduced emissions
- Less fuel consumption
- Reduced crash risk
- Reduced congestion

Improved Trucking Productivity and Reliability

- Increased productive drive time per day
- Increased non-driving productivity
- Driver quality of life/retention
- Better rested drivers
- Improved resiliency

1.5.4.2 Parking Demand Analysis

Geotab truck telematics data was acquired to better understand truck parking demand in the state. Fifteen major truck parking facilities were identified in the study region by reviewing public sources. Table 37 lists the facilities identified, indicating the nearby town or city and major road to which they are adjacent. These facilities were georeferenced and ran through the Geotab Altitude Platform, to estimate the characteristics of the trucks parking there and the function the facilities play in regional truck operations. The last column in Table 37 shows the percent of truck parking events by facilities, which shows how parking demand distributes throughout the state. The parking facility within the EPFA Study Area that receives the most activity is the Flying J Truck Stop in Frystown, accounting for nearly one-quarter of all truck parking in the region. This is a full-service facility with 140 spaces for trucks. The second largest facility is the Love's Truck Stop in Shartlesville, accounting for 16 percent of all truck parking activity, followed by the Allentown Service Plaza, accounting for 14 percent of parking demand. These three parking facilities account for over one-half of all truck parking activity at major truck stops or rest areas within the region.

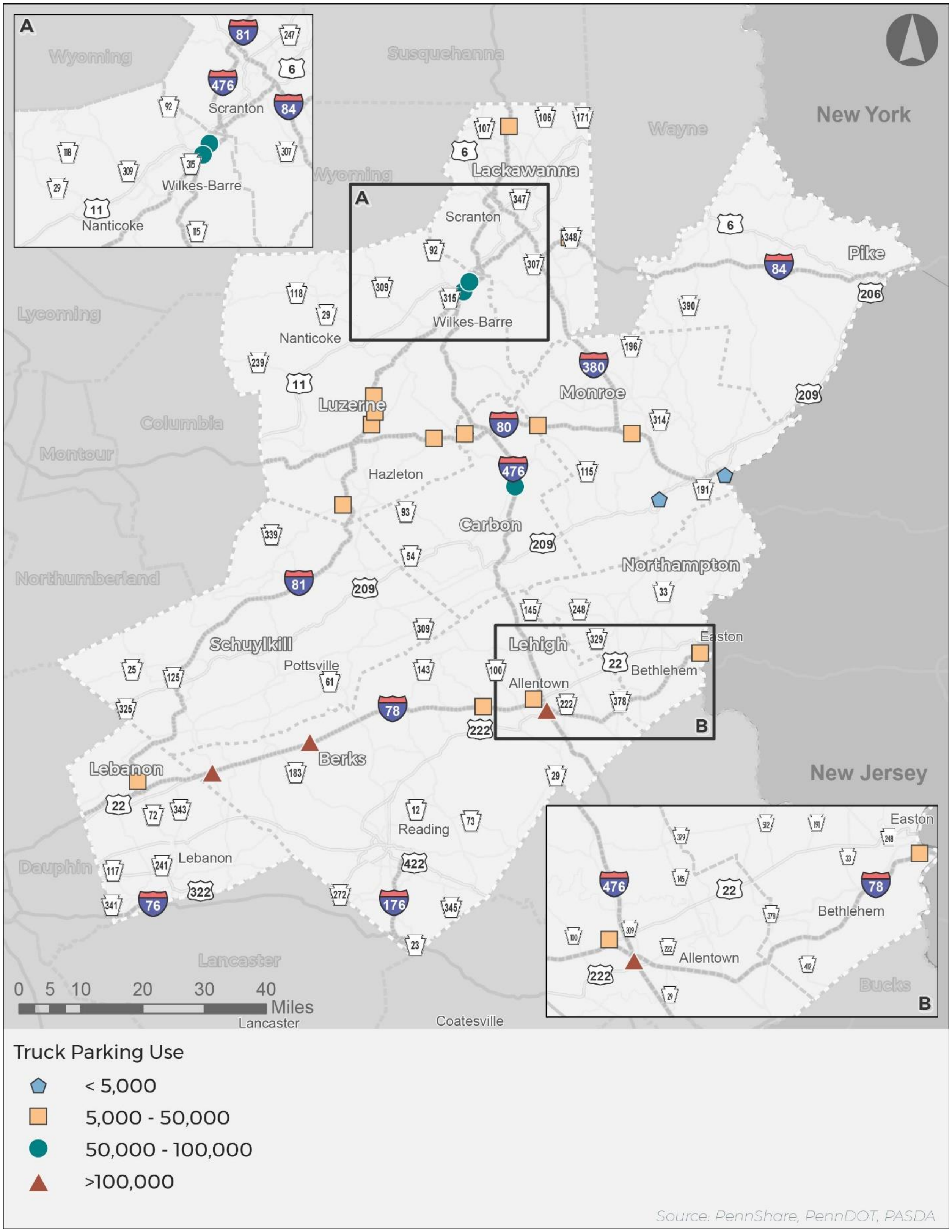
Table 37: Major Truck Parking Facilities in the EPFA Region

Name	Major Roadway(s)	Municipality	Percent of Parking Demand
Flying J Truck Stop	I-78/US 22	Frystown	22%
Love's Truck Stop	I-78	Shartlesville	16%
Allentown Service Plaza	I-476	Krocksville	14%
Hickory Run Service Plaza	I-476	Christmans	9%
Petro Travel Center	I-81	Dupont	7%
Pilot Travel Center	I-81	Pittston	6%
Love's Travel Stop	I-81	Jonestown	5%
Onvo Travel Plaza	I-78	New Smithville	3%
Rest Area	I-81	Mountain Top	2%
AK Best	I-80	White Haven	2%
Rest Area	I-81	Dorrance	2%
Rest Area	I-80	Tannersville	2%
Blue Ridge Travel Plaza	I-81	Mountain Top	2%
Rest Area	I-81	Greenfield	1%
Rest Area	I-78	Easton	1%
Onvo Travel Plaza	I-80	Blakeslee	1%
Fuel On	I-81	Hazleton	1%
Trexler Truck Stop	I-78/US 22	Allentown	1%
Onvo Travel Plaza	I-84	Mount Cobb	1%
NHS Rest Stop or Truck Facility 16	I-80	White Haven	1%
NHS Rest Stop or Truck Facility 42	I-80	East Stroudsburg	0%
Atlantic Travel Center	US 209	Stroudsburg	0%
Bandit Sunoco	I-80	White Haven	0%

Source: WSP

Figure 83 maps the parking facilities by amount of parking records. There are two main truck parking corridors in the study region. Parking facilities along I-78 and US-22 see the largest demand. These facilities approach Allentown from the west, providing convenient locations for trucks to stop on long-haul trips to the interior of the country. The second truck parking corridor is I-81, from I-80 to Scranton.

