PART III: Freight

Overview

Freight transportation is the movement of raw materials, intermediate goods, and finished products from one location to another. This movement occurs along a complex, multimodal network composed of millions of miles of public roads, railways, navigable waterways, pipelines, and airways.[32]

This network connects raw materials to manufacturers, products to consumers, and American goods to domestic and international markets. Nearly all the goods and materials most Americans consume or produce require movement along the freight transportation system at some point. The ability to get freight where and when we want it is, in large part, what enables a high quality of life for all Americans. In 2015, our freight transportation system moved a daily average of about 49.3 million tons of freight worth more than $52.5 billion.[33]

Report Summary

- The FAST Act establishes the National Highway Freight Network (NHFN) and directs the Federal Highway Administration (FHWA) to prepare a biennial report on the conditions and performance (C&P) of the NHFN (hereafter termed the "*Highway Freight C&P* Report to Congress").
- This is the second edition of the *Highway Freight C&P* Report to Congress. It updates data in the previous edition to 2016 or the latest year available at the time of analysis and includes data on Critical Rural and Urban Freight Corridors (CRFCs and CUFCs) for the first time.
- The *Highway Freight C&P* Report to Congress supports decision- and policy makers in improved understanding of national infrastructure conditions and performance trends.
- The data presented in this report will help stakeholders make more effective decisions to meet challenges associated with an expected increase in demand.

The Nation's freight transportation system is dynamic, complex, and an extraordinary asset to our wellbeing and our country's economic health. Significant investments, however, are required to sustain the conditions and performance of our Nation's freight system and accommodate expected growing demand. By describing the conditions and performance of the National Highway Freight Network (NHFN), this section will support improved decision-making leading to a safer, more reliable, and more efficient freight transportation system.

Pursuant to 23 United States Code (U.S.C) §167(h), as amended by the Section 1116(a) of the Fixing America's Surface Transportation (FAST) Act of 2015, the Federal Highway Administration (FHWA) prepared this section to serve as the second edition of the biennial report on the conditions and performance (C&P) of the NHFN (referred to hereafter as the "*Highway Freight C&P* Report to Congress"). This section is part of the 24th edition of the *Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance* Report to Congress (C&P Report).

23 U.S.C. §167(h) designates the NHFN and establishes a national policy of maintaining and improving the conditions and performance of this new network. The NHFN comprises four component subsystems: the Primary Highway Freight System (PHFS), other Interstate portions not on the PHFS, and Critical Rural Freight Corridors (CRFCs) and Critical Urban Freight Corridors (CUFCs), newly defined in the FAST Act.

States are responsible for designating CRFCs and CUFCs. In urban areas with a population of 500,000 or more, the representative metropolitan planning organization (MPO) may make the designation in consultation with the State; if the urban area population is under 500,000, the State makes the designation in consultation with the MPO. Designating CRFCs and CUFCs is optional but extends the flexibility of States to apply National Highway Freight Program (NHFP) funds. As of

[32] Public roads, including Interstates, comprise about 4 million miles. Bureau of Transportation Statistics, Freight Facts and Figures 2017, Table 3-1. https://www.bts.dot.gov/sites/bts.dot.gov/files/docs/FFF_2017.pdf
[33] Bureau of Transportation Statistics, Freight Facts and Figures 2017, p. 2-1. https://www.bts.dot.gov/sites/bts.dot.gov/files/docs/FFF_2017.pdf

May 1, 2018, 18 States submitted both CRFCs and CUFCs; an additional two States had submitted only CRFCs; and two other States had submitted only CUFCs.

With the inclusion of the newly submitted CRFCs and CUFCs, the NHFN consists of an estimated 54,310 miles, including 41,308 miles of Interstate and 9,541 miles of non-Interstate roads. CRFCs/CUFCs represent a total of 3,461 miles, or about six percent, of all NHFN mileage.

What's New

To address the FAST Act requirement for a biennial Highway Freight C&P Report, FHWA will update NHFN conditions and performance data to the latest years available when conducting the analysis. FHWA intends for each edition of the *Highway Freight C&P* Report to Congress to build on previous editions to add to and refine an understanding of NHFN conditions and performance. However, the Highway Performance Monitoring System (HPMS), Freight Analysis Framework (FAF), and other datasets used for the NHFN conditions and performance analysis are updated at different times, using different methodologies. As a result, the data reported here may represent different dates and should be viewed as snapshots in time. Future editions may include new conditions and performance indicators as additional information becomes available.

Highlights of NHFN Conditions and Performance

NHFN Conditions

- With the inclusion of the CRFCs and CUFCs submitted as of May 1, 2018, the NHFN's total mileage is 54,310 miles. Most mileage (about 77 percent) is in "good" condition, the same as the percentage of "good" condition mileage reported in the previous edition. Most (about 75 percent) NHFN mileage is of "good" ride quality.
- Of an estimated total of 54,263 bridges on the NHFN, more than half (53 percent) are in "good" condition and a relatively small percentage (4 percent) are in "poor" condition.

NHFN Performance

- As reported in the previous edition, many portions of the NHFN, including high-volume truck portions (defined as portions that carry more than 8,500 trucks per day), experience congestion.
- Average travel speeds for just over half (52 percent) of the Nation's top 25 domestic freight corridors experienced marginal increases or remained the same between 2011 and 2016. Over the same period, reliability decreased for 72 percent of these corridors.

This edition includes NHFN conditions and performance data from and prior to 2016, representing an update of two years over the previous (and first) edition, which appeared in the 23rd C&P Report. The previous edition used 2014 data from the HPMS; this edition uses 2016 HPMS data. The previous edition used data from FAF version 4. This edition continues to use FAF version 4 as there were no major FAF version updates since the last edition (the initial release of FAF version 5 is expected in late 2020).[34]

This edition includes some data with sources other than FAF version 4 and HPMS; the latest available data from these sources may be from years other than 2016. This edition excludes several exhibits from the previous edition that did not have any updates over the last two years.

This edition includes the following new indicators:

- NHFN pavement conditions:
  - Overall ride quality
  - Individual pavement distresses
  - Overall ride quality by roadway functional class

[34] Please visit www.bts.gov for FAF information and data. Descriptions of FAF versions are available at https://faf.ornl.gov/fafweb/News.aspx.

- NHFN bridge conditions:
  - Overall condition rating
  - Overall condition rating by roadway functional class

Notably, this edition includes CRFCs and CUFCs in the overall NHFN conditions and performance assessment.[35] This represents an important topic not covered in the previous edition; data on CRFCs and CUFCs had not yet been submitted when the previous edition was developed.

This edition benefitted from the implementation of data improvements identified in the previous edition. The first edition identified a need to better align NHFN with data sources (including the HPMS) to permit more seamless analyses of the Nation's freight transportation system. Since publication of the first edition, FHWA has developed and used new techniques to align HPMS and other datasets, such as the National Bridge Inventory (NBI), with the NHFN.

The first *Highway Freight C&P* Report to Congress provided a baseline understanding of NHFN conditions and performance using available data. This second edition improves this baseline by including additional indicators and examining new units of analysis not previously available, such as CRFCs and CUFCs.

Introduction

Section 1116(a) of the FAST Act of 2015 includes several provisions to better identify needs for the freight transportation system and increase Federal support for responding to these needs. Among other provisions, the FAST Act designates the NHFN and establishes a national policy of maintaining and improving the conditions and performance of this new network. The NHFN replaces the National Freight Network and Primary Freight Network established under the Moving Ahead for Progress in the 21st Century Act (MAP-21). The FAST Act requires the re-designation of the NHFN every 5 years and repealed Section 1116 of MAP-21, which allowed for an increased Federal share for certain freight projects. The FAST Act also directs FHWA to prepare a report describing the conditions and performance of the NHFN.

Pursuant to the requirements of 23 U.S.C. §167(h) as amended by Section 1116(a) of the FAST Act, FHWA prepared this section as the second edition of the *Highway Freight C&P* Report to Congress. This second edition builds on the foundation provided by the first edition while incorporating new data and analytical techniques to provide a more comprehensive view of the NHFN. This edition includes the following four major sections:

- Federal Programs for Improved Freight Conditions and Performance describes Federal programs that support improved freight conditions and performance as well as trends affecting freight movement along the NHFN and other freight transportation systems.
- Freight Transportation Network Overview describes the Nation's freight transportation networks, focusing on the NHFN and its component roadways.
- Conditions and Performance provides an analysis of NHFN condition and performance using key indicators.
- Spotlight Topics highlight topics that affect overall freight movement and have relevance for improved NHFN management, planning, and decision-making.

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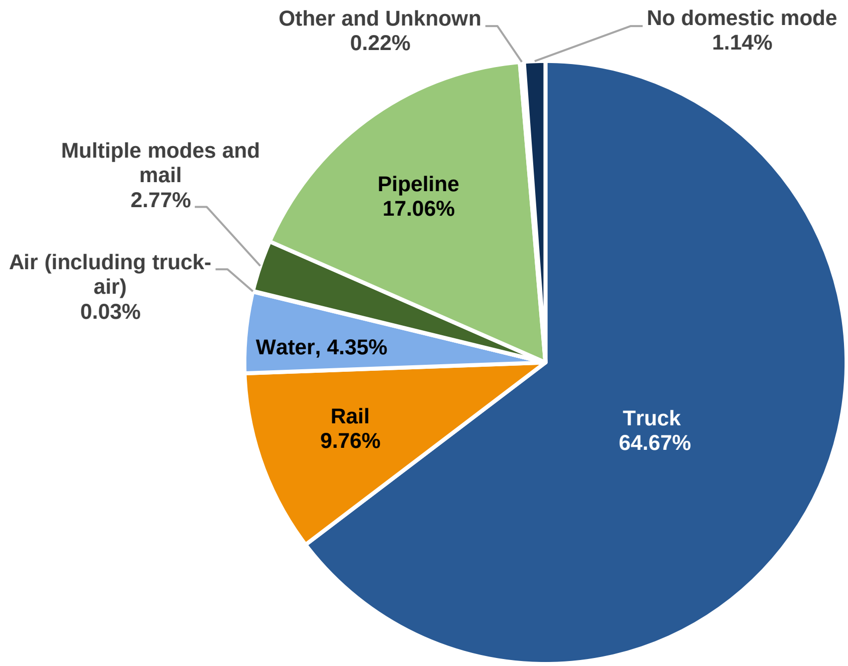
[35] The NHFN conditions and performance analysis presented in this section focuses on National Highway System (NHS) roadway functional classes. Due to data limitations, CRFCs/CUFCs at roadway functional classes below the NHS (e.g., rural minor collectors) were not included in the analysis. The analysis includes only CRFCs/CUFCs submitted as of May 1, 2018.

Federal Programs for Improved Freight Network Conditions and Performance

The freight transportation network is an extraordinary national asset, enabling economic activity and a high quality of life. However, the network has several areas of need, especially along the highway system, which is the dominant mode for freight by tonnage and value. *Exhibits III-1* and *III-2* show total tonnage and value moved by all freight modes in 2017, representing a two-year update on total freight tonnage and value figures since the last edition.

