Kansas State Freight Plan

FINAL APPENDICES

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Appendix A. Federal Compliance Crosswalk

Figure A-1 highlights State Freight Plan content requirements and where this information may be found in the Kansas State Freight Plan. Note, federal rulemaking is still pending on BIL requirements.

Figure A-1: Crosswalk Between State Freight Plan Requirements and the Kansas State Freight Plan

State Freight Plan Requirements	Kansas State Freight Plan Contents
FAST Act Requirements	
An identification of significant freight system trends, needs, and issues with respect to the State	• Chapter 6 – Planning for the future
A description of the freight policies, strategies, and performance measures that will guide the freight-related transportation investment decisions of the State	• Freight-related investment will be guided by KDOT's Vision and Goals – Chapter 1.1 – Vision and Goals • Performance measures identified and analysis conducted – Chapter 5 – Freight System Assessment • Policies and strategies identified – Chapter 7.1 Policy and Program Opportunities
When applicable, a listing of…	
multimodal critical rural freight facilities and corridors designated within the State under section 70103 of title 49 (National Multimodal Freight Network)	• All corridors highlighted – Chapter 4.1 Key Roadways, Corridors and Truck Parking
critical rural and urban freight corridors designated within the State under section 167 of title 23 (National Highway Freight Program)	• CR/CUFCs highlighted – Chapter 4.1 Key Roadways, Corridors and Truck Parking • Methodology for designating CR/CUFCs – Appendix E – Designating Kansas' Freight Corridors of Significance
A description of how the plan will improve the ability of the State to meet the national multimodal freight policy goals described in section 70101(b) of title 49, United States Code and the national highway freight program goals described in section 167 of title 23	• Broad description – Chapter 1.1 Vision and Goals • Appendix A Federal Compliance Crosswalk indicates that Kansas reviewed the freight system and made recommendations in line with USDOT objectives
A description of how innovative technologies and operational strategies, including freight intelligent transportation systems, that improve the safety and efficiency of the freight movement, were considered	• Chapter 6 – Planning for the Future outlines considerations for how technology will change the face of freight transportation in Kansas in the future. • Chapter 7.1 – Policy and Program Opportunities recommend technology-centered solutions to "Address congestion, delay, and improve freight system resiliency" and "Improve safety and efficiency of freight system operations."

State Freight Plan Requirements	Kansas State Freight Plan Contents
In the case of roadways on which travel by heavy vehicles (including mining, agricultural, energy cargo or equipment, and timber vehicles) is projected to substantially deteriorate the condition of the roadways, a description of improvements that may be required to reduce or impede the deterioration	• Chapter 5 – Freight System Assessment explicitly conducted evaluation of the system by heavy vehicles through 5 corridor case studies. Additionally, OS/OW permit data was reviewed and patterns observed for heavy vehicle routes. • Chapter 7.1 – Policy and Program Opportunities recommends solutions to "Preserve and improve roadways used by heavy vehicles."
An inventory of facilities with freight mobility issues, such as bottlenecks, within the State, and for those facilities that are State-owned or operated, a description of the strategies the State is employing to address those freight mobility issues	• Chapter 5 – Freight System Assessment identified the top 10 bottlenecks in the state. • Chapter 7.1 – Policy and Program Opportunities recommends solutions to "Address congestion, delay, and improve freight system resiliency"
Consideration of any significant congestion or delay caused by freight movements and any strategies to mitigate that congestion or delay	• Chapter 5 – Freight System Assessment explicitly conducted a truck travel time reliability assessment of the interstate system to identify areas of congestion or delay. • Chapter 7.1 – Policy and Program Opportunities recommends solutions to "Address congestion, delay, and improve freight system resiliency"
A freight investment plan that, subject to 49 U.S.C. 70202(c), includes a list of priority projects and describes how funds made available to carry out 23 U.S.C. 167 would be invested and matched	• Chapter 7 – Freight System Investment Plan
Consultation with the State Freight Advisory Committee, if applicable	• Chapter 2 – Key Stakeholders and Freight Plan Outreach provided indication of those consulted – including the Kansas Freight Advisory Committee. • Appendix B – Stakeholder Outreach provides more detailed information
BIL Requirements	
The most recent commercial motor vehicle parking facilities assessment conducted by the State, in consultation with relevant State motor carrier safety personnel: • Capability of the State, together with the private sector in the State, to provide adequate parking facilities and rest facilities for commercial motor vehicles engaged in inter-state transportation. • The volume of commercial motor vehicle traffic in the State; and • Whether there exist any areas within the State with a shortage of adequate commercial vehicle parking	• Chapter 4.1 – Key Roadways, Corridors and Truck Parking inventories all truck parking in Kansas and 20-miles outside the state borders. • Chapter 5 – Freight System Assessment documents the volume of truck volumes on Interstates, calculates truck parking utilization, and identifies truck parking issues, including locations of undesignated parking, based on reports from Jason's Law, the 2015 Kansas Truck Parking Study, and stakeholder input. • Chapter 7.1 – Policy and Program Opportunities recommends KDOT work with stakeholders to identify opportunities to expand truck parking capacity where needed, continue to maintain and improve Kansas' Truck Parking Information Management System (TPIMS), and develop a strategic investment plan for

State Freight Plan Requirements	Kansas State Freight Plan Contents
facilities, including an analysis (economic or otherwise, as the State determines to be appropriate) of the underlying causes of such a shortage.	Kansas' weigh stations (which could lead to investment in new truck parking at these sites, as warranted). • Information from all relevant Chapters has been consolidated, with additional details, in Appendix F.
Most recent supply chain cargo flows in the State, expressed by mode of transportation	• Chapter 3 – Economic Context of Freight on Kansas' Transportation System provides an overview of key industries, where they are located, and an overview of the freight commodity flows that are associated with those industries, as well as goods movement in Kansas by mode.
An inventory of commercial ports in the State	• Chapter 4 – Freight System Profile includes an inventory of Kansas' maritime system facilities and key facilities in adjacent states and coasts.
If applicable, consideration of the findings or recommendations made by any multi-State freight compact to which the State is party	• Chapter 5 – Freight System Assessment calculates truck parking utilization using truck parking information system data collected through a Mid America Association of State Transportation Officials (MAASTO) multi-state truck parking project. • Chapter 7.1 – Policy and Program Opportunities recommends solutions to "Strengthen coordination and partnerships," including collaboration with neighboring states through multi-state freight coalitions (e.g., MAASTO, MAFC).
The impacts of e-commerce on freight infrastructure in the State	• Chapter 6 – Planning for the Future provides an overview of the proliferation of e-commerce in the US and outlines key developments and impacts in Kansas.
Considerations of military freight	• Chapter 4.6 – Strategic Defense System outlines the STRAHNET and STRACNET in Kansas and how it connects to key military installations in the state. • Chapter 5 – Freight System Assessment evaluates OS/OW permits issued in Kansas for military freight commodities.
Strategies and goals to decrease: • The severity of impacts of extreme weather and natural disasters on freight mobility • The impacts of freight movement on local air pollution • The impacts of freight movement on flooding and stormwater runoff; and • The impacts of freight movement on wildlife habitat loss	• Broad description – Chapter 1.1 Vision and Goals • Chapter 7.1 – Policy and Program Opportunities recommends solutions to "Address extreme weather, air pollution, flooding, and wildlife and habitat loss"

State Freight Plan Requirements	Kansas State Freight Plan Contents
Two broader priorities, one of which must be addressed by states conducting a freight plan: • Enhance reliability and redundancy of freight transportation, or • Improve the ability to rapidly restore access and reliability with respect to freight transportation.	• Chapter 6 – Planning for the Future considers the various different disruptors that impact goods movement. • Chapter 7.1 – Policy and Program Opportunities recommends solutions to "Address extreme weather, air pollution, flooding, and wildlife and habitat loss" and are aimed at KDOT strengthening the resiliency of the state's freight system.

Appendix B. Stakeholder Outreach

This Appendix provides an overview of KDOT's stakeholder outreach efforts as part of the State Freight Plan and Rail Plan updates.