Figure 83: Distribution of Demand at Private Truck Parking Facilities in the EPFA Region



Source: WSP Analysis of Geotab Data

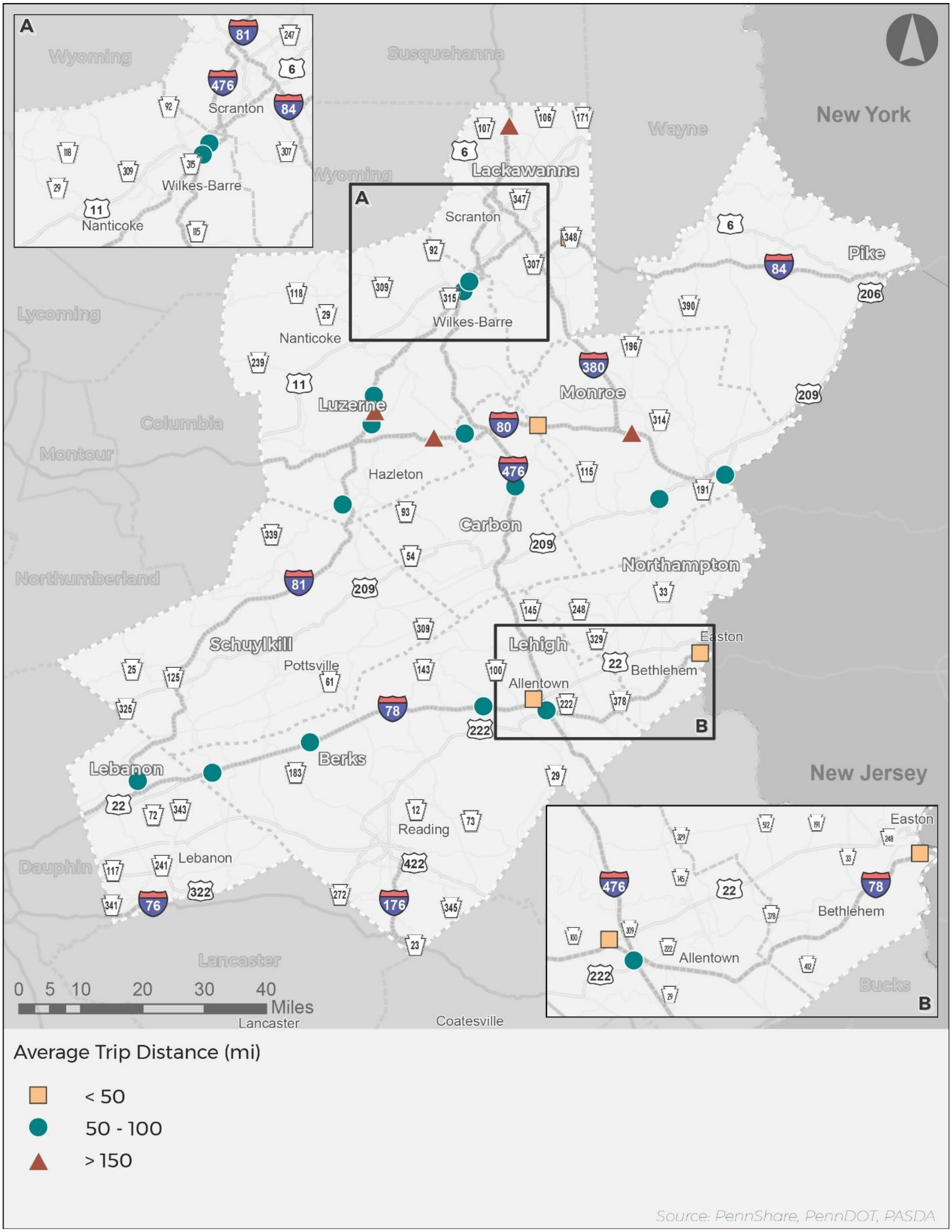
The average trip distance before parking activity provides an indication of the type of trucking using the facilities. As described at the beginning of this chapter, parking for overnight or long-term rest would tend to correlate with longer trip distances, while parking for staging would correlate with shorter trip distances. Figure 84 shows the average trip distance of trucks stopping at the parking facilities. The following insights can be derived from this map:

- None of the parking facilities had average distances lower than 50 miles, indicating that there isn't a single facility that primarily serves staging parking.
- The facilities with the shortest average trip distances are Trexler Truck Stop, Onvo Travel Plaza (Blakeslee), Rest Area Easton and Love's Truck Stop (Shartlesville). These are serving demand coming from primarily local trips.
- The facilities with the longest average trip distances are the rest areas in Tannersville, Greenfield, White Haven, and Dorrance. All of these facilities had longer average trip distances than 110 miles, and clearly serve long-haul operations.

Figure 85 shows the type of truck parking at these facilities – to better understand the demand being served. The overall share of heavy trucks parking at facilities in EPFA study area is relatively high, which is expected given the freight intensity of the region. The Geotab data shows that 94% of commercial parking events involved heavy duty trucks (Gross Vehicle Weight Rating higher than 26000 lbs.) and 6% involved medium-duty trucks (Gross Vehicle Weight Rating between 10001 - 26000 lbs.). Medium-duty trucks typically operate more frequently in urbanized areas, primarily for making deliveries at commercial establishments or delivering packages to homes; although medium-duty trucks delivering to homes are unlikely to park at truck stops or public facilities because they operate out of terminals and operate planned routes. However, Figure 85 shows that parking facilities near urban centers such as Scranton, Allentown, and Bethlehem tend to have a high share of heavy-duty parking, likely because these parking facilities are proximate to major freight corridors. However, the lowest shares of non-heavy parking occur in more rural areas of the study region, where likely passenger vehicles, small trucks, and farm equipment are parking at these facilities. Distinguishing between heavy- and medium-duty parking demand is useful because they require different geometrics and accommodations.

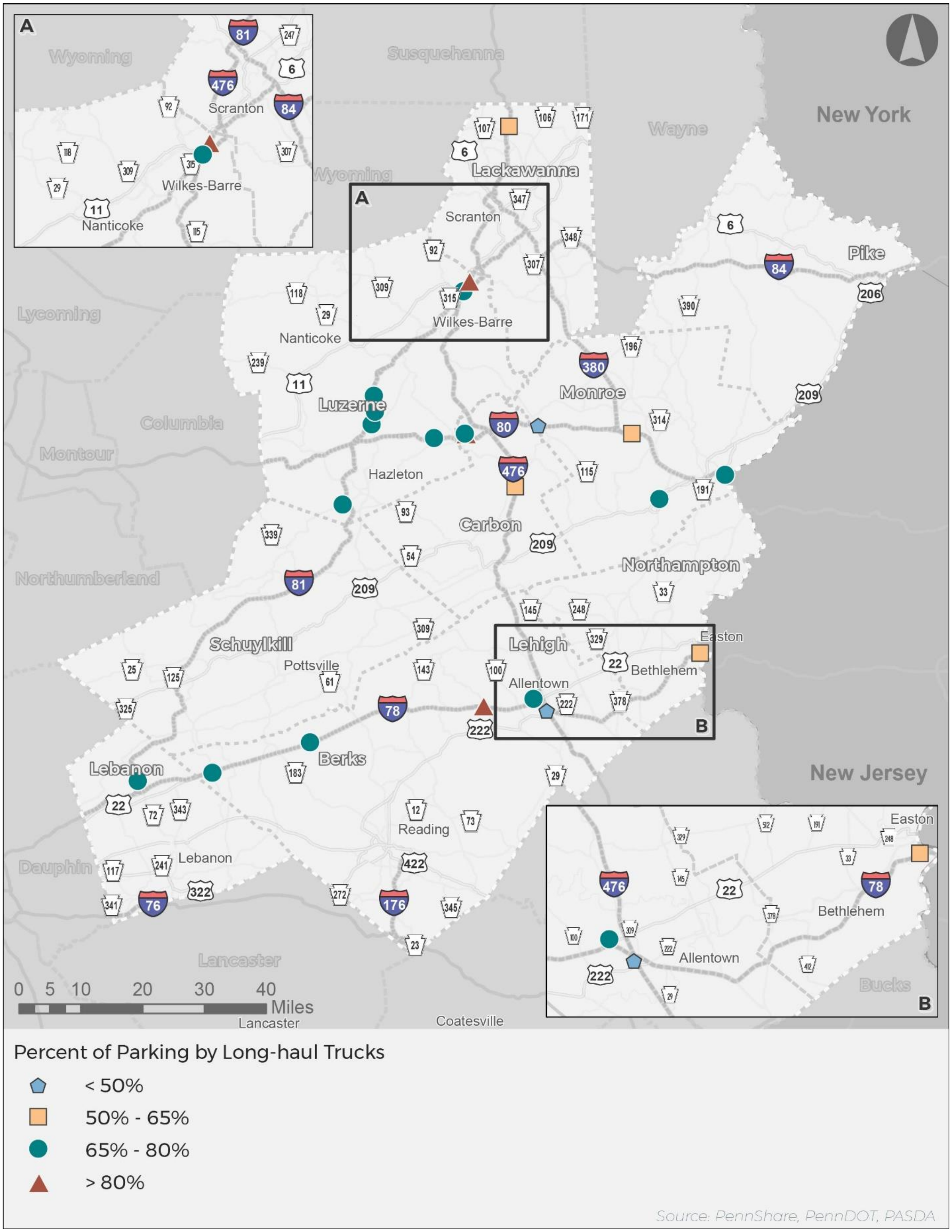
The percentage of medium-duty trucks is relatively high at the Onvo Travel Plaza facilities in Blakeslee and Mount Cobb, Pilot Travel Center facility in Pittston, and Blue Ridge Travel Plaza facility in Mountain Top, which could present an opportunity to free up capacity for long-haul truck parking if medium-duty truck parking activity can be relocated closer to markets served by smaller trucks. Medium-duty trucks are most likely to use facilities for short periods during daytime, primarily to refuel and take short breaks. The demand for heavy-duty trucks peaks at different times of the day and has different characteristics.