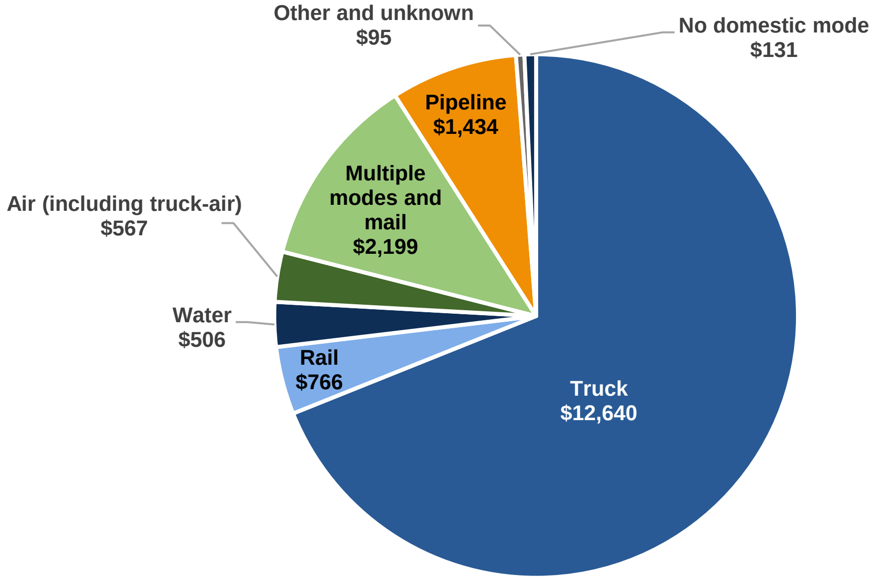
Exhibit III-1 ■ Freight Modal Share by Tonnage, 2017



Note: Approximately 17.9 billion tons of freight were moved in 2017 (total tonnage). Data do not include imports and exports that pass through the United States from a foreign origin to a foreign destination by any mode. Numbers may not add to totals due to rounding. Data in this version are not comparable to similar data in previous years because of updates to the Freight Analysis Framework. All truck, rail, water, and pipeline movements that involve more than one mode, including exports and imports that change mode at international gateways, are included in multiple modes and mail to avoid double counting. As a consequence, rail and water totals in this table are less than those in other published sources. **Multiple modes and mail** includes U.S. Postal Service, courier shipments, and all intermodal combinations, except air and truck. **Other and Unknown** primarily comprises unidentified modes but includes miscellaneous categories, such as aircraft delivered to customers and shipments through foreign trade zones. **Air (including truck-air)** includes truck moves to and from airports.

Source: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, version 4.5.1, 2019 (https://www.bts.gov/faf).

Exhibit III-2 ■ Freight Modal Share by Value (billions of 2012 $), 2017



Note: Total freight moved in 2017 was worth approximately $18.3 trillion (in 2012 dollars). Data do not include imports and exports that pass through the United States from a foreign origin to a foreign destination by any mode. Numbers may not add to totals due to rounding. Data in this version are not comparable to similar data in previous years because of updates to the Freight Analysis Framework. All truck, rail, water, and pipeline movements that involve more than one mode, including exports and imports that change mode at international gateways, are included in multiple modes and mail to avoid double counting. As a consequence, rail and water totals in this table are less than those in other published sources. **Multiple modes and mail** includes U.S. Postal Service, courier shipments, and all intermodal combinations, except air and truck. **Other and Unknown** primarily comprises unidentified modes but includes miscellaneous categories, such as aircraft delivered to customers and shipments through foreign trade zones. **Air (including truck-air)** includes truck moves to and from airports.

Source: U.S. Department of Transportation, Bureau of Transportation Statistics and Federal Highway Administration, Freight Analysis Framework, version 4.5.1, 2019 (https://www.bts.gov/faf).

Expected economic and population growth in the coming decades will likely lead to increased freight demand, especially increased freight volumes moved by truck. There are substantial challenges to moving freight to meet this demand, especially where providing additional capacity may be difficult.

Congress created several Federal freight programs (described in greater detail below) with the aim of addressing these challenges and ensuring that the U.S. freight system and its highway network are prepared to support U.S. economic growth and competitiveness. The most recent of these is the FAST Act of 2015.

FAST Act Freight Provisions

The FAST Act's freight provisions provide a basis for Federal policies and resources to improve mobility on America's highways, create jobs and support economic growth, and accelerate project delivery and promote innovation. These provisions also guide the Federal approach to freight planning and decision-making. Several provisions aimed to improve the conditions and performance of the national freight network and support investment in freight-related surface transportation projects.

Summary of FAST Act Freight Provisions

- Established the NHFP, which authorizes $6.3 billion in formula funds over 5 years for States to invest in freight projects on the NHFN (FAST Act Sec. 1116, 23 U.S.C. § 167, 23 U.S.C. § 104(b)(5)),
- Required the Secretary to submit biennial reports to Congress on the conditions and performance of the NHFN (FAST Act Sec. 1116, 23 U.S.C. § 167(h)),
- Established a National Multimodal Freight Policy that includes national goals to guide decision-making (FAST Act Sec. 8001, 49 U.S.C. §70101),
- Required the development of a National Freight Strategic Plan to implement the goals of the new National Multimodal Freight Policy (FAST Act Sec. 8001, 49 U.S.C. § 70102),
- Established a National Multimodal Freight Network that assists States in strategically directing resources toward improved system performance for efficient freight movement and informs freight planning along the network (FAST Act Sec. 8001, 49 U.S.C. § 70103),
- Created a new discretionary freight-focused grant program that will invest $4.5 billion over 5 years (FAST Act Sec. 1105, 23 U.S.C. 117), and
- Required the Bureau of Transportation Statistics to collect and annually report on performance measures for the Nation's top 25 ports by 20-foot equivalent unit, tonnage, and dry bulk (FAST Act Sec. 6018, 49 U.S.C § 6314(b)).

National Highway Freight Program

The FAST Act establishes the NHFP, a new freight formula program designed to improve the efficient movement of freight on the NHFN, among other goals. The NHFP represents the first dedicated Federal funding source for freight. NHFP goals include investing in infrastructure and operational improvements that strengthen economic competitiveness, reduce congestion and the cost of freight transportation, improve reliability, and increase productivity. (See *Exhibit III-7* for NHFP goal areas that informed the conditions and performance indicators selected for this edition of the *Highway Freight C&P* Report to Congress).

NHFP funds may be obligated for projects that contribute to the efficient movement of freight on the NHFN and are consistent with other Federal freight planning requirements (see 23 U.S.C. §§ 134 to 135 and 49 U.S.C § 70202). To use NHFP funds for projects, States must identify relevant projects in their Statewide Transportation Improvement Program (STIP) and MPOs must do so in their Transportation Improvement Program (TIP). The projects must also be consistent with States' long-range statewide transportation plans and MPOs' metropolitan transportation plans. Effective December 4, 2017, pursuant to 23 U.S.C 167(i)(4), a State may not obligate NHFP funds apportioned to the State unless the State developed a FAST Act-compliant State Freight Plan, as required by 49 U.S.C. 70202(a).

Exhibit III-3 ■ Percentage of NHFP Funds Obligated or Unobligated, as of December 4, 2017, by Year of Fund Apportionment from FY 2016 to FY 2018

Category	FY2016	FY2017	FY2018
Obligated	83.7%	63.9%	9.8%
Unobligated	16.4%	36.1%	90.2%

Source: FHWA, Office of Freight Management and Operations.

Starting with the year in which NHFP funds are apportioned, States have four years to obligate them (i.e., States' authority to obligate Fiscal Year (FY) 2016 funds lapses on September 30, 2019). As of the second anniversary of the enactment of the FAST Act (December 4, 2017), States had obligated approximately 51 percent of all NHFP funds apportioned on a national basis through that date. *Exhibit III-3* depicts States' progress in obligating NHFP funds by year of fund apportionment.

Trends Affecting NHFN Freight Movement

The trends described below provide additional background for understanding NHFN freight conditions and performance, updated to 2016.

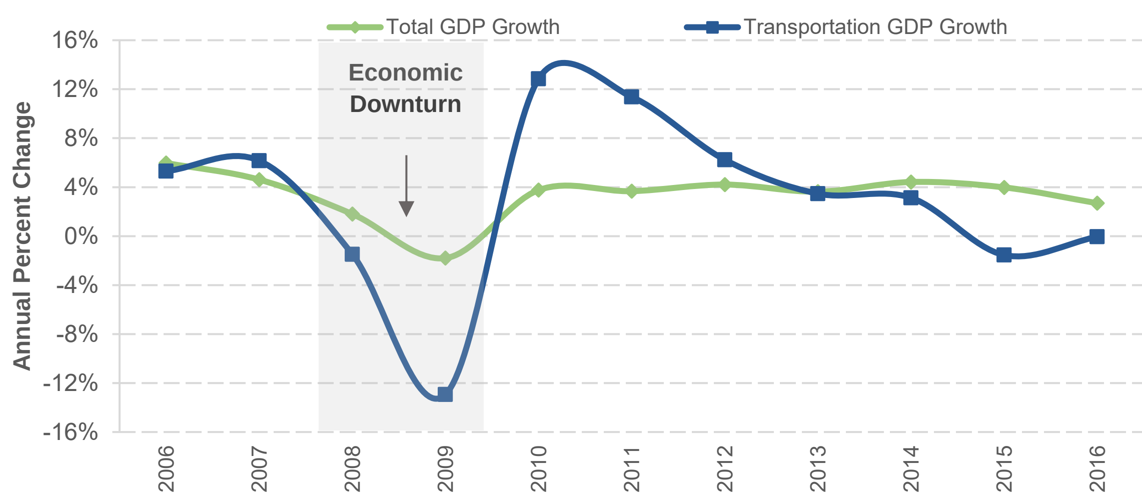
Economic Recovery and Freight Demand

"Freight demand" refers to the demand for both physical movement of inputs and for finished goods by freight carriers on all modes (road, rail, air, water, and pipeline). Increases in freight demand are linked to economic and population growth: a growing economy increases demand for freight, and increased freight demand in turn signifies economic growth. Conversely, freight demand, and thus freight transportation, contract when the economy slows.

The National Bureau of Economic Research dates the last economic downturn as lasting for approximately 19 months from December 2007 to June 2009.[36] Between June 2009 and September 2017, gross domestic product (GDP) increased by over 20 percent.[37] Unemployment rates declined over the same period, falling from 9.5 percent in June 2009 to 4.2 percent in September 2017.[38] As of 2016, total GDP for all sectors grew beyond its highest pre-downturn levels.[39] In close correlation to rising GDP and decreasing unemployment rates after the economic downturn, demand for freight transportation increased by 27.6 percent since a low point in 2009.[40]

Exhibit III-4 shows the correlation between total GDP and GDP growth attributed to the transportation sector (transportation GDP) from 2006 to 2016.[41]

Exhibit III-4 ■ Growth in Total GDP and Transportation GDP, 2006–2016



Source: U.S. Department of Commerce, Bureau of Economic Analysis, *National Income and Product Accounts Tables*, tables 1.1.5, 2.4.5, 3.11.5, 3.15.5, 4.2.5, 5.4.5, 5.5.5, and 5.7.5B (https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=2&isuri=1&1921=survey).

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[36] National Bureau of Economic Research, "US Business Cycle Expansions and Contractions." http://www.nber.org/cycles/cyclesmain.html.
[37] Bureau of Economic Analysis (BEA). "Vintage History of Quarterly Gross Domestic Product (GDP) and Gross Domestic Income (GDI) Estimates." https://www.bea.gov/data/gdp/gross-domestic-product/gdp-gdi-vintage-history
[38] Bureau of Labor Statistics. "Labor Force Statistics from the Current Population Survey: 2009 to 2017." https://data.bls.gov/pdq/SurveyOutputServlet
[39] BEA, "National Income and Product Accounts: Section 1: Domestic Product and Income." Table 10105-A. https://apps.bea.gov/iTable/iTable.cfm?ReqID=19&step=4&isuri=1&1921=flatfiles.
[40] U.S. Department of Transportation, "A Growing Economy and Freight Demand." Special Reports and Issue Briefs. December 2017. Unpublished as of January 2019.
[41] U.S. Department of Transportation, "A Growing Economy and Freight Demand." Special Reports and Issue Briefs. December 2017. Unpublished as of January 2019.