B.1 KFAC

KFAC Stakeholder Organizations and Agencies Represented:

- Kansas Department of Transportation
- Kansas Turnpike Authority
- Kansas Department of Commerce
- Kansas Department of Health and Environment
- Kansas Department of Agriculture
- Kansas Highway Patrol
- FHWA, Kansas Division
- Kansas FMCSA
- BNSF Railway
- Union Pacific
- WATCO (Kansas and Oklahoma Railroad; South Kansas and Oklahoma Railroad; Kaw River Railroad)
- Genesee and Wyoming, Inc.
- Jaguar Transport Holdings
- Mid America Regional Council
- Wichita Area Metropolitan Planning Organization
- Kansas Independent Oil and Gas Association
- Kansas City SmartPort
- PMCA of Kansas (now Fuel True)
- Kansas Global Trade Services
- Central Valley Ag Cooperative
- Dairy Farmers of America
- KS Cooperatives Council
- Kansas Motor Carriers Association
- Siemens Gamesa
- NorthPoint Development
- Port KC
- Scoular Grain
- Cargill
- Kansas Manufacturing Solutions
- Beyond Warehousing
- City of Wichita
- Great Plains Industrial Park
- UPS
- J&H Trucking
- Sauder Custom Fabrication
- City of Edgerton
- Percipio Partners
- International Brotherhood of Teamsters, Local 696
- SMART

KFAC Meeting Summaries

Meeting 1: KDOT Kick-Off, Freight Trends, and Kansas' Freight Profile

On June 22, 2022, the first meeting of the Kansas Freight Advisory Committee (KFAC) was held, as part of developing the Kansas State Freight Plan. The meeting opened with a welcome from Secretary Julie Lorenz, followed by introductions from KFAC members, the KDOT Project Team, and other attendees. The Kansas Department of Transportation (KDOT) and Consultant Team provided the group with an update on the State Rail Plan and State Freight Plan processes, including plan objectives and purposes, as well as an outline of the KFAC's role during freight plan development. Then, the

Consultant Team presented a summary of freight trends in Kansas, followed by an overview of the processes and initial results from the ongoing assessment of Kansas' freight system. Finally, the Consultant Team reviewed a profile of the state freight system and introduced the process of updating Kansas' Freight Corridors of Significance (FCS). Throughout the meeting, KFAC members had an opportunity to provide feedback through a live polling platform (Mentimeter), as well as through discussion about freight system trends, evaluation measures, and the FCS designation.

Meeting 2: Kansas Freight Needs Assessment and Opportunities

On August 31, 2022, the second meeting of the Kansas Freight Advisory Committee (KFAC) was held, as part of developing the Kansas State Freight Plan. The meeting opened with a welcome from Cory Davis, followed by introductions from KFAC members, the Kansas Department of Transportation (KDOT) Project Team, and other attendees. The Consultant Team provided the group with a progress update on the State Freight Plan, including takeaways from the first KFAC meeting and an update on the Freight Corridors of Significance (FCS) designation. Then, the Consultant Team presented a summary of Kansas' freight system evaluation and identification of needs, through a Strengths, Weaknesses, and Threats analysis. This was followed by a presentation of scenario planning efforts undertaken by KDOT through the Long Range Transportation Plan (LRTP), and how this impacts planning for the future of freight in Kansas. Finally, the Consultant Team provided an overview of the process to identify policy, program, and project opportunities for the State Freight Plan. This was followed by a presentation of the draft policy and program opportunities, in the form of draft strategy areas and actions, as well as potential project opportunities, through examples of projects (new facilities, technology projects, needs-specific studies) for KDOT consideration. Throughout the meeting, KFAC members had an opportunity to provide feedback through a live polling platform (Mentimeter), as well as through discussion about freight system needs, planning for the future of freight, and opportunities for KDOT.

Meeting 3: Draft State Freight Plan

On October 19, 2022, the third meeting of the Kansas Freight Advisory Committee (KFAC) was held, as part of developing the Kansas State Freight Plan. The meeting opened with a welcome from Cory Davis, followed by introductions from KFAC members, the Kansas Department of Transportation (KDOT) Project Team, and other attendees. The Consultant Team provided the group with an overview of the process to develop the State Freight Plan, including the purpose of developing a state freight plan to address US Department of Transportation (USDOT) requirements, the plan development framework, key inputs in the planning process, and a sample of takeaways from KFAC Meetings 1 and 2. Then, the Consultant Team presented the profile and assessment of Kansas' freight system. The profile included an overview of the state's multimodal freight assets, the National Highway Freight Network (NHFN) and key freight corridors designated as part of the State Freight Plan process. Additional items profiled to meet new federal requirements include documenting the state's Strategic Defense System, truck parking assets, and commodity flow analysis. The assessment included an overview of evaluation measures and results on both a statewide and corridor-specific level, which informed the identification of top freight needs and issues in Kansas. Finally, the Consultant Team provided an overview of identified opportunities and strategies for Kansas' freight system, including policy and program opportunities, projects for National Highway Freight Program (NHFP) funding, and freight project opportunity concepts for further development. The meeting closed with KDOT expressing thanks to the KFAC for their participation and inputs, and plans to continue convening freight stakeholders beyond the publication of the State Freight Plan, to discuss freight changes, needs, and opportunities for Kansas. Throughout the meeting, KFAC members had an opportunity to provide feedback through a live polling platform (Mentimeter), as well as through discussion about freight system needs and opportunities.

B.2 RPAC

RPAC Stakeholder Organizations and Agencies Represented:

- Chase County
- Great Plains Industrial Park
- Kansas Grain and Feed Association (KGFA)
- Kansas Railroads
- Kansas Legislature
- Sedgwick County
- SMART
- WATCO (Kansas and Oklahoma Railroad; South Kansas and Oklahoma Railroad; Kaw River Railroad)
- Kansas Department of Agriculture (KDA)
- Missouri DOT
- Oklahoma DOT
- Amtrak

RPAC Meeting Summaries

Meeting 1: About the Kansas State Rail Plan Update and Rail Needs and Issues (held April 2021)

Meeting 1 of the Kansas Rail Plan Advisory Committee (RPAC) served as the kick-off meeting for the Kansas State Rail Plan. After RPAC member introductions, the Kansas Department of Transportation (KDOT) introduced the State Rail Plan (SRP) to the RPAC. This included an introduction from Secretary Julie Lorenz, who emphasized the importance of transportation planning, as well as the role of rail in supporting Kansas' residents, economy, and quality of life. KDOT and the Consultant Team then provided more information about the objective and purpose of the State Rail Plan, as well as an outline of the RPAC's role throughout the development of the plan. Then, KDOT and the Consultant Team presented previously identified needs and issues for rail in Kansas, classified by goal area. Needs and issues were first presented for passenger rail, followed by freight rail. The RPAC group had the opportunity to provide feedback and input on the goals, needs, and issues through a live polling platform, as well as through discussion.

Meeting 2: Passenger Rail in Kansas (held June 2021)

Meeting 2 of the Kansas Rail Plan Advisory Committee (RPAC) was the second meeting for the Kansas State Rail Plan (SRP). After a welcome from the Kansas Department of Transport (KDOT) and RPAC member introductions, the Consultant Team provided a progress update for the SRP. The Consultant Team then moved into the meeting's focus – passenger rail. First, the Consultant Team provided an overview of the Kansas Long Range Transportation Plan's Vision and Goals, which inform the development of the SRP. Performance measures for passenger rail were presented by goal area, and RPAC members had the opportunity to provide feedback on the performance measures through a live polling platform, as well as through discussion. Next, the Consultant Team provided an overview of the passenger rail system in Kansas and led the RPAC members in polling and discussion about existing status, needs, and opportunities of passenger rail in the state

Meeting 3: Freight Rail in Kansas (held July 2021)

Meeting 3 of the Kansas Rail Plan Advisory Committee (RPAC) was the third meeting for the Kansas State Rail Plan (SRP). The meeting opened with a welcome from the Kansas Department of Transportation (KDOT) and RPAC member introductions. Then, the Consultant Team presented Kansas' Economic Profile, to provide context for both freight and rail planning efforts in Kansas. The Consultant Team also provided an overview of stakeholder outreach conducted to date to inform freight rail planning. Next, the Consultant Team then moved into the meeting's main focus – freight rail. Evaluation measures and data for freight rail were presented by SRP goal area to demonstrate the status of the state's freight rail system. RPAC members had the opportunity to provide feedback on this overview of Kansas' freight rail system, through a live polling platform, as well as through discussion about the existing status, needs, and opportunities of freight rail in the state.

Meeting 4: Kansas' Rail System Opportunities and Investment (held September 2021)

Meeting 4 of the Kansas Rail Plan Advisory Committee (RPAC) was the fourth meeting for the Kansas State Rail Plan (SRP). The meeting opened with a welcome from the Kansas Department of Transportation) and RPAC member introductions. The Consultant Team provided a summary of the assessment of Kansas' rail system, with a focus on strengths, weaknesses, and threats, classified by Plan goal area. Then, the Consultant Team presented potential policy and program opportunities for the state rail system, followed by potential freight and passenger rail project opportunities. Finally, the Consultant Team identified state and federal funding sources that may be used to support rail opportunities in Kansas, with considerations of existing needs and future changes. Throughout the meeting, RPAC members had an opportunity to provide feedback through a live polling platform, as well as through a discussion about the rail system assessment, potential opportunities, and considerations for allocating state funding.