Figure 84: Average Trip Distance Before Parking Activity



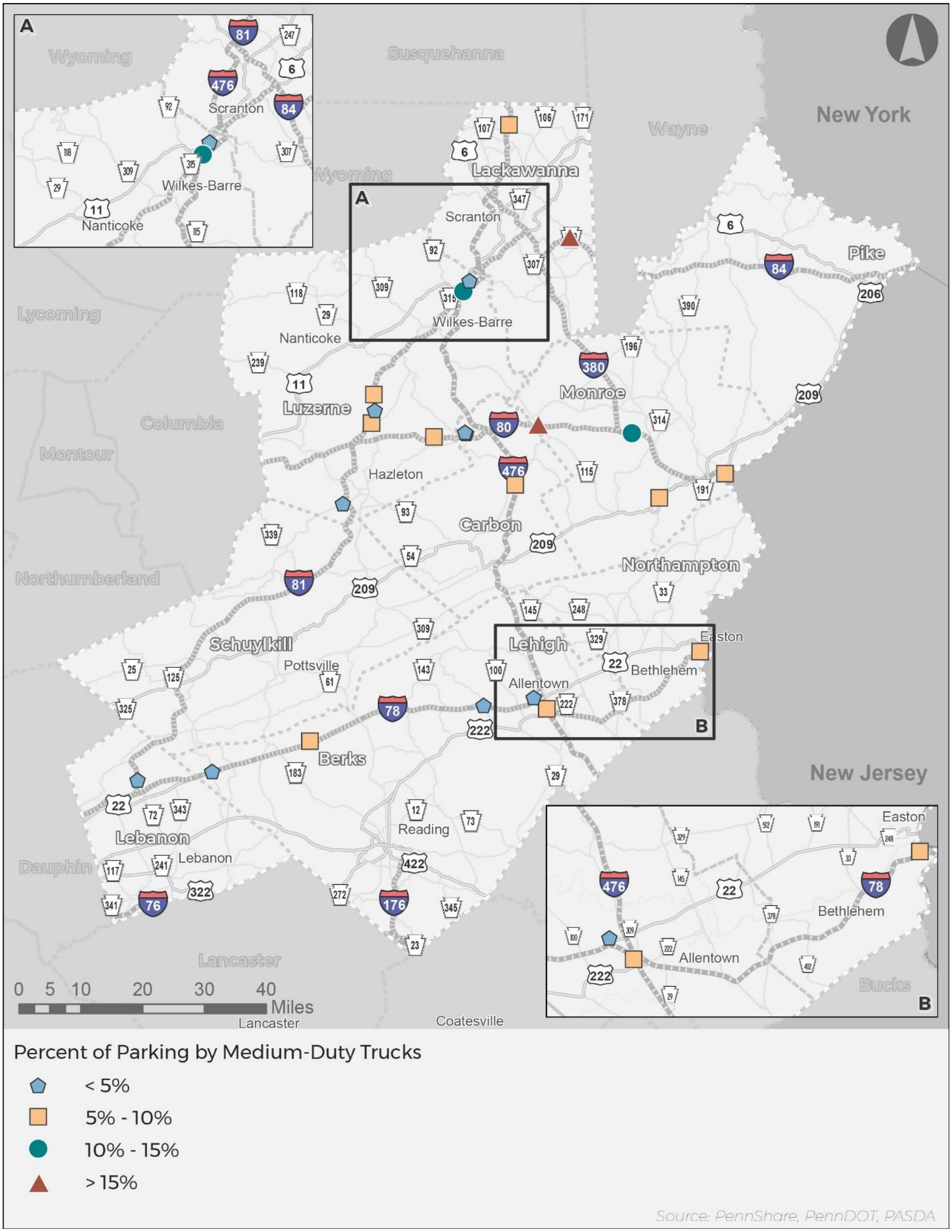
Source: WSP Analysis of Geotab Data

Figure 85: Percentage of Heavy-Duty Truck Parking



Source: WSP Analysis of Geotab Data

Figure 86: Percentage of Medium-Duty Truck Parking



Source: WSP Analysis of Geotab Data

1.6 Rail Freight Infrastructure

The study area has extensive railroad coverage (Figure 87) that connects industrial centers with the region's major ports and population centers, linking to major regional and national rail connections. Most of the rail network is dedicated to freight with no commuter or passenger rail service currently operating within the region, with the exception of limited tourist destinations operating local routes.

Table 38 and Figure 88 document railroad mileage by railroad operators and class. The primary Class I rail operator within the EPFA study area is Norfolk Southern, with more than 500 miles of active rail capacity. Numerous short line rail operators exist within the study area, with two (Reading Blue Mountain & Northern and Delaware-Lackawanna) operating along more than 500 miles of railroads within the study area.