Freight Volume Shifts

KEY TAKEAWAYS

- Congress created the NHS, NN, and NHFN to identify roadways of strategic importance to the national economy and mobility.
- The NHFN is composed of four component roadway systems but the NHS represents over 90 percent of what makes up the NHFN. As of May 1, 2018, total NHFN mileage was 54,310, including CRFCs and CUFCs.
- The NHFN highlights critical components of the freight network that support States, MPOs, and others in prioritizing and programming projects to meet freight needs.

DOT predicts increases in freight volume from 2015 to 2045, but freight flow patterns and changes over this period may not be uniform across all economic sectors, modes, and locations. Freight volumes reflect how different economic sectors are growing or contracting. However, regional and local economies also affect where, how, and how much freight is flowing in and around a particular area or locality.

The Bureau of Transportation Statistics created the Freight Transportation Services Index (TSI) to provide an aggregated measure of freight traffic and transportation services output. The TSI is one indicator of freight flow volumes. The TSI for freight and passengers increased since the December 2007–June 2009 economic downturn, from 96.2 in June 2009 to 123.1 in June 2016.[42]

First-Mile and Last-Mile Connectivity

The U.S. economy is undergoing dramatic changes with major evolutions in manufacturing and trade, especially in first- and last-mile contexts. CRFCs and CUFCs, introduced in the FAST Act provide a flexible opportunity for States to work with MPOs to designate priority connectors to the NHFN that support intermodal connectivity as well as first- and last-mile connectivity from producers to consumers. The designation of CRFCs and CUFCs is intended to more effectively channel Federal investments to better serve local and regional freight needs.

Projected increases in freight demand and other trends—particularly e-commerce—will have substantial effects on freight flows, needs, and opportunities. Warehousing, supply chain and logistics changes, and other industry trends may also have impacts on freight origins, destinations, and freight volumes, especially volumes moving on first- and last-mile connectors. Intermodal and first-/last-mile connectivity will continue to benefit from targeted Federal resources that can leverage other public-sector or private industry investments.

Freight Transportation Network Overview

Every day, millions of trucks, trains, airplanes, ships, and barges move over American highways, local roads, railways, airways, and navigable waterways, transporting millions of tons of raw materials and finished goods. Pipelines also carry a variety of raw materials, primarily those used for energy purposes (e.g., natural gas, liquid petroleum, biofuels). The U.S. economy depends on safe, affordable, and reliable freight transportation to connect businesses to domestic markets and markets throughout the world.

All modes move freight, but trucking is the dominant mode for domestic freight movements by both tonnage and value (see Exhibits *III-1 and III-2)*. Trucks move a wide variety of goods, ranging from high-value, time-sensitive freight to lower-value bulk tonnage, such as some types of agricultural products, gasoline for local distribution, and municipal solid waste.

The Nation's highway freight transportation system is composed of the National Highway System (NHS), the National Network (NN), and the National Highway Freight Network (NHFN):

[42] Bureau of Transportation Statistics. Transportation Services Index: 2000 to 2020. https://www.transtats.bts.gov/OSEA/TSI/

- The National Network (NN). This is the system of roadways officially designated to accommodate commercial freight-hauling vehicles as authorized by the Surface Transportation Assistance Act of 1982 (P.L. 97-424) and specified in the U.S. Code of Federal Regulations (23 CFR part 658).
- The National Highway Freight Network (NHFN). 23 U.S.C. §167(h) designates the NHFN and establishes a national policy of maintaining and improving the conditions and performance of this new network. The NHFN highlights critical components of the freight network that support States, MPOs, and others in prioritizing and programming projects to meet freight needs. The NHFN comprises four component systems: the PHFS, other Interstate portions not on the PHFS, CRFCs, and CUFCs.

The National Highway System (NHS)

The NHS includes roadways that are of paramount importance to the Nation's economy, defense, and mobility. It is composed of the Interstate system, other principal arterials, the Strategic Highway Network, major Strategic Highway Network Connectors, and intermodal connectors. See Chapter 1 for additional details.

Note that these subsystems can overlap and are not mutually exclusive.

Freight Intermodal Connectors

Intermodal connectors are not statutorily defined but are important components of the Nation's highway freight transportation system. FHWA defines intermodal connectors as roads that provide first- or last-mile connection between major rail, port, airport, and intermodal freight facilities on the NHS.[43] These connectors are key conduits for the timely and reliable delivery of freight. Intermodal connectors are usually short (the majority are less than one mile in length).[44] They are typically local, county, or city streets that serve heavy truck volumes moving between intermodal freight terminals and the NHS, primarily in major metropolitan areas.

The introduction of CRFCs and CUFCs provides States an important opportunity to designate high-priority first- and last-mile connectors to the NHFN. CRFCs and CUFCs are eligible for NHFP funds that will help States improve local, regional, and statewide freight movement connectivity and efficiency.

Overview of the NHFN

The NHFN's four components are described below:

- *Primary Highway Freight System (PHFS)*: The PHFS is a network of highways identified as the most critical highway portions of the U.S. freight transportation system, as determined by measurable and objective national data. FHWA must re-designate the PHFS every 5 years, subject to a cap of up to 3 percent growth in total mileage with each re-designation.
- *Other Interstate portions not on the PHFS*: These routes provide important continuity and access to freight transportation facilities. They change with additions and deletions to the Interstate Highway System.
- *CRFCs*: CRFCs are public roads in nonurbanized areas that provide access and connection to the PHFS and the Interstate along with important ports, public transportation facilities, or other intermodal freight facilities.
- *CUFCs*: CUFCs are public roads in urbanized areas that provide access and connection to the PHFS and the Interstate Highway System along with other ports, public transportation facilities, or other intermodal transportation facilities.

[43] FHWA, "Freight intermodal Connectors Study." April 2017. https://ops.fhwa.dot.gov/publications/fhwahop16057/index.htm
[44] FHWA, "Freight Intermodal Connectors Study." April 2017. https://ops.fhwa.dot.gov/publications/fhwahop16057/index.htm

Pursuant to Section 1116(a) of the FAST Act, States, and in certain cases, MPOs, can identify and submit CRFCs and CUFCs. However, designation is subject to mileage limitations. Total NHFN centerline mileage will therefore change when States elect to submit CRFCs and CUFCs, as well as with additions and deletions to the Interstate Highway System. *Exhibit III-5* provides mileage counts for each of the NHFN's four component roadways, including CRFCs and CUFCs.

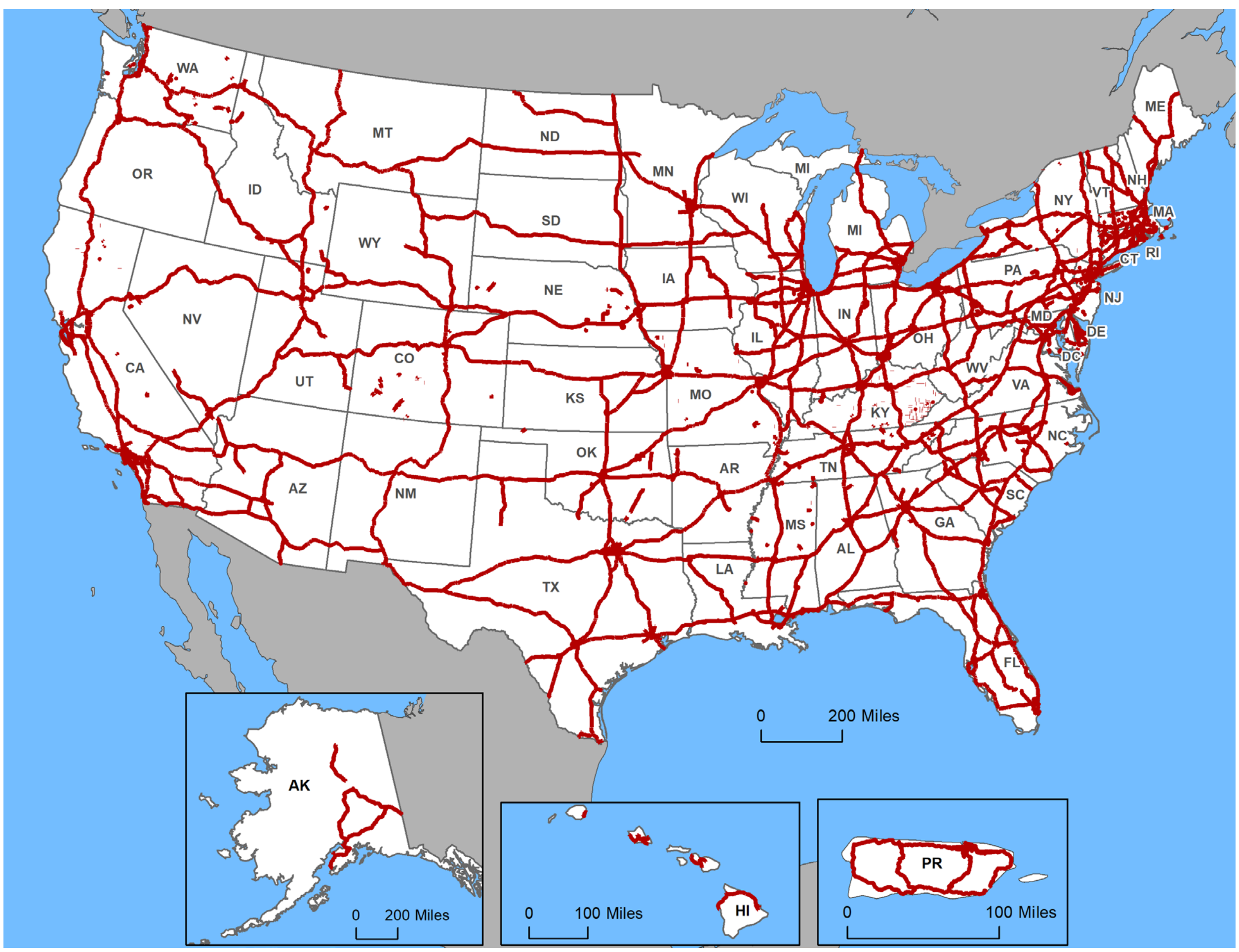
Exhibit III-5 ■ National Highway Freight Network Mileage Counts by Component Roadway

NHFN Roadway Component	Mileage
PHFS	41,308 centerline miles
Other Interstate portions not on the PHFS	Estimated 9,541 centerline miles of Interstate nationwide
CRFCs	2,185 centerline miles
CUFCs	1,276 centerline miles

Note: PHFS is Primary Highway Freight System; CRFCs are Critical Rural Freight Corridors; CUFCs are Critical Urban Freight Corridors.
Source: FHWA, Office of Freight Management and Operations, as of May 1, 2018.

Exhibit III-6 is a map of the NHFN including all NHFN component roadways.

Exhibit III-6 ■ Map of the National Highway Freight Network



Note: The NHFN includes some mileages of such short length (including some CRFCs and CUFCs) that they may not be visible on a national-scale map. NHFN 2019 data (including CRFCs and CUFCs) were used to produce this map.
Source: FHWA, Office of Freight Management and Operations, 2019.

The NHFN also represents all functional classes of roadways. Each class describes the role that a roadway segment plays in serving traffic flows through a larger network. For example, Interstates are the highest classification within a broader category of arterials. Interstates represent the majority of all NHFN mileage.

Changes in NHFN Mileage Since May 2018

As of April 9, 2021, the NHFN consists of an estimated 57,943 miles, including 41,514 miles of Primary Highway Freight System (PHFS) and 9,710 miles of non-PHFS Interstate roads. The CRFCs and CUFCs represent a total of 6,720 miles (about 11.6 percent) of this total NHFN mileage.

The NHFN provides the transportation backbone for freight movements at the national, regional, and local levels. The next section focuses on describing NHFN conditions and performance.