B.3 Freight Consultations

Railroads:

- BNSF
- Genesee and Wyoming – Kyle Railroad (KYLE)
- Hutchinson Transportation Company
- Jaguar Transport Holdings - Cimarron Valley Railway (CVR)
- KCS
- New Century Air Center Railroad (JCAX)
- Pioneer Rail Corp – Garden City Western (GCW)
- UP
- V&S Railroad
- WATCO Companies (SKOL, K&O, and KAW/KCTR)

Freight system users and support services:

- Air Capitol Delivery & Warehouse
- Cloud County Co-Op
- Coffeyville Resources
- Grain Craft
- Great Plains Industrial Park
- Kansas City Smart Port
- Kansas Farm Bureau
- Kansas Global Trade Services
- Kansas Grain and Feed Association
- Kuehne + Nagel
- Mickelson & Company
- North Point Development
- Seaboard Energy
- South Central Transportation Coalition (attended by representatives from the City of Derby, Greater Wichita Partnership, Wichita Chamber, and TranSystems)
- Spirit AeroSystems

State agencies:

- Kansas Department of Agriculture (KDA)
- Kansas Department of Commerce (KDC)
- Kansas Department of Transportation (KDOT)

Economic development agencies:

- ElevateEdgerton!
- Greater Wichita Partnership

B.4 Agriculture Stakeholder Roundtable

Attendees

Agriculture stakeholder attendees represented the following organizations:

- AgMarkCloud County Coop
- CoMark Equity Alliance
- Conestoga Energy Partners
- Cornerstone Ag
- Dairy Farmers of America (DFA)
- DeLong Grain
- East Kansas Agri-Energy
- Garden City Company
- Grain Craft
- J-6 Enterprises
- Kansas Agribusiness Retailers Association (KARA)
- Kansas Corn
- Kansas Grain and Feed Association (KGFA)
- Kansas Sorghum Producer's Association
- Kansas Soybean Association
- Kansas Wheat Commission
- Nu-Life Market
- Renew Kansas Biofuels Association
- Skyland Grain
- Team Marketing Alliance (TMA) Grain
- US Wheat Associates

Summary of Findings

This Agriculture Stakeholder Roundtable was held to: Obtain a list of freight and rail transportation system strengths, needs, and opportunities from Kansas' diverse agricultural stakeholders to aid in developing the Kansas State Rail Plan and State Freight Plan Updates.

After welcomes from Secretary Mike Beam of the Kansas Department of Agriculture and Secretary Julie Lorenz of the Kansas Department of Transportation, the Consultant Team provided an overview of the Kansas State Rail Plan and Freight Plan. This was followed by roundtable participant introductions, which included polling (Mentimeter) to understand the commodities and freight system users represented at the roundtable. Then, participants were led through several modules focused on freight and rail system strengths, needs, and opportunities, and participants were asked to provide feedback through polling, discussion, and chat box comments.

Key points of the meeting included:

- Introduction from Secretary Mike Beam (KDA): Agriculture is a big part of the Kansas economy, and nationwide Kansas ranks in the top 5 states of total value of agricultural production. Top commodities include sorghum for grain, wheat, and cropland.
- Introduction from Secretary Julie Lorenz (KDOT): Current freight rail investments in Kansas include $5 million under the new IKE short line rail program and $5 million for the existing rail service program. Short line rail program funds include those for expanding service, with new grain elevators (five to date) gaining access to rail service.
- Roundtable Participant Introductions: Participants represented grains, feed & forge, food processing, ag inputs/sales, pet food, proteins, ag manufacturing, and other commodities that use Kansas' highway, rail, and multimodal (e.g., intermodal/transload facilities, ports, grain elevators) systems, with commodities destined for domestic and international markets.

Freight and Rail System Strengths

- A top strength of Kansas' multimodal freight system is the state's location (provides good access to markets and points of exports), followed by good system maintenance and low levels of congestion.
- Stakeholders appreciate KDOT's efforts to maintain not only the highway system but also the bridge system.
- The Kansas agriculture supply chain is also a strength – including local wheat origination into Kansas flour mills.

Freight and Rail System Needs

- Participants' top multimodal freight system needs are located both within and outside of Kansas.
- Top infrastructure needs include system capacity and access to other modes, followed by system reliability and system condition, among other infrastructure issues.
- Rail rates are highly controlled by Class I, with little competition. This has been an issue in Kansas. Investments to improve the roadway system and access to/other modes (e.g., waterway) would provide competition to Class I railroads. Infrastructure investments to provide access to additional rail carriers would also unlock access to new markets.
- Stakeholders also noted needs for a transloading facility for containers in western Kansas, more domestic wheat mills with shuttle car capacity, improved rail access to grain elevators, the ability to handle manifest cars faster, private car storage, siding programs, and aging infrastructure for grain handling facilities, among others.
- A top non-infrastructure or policy need is weight limits, followed by available/skilled workforce, carrier operations or scheduling, and delivery restrictions or route restrictions, among other non-infrastructure and policy issues.
- Kansas' weight limit for trucks is lower than neighboring states, which is a constraint for many stakeholders, especially given the chronic shortage of CDL drivers. In recent years, truck weights have been increased on 6 axles to 91k lbs, but northern neighbors have gone up to ~107k lbs. This would increase the industry's ability to utilize the roadway system.
- Stakeholders also noted the need for facilities for car repair.

Freight and Rail System Opportunities

- A top opportunity for Kansas' multimodal freight system is upgrading/expanding multimodal connections (including new transload or elevator sites), followed by upgrading/expanding railroad and roadway infrastructure.
- Opportunities for infrastructure include using funds to upgrade the existing aging infrastructure for grain handling facilities, short line infrastructure, rail sidings, and highway and bridge systems, among others. This includes investments in identified poor service areas. There is also interest in new and/or improved transloading facilities, multimodal connections, and commercial storage facilities.
- *Opportunities for non-infrastructure/policy include using state funds for projects that have a return on investment (e.g.,* for freight rail to support agriculture as a backbone of the Kansas economy), continued rail access to Mexico with the pending KCS sale, increasing the load weight requirement, and working with neighboring states, among others.

Appendix C. Kansas' Freight-Reliant Industries

Freight-Reliant Industry Crosswalks

This section provides an overview of Kansas' freight-reliant industries as they relate to NAICS and KDC Key Industries. Freight-reliant industries refer to industries designated as particularly dependent on the freight system. NAICS is the standard used by federal agencies to classify business establishments by industry. Among the twenty sectors classified by NAICS, eight have been identified as freight-reliant industries for the Kansas State Rail Plan and Freight Plan.[1] KDC also identifies nine key industries, six of which are classified as freight-reliant industries. The crosswalk between NAICS and KDC classifications is shown in Figure C-2 below.

Figure C-2: Kansas' Key Freight-Reliant Industries Crosswalk

Key Freight-Reliant Industry	Freight-Reliant Industry (2-Digit NAICS Code)	Sub-industry/Sub-sector (3- to 6-Digit NAICS Code)
Agriculture,* forestry, fishing, and hunting	Agriculture, forestry, fishing, and hunting (11)	All Agriculture, forestry, fishing, and hunting (11)
Energy & Natural Resources*	Mining, quarrying, and oil and gas extraction (21)	Oil and Gas Extraction (211) Mining, except Oil and Gas (212) Support Activities for Mining (213)
	Utilities (22)	Electric Power Generation, Transmission, and Distribution (2211) Natural Gas Distribution (2212)
	Manufacturing (31-33)	Petroleum Refineries (324110) All Other Petroleum and Coal Products Manufacturing (324199) Ethyl Alcohol Manufacturing (325193) All Other Basic Organic Chemical Manufacturing (325199)
Advanced Manufacturing*	Manufacturing (31-33)	All Manufacturing (31-33)
Food Processing & Manufacturing*		Food Manufacturing (311) Beverage and Tobacco Product Manufacturing (312)

[1] US Census, North American Industry Classification System, Last Revised June 6, 2021, https://www.census.gov/naics/; US Census, NAICS Codes, https://www.census.gov/programs-surveys/economic-census/guidance/understanding-naics.html

Key Freight-Reliant Industry	Freight-Reliant Industry (2-Digit NAICS Code)	Sub-industry/Sub-sector (3- to 6-Digit NAICS Code)
Aerospace & Defense*		Aerospace Product and Part Manufacturing (3364) Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing (334511) Small Arms Ammunition Manufacturing (332992) Ammunition (except Small Arms) Manufacturing (332993) Small Arms, Ordnance, and Ordnance Accessories Manufacturing (332994) Military Armored Vehicle, Tank, and Tank Component Manufacturing (336992)
Transportation & Warehousing (also referred to as (Logistics & Distribution*	Transportation and warehousing (48-49)	Air Transportation (481) Rail Transportation (482) Water Transportation (483) Truck Transportation (484) Pipeline Transportation (486) Support Activities for Transportation (488) Couriers, Messengers, Local Delivery (492) Warehousing and Storage (493)
Construction	Construction (23)	All Construction (23)
Wholesale Trade	Wholesale trade (42)	All Wholesale trade (42)
Retail Trade	Retail trade (44-45)	All Retail trade (44-45)

CPCS Analysis of US Census, NAICS Codes, https://www.census.gov/programs-surveys/economic-census/guidance/understanding-naics.html; CPCS Analysis of Kansas Department of Commerce, Key Industries, https://www.kansascommerce.gov/businesses/industries/
Note: * signals key industry identified by KDC

Freight-Reliant Industry Data Tables, By County

This section provides detailed sales volume (in thousands of dollars) and employment information for freight-reliant industries in Kansas by county.