Figure 87: Existing Railroad Network in the EPFA Region

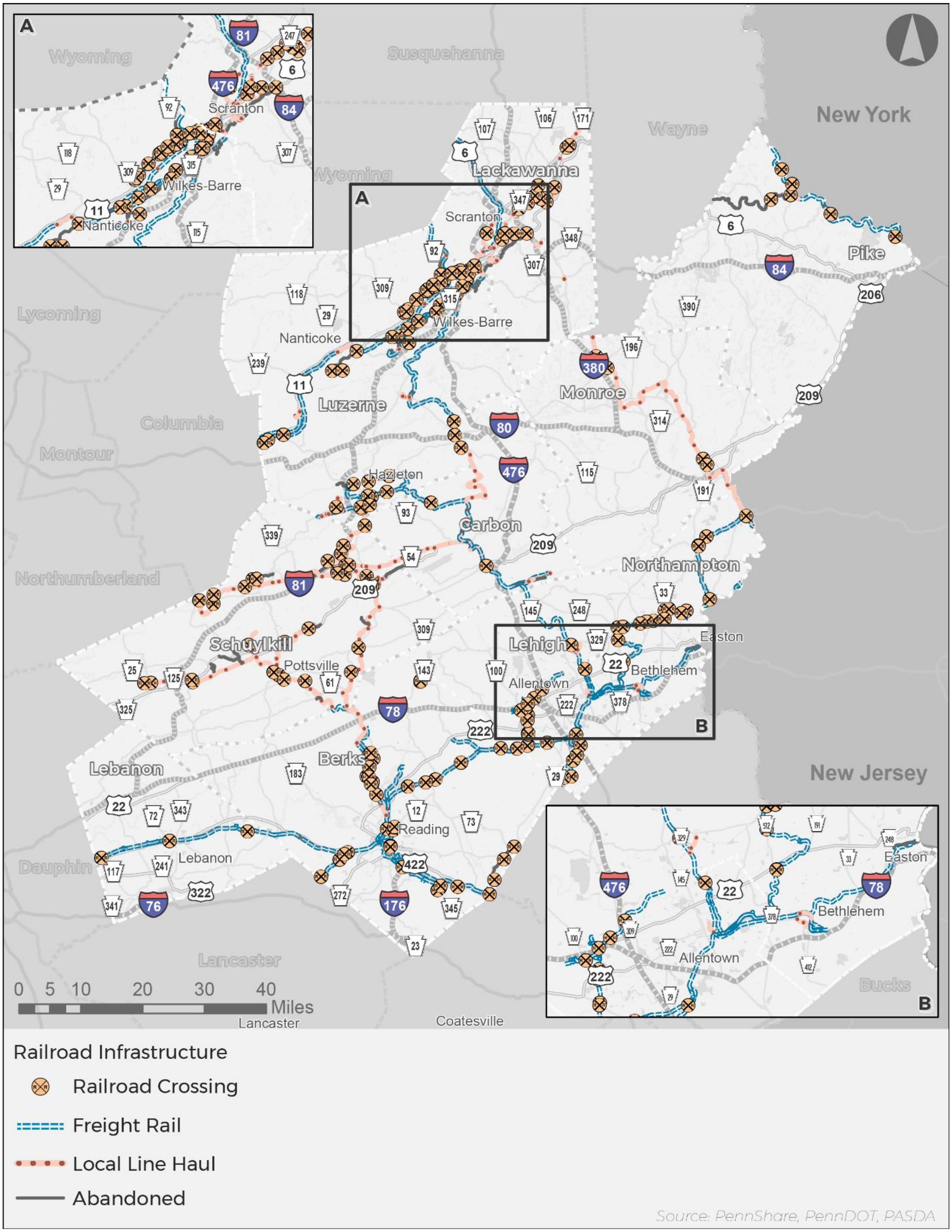
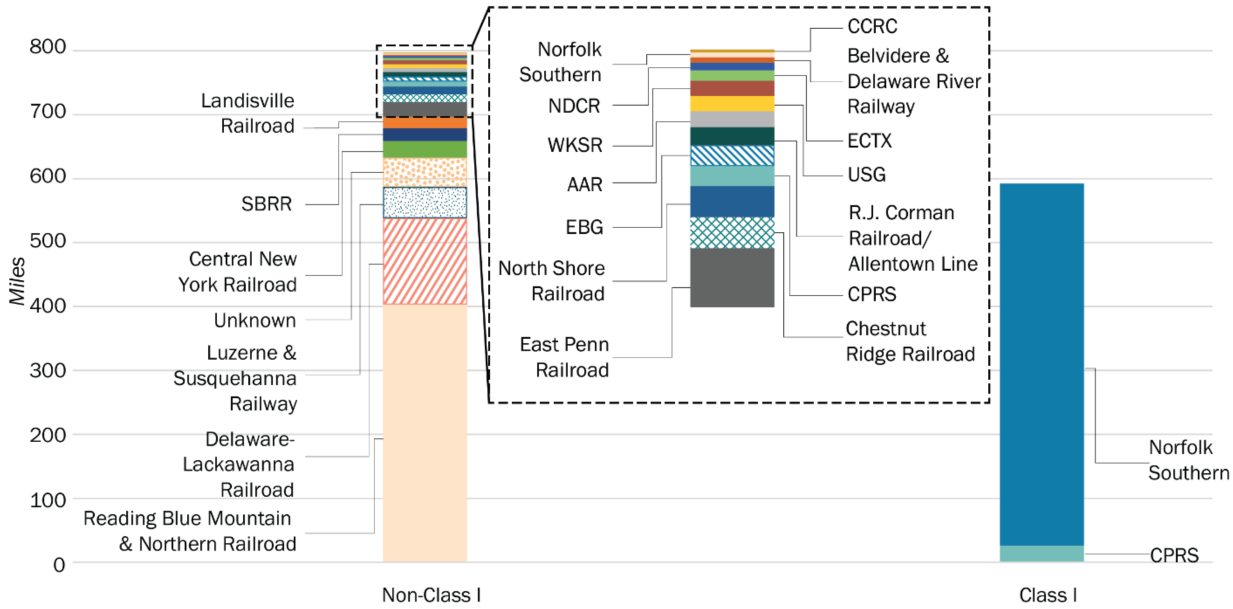


Table 38: Railroad Mileage by Operators and Class of Rail

Railroad Operators	Class I	Non-Class I	Total
Norfolk Southern	566	2	568
Reading Blue Mountain & Northern Railroad (RBMN)		403	403
Delaware–Lackawanna Railroad		135	135
Luzerne & Susquehanna Railway		49	49
Unknown		46	46
Canadian Pacific Railway (CPRS)	26	8	34
Central New York Railroad		26	26
East Penn Railroad		23	23
Stourbridge Railroad (SBRR)		20	20
Landisville Railroad		18	18
Chestnut Ridge Railroad		12	12
North Shore Railroad		12	12
Eastern Berks Gateway (EBG)		8	8
R.J. Corman Railroad/Allentown Line		7	7
Allentown and Auburn Railway (AAR)		6	6
United States Gypsum (USG)		6	6
Wanamaker, Kempton and Southern (WKSR)		6	6
Electric City Trolley Museum (ECTX)		4	4
N.D.C. Railroad (NDCR)		3	3
Belvidere and Delaware River Railway		2	2
Carbon County Railroad Commission (CCRC)		1	1
Total	**592**	**797**	**1,389**

Source: PennDOT

Figure 88: Railroad Mileage by Operators and Class



Source: PennDOT

Within the EPFA study area, more than 90 percent of existing rail mileage is identified as active, as shown in Table 39 and Source: PennDOT