NHFN Conditions and Performance

As in the previous edition, this edition uses a series of indicators to assess NHFN conditions and performance. FHWA used pertinent FAST Act NHFP goal areas as a framework to determine which indicators to include in this report. *Exhibit III-7* shows these NHFP goal areas and the selected indicators.

Exhibit III-7 ■ Conditions and Performance Indicators by FAST Act National Highway Freight Program Goal Areas

NHFP Goal Areas Pertinent to NHFN	Selected Indicator	Indicator Type
State of Good Repair	Pavement Condition	Conditions
	Overall Ride Quality and Ride Quality by Roadway Functional Class	
	Individual Pavement Distresses	
	Bridge Overall Condition and Condition by Roadway Functional Class	
	Bridge Deck Condition	
	Bridge Superstructure Condition	
	Bridge Substructure Condition	
	Culvert Condition	
Congestion, Economic Efficiency, Productivity, and Competitiveness	Peak-period Congestion on NHFN	Performance
	Peak-period Congestion on High-Volume Truck Portions of NHFN	
	Annual Average Travel Speeds for Top 25 Domestic Freight Corridors	
	Travel Time Reliability Index for Top 25 Domestic Freight Corridors	
Safety, Security and Resilience	Number of Fatal Crashes and Fatalities	

Source: FHWA, Office of Freight Management and Operations.

This edition expands the selected indicators to present additional information on NHFN pavement and bridge conditions. For greater detail, refer to the What's New section.

Each of the selected indicators and a corresponding assessment is presented in greater detail below.

Conditions

As discussed elsewhere in the C&P Report (see Chapter 6), as part of the implementation of the Transportation Performance Management framework established by MAP-21 and continued under the FAST Act, a Final Rule for Pavement and Bridge Performance Measures (PM-2) was published on January 18, 2017. This rule defines NHS pavement and bridge condition performance measures, along with minimum condition standards, target establishment, progress assessment, and reporting requirements. Although State reporting under the PM-2 rule had not yet commenced at the time this analysis was conducted, this edition continues a gradual shift toward reporting pavement and bridge measures consistent with those specified in the PM-2 rule.[45] The PM-2 rule only requires that targets be set for NHS pavement and bridges, but this edition applies the same criteria to NHFN pavement and bridges.

NHFN Pavement Condition

States report pavement condition to FHWA using the HPMS for Federal-aid highways. The HPMS is the source for all pavement-related data presented in this section. The HPMS includes information on the International Roughness Index (IRI), which is an indicator of the ride quality experienced by drivers. The HPMS also contains information on other pavement distresses, including faulting at the joints of concrete pavements, the amount of rutting on asphalt pavements, and the amount of cracking on both concrete and asphalt pavements.

Exhibit *III-8* identifies criteria for NHFN pavement "good," "fair," and "poor" classifications, based on the information laid out in the PM-2 rule. The rule also established criteria for overall pavement ratings, based on combinations of ratings for individual distresses. For a section of pavement to be rated in "good" condition, its ratings for all three relevant distresses (ride quality, cracking, and rutting for asphalt pavements; ride quality, cracking, and faulting for concrete pavements) must be rated as "good." For a section of pavement to be rated as "poor," at least two of the relevant distresses must be rated as "poor." Any pavements not rated as "good" or "poor" are classified as "fair."

Exhibit III-8 ■ Pavement Condition Indicator Classifications Used in the Highway Freight C&P Report to Congress

Conditions Indicator	Rating Criteria	Good	Fair	Poor
Pavement Ride Quality	The IRI measures the cumulative deviation from a smooth surface in inches per mile.	IRI < 95	IRI 95 to 170	IRI > 170
Pavement Cracking (Asphalt)	For asphalt pavements, cracking is measured as the percentage of the pavement surface in the wheel path in which interconnected cracks are present.	< 5%	5% to 20%	> 20%
Pavement Cracking (Jointed Plain Concrete)	For jointed plain concrete pavements, cracking is measured as the percentage of cracked concrete panels in the evaluated section.	< 5%	5% to 15%	> 15%
Pavement Cracking (Continuous Reinforced Concrete)	For continuous reinforced concrete pavements, cracking is measured as the percentage of cracking for the evaluated section.	< 5%	5% to 10%	> 10%
Pavement Rutting (Asphalt Pavements Only)	Rutting is measured as the average depth in inches of any surface depression present in the vehicle wheel path.	< 0.20	0.20 to 0.40	> 0.40
Pavement Faulting (Concrete Pavements Only)	Faulting is measured as the average vertical displacement in inches between adjacent jointed concrete panels.	< 0.10	0.10 to 0.15	> 0.15

Source: FHWA (https://www.federalregister.gov/documents/2017/01/18/2017-00550/national-performance-management-measures-assessing-pavement-condition-for-the-national-highway).

The analysis presented in this section provides a baseline understanding of NHFN pavement condition, ride quality, and individual pavement distresses for expansion in future editions of this report. The data suggest that there may be opportunities to improve ride quality for roadways located lower down in the roadway functional class hierarchy.

Exhibit III-9 summarizes the overall ride quality of NHFN pavement in 2016 ("good," "fair," and "poor"). About three-quarters (77 percent) of NHFN pavement was rated "good," 19 percent was rated "fair," and 4 percent was rated "poor." These are the same NHFN pavement condition values provided in the previous edition (which used 2014 HPMS data). Between 2014 and 2016, NHFN pavement condition remained largely unchanged.

[45] As of 2020, State reporting under the PM-2 rule was well underway with pavement and bridge data reported by States in 2018. Mid-period performance will be reported in October 2020.

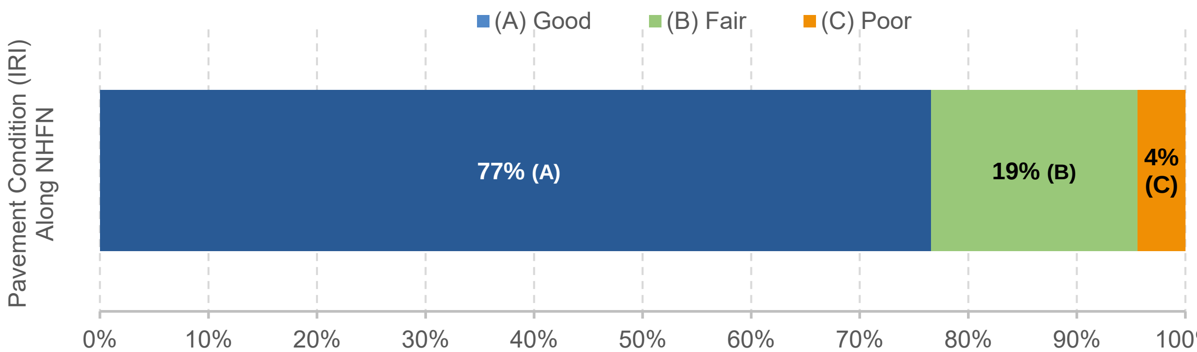
NHFN Pavement Condition Analysis: Centerline and Lane Miles

Information presented in Exhibit III-9 is based on an analysis of NHFN centerline miles. Centerline miles measure a road from start point to end point without regard for the number or size of roadway lanes.

IRI values reported in HPMS are based on centerline miles; reporting agencies use a consistent approach to calculate centerline miles. For these reasons, using centerline lines can help ensure a more consistent analysis. However, centerline miles do not provide information on the number or width of roadway lanes, thus presenting some limitation to their analysis.

Information presented in Exhibit III-10 and Exhibit III-11 is based on an analysis of NHFN mileage weighted by lane miles. Lane miles measure a road centerline multiplied by the number of lanes on that road. The PM-2 rule requires that targets be set on a lane-mile weighted basis for pavements. Weighting by lane miles or deck area aligns better with the costs that agencies would incur to improve existing pavements or bridges (i.e., it costs more to reconstruct a four-lane road than a two-lane road).

Exhibit III-9 ■ National Highway Freight Network Pavement Condition Based on IRI, 2016



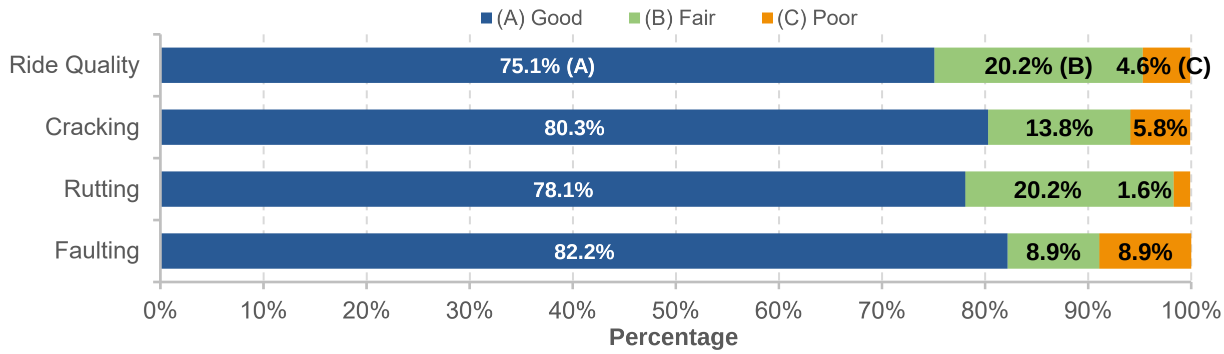
Note: NHFN is National Highway Freight Network; IRI is International Roughness Index. With the inclusion of the CRFCs and CUFCs submitted as of May 1, 2018, the total mileage of the NHFN is 54,310.

Source: Highway Performance Monitoring System, 2016.

Exhibit III-10 indicates that about three-quarters (75.1 percent) of NHFN mileage was rated as having "good" overall ride quality whereas a relatively small portion (4.6 percent) was rated as having "poor" ride quality. Most NHFN mileage with cracking, rutting, or faulting was still rated "good" (80.3 percent, 78.1 percent, and 82.2 percent, respectively). NHFN mileage with faulting had the highest percentage of "poor" pavement condition (8.9 percent of mileage), compared with NHFN mileage with rutting or faulting.[46]

[46] In accordance with the rating criteria presented in Exhibit III-8, cracking was calculated for all pavement types on the NHFN, rutting was calculated only for asphalt pavement types, and faulting was calculated only for concrete pavement types. About 73 percent of total NHFN lane miles are represented in the cracking value, 59 percent of total NHFN lane miles are represented in the rutting value, and 16 percent of total NHFN lane miles are represented in the faulting value.

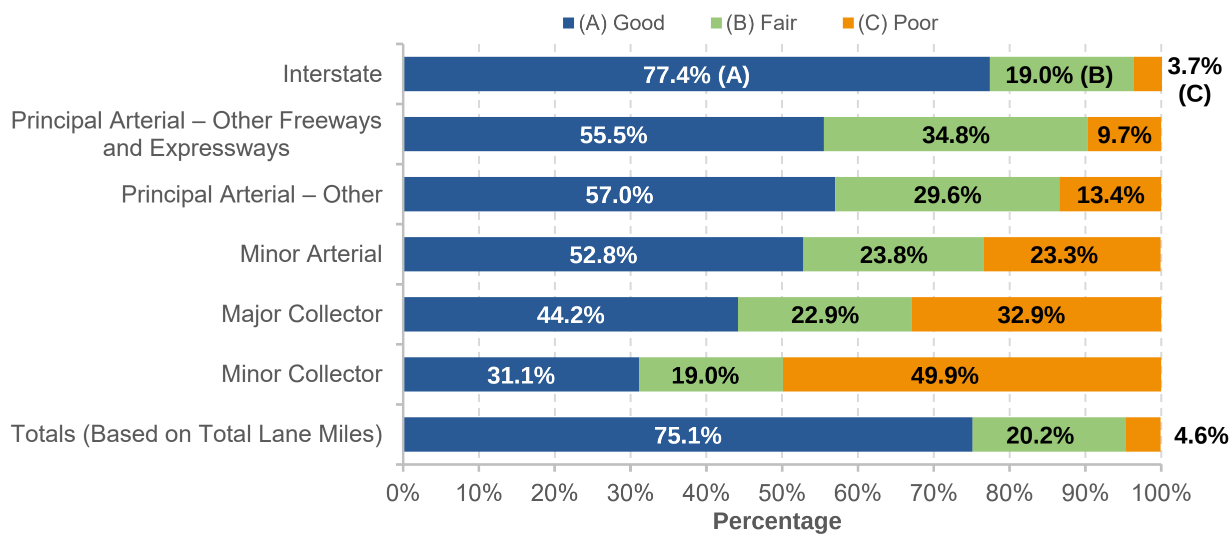
Exhibit III-10 ▪ National Highway Freight Network Pavement Condition Overall Ride Quality and Individual Pavement Distresses, 2016



Sources: Highway Performance Monitoring System, 2016; National Highway Freight Network as of May 1, 2018.