Figure C-3: Freight-Reliant Industry Sales Volumes (in thousands of dollars) and Employment (in actual numbers of employees) by County

County	Agriculture, Forestry, and Fishing		Construction		Manufacturing		Mining, Quarrying, and Oil and Gas Extraction		Retail Trade		Transportation and Warehousing		Utilities		Wholesale Trade	
	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment
Allen County	4270	37	28382	197	47282	310	16097	24	139313	572	20290	179	17712	46	785603	939
Anderson County	4619	48	15638	129	14966	85	1423	3	82831	324	19924	176	1474	4	219518	76
Atchison County	4873	85	39050	266	28267	231	4116	12	80651	403	5079	75	756	4	192773	124
Barber County	5719	60	30212	173	130762	235	32213	61	66365	249	7621	51	2498	2	144176	42
Barton County	22950	191	134589	936	326577	1281	80128	254	631114	2226	132622	653	49243	86	892672	628
Bourbon County	4251	48	68544	666	242758	1433	423	7	107044	725	8555	108	1343	8	444160	361
Brown County	5743	70	21464	150	93801	257			94610	660	4975	94	37609	42	335775	324
Butler County	26454	304	235214	1467	3975269	2057	19408	58	516119	2469	80570	580	50151	91	19421208	4596
Chase County	3987	34	1839	7	46331	200	10702	70	32574	105	1624	26	171	1	40779	27
Chautauqua County	4118	87	5416	30	7646	29	12803	40	27069	127	1040	27	11792	20	51030	28
Cherokee County	19623	91	19308	232	216606	1070			91976	447	11879	173	12275	46	674446	624
Cheyenne County	5788	57	3974	23	7921	18			16809	82	10889	44	9786	26	94512	86
Clark County	10301	62	4641	33	27453	51			11265	67	6345	41	1056	9	26845	21
Clay County	18178	75	22813	199	55076	526			49188	377	10140	112	35740	70	135203	109
Cloud County	8538	65	12590	95	124939	347	8356	18	117726	601	20924	115	17556	35	383276	539
Coffey County	3582	38	35053	203	25506	184	41544	70	134257	522	11584	154	12741	36	50617	51
Comanche County	2016	14	2077	15	5421	37	4324	7	8014	56	7869	45	20659	26	54232	18
Cowley County	7941	94	89892	593	1839551	3428	10403	19	312821	1580	30469	294	47430	98	1405031	1462
Crawford County	11572	133	245014	1334	496040	1767	12910	66	498796	2918	22486	406	31696	88	839341	914
Decatur County	4477	62	5296	55			511	5	18062	130	2283	39			99448	68
Dickinson County	9658	105	40567	236	120129	751	4933	12	145070	654	29879	200	57585	98	254731	204

County	Agriculture, Forestry, and Fishing		Construction		Manufacturing		Mining, Quarrying, and Oil and Gas Extraction		Retail Trade		Transportation and Warehousing		Utilities		Wholesale Trade	
	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment
Doniphan County	4343	53	20754	113	28394	398	602	5	35259	200	10907	98	6868	17	238974	177
Douglas County	18456	205	420028	2350	664366	2552	20423	67	1784177	7748	70634	749	64128	273	996748	1150
Edwards County	5990	97	3288	22	21114	99	2433	4	16029	102	4735	56			95490	74
Elk County	1204	18	5276	27	5007	18	12295	49	15721	85	614	21			3602	3
Ellis County	8234	90	270974	1454	232294	915	109066	219	762729	2809	60459	344	9120	344	803525	504
Ellsworth County	2800	43	12356	109	29186	416	627	1	43653	288	13473	88	90822	110	43337	25
Finney County	40610	272	182226	891	3016559	3987	54521	85	775805	2934	92642	571	128194	220	1177256	873
Ford County	41592	193	145374	718	4622449	5903			718225	2717	86741	556	36503	67	1053893	792
Franklin County	7540	77	70652	492	244481	791	11390	26	273012	2071	57188	407	44172	71	951088	1098
Geary County	8552	72	228372	981	391427	704	317	2	307442	1449	47050	294			157408	145
Gove County	9968	83	9600	58	34642	99			109655	323	8570	72			201967	149
Graham County	2421	30	5157	41	2510	13	11700	69	35328	121	2858	34			160062	141
Grant County	36151	175	69612	490	70765	123	55961	129	85574	280	189859	394	12742	17	1011161	336
Gray County	60684	458	18020	179	55267	41			32390	197	22249	195	3596	10	312420	178
Greeley County	11353	100	3208	17					6563	63	707	16	21886	20	55789	57
Greenwood County	3492	39	13335	78	13656	80	30095	49	43057	215	7527	97	20395	25	97037	82
Hamilton County	74698	370	3930	29	30057	28	6298	18	35196	96	9107	58	5995	8	105074	63
Harper County	8187	72	5080	37	146124	289	4016	23	69301	351	14815	138	17540	29	239648	71
Harvey County	55038	897	161302	933	402548	2885	12868	18	431739	2101	58379	405	6902	34	580432	625
Haskell County	28447	188	12628	96	28524	71	978	5	37125	176	20591	104	37906	60	149362	142
Hodgeman County	6532	64	1941	17	32797	8			26374	83	1784	26	1748	4	19958	6
Jackson County	3050	49	21566	156	46068	122			88954	641	9545	110	663	4	226202	136
Jefferson County	9686	108	46704	511	140991	349	93	1	64298	469	10223	165	20066	54	45187	59
Jewell County	9987	89	2419	18	22373	33			13188	72	10077	104	40121	69	49638	44

County	Agriculture, Forestry, and Fishing		Construction		Manufacturing		Mining, Quarrying, and Oil and Gas Extraction		Retail Trade		Transportation and Warehousing		Utilities		Wholesale Trade	
	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment
Johnson County	195733	746	4463185	21476	5950731	21114	105172	521	10985810	50474	831738	6577	225420	860	20679910	19250
Kearny County	26918	225	2483	24	2879	6	13107	29	14431	132	11111	85	13650	25	21928	22
Kingman County	13961	142	15517	267	14855	321	16446	39	54496	263	6993	91	21057	22	161461	138
Kiowa County	3043	41	5527	36	83500	45	3522	4	48829	205	28600	125			19672	17
Labette County	2593	27	27778	237	356016	2329	2459	15	191287	1022	48947	399	27414	59	578523	413
Lane County	14459	97	1166	8	25865	62			31374	190	1927	18			149938	100
Leavenworth County	13527	204	215116	1373	536224	1400	7353	22	622728	2605	35242	376	20595	83	746206	556
Lincoln County	2114	36	8356	73	5026	44			26107	148	3075	39			57239	50
Linn County	7434	96	17377	129	23732	89	7425	16	55744	330	2073	52	42709	89	185593	90
Logan County	6022	49	10242	52	3023	9			25999	109	27073	128			88609	55
Lyon County	4063	48	88973	531	1042018	2443	7810	27	378342	1930	53436	413	1563	8	864434	693
Marion County	5915	72	31492	188	72416	307	18509	35	86624	457	12929	195	56798	93	249604	199
Marshall County	10091	91	49568	230	183174	1238			91162	654	21056	190	10248	22	511220	370
McPherson County	19157	172	129442	664	1059755	2756	51147	84	398445	1797	82678	376	11821	100	886095	535
Meade County	15886	139	10310	123	24553	79	3522	4	31247	174	25701	125	7198	19	69992	68
Miami County	7050	80	125728	821	172414	532	12596	18	281665	1379	65329	327	47528	93	401902	225
Mitchell County	9700	97	19057	120	86083	695	8804	10	94637	423	12698	105	28648	50	281404	179
Montgomery County	10320	71	145380	910	11773595	5075	23546	103	383291	2008	69854	500	26237	41	926086	475
Morris County	4919	59	11126	102	71281	319	3522	4	50302	289	3201	51	41775	62	75355	59
Morton County	3748	43	8038	45	75043	34	24888	35	17031	100	7828	54	604	3	66918	56
Nemaha County	17316	202	17691	128	128552	1129	13205	15	95081	492	57620	443	2996	12	615471	590
Neosho County	8715	69	56222	317	162139	1158	17388	28	191822	983	16029	174	2786	14	793755	498
Ness County	1474	20	17184	145	57474	55	12545	42	33802	165	5204	78			170752	97
Norton County	2689	40	6372	46	32342	69	9258	26	48453	237	6513	62	26890	44	112997	216