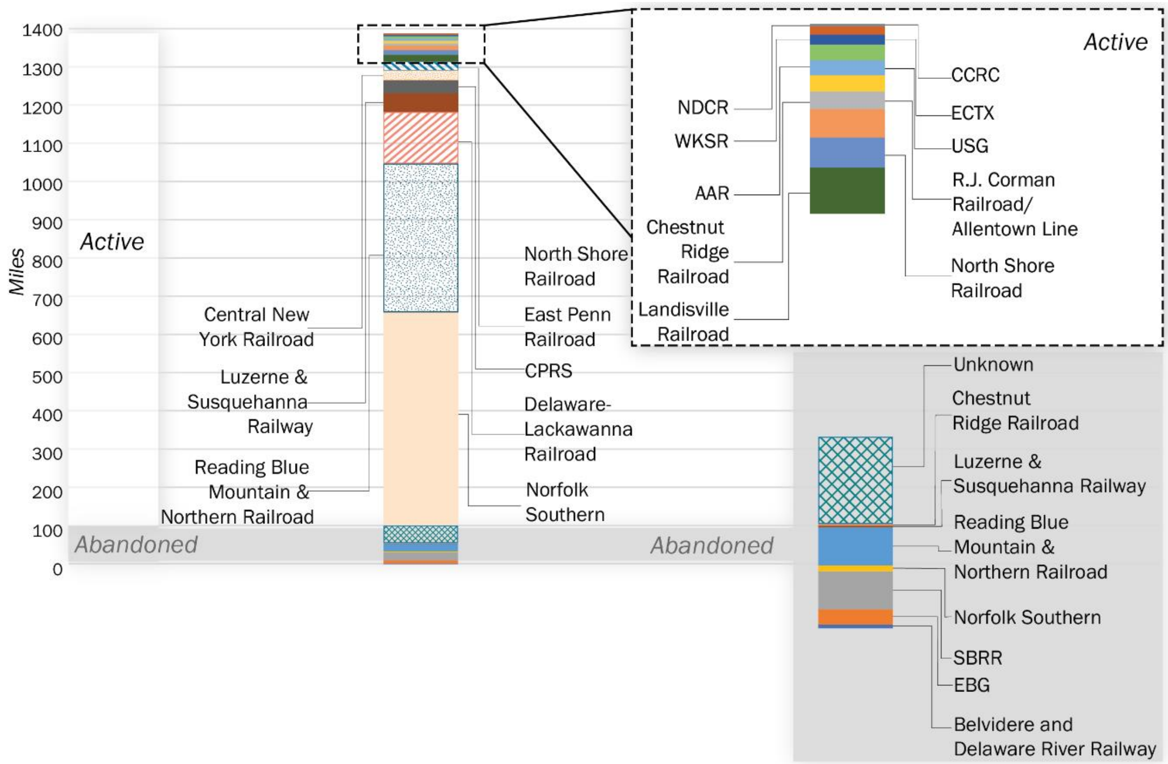
Figure 89. Abandoned rail line ownership is predominantly of unknown ownership, owned by Reading Blue Mountain & Northern Railroad, or the former Stourbridge Railroad.

Table 39: Railroad Mileage by Operators and Status

Railroad Operators	Abandoned	Active	Total
Norfolk Southern	3	558	561
Reading Blue Mountain & Northern Railroad	20	389	409
Delaware–Lackawanna Railroad		135	135
Luzerne & Susquehanna Railway	1	49	49
Unknown	46		46
Canadian Pacific Railway (CPRS)		34	34
Central New York Railroad		26	26
East Penn Railroad		23	23
Stourbridge Railroad (SBRR)	20		20
Landisville Railroad		18	18
Chestnut Ridge Railroad	1	11	12
North Shore Railroad		12	12
Eastern Berks Gateway (EBG)	8		8
R.J. Corman Railroad/Allentown Line		7	7
Allentown and Auburn Railway (AAR)		6	6
United States Gypsum (USG)		6	6
Wanamaker, Kempton and Southern (WKSR)		6	6
Electric City Trolley Museum (ECTX)		4	4
N.D.C. Railroad (NDCR)		3	3
Belvidere and Delaware River Railway	2		2
Carbon County Railroad Commission (CCRC)		1	1
Total	**101**	**1,288**	**1,388**

Source: PennDOT

Figure 89: Railroad Mileage by Operators and Status



Source: PennDOT

There are more than 600 railroad crossings located within the study area as shown in Table 40. Of these, more than one-third are under state jurisdiction. More than 80 percent of the rail crossings within the study area are located in five counties (Luzerne, Berks, Schuylkill, Lehigh, and Lackawanna).

Table 40: Number of Rail Crossings by County

County	Total Grade Crossings	State-Owned Grade Crossings
Berks	114	38
Carbon	11	3
Lackawanna	60	18
Lebanon	23	4
Lehigh	66	19
Luzerne	175	60
Monroe	14	4
Northampton	56	22
Pike	8	6
Schuylkill	74	35
Total	**601**	**209**

Source: PennDOT (State Roads), FRA (All Crossings)

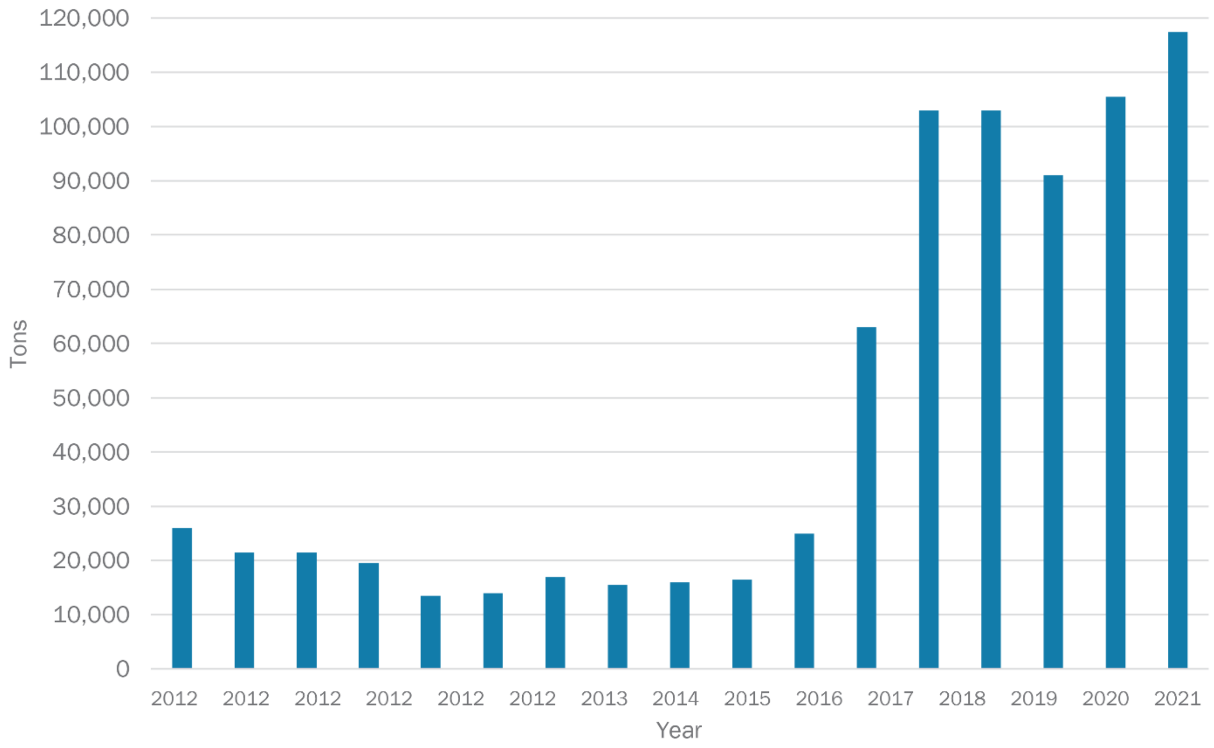
1.7 Air Cargo

Lehigh Valley International Airport (ABE) is the fourth busiest airport in Pennsylvania for passenger movements, but the second busiest airport in the Commonwealth for air cargo (as of 2021). ABE is situated at a critical juncture of a well-developed east west highway freight and logistics corridor that lacks air cargo capacity. Growth in air cargo at ABE has occurred in tandem with overall freight growth in the region, but is largely tied to Amazon Air operations, which began in 2016. Amazon Air is the primary generator of air cargo tonnage at ABE, with FedEx operations serving the remainder of freighter operations. Belly cargo, which refers to cargo that moves on passenger flights, represents a small fraction of all cargo moved at ABE (less than .001 percent of all air cargo moved in 2021). In addition to air cargo activity at ABE, two additional airports within the study area serve significant smaller amounts of air cargo when compared to ABE: Wilkes Barre-Scranton International Airport (AVP) and Reading Regional Airport (RDG). This section includes a review of T-100 Data from the Bureau of Transportation Statistics (BTS) for each of these airports.