Exhibit III-11 provides a second perspective on NHFN conditions, showing overall ride quality by roadway functional class. In general, ride quality along the NHFN declines with lower roadway functional class. For example, most NHFN Interstate mileage (approximately 77.4 percent) is rated as "good," whereas 31.1 percent of NHFN Minor Collector mileage is rated "good." Similarly, the percentage of mileage rated "poor" increases with lower roadway functional class. About 3.7 percent of NHFN Interstate mileage is rated "poor" whereas 49.9 percent of NHFN Minor Collector mileage is rated "poor."

Exhibit III-11 ▪ National Highway Freight Network Ride Quality by Roadway Functional Class, 2016



Sources: Highway Performance Monitoring System, 2016; National Highway Freight Network as of May 1, 2018.

Bridges on the NHFN

The NBI was analyzed to inventory bridges on the NHFN. The analysis presented in this edition is based on an estimated total of 54,263 NHFN bridges (compared with 57,600 total NHFN bridges identified in the previous edition of this report).[47]

The PM-2 rule redefined the criteria for determining structurally deficient bridges and made them equal to the criteria that classify bridges as being in "poor" condition. The PM-2 rule considers only the first four of these metrics (deck condition, superstructure condition, substructure condition, and

[47] Due to limitations in available data and the analysis methodology used, the total number of NHFN bridges is estimated. For more information on the methodology, see the Data Quality and Procedures section.

culvert condition); if any one of these criteria is rated "poor," the bridge is classified as "poor."[48] A bridge is classified as "good" only if all metrics are rated as "good." The PM-2 rule only requires that targets be set for NHS bridges, but this section applies the same criteria to NHFN bridges.

The classification of a bridge in "poor" condition does not imply that the bridge is unsafe. Instead, the classification indicates the extent to which a bridge has deteriorated from its original condition when first built. A bridge with a classification of poor might experience reduced performance in the form of lane closures or load limits. If a bridge inspection determines a bridge to be unsafe, it is closed.

Exhibit *III-12* provides the bridge condition indicator classifications used in this edition of the *Highway Freight C&P* Report to Congress.

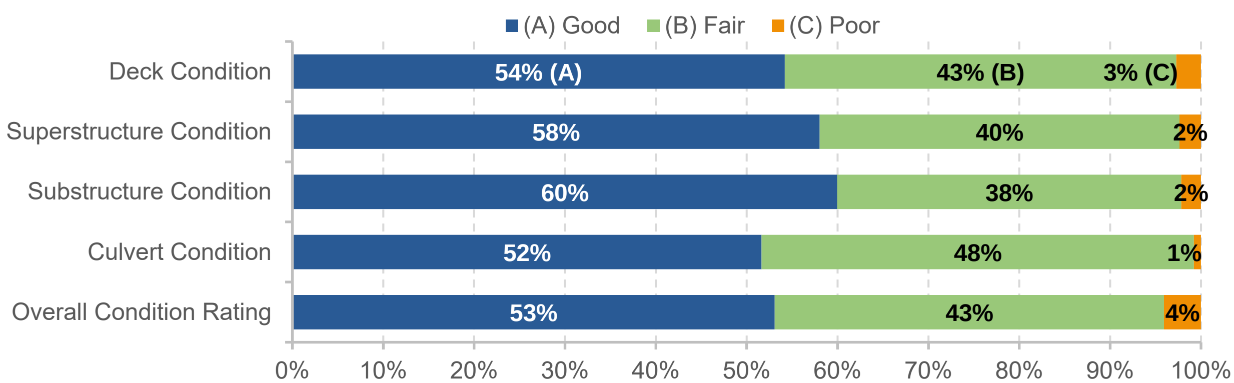
Exhibit III-12 ■ Bridge Condition Indicator Classifications Used in the Highway Freight C&P Report to Congress

Conditions Metric	Rating Criteria	Good	Fair	Poor
Bridge Deck Condition	Ratings are on a scale from 0 "Failed" to 9 "Excellent."	≥ 7	5 to 6	≤ 4
Bridge Superstructure Condition	Ratings are on a scale from 0 "Failed" to 9 "Excellent."	≥ 7	5 to 6	≤ 4
Bridge Substructure Condition	Ratings are on a scale from 0 "Failed" to 9 "Excellent."	≥ 7	5 to 6	≤ 4
Culvert Condition	Ratings are on a scale from 0 "Failed" to 9 "Excellent."	≥ 7	5 to 6	≤ 4

Source: FHWA (https://www.federalregister.gov/documents/2017/01/18/2017-00550/national-performance-management-measures-assessing-pavement-condition-for-the-national-highway).

Exhibit III-13 shows NHFN bridge deck, superstructure, substructure, and culvert condition, as well as an overall condition rating.[49] This edition reports on an overall condition rating for NHFN bridges for the first time; the data show that more than half of NHFN bridges (53 percent) are in "good" condition, 43 percent are in "fair" condition, and 4 percent are in "poor" condition. The data also indicate that bridge deck, superstructure, substructure, and culvert condition generally stayed the same between 2014 and 2016.

Exhibit III-13 ■ Condition of Bridges on the National Highway Freight Network, 2016



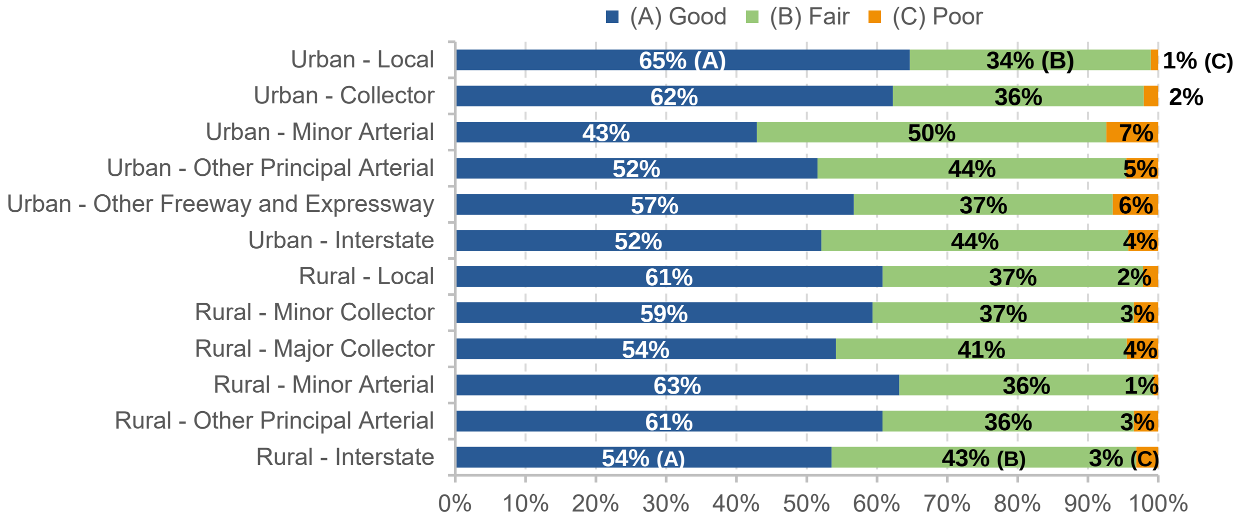
Source: National Bridge Inventory, 2016.

Exhibit III-14 shows the condition of NHFN bridges by roadway functional class.

[48] The bridge deck is the roadway or traveling surface of the bridge; the superstructure is the main part of the bridge, such as the beams, that rests on the substructure; the substructure is the foundation and other parts that support the superstructure. A culvert is a type of bridge substructure that allows water to flow through; a culvert is termed "bridge" if its length is greater than 20 feet, or 6.1 meters.

[49] Overall bridge condition data were not included in the previous edition of the *Highway Freight C&P* Report to Congress.

Exhibit III-14 ■ Condition of Bridges on the National Highway Freight Network, by Roadway Functional Class, 2016



Source: National Bridge Inventory, 2016.

NHFN Bridge Condition Analysis: Deck Length

Information presented in *Exhibit III-13* and *Exhibit III-14* was based on an analysis of NHFN bridge deck length rather than the number of bridges on the NHFN. Focusing the analysis on bridge deck length allows for a more neutral understanding of bridge conditions that avoids a potential data bias toward smaller bridges.

Performance

Safety

Safety indicators help enable decision makers and other stakeholders to monitor changes in system condition and performance against established visions, goals, and objectives. Crash statistics discussed in this section were extracted from the Fatality Analysis Reporting System (FARS) for rural and urban Interstate highways, which make up the majority of NHFN mileage. NHFN Interstates were combined with geocoded FARS data crash locations to obtain the crash data reported below. The data presented here show a rising trend in the number of crashes and fatalities on the NHFN, particularly on urban Interstate highways.

Exhibit III-15 shows the number of fatal motor vehicle crashes and fatalities on the NHFN in 2014, 2015, and 2016.

Exhibit III-15 ■ Fatal Crashes and Fatalities on the National Highway Freight Network, 2014–2016

	Rural/Urban Areas							
	Rural Areas		Urban Areas		Unknown		Total	
Year	Fatal Crashes	Fatalities	Fatal Crashes	Fatalities	Fatal Crashes	Fatalities	Fatal Crashes	Fatalities
2014	1,521	1,762	2,112	2,332	0	0	3,633	4,094
2015	1,647	1,918	2,190	2,424	4	4	3,841	4,346
2016	1,988	2,296	2,457	2,710	2	2	4,447	5,008