County	Agriculture, Forestry, and Fishing		Construction		Manufacturing		Mining, Quarrying, and Oil and Gas Extraction		Retail Trade		Transportation and Warehousing		Utilities		Wholesale Trade	
	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment
Osage County	3101	52	17339	150	13706	70	4316	10	71206	453	4601	76	23780	45	288078	214
Osborne County	9272	89	5810	38	6758	20			73437	264	18785	103	6541	37	190565	93
Ottawa County	6602	56	5445	51	19326	188			18339	96	15457	103			197776	157
Pawnee County	6812	45	18108	131	25491	52	2742	6	38641	233	10991	92	716	4	251081	189
Phillips County	24304	177	17670	80	299732	129	7067	15	137456	451	19319	115	1856	6	77323	55
Pottawatomie County	16125	141	126870	856	165313	1077	1260	10	280586	2204	22164	256	17018	40	907285	833
Pratt County	7374	65	33122	232	116172	175	154803	267	162457	793	73780	232	8587	14	314534	258
Rawlins County	3047	32	3263	27	7816	50			23140	123	3030	36	1706	3	68438	65
Reno County	80949	433	277251	1397	1069789	2721	29953	52	670348	3526	843877	811	43824	83	2208253	1257
Republic County	11788	161	5841	33	7805	66	984	5	61442	284	13192	122			92200	54
Rice County	13516	126	18042	140	173147	385	18616	186	34901	346	40579	180	66523	78	293661	223
Riley County	18699	130	288305	1675	244179	943	8352	15	1088476	5059	25127	295	3252	15	698551	706
Rooks County	2739	47	23809	151	852307	149	4753	21	60202	278	12505	91	2333	14	107779	80
Rush County	2278	25	8399	43	31662	172	309	2	13163	63	20055	155			49924	30
Russell County	2523	25	20999	159	66015	120	68113	160	77823	314	43762	138	7116	11	216399	149
Saline County	13080	86	354895	1616	1663416	5048	1967	12	1245262	4551	119889	879			6953081	4536
Scott County	38363	201	11731	74	17041	41	687	5	65443	194	14777	101	7427	10	181021	134
Sedgwick County	112611	604	3716776	18288	10635053	60953	430307	886	8541147	39962	1463869	10367	137075	237	10919074	9627
Seward County	8000	56	118011	609	1989554	2682	15863	57	292481	1217	64936	409	188540	295	628024	508
Shawnee County	21118	224	1054595	5790	1264152	3734	120264	87	2328118	12404	251711	2263	74756	960	4897260	4698
Sheridan County	17475	108	17617	92	11428	46			27888	130	3862	28	5892	9	109872	101
Sherman County	11871	89	12606	73	72468	96			100981	466	25100	166	203	14	341817	195
Smith County	6680	64	3200	28	18425	66	394	4	32465	207	8865	100	2633	5	73154	35
Stafford County	1529	19	5075	42	20158	55	6349	11	22675	143	2918	54	13019	19	32539	31
Stanton County	21166	172	2576	19	50161	95	677	5	9747	71	5379	46	13061	15	356115	272

County	Agriculture, Forestry, and Fishing		Construction		Manufacturing		Mining, Quarrying, and Oil and Gas Extraction		Retail Trade		Transportation and Warehousing		Utilities		Wholesale Trade	
	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment	Sales Volume	Employment
Stevens County	38713	219	48563	276	39479	68	14317	35	37647	149	66821	327	99550	85	111254	93
Sumner County	10256	90	25198	217	131636	757	10600	17	204112	1131	50677	545	28895	57	175806	87
Thomas County	43335	268	24871	177	37865	143	10424	34	366390	986	22093	136	33621	106	433247	304
Trego County	11102	91	13203	60	6189	33	2937	4	53065	146	4495	36	41952	56	187533	36
Wabaunsee County	3794	64	17227	103	32405	354	4178	8	35756	132	5399	42	0	2	36701	34
Wallace County	3804	47	962	12	97	1	2318	4	17506	91	844	12	1536	2	51475	53
Washington County	30235	185	13288	111	9963	23	2778	6	38185	279	15482	90	8121	30	218275	100
Wichita County	32285	165	6611	27	71051	93			28366	143	8079	46	3595	5	371246	246
Wilson County	1710	19	49277	300	131793	949	15213	88	65998	337	6753	86	998	1	102896	75
Woodson County	2457	25	1526	9	57309	32	4986	7	33734	141	313	17	32390	32	315970	37
Wyandotte County	25656	311	1864690	7825	7572463	8153	13993	40	3510240	11510	1135389	6013	30477	102	10910980	9191

Source: Data Axle 2021 Business Establishment Data

Appendix D. Commodity Flow Profile

D.1 Introduction

Kansas is located in the heart of the US and is well-connected by multiple modes of transportation. Understanding the commodities carried on the transportation system is valuable for future planning and decision-making for infrastructure improvements that reflect the states' economy.

Methodology

CPCS Analysis of FHWA FAF 5

FHWA's Freight Analysis Framework (FAF) version 5.0 provides two key measures of freight transportation – tonnage and value. Tonnage indicates the physical volume of goods carried by Kansas' freight infrastructure, while value represents how much the freight transported on the system is worth, in terms of dollars. Additional detail about movements by mode, commodity, and trading partner is also provided based on an analysis of FAF data.

Kansas FAF Zones

- **FAF Zone 201:** Kansas City-Overland Park-Kansas City, MO-KS CFS Area (KS Part)
- **FAF Zone 202:** Wichita-Arkansas City-Winfield, KS CFS Area
- **FAF Zone 209:** Remainder of Kansas

CPCS Disaggregation of FHWA FAF 5

While FAF breaks Kansas into three zones, the FAF disaggregation analysis conducted for the Kansas State Freight Plan disaggregates FAF data into finer geographical regions, based on FAF zones and KDOT Districts, to capture more detailed regional freight movements. The disaggregation preserves FAF Zone 201 and FAF Zone 202 but divides FAF Zone 209 into four regions (Figure D-4), using KDOT Districts (Figure D-5) as a reference. The tonnage and value derived from the FAF disaggregation include five modes: truck, rail, water, air (includes truck-air), and multiple modes and mail. Pipeline data was not disaggregated. The FAF disaggregation analysis also incorporates commodity flow data and results for select agricultural commodities provided by the Kansas Department of Agriculture (KDA). In addition, this analysis uses the Carload Waybill Sample from the Surface Transportation Board (STB) to calibrate the railroad disaggregation.

Figure D-4: KDOT Districts

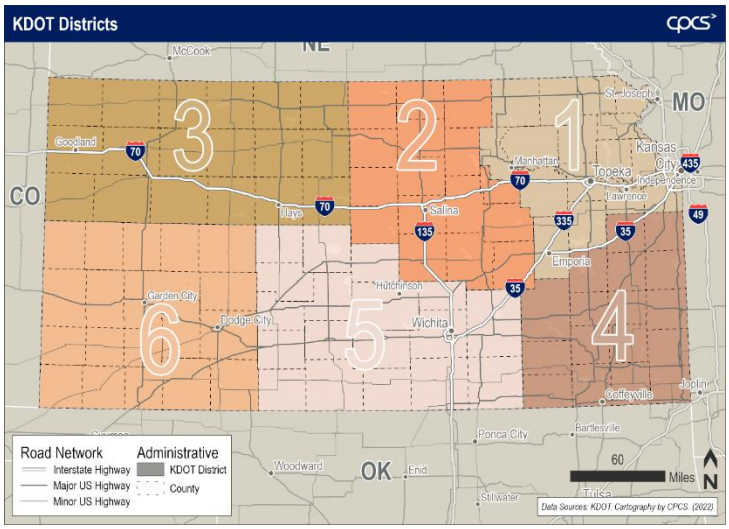
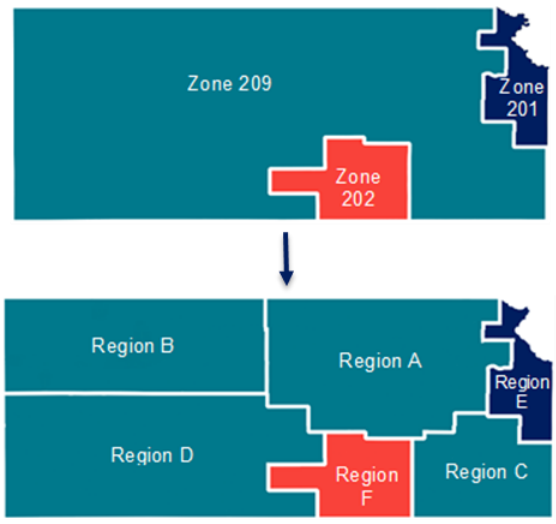


Figure D-5: FAF Zone Disaggregation



Commodity Flow Results

The commodity flow analysis is divided into four sections:

- The **Statewide Profile** depicts overall freight traffic by tonnage and value, with detail on top commodities, regions, and modes.
- **Trading Patterns** describe domestic and international trading activities with detail on domestic and international trading partners. Using disaggregated FAF data, this section also provides an overview of trading patterns for the six regions in Kansas.
- **Modal Profiles** focus on tonnage and value, with modal detail from FAF data – truck, rail, water, air, pipeline, and multiple modes and mail.[2]
- **Top Commodities** dive into the freight movements for the four key commodities and commodity groups in Kansas – cereal grains, energy, agriculture, and foodstuffs (excluding cereal grains), and manufacturing.