1.7.1 Air Cargo at Lehigh Valley International Airport

Recent growth in air cargo tonnage at ABE is illustrated in Figure 90. This illustrates the growth associated with Amazon Air beginning in 2015. While air cargo tonnage declined slightly in 2019, growth has continued through 2021.

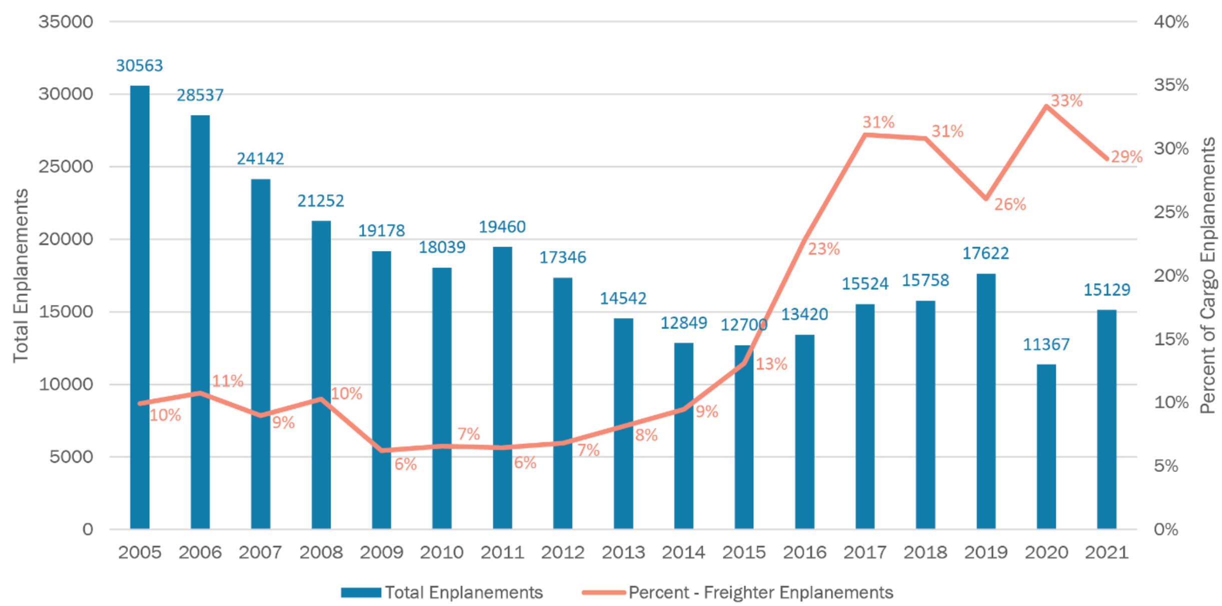
Figure 90: Air Cargo Tonnage at ABE, 2005-2021



Source: BTS T-100 Data

In addition to the overall tonnage growth, the expansion of ABE as a significant air cargo hub is further illustrated in Figure 91. This shows an overall decline (and in recent years, plateau) in total enplanements (passenger and freighter) at ABE. However, while overall enplanements have generally been stable since 2014, the percentage of freighter movements has grown substantially, representing nearly one-third of all movements at ABE in 2021.

Figure 91: Enplanements and Percentage of Freighter Enplanements at ABE, 2005-2021



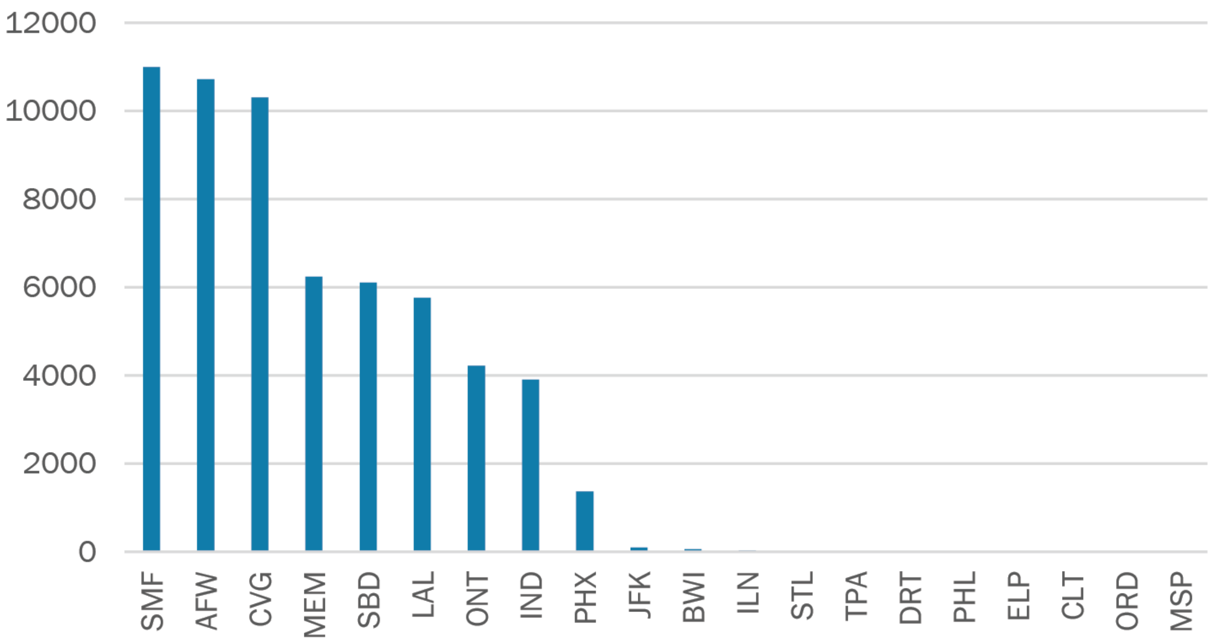
Source: BTS T-100 Data

Finally, a review of air cargo origins (Figure 92) and destinations (Figure 94) for air cargo associated with ABE illustrates the concentrated nature of cargo moving into or out of ABE.

Air cargo destined to ABE (Figure 92 and Figure 93) are primarily originating at 8 airports, with Sacramento, CA, Fort Worth, TX, and Cincinnati, OH/Northern Kentucky (CVG) the three top tier origins, each associated with Amazon Air. Second tier origins include Memphis (FedEx), San Bernadino, CA (Amazon), and Lakeland, FL (Amazon), while a third tier includes Ontario, CA (Amazon), Indianapolis, IN (FedEx), and Phoenix, AZ (Amazon). Substantially lower flows (less than 100 tons annually, each) are evident at 11 additional airports, including global air cargo hubs JFK, BWI, and Chicago-O'Hare (ORD).