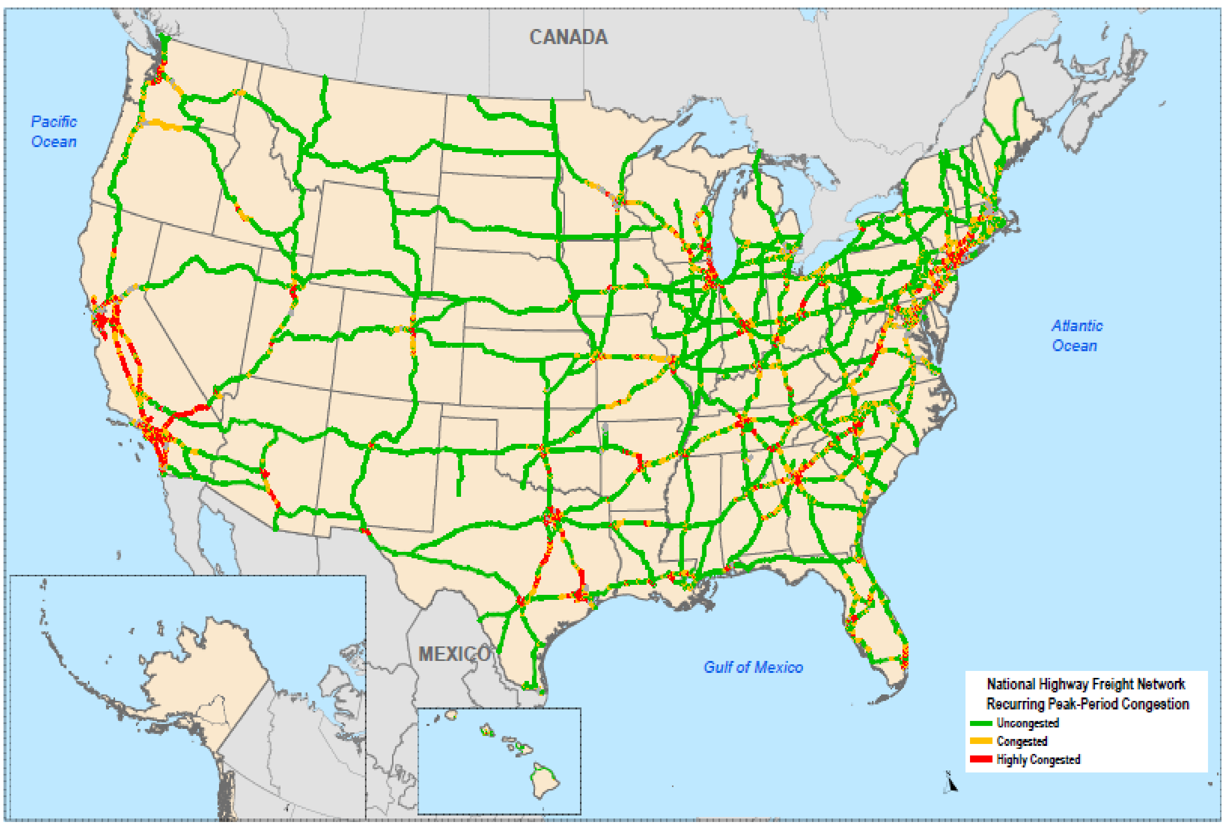
Source: National Highway Traffic Safety Administration, FARS 2016.

Congestion

Congestion on highways and bridges occurs when traffic demand approaches or exceeds the available capacity of the system. Congestion is typically described as either "recurring," meaning it takes place at roughly the same place and time every day, or "nonrecurring," which is caused by temporary disruptions (e.g., traffic incidents, bad weather, construction work) that render part of the roadway unusable. Congestion that negatively influences freight traffic tends to occur on a recurring basis during peak periods, particularly in and near major metropolitan areas.

Exhibit III-16 identifies estimated locations of peak-period congestion on the NHFN in 2015.[50] As in the peak-period congestion map presented in the previous edition of this report, most recurring, highly congested conditions occur within or near major metropolitan areas.

Exhibit III-16 ■ Estimated Peak-Period Congestion on the National Highway Freight Network, 2015



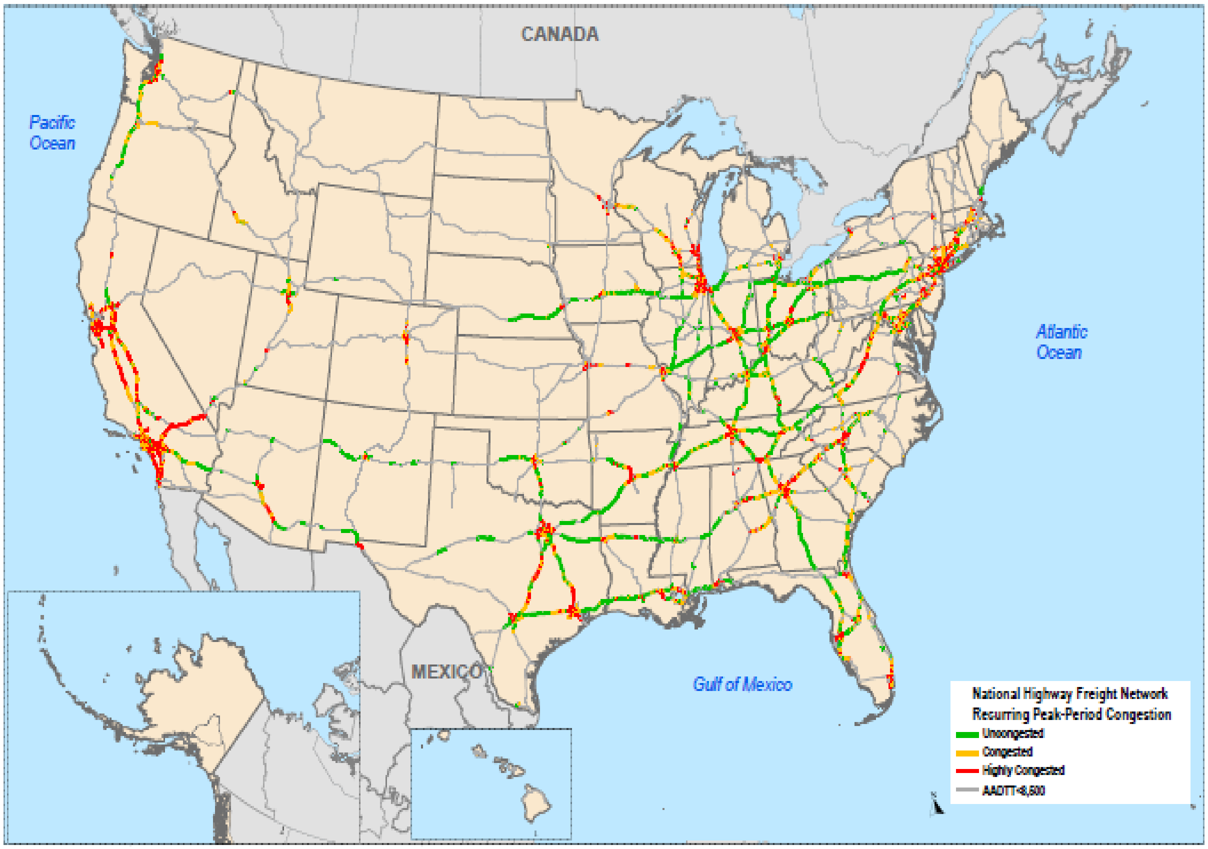
Note: This map uses FAF version 4.3, which is based in large part on results from the Commodity Flow Survey administered in 2012. FAF version 4 data beyond 2012 were estimated based on the 2012 CFS. **Highly congested** segments are stop-and-go conditions with volume/service flow ratios greater than 0.95. **Congested segments** have reduced traffic speeds with volume/service flow ratios between 0.75 and 0.95. The volume/service flow ratio is estimated using the procedures outlined in the Highway Performance Monitoring System Field Manual Appendix N.

Source: FHWA, Office of Freight Management and Operations, Freight Analysis Framework, version 4.3, 2016.

Exhibit III-17 illustrates the locations of estimated peak-period congestion on the high-volume truck portions of the NHFN as of 2015. High-volume truck portions of the NHFN carry more than 8,500 trucks per day, including freight-hauling long-distance trucks, freight-hauling local trucks, and other trucks with six or more tires. Similar to *Exhibit III-16,* the map indicates that highly congested conditions occur within or near major metropolitan areas. High-volume truck portions of the NHFN are more prone to experiencing congested conditions than portions with lower average truck volume.

[50] See *Exhibit III-16* and *Exhibit III-17* notes for explanation of why these locations are estimated.

Exhibit III-17 ■ Estimated Peak-period Congestion on High-Volume Truck Portions of the NHFN, 2015



Note: Note: This map uses FAF version 4.3, which is based in large part on results from the Commodity Flow Survey administered in 2012. FAF version 4 data beyond 2012 were estimated based on the 2012 CFS. **Highly congested** segments are stop-and-go conditions with volume/service flow ratios greater than 0.95. **Congested segments** have reduced traffic speeds with volume/service flow ratios between 0.75 and 0.95. AADTT is average annual daily truck traffic. The volume/service flow ratio is estimated using the procedures outlined in the Highway Performance Monitoring System Field Manual Appendix N.

Source: FHWA, Office of Freight Management and Operations, Freight Analysis Framework, version 4.3, 2016.

FHWA Monitors Freight Performance Using Multiple Measures

FHWA routinely uses multiple measures to monitor freight system congestion and overall performance. For example, as part of its Freight Performance Measurement program, FHWA uses measures of travel time reliability and speed for corridors, border crossings, urban areas, freight intermodal connections, and freight bottlenecks.

Additional information is available on FHWA's website at http://ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/.

Truck Travel Time Speed and Reliability

Truck travel time speed and reliability are two additional indicators of highway freight system performance. Slower speeds and unreliable travel times caused by congestion, inclement weather conditions, or other factors can increase fuel and driver costs and delay shipments, which in turn affect efficiency and productivity. Average travel speeds serve as an indicator of congestion for each corridor. Variability in travel times serves as an indicator of reliability for each corridor.

Exhibit III-18 displays annual average travel speeds on the top 25 domestic freight corridors on the NHFN over a 5-year timeframe (2011 through 2016). As in the previous edition, travel speeds are measured using data derived from FHWA National Performance Management Research Data Set (NPMRDS) truck probes.

FHWA, State DOTs, and MPOs use the NPMRDS to calculate transportation performance measures. The NPMRDS provides historical average travel times in five-minute increments daily covering the entire NHS. The NPMRDS collects vehicle probe-based travel time data for passenger vehicles and trucks. Probe data are collected from a variety of sources including mobile devices, connected autos, portable navigation devices, truck fleets, and sensors. The data provide nationwide coverage using data from over 700,000 trucks operating in North America. Most of the data are from medium to large fleets that operate tractor-trailer combination trucks in every sector of the industry and every region of the United States and Canada.

To determine the top 25 domestic freight corridors, in 2015 FHWA used FAF version 3 data, collected by NPMRDS vehicle probes, to identify the top 10 percent of the FAF highway segments by tonnage. FHWA connected segments with the highest tonnage and known freight generators (land uses or groups of land uses that generate high freight transportation volumes, such as truck terminals, intermodal rail yards, water ports, airports, warehouses and distribution centers, or large manufacturing facilities) or population centers (origins and destinations).[51]

Just over half (52 percent) of the top 25 domestic freight corridors by tonnage on the NHFN experienced an increase in speed in 2016 compared with 2011; the remaining corridors experienced a decrease in speed over this period. The I-84 Boise to I-86 corridor experienced the greatest increase in average speed, whereas the I-95 Richmond to New Haven corridor experienced the greatest decrease.

FHWA also uses the NPMRDS data to assess corridor-level travel time reliability, which it defines as the consistency or dependability in travel times, as measured from day to day and/or across different times of the day.[52] Travel time reliability is derived from measured average speeds of commercial vehicles for the Top 25 Domestic Freight Corridors annually. Compared with measures of congestion, measures of travel time reliability provide a different perspective of travel beyond a simple average travel time.

To the freight industry, reliability in the predictability of travel time is of critical importance. As one example, many industries rely on "just in time" manufacturing—having the right material, at the right time, at the right place, and in the exact amount needed. The ripple effect of a late delivery can be costly; frequent delivery delays disrupt the effectiveness of production. Poor reliability requires drivers to budget extra time when planning trips, tracking routes in real time, and making route adjustments in response to inconsistent travel time and excess delay. Unpredictable travel times may lead to negative impacts such as delayed deliveries or unwanted schedule changes that add cost to freight operations or deliveries[53] and may result in lost pay to and increased stress on truck drivers.