D.2 Statewide Profile

A total of 468 million tons of goods worth $348.6 billion moved to, from, and within Kansas in 2017.

Among freight moved in Kansas, goods movement that stayed within the state made up about half of all goods movement in the state by tonnage, but less than 30 percent by value. Outbound goods made up over 39 percent of total goods movement in Kansas by value, followed by inbound goods (33 percent). This information is further detailed in Figure D-6.

Figure D-6: Kansas Tonnage and Value of Total Freight Flows by Direction (2017)

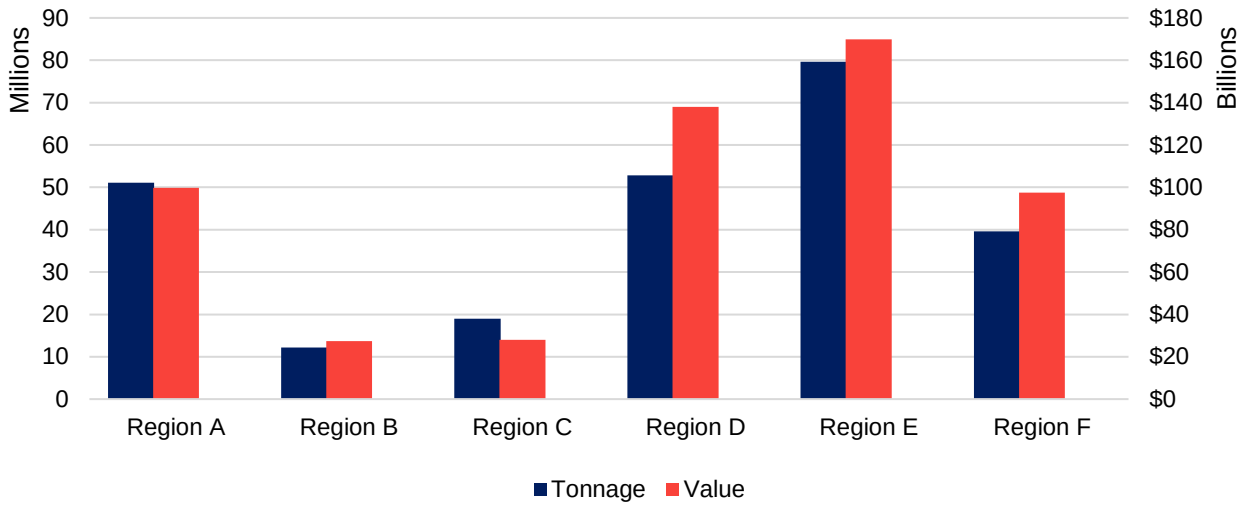
Direction	Tons (Millions)	Share of Total	Value (Billions $)	Share of Total
Outbound	120.4	25.7%	136.9	39.3%
Inbound	117.6	25.1%	115.2	33.0%
Within	230.0	49.2%	96.5	27.7%
Total	468.0	100%	348.6	100%

Source: CPCS Analysis of FHWA FAF 5

As demonstrated in Figure D-7, Region E handled the largest volume (79.7 million tons) and value ($169.9 billion) of freight in Kansas in 2017. Region D follows, handling 52.8 million tons of freight worth $138.0 billion.

[2] Multiple modes and mail includes small package trucking and combined modes, such as truck-rail and rail-water.

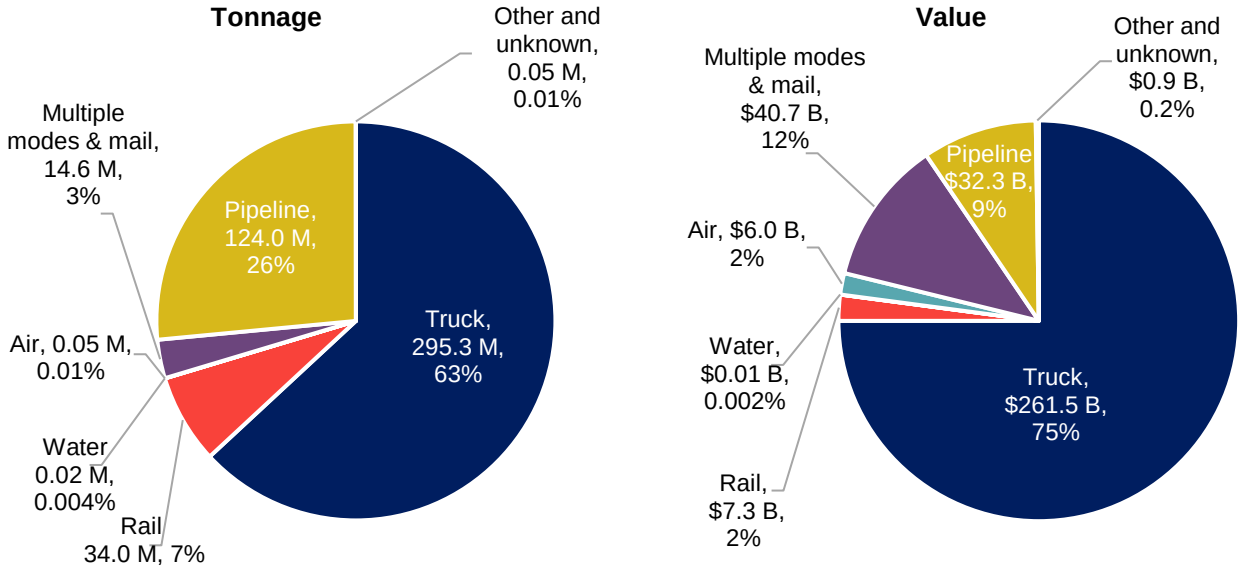
Figure D-7: Total Tonnage and Value by Region (2017)



Source: CPCS Disaggregation of FHWA FAF 5. Note: Disaggregation data does not include pipeline movements.

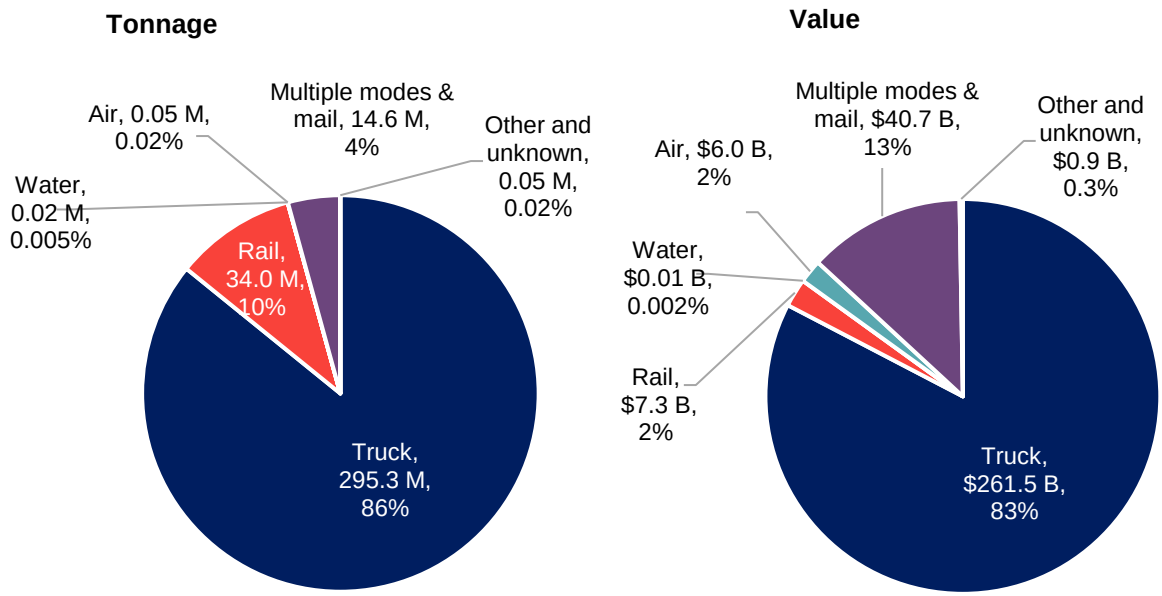
Figure D-8 and Figure D-9 demonstrate the modal splits of Kansas' goods movements, with and without pipeline, respectively. Since pipelines carry select and specific products, usually in large volumes, these high volumes can overshadow the importance of other modes. Trucks make up the largest share of the goods movement by both volume and value. When removing pipeline, rail carries the next largest share of goods by tonnage but represents a smaller share of goods moved by value, indicating the efficiency of railroads in transporting bulk goods. Meanwhile, multiple modes and mail carry high-value goods, moving a large share of goods by value, but a smaller share by tonnage.