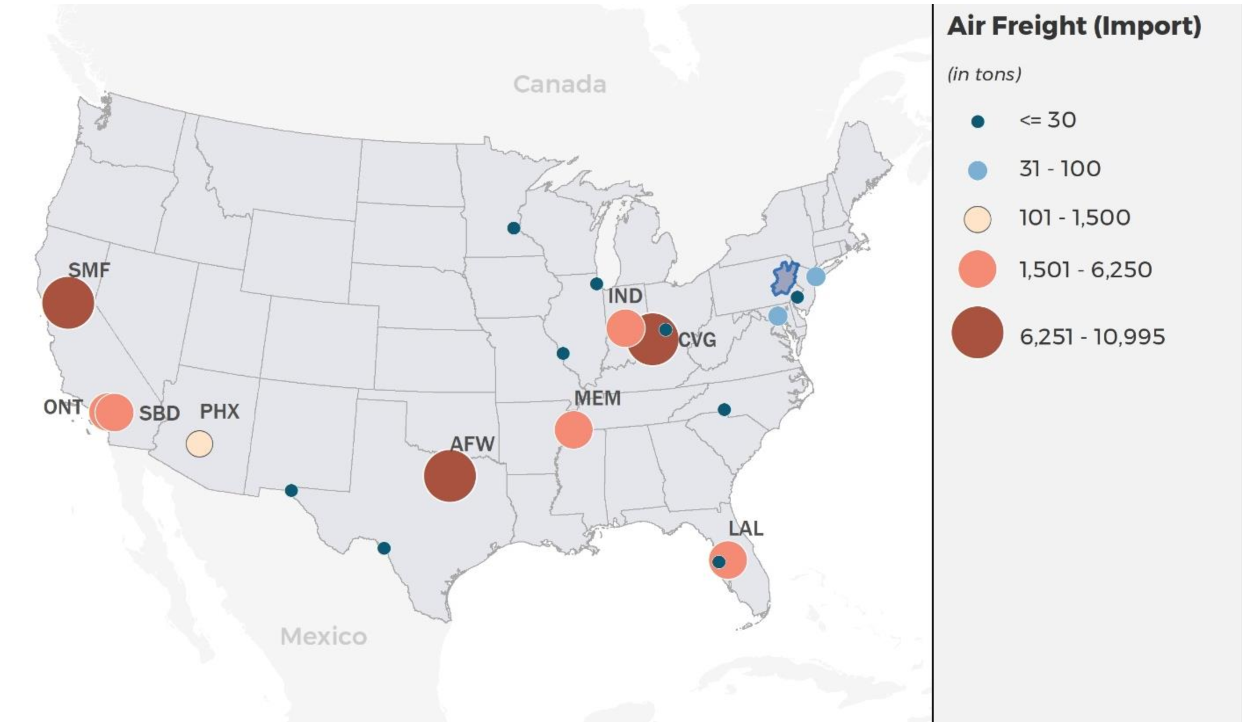
Air cargo originating in ABE (Figure 94 and Figure 95) are primarily destined to 10 airports, with Fort Worth, TX (Amazon) the most substantial destination for air cargo originating at ABE. Six second tier airports exhibit smaller but substantial cargo flows: Sacramento, CA (Amazon), Wilmington, OH (Amazon), Memphis (FedEx), Lakeland, FL (Amazon), San Bernadino, CA (Amazon), and Indianapolis, IN (FedEx). Three additional airports (each associated with Amazon operations) exhibit substantially smaller but measurable cargo flows: Rockford, IL, Cincinnati, OH, and Ontario, CA. Substantially lower flows (less than 35 tons annually, each) are evident at 12 additional airports, including global air cargo hubs Los Angeles (LAX), BWI, and Chicago-O'Hare (ORD).