[51] FHWA, *Status of the Nation's Highways, Bridges, and Transit Conditions and Performance*: 23rd Edition: Part III: Highway Freight Transportation–Report to Congress. https://ops.fhwa.dot.gov/freight/infrastructure/nfn/rptc/cp23hwyfreight/iii_ch11.htm

[52] FHWA, Travel Time Reliability Measures. https://ops.fhwa.dot.gov/perf_measurement/reliability_measures/index.htm#targetText=Travel%20time%20reliability%20measures%20the,different%20times%20of%20the%20day.

[53] FHWA, Travel Time Reliability Measures. https://ops.fhwa.dot.gov/perf_measurement/reliability_measures/index.htm#targetText=Travel%20time%20reliability%20measures%20the,different%20times%20of%20the%20day.

Exhibit III-18 ■ Annual Average Travel Speeds for the Top 25 Domestic Freight Corridors by Tonnage on the National Highway Freight Network, 2011–2016

Corridor	2011	2012	2013	2014	2015	2016
I-5: Medford, OR to Seattle	56.64	56.33	56.12	54.94	56.15	55.99
I-5/CA 99: Sacramento to Los Angeles	56.19	56.05	56.11	55.99	56.11	56.25
I-10: Los Angeles to Tucson	59.53	59.42	59.42	58.6	59.54	59.45
I-10: San Antonio to New Orleans	61.79	61.45	61.77	60.82	61.78	61.75
I-10: Pensacola to I-75	64.69	63.9	64.03	63.99	64.27	64.57
I-30: Little Rock to Dallas	61.78	62.64	62.82	62.13	62.7	62.84
I-35: Laredo to Oklahoma City	61.06	61.45	61.05	59.76	60.29	60.57
I-40: Oklahoma City to Flagstaff	63.99	63.86	64.15	64.31	64.18	64.31
I-40: Knoxville to Little Rock	62.34	62.24	62.14	61.53	62.3	62.71
I-40: Raleigh to Asheville	62.42	62.36	62.32	61.62	61.9	62.05
I-55/I-39/I-94: St. Louis to Minneapolis	62	62.37	62.16	62.1	62.57	63.03
I-57/I-74: I-24 (IL) to I-55 (IL)	62.86	62.71	62.56	62.76	63.59	63.62
I-70: Kansas City to Columbus	61.51	61.94	61.81	61.5	61.98	62.35
I-65/I-24: Chattanooga to Nashville to Chicago	60.97	61.04	60.85	59.57	59.95	60.39
I-75: Tampa to Knoxville	62.74	62.47	62.39	61.67	62.13	62.15
I-75: Lexington to Detroit	60.18	60.76	60.66	59.3	59.43	60.19
I-78/I-76: New York to Pittsburgh	59.59	59.94	59.88	59.34	59.7	60.01
I-80: New York to Cleveland	60.78	61.12	61.13	60.68	61.14	61.59
I-80: Cleveland to Chicago	61.86	62.26	61.99	61.57	62.09	61.8
I-80: Chicago to I-76 (CO/NE border)	62.96	63.16	63.36	63.39	63.64	63.77
I-81: Harrisburg to I-40 (Knoxville)	62.38	62.42	62.6	62.6	62.53	62.65
I-84: Boise to I-86	61.81	62.53	62.53	62.43	62.91	63.36
I-94: Chicago to Detroit	59.89	60.54	59.95	58.74	59.24	59.59
I-95: Miami to I-26 (SC)	63.07	62.63	62.48	61.77	62.27	62.35
I-95: Richmond to New Haven	55.36	55.52	54.7	51.72	54.33	54.38

Notes: Weekdays 24/7, presented in miles per hour. Darker shading indicates lower annual average travel speed.

Source: National Performance Management Research Data Set (NPMRDS) 2016 as provided by FHWA, Office of Freight Management and Operations.

Exhibit III-19 shows truck travel time prediction reliability for the top 25 domestic freight corridors by tonnage on the NHFN over a five-year timeframe (2011 to 2016). Values greater than 1.00 illustrate travel time variability. Higher numbers indicate greater variability, and the numbers after the decimal points can be treated as percentages. For example, the 2016 travel time reliability index for I-5/CA 99: Sacramento to Los Angeles is 1.36. This means travel times in 2016 were 36 percent longer on heavy travel days, compared with normal days. *Exhibit III-19* indicates that from 2011 to 2016, truck travel time reliability decreased for the majority (72 percent) of top 25 domestic freight corridors.

Exhibit III-19 ■ Travel Time Reliability Index for the Top 25 Domestic Freight Corridors by Tonnage on the National Highway Freight Network, 2011–2016

Corridor	2011	2012	2013	2014	2015	2016
I-5: Medford, OR to Seattle	1.31	1.34	1.37	1.41	1.48	1.51
I-5/CA 99: Sacramento to Los Angeles	1.28	1.33	1.34	1.33	1.35	1.36
I-10: Los Angeles to Tucson	1.24	1.21	1.26	1.27	1.34	1.38
I-10: San Antonio to New Orleans	1.23	1.28	1.3	1.31	1.31	1.32
I-10: Pensacola to I-75	1.06	1.06	1.06	1.07	1.06	1.07
I-30: Little Rock to Dallas	1.21	1.15	1.14	1.17	1.18	1.21
I-35: Laredo to Oklahoma City	1.24	1.24	1.28	1.3	1.39	1.42
I-40: Oklahoma City to Flagstaff	1.1	1.12	1.11	1.11	1.12	1.11
I-40: Knoxville to Little Rock	1.17	1.18	1.2	1.24	1.16	1.15
I-40: Raleigh to Asheville	1.11	1.12	1.14	1.15	1.15	1.15
I-55/I-39/I-94: St. Louis to Minneapolis	1.15	1.13	1.14	1.14	1.15	1.13
I-57/I-74: I-24 (IL) to I-55 (IL)	1.09	1.12	1.15	1.14	1.1	1.14
I-70: Kansas City to Columbus	1.21	1.18	1.2	1.2	1.21	1.19
I-65/I-24: Chattanooga to Nashville to Chicago	1.26	1.26	1.29	1.34	1.34	1.33
I-75: Tampa to Knoxville	1.16	1.16	1.2	1.21	1.22	1.25
I-75: Lexington to Detroit	1.26	1.24	1.29	1.3	1.34	1.34
I-78/I-76: New York to Pittsburgh	1.16	1.2	1.2	1.21	1.22	1.23
I-80: New York to Cleveland	1.26	1.19	1.19	1.2	1.22	1.21
I-80: Cleveland to Chicago	1.18	1.14	1.17	1.21	1.17	1.24
I-80: Chicago to I-76 (CO/NE border)	1.13	1.12	1.12	1.12	1.12	1.14
I-81: Harrisburg to I-40 (Knoxville)	1.11	1.12	1.11	1.11	1.1	1.11
I-84: Boise to I-86	1.14	1.08	1.09	1.14	1.14	1.1
I-94: Chicago to Detroit	1.09	1.08	1.1	1.15	1.11	1.15
I-95: Miami to I-26 (SC)	1.17	1.18	1.21	1.23	1.26	1.31
I-95: Richmond to New Haven	1.62	1.59	1.69	1.85	1.76	1.75

Notes: Darker shading indicates a higher travel time reliability index value.

Source: National Performance Management Research Data Set 2016 as provided by FHWA, Office of Freight Management and Operations.

Overview of CRFCs and CUFCs

As noted earlier in this section, CRFCs and CUFCs are freight corridors that provide critical connectivity to the NHFN. By designating these important corridors, States can direct resources toward improved system performance and efficient movement of freight on the NHFN.[54] CRFCs and CUFCs provide links between NHFN and freight generators such as manufacturers, distribution points, and rail intermodal and port facilities. CRFCs and CUFCs are significant in establishing and strengthening States' first-/last-mile and intermodal connectivity, both integral components of an efficiently functioning freight system.

Submittal of CRFCs and CUFCs increases a State's NHFN mileage, allowing expanded use of NHFP formula funds and Infrastructure for Rebuilding America (INFRA) funds[55] for eligible projects that support national goals identified in 23 U.S.C. 167(b) and 23 U.S.C. 117(a)(2).[56]

States are responsible for designating CRFCs. States also designate CUFCs, in consultation with MPOs, in urbanized areas with populations under 500,000; in urbanized areas with populations over

[54] FHWA, FAST Act Section 1116 National Highway Freight Program (NHFP) Guidance, Designating and Certifying Critical Rural Freight Corridors and Critical Urban Freight Corridors, Questions & Answers. Posted April 26, 2016, Update May 23, 2016. At https://ops.fhwa.dot.gov/fastact/crfc/sec_1116_gdnce.pdf.
[55] Authorized in Section 1101(a)(5) of the FAST Act and administered pursuant to 23 U.S.C. 117.
[56] FHWA, "FAST Act, Section 1116 NHFP Guidance: Designating and Certifying Critical Rural Freight Corridors and Critical Urban Freight Corridors." 2016. https://ops.fhwa.dot.gov/fastact/crfc/sec_1116_gdnce.htm.

500,000, MPOs are responsible for designating CUFCs in consultation with States, and for determining how to distribute CUFC mileage among the urbanized areas.

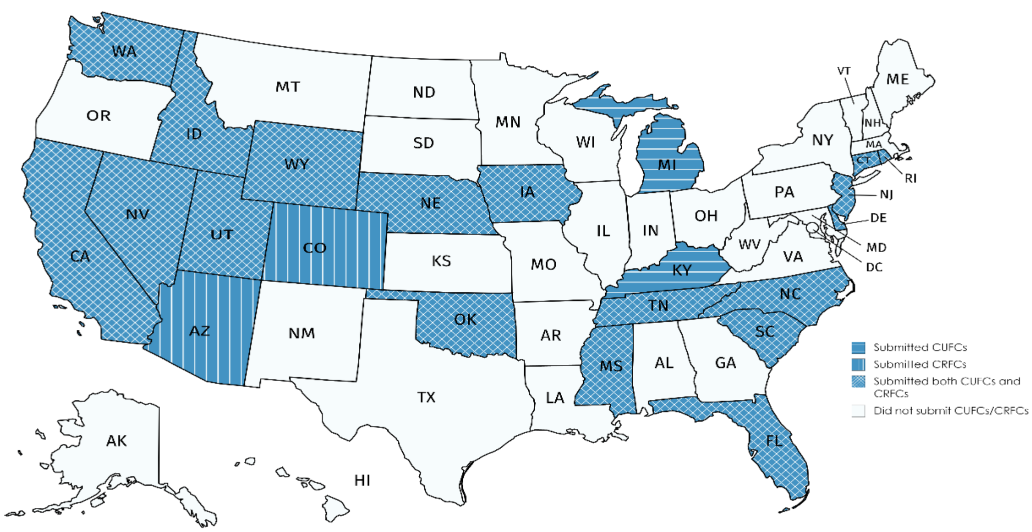
Each State is given a maximum total number of miles for CRFC and CUFC submittal; there is no deadline for submittals. The mileage maximums are based on centerline roadway mileage. Information on the estimated maximum limit of CRFC and CUFC mileage for each State is available on the FHWA NHFN website as part of the table of NHFN mileages by State.[57]

The CRFC and CUFC categories provide flexibility for States to designate any functional class of roadway, including local roads, as well as planned facilities. FHWA encourages States and MPOs, when making CRFC submittals, to consider first- or last-mile connector routes from high-volume freight corridors to key rural freight facilities, including manufacturing centers, agricultural processing centers, farms, intermodal, and military facilities. FHWA encourages States, when making CUFC submittals, to consider first- or last-mile connector routes from high-volume freight corridors to freight-intensive land and key urban freight facilities, including ports, rail terminals, and other industrial-zoned land.

Submitting CRFCs and CUFC designations and certifications is optional, but extends the flexibility of States to apply NHFP funds. As of May 1, 2018, 18 States had submitted both CRFCs and CUFCs. An additional two States had submitted only CRFCs, and two other States submitted only CUFCs.