Figure D-8: Total Tonnage and Value by Mode (2017)



Source: CPCS Analysis of FHWA FAF 5. Note: Air includes truck-air. Note: Modal shares represent modes used for the domestic movement of goods. Therefore, for international goods movement (i.e., imports and exports) within the total flows, "mode" refers to the domestic movement of import and export goods within the US.

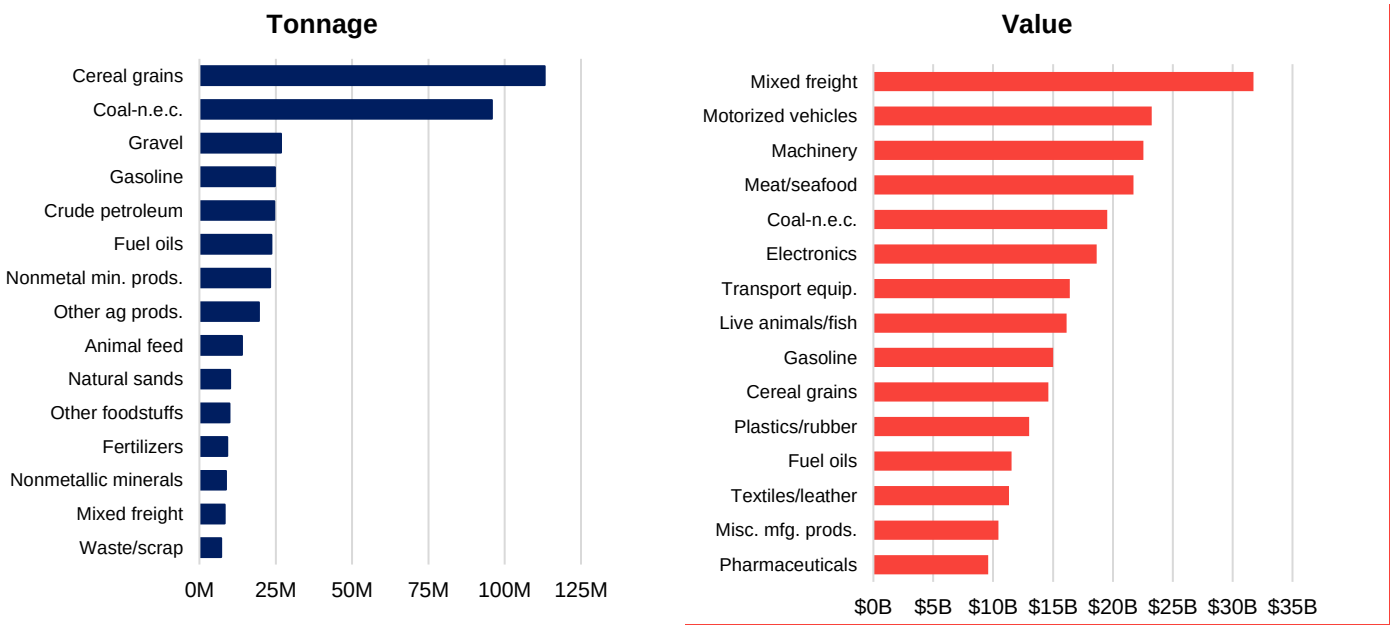
Figure D-9: Total Tonnage and Value by Mode without Pipelines (2017)



Source: CPCS Analysis of FHWA FAF 5. Note: Air includes truck-air. Note: Modal shares represent modes used for the domestic movement of goods. Therefore, for international goods movement (i.e., imports and exports) within the total flows, "mode" refers to the domestic movement of import and export goods within the US.

Figure D-10 lists the top fifteen commodities by volume and by value handled on Kansas' freight system. Cereal grains and coal-n.e.c. were the top commodities by tonnage, totaling 113.4 million tons and 95.8 million tons respectively. Manufacturing goods, including mixed freight ($31.7 billion), motorized vehicles ($23.3 billion), and machinery ($22.6 billion), are the top commodities by value.

Figure D-10: Total Tonnage and Value by Commodity (2017)



Source: CPCS Analysis of FAF 5. Note: Coal n.e.c. refers to packaged fuel, powdered fuel, and other products of petroleum and coal, not elsewhere classified.

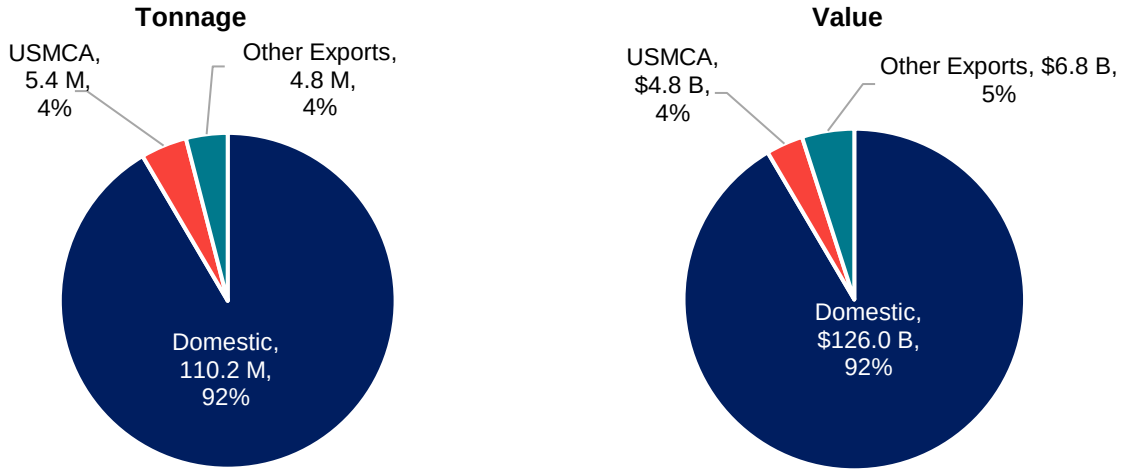
D.3 Trading Patterns

Overview

Among outbound movements originating from Kansas, 92 percent traveled domestically, by both volume and value (Figure D-11). The remaining outbound movements are split between United States-Mexico-Canada Agreement (USMCA) exports to Mexico or Canada and exports to other counties. Exports to Mexico and Canada are slightly higher by tonnage, while exports to other countries are slightly higher by value.

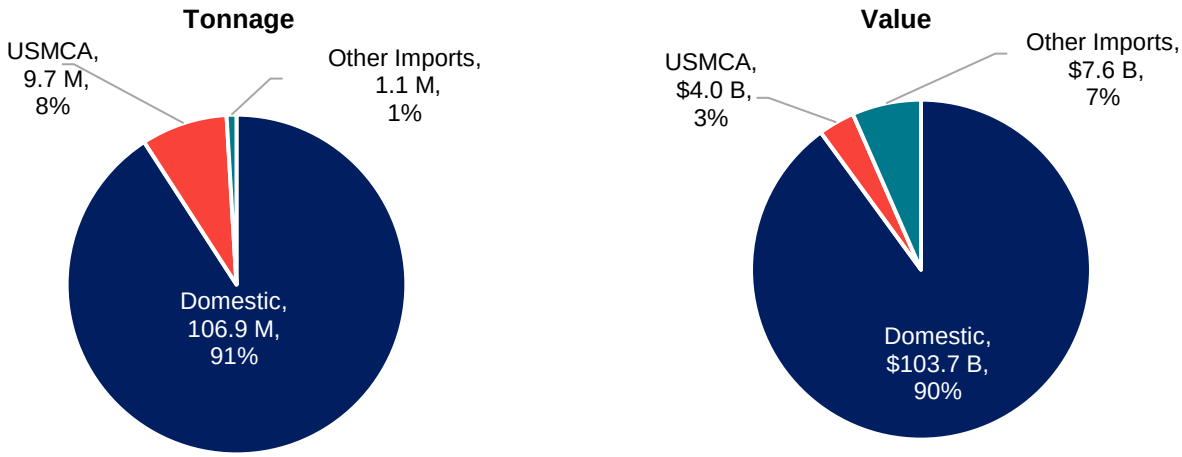
Domestic movements also make up the majority of inbound commodities destined for Kansas (Figure D-12), by both volume (91 percent) and value (90 percent). When measured by tonnage, imports from non-USMCA countries make up less than 1 percent of total imports; however, they make up 7 percent of inbound movements by value. This is due to the high-value, but low-volume nature of top imported commodities, such as machinery, textiles/leather, and electronics.