Figure 92: Air Cargo Origins (by tonnage) Destined to ABE, 2021



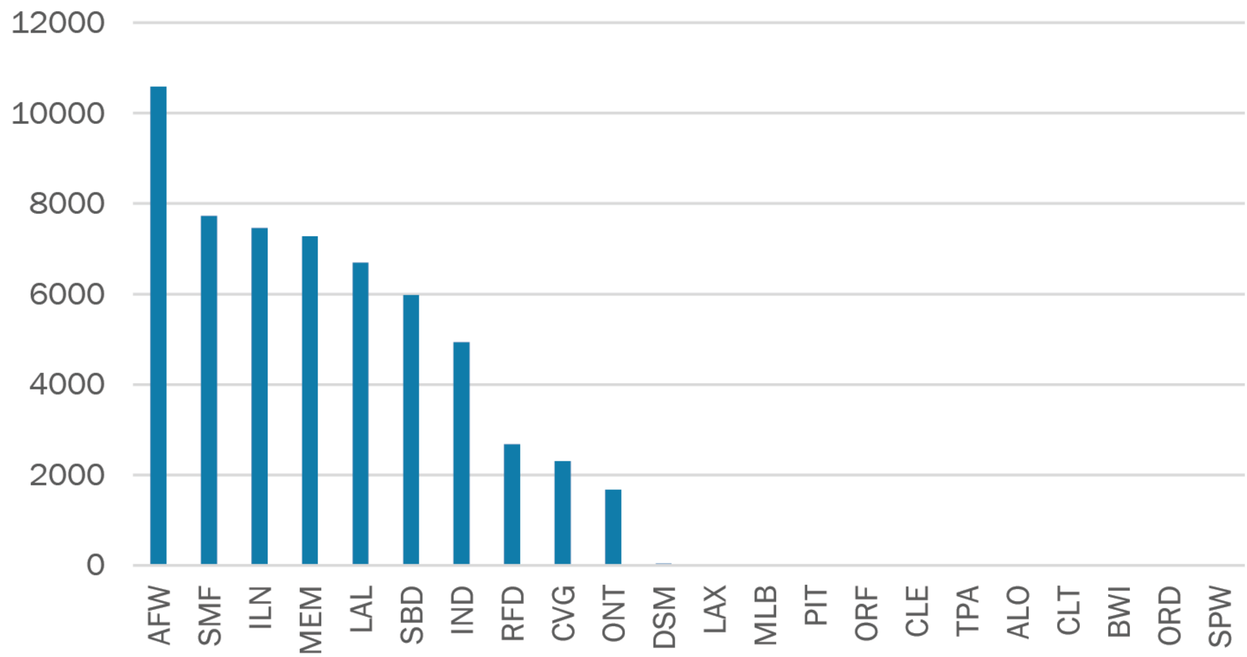
Source: BTS T-100 Data

Figure 93: Distribution of Air Cargo Origins (by tonnage) Destined to ABE, 2021



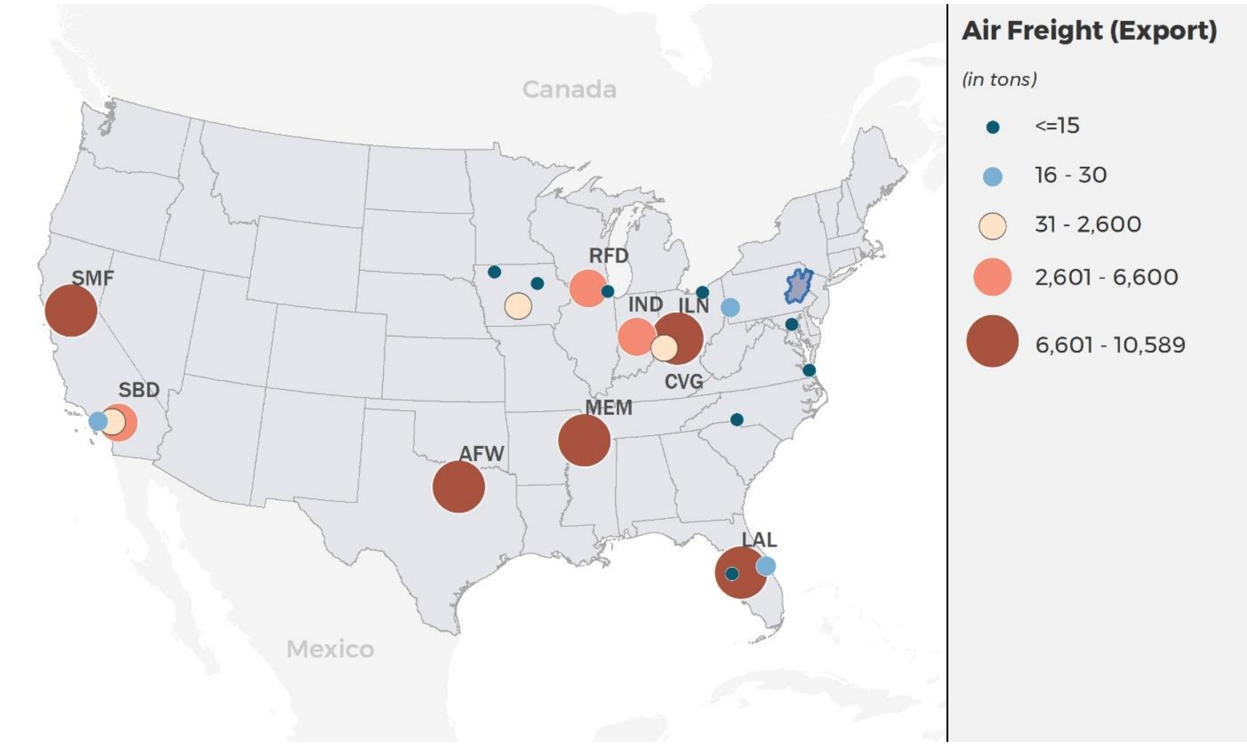
Source: BTS T-100 Data

Figure 94: Air Cargo Destinations (by tonnage) Originating at ABE, 2021



Source: BTS T-100 Data

Figure 95: Distribution of Air Cargo Destinations (by tonnage) Originating at ABE, 2021

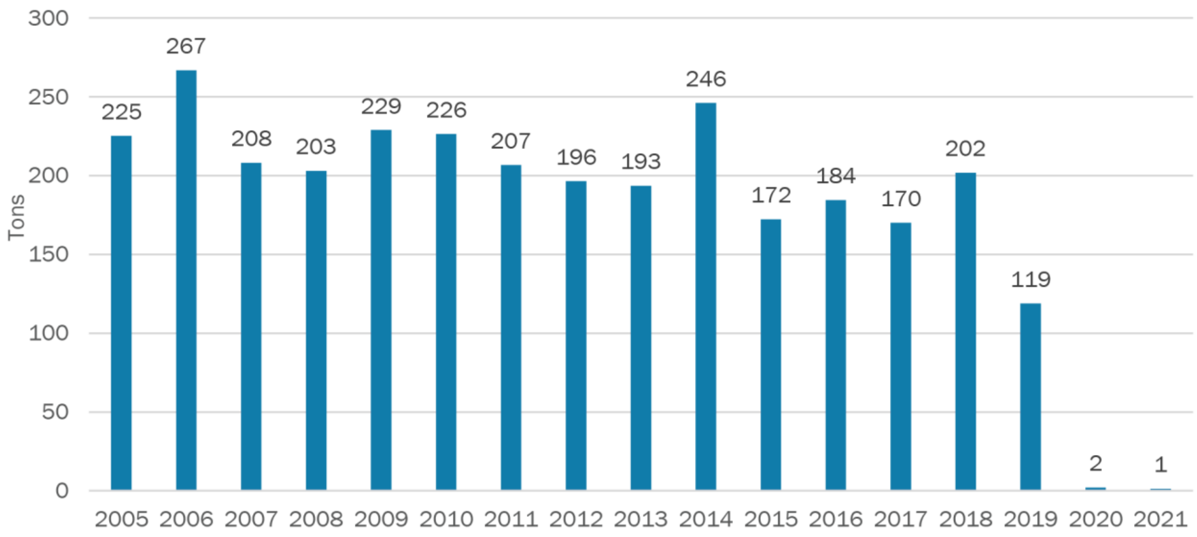


Source: BTS T-100 Data

1.7.2 Air Cargo at Wilkes Barre/Scranton International Airport

Air cargo activity at Wilkes Barre-/Scranton International Airport (AVP) is substantially lower compared to air cargo activity at ABE. A review of total air cargo tonnage at AVP is included in Figure 96. A review of annual air cargo tonnage from 2005 to 2021 indicates tonnages generally between 150-250 tons per year, with a substantial decline in 2020 and 2021, where total air cargo activity at AVP was nearly zero. Historically, air cargo activity at AVP was primarily comprised of FedEx feeder service to or from ABE.

Figure 96: Air Cargo Tonnage at AVP, 2005-2021

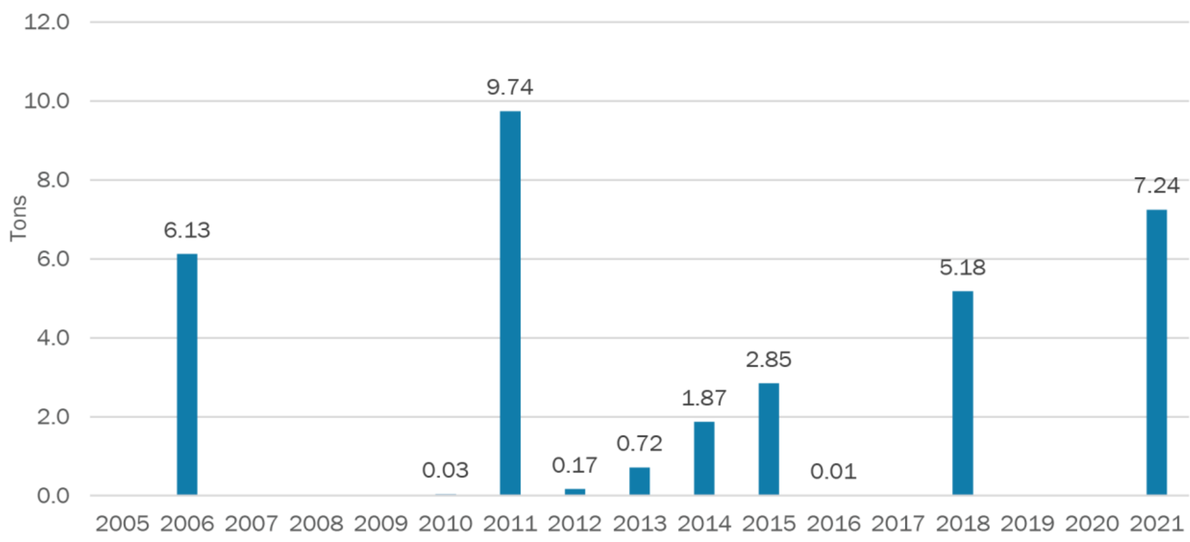


Source: BTS T-100 Data

1.7.3 Air Cargo at Reading Regional Airport

Air cargo activity at Reading Regional Airport (RDG) is sporadic and inconsistent, indicative of an airport that currently has no scheduled passenger or freighter air service. A review of total air cargo tonnage at RDG is included in Figure 97. A review of annual air cargo tonnage from 2005 to 2021 indicates tonnages no greater than 10 tons per year, with several years showing no recorded air cargo activity.

Figure 97: Air Cargo Tonnage at RDG, 2005-2021



Source: BTS T-100 Data