Exhibit III-20 shows a map of States with CRFCs and/or CUFCs submitted as of May 1, 2018. Appendix F provides a full list of all submitted routes.

Exhibit III-20 ■ States with CRFCs and/or CUFCs



Note: CRFCs are Critical Rural Freight Corridors and CUFCs are Critical Urban Freight Corridors.
Source: FHWA, Office of Freight Management and Operations. Represents data as of May 1, 2018.

The submitted CRFCs and CUFCs comprised 3,461 total miles, representing about six percent of NHFN roadway mileage. CRFC and CUFC roads classified as "Principal Arterial-Other" make up more than half (60 percent) of total CRFC and CUFC mileage. *Exhibit III-5* provides a breakdown of the NHFN mileage, including the CRFC and CUFC components.

When submitting CRFCs and CUFCs, States are required to classify these corridors using one or more specific route identifiers (*Exhibit III-21* and *Exhibit III-22*). Of the 11 route identifier categories, there are seven identifiers for CRFCs and four identifiers for CUFCs. These identifiers describe general criteria for how States should classify their CRFCs and CUFCs.

[57] https://ops.fhwa.dot.gov/freight/infrastructure/nfn/maps/nhfn_mileage_states.htm

Exhibit III-21 ■ Route Identifiers for Critical Rural Freight Corridors

CRFC ID	Route/Facility Descriptor
A	Rural principal arterial roadway with a minimum of 25 percent of the annual average daily traffic of the road measured in passenger vehicle equivalent units from trucks
B	Provides access to energy exploration, development, installation, or production areas
C	Connects the PHFS or the Interstate System to facilities that handle more than: 50,000 20-foot equivalent units per year or 500,000 tons per year of bulk commodities
D	Provides access to a grain elevator, agricultural facility, mining facility, forestry facility, or intermodal facility
E	Connect to an international port of entry
F	Provides access to significant air, rail, water, or other freight facilities
G	Corridor that is vital to improving the efficient movement of freight of importance to the economy of the State

Note: PHFS is Primary Highway Freight System.
Source: FHWA, Office of Freight Management and Operations.

Exhibit III-22 ■ Route Identifiers for Critical Urban Freight Corridors

CUFC ID	Route/Facility Descriptor
H	Connects an intermodal facility to the PHFS, the Interstate System, or an intermodal freight facility
I	Located within a corridor of a route on the PHFS and provides an alternative highway option important to goods movement
J	Serves a major freight generator, logistic center, or manufacturing and warehouse industrial land
K	Corridor that is important to the movement of freight within the region, as determined by the MPO or the State

Note: PHFS is Primary Highway Freight System; MPO is metropolitan planning organization.
Source: FHWA, Office of Freight Management and Operations.

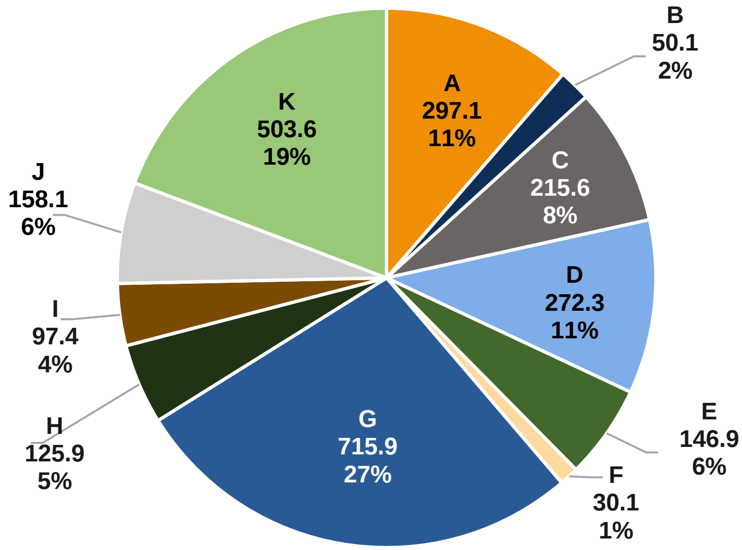
States were permitted to select multiple route identifiers for each submitted CRFC or CUFC route, and often did. About 30 percent of all submitted CRFC and CUFC routes had multiple (two or more) identifiers; about 60 percent of submitted CRFC and CUFC routes had only one unique identifier. The remaining 10 percent of submitted CRFC and CUFC routes did not have identifiers.

The frequency with which States selected multiple identifiers for the CRFCs and CUFCs indicates that States are using the flexibility inherent in these categories to identify high-priority corridors. Future analyses will further examine the methodologies employed by States to select their CRFCs and CUFCs, including the freight modeling tools, processes, or mechanisms that may have been used. The analysis presented here provides a baseline for expanded analyses in future editions of this *Highway Freight C&P* Report to Congress.

As *Exhibit III-23* demonstrates, among the CRFC and CUFC routes submitted with only one identifier, about 27 percent of mileage (about 715 miles total) was identified as category G, a "corridor that is vital to improving the efficient movement of freight of importance to the economy of the State."[58] About 19 percent of mileage (about 503 miles total) was identified as category K, a "corridor that is important to the movement of freight within the region, as determined by the MPO or the State."[59]

[58] Note that percentage is calculated by summing the total amount of CUFC route mileage submitted under category G, and dividing by the total route mileage of all CUFC and CRFC routes submitted as of May 1, 2018.
[59] See previous footnote for a description of how this percentage was calculated.

Exhibit III-23 ■ CRFC and CUFC Route Segment Length (in Miles) by Unique Identifier, 2018



Notes: CRFCs are Critical Rural Freight Corridors and CUFCs are Critical Urban Freight Corridors. See Exhibit III-21 and Exhibit III-22 for definitions of the route identifiers.

Source: FHWA, Office of Freight Management and Operations. Represents data as of May 1, 2018.

Spotlight Topics

This section provides an overview of several spotlight topics for freight transportation. These topics include issues, initiatives, or challenges that significantly impact freight transportation planning, management, and decision-making. These topics also provide additional context to better assess and understand freight system conditions, performance, and needs (including, but not limited to, the NHFN).

NHFN Data Quality and Procedures

With establishment of the NHFN, Congress provided a new opportunity to direct resources to improve a freight-specific roadway network. FHWA is still in the early stages of compiling NHFN data, identifying opportunities to expand or improve on these data, and understand where there may be gaps, inconsistencies, or other data needs to address. FHWA is working to create data visualization and analysis tools to better analyze NHFN data. Through these and other efforts, it is expected that the ability to analyze NHFN data will improve, becoming more comprehensive over time.

Jason's Law and the National Coalition for Truck Parking

One of the major challenges to the safe movement of freight is the availability of adequate truck parking. The first *Highway Freight C&P* Report to Congress provided an in-depth discussion of the pervasiveness of truck parking challenges across the country and affirmed truck parking as a priority topic for DOT and its operating administrations.

Section 1401 of MAP-21, identified as "Jason's Law," directed DOT to conduct a survey and a comparative assessment to:

1. Evaluate the capability of each State to provide adequate parking and rest facilities for commercial motor vehicles engaged in Interstate transportation.
2. Assess the volume of commercial motor vehicle traffic in each State.
3. Develop a system of metrics to measure the adequacy of commercial motor vehicle parking facilities in each State.

The Jason's Law Truck Parking Survey Results and Comparative Analysis of August 2015 (Truck Parking Survey) documented the location of more than 308,000 truck parking spaces, including over 36,000 at public rest areas and over 272,000 at private truck stops.[60] The Truck Parking Survey found that truck parking is a national problem, especially along key freight corridors. More than 75 percent of respondent truck drivers reported regularly experiencing problems with finding "safe parking locations when rest was needed." Ninety percent reported struggling to find safe parking at night. Other findings included:

- Truck parking capacity is a problem in all States, with the greatest problems more evident on major freight corridors and in large metropolitan areas.
- Consistent, continued measurement is important to provide data to understand dynamic truck parking needs and assess whether the situation is improving.
- Truck parking analysis is an important component of State and MPO freight plans, as well as regional and corridor-based freight planning.
- There is a need to understand the supply chains of key industries and commodities to, from, and through States to better anticipate and plan for parking needs.
- Local regulations and zoning often create challenges for development of truck parking facilities.
- Public and private sector coordination is critical to address long-term truck parking needs.

In August 2015, DOT formed the National Coalition on Truck Parking (Coalition) in response to the needs identified in the Truck Parking Survey. The Coalition convenes stakeholders from transportation organizations, the freight industry, and other groups to engage in the following activities:

- Collaborate nationally and among regions to identify opportunities and solutions for truck parking needs.
- Share information on data and new analyses to understand needs and trends in truck parking.
- Encourage partnerships to implement solutions.
- Identify opportunities to use existing and new programs to support truck parking implementation.

State Freight Plans

Section 8001(a) of the FAST Act includes a provision that requires each State that receives funding under the NHFP to develop a State Freight Plan. These plans can help States address current or upcoming challenges affecting the movement of freight into, out of, and through their States; furthermore, they include information that supports a deeper analysis of freight infrastructure conditions and performance. The FAST Act established 10 requirements for State Freight Plans but the plans may be organized in any structure that works best for individual States. (See Appendix E for the list of 10 required elements.) States may also consider optional items to include in their State Freight Plans. A State Freight Plan must be updated every 5 years, and must address a 5-year forecast period, although DOT strongly encourages an outlook of two decades or more.

Another intent of FAST Act State Freight Plans is to help States coordinate their freight planning efforts and investment decisions among transportation modes. A plan that considers the needs and capabilities of the entire freight system, including providing improved connectivity between different modes, can increase efficiencies and lead to improved overall transportation safety.

As of May 1, 2018, 45 States and the District of Columbia had submitted FAST Act-compliant plans to FHWA.[61]

[60] FHWA, "Jason's Law Truck Parking Survey Results and Comparative Analysis." August 2015. https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/index.htm
[61] As of 2019, all 50 States and the District of Columbia had submitted FAST Act-compliant State Freight Plans to FHWA.

FHWA views FAST Act-compliant plans as a critical resource for States to use in prioritizing freight transportation investments and guiding future transportation policy-making. These plans ultimately reflect each State's analysis of its own economy and how key economic sectors rely on the freight transportation system. The more comprehensively a plan represents the State's freight-related transportation modes, the more useful it will be in meeting the freight transportation needs of the State's industries and MPOs, and supporting their decision-making processes.

Freight State-of-the-Practice Innovations: Freight Demand Modeling and Data Improvement Program

Understanding and forecasting freight flows enables a greater understanding of NHFN conditions and performance and can support planning for future transportation capacity, operation, preservation, safety and security, energy, and economy investment needs. Better freight flow data and models will enable State, regional, and local planners to predict freight movement trends more effectively and make more informed project investment decisions.

The FHWA Freight Demand Modeling and Data Improvement Program, funded by the Strategic Highway Research Program (SHRP2), developed tools and resources to improve freight data sets and freight modeling practices. The program also identified freight modeling and data priority needs, innovative ideas, and new solutions for broad application. The program assisted State departments of transportation and MPOs with development of advanced tools and models to forecast future freight flows.

As part of SHRP2, FHWA and the American Association of State Highway and Transportation Officials conducted a series of Freight Data Collaboration and Standardization Regional Forums, bringing together State departments of transportation and MPOs to identify areas of collaboration on regional or local freight data collection, standardization, and maintenance. The overall goal was to collaborate on improving freight data programs to support local, regional, and State freight transportation programs.

The Freight Demand Modeling and Data Improvement Program benefits State, regional, and local planners by providing them with tools to develop better freight data and models. This will improve planners' and modelers' abilities to predict freight movement trends and support more informed project investment decisions for safer, more reliable, and efficient freight movement.

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