Figure D-11: Total Outbound Volume and Value by Domestic, USMCA Exports & Other Exports (2017)



Source: CPCS Analysis of FAF 5.

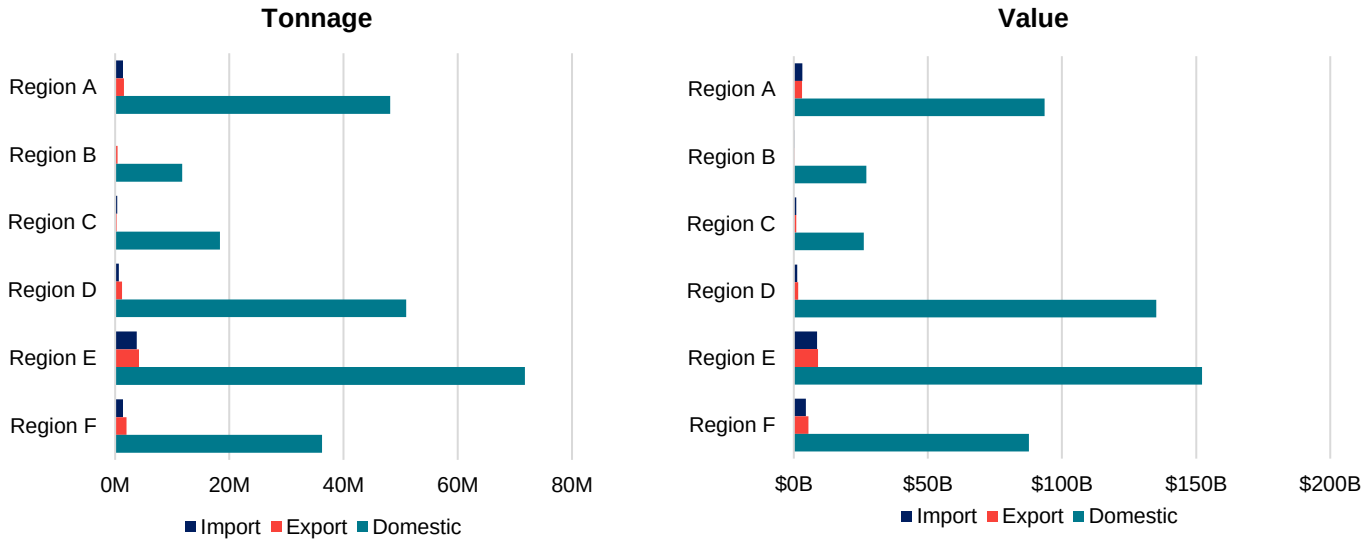
Figure D-12: Total Inbound Volume and Value by Domestic, USMCA Exports & Other Exports (2017)



Source: CPCS Analysis of FAF 5.

As shown in Figure D-13, Region E handles the highest amount of freight, both domestically and internationally. This is followed by Region D for domestic goods moved in Kansas, while Region F follows for international imports and exports.

Figure D-13: Kansas Total Tonnage and Value by Trade Type by Region (excluding Pipeline) (2017)

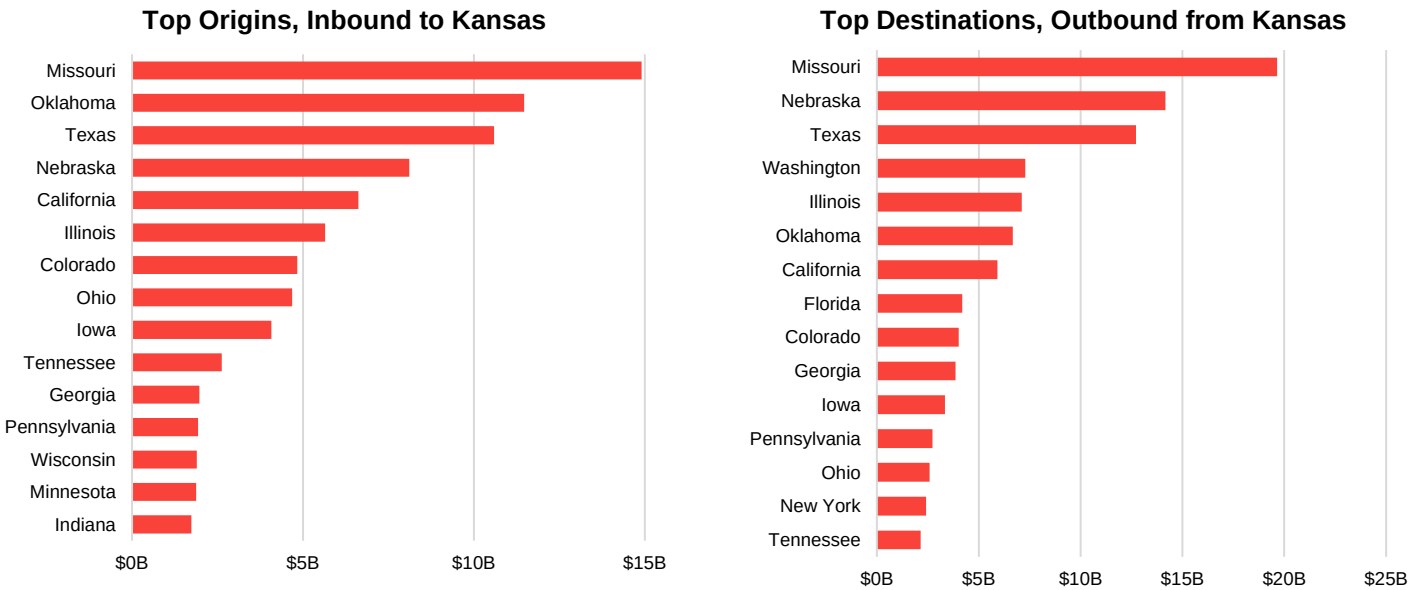


Source: CPCS Disaggregation of FHWA FAF 5. Note: Disaggregation data does not include pipeline movements.

Domestic Trading Partners

Kansas' top domestic trading partner is Missouri, with over $34.5 billion in goods moved between the states in 2017. This is followed by Texas ($23.3 billion), Nebraska ($22.3 billion), and Oklahoma ($18.1 billion). Figure D-14 identifies Kansas' top ten domestic trade partners by value, by both origin and destination.

Figure D-14: Domestic Trade Partners by Value (2017)

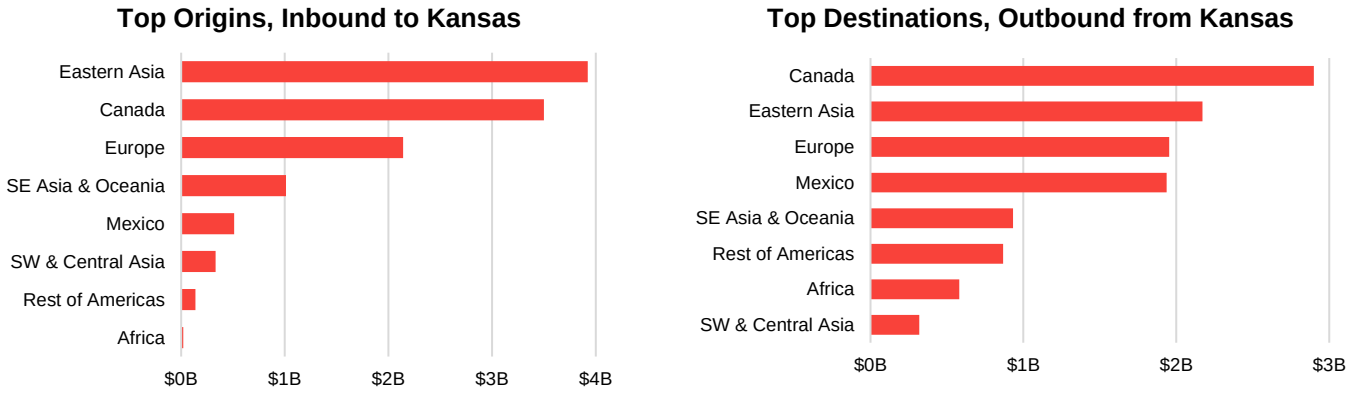


Source: CPCS Analysis of FAF 5.

International Trading Partners

Canada and Eastern Asia are Kansas' two biggest international trading partners. Kansas imports the most goods, by value, from Eastern Asia ($3.9 billion), followed by Canada ($3.5 billion). Meanwhile, the state exports the most goods, by value, to Canada ($2.9 billion), followed by Eastern Asia ($2.2 billion).

Figure D-15: International Trade Partners by Value (2017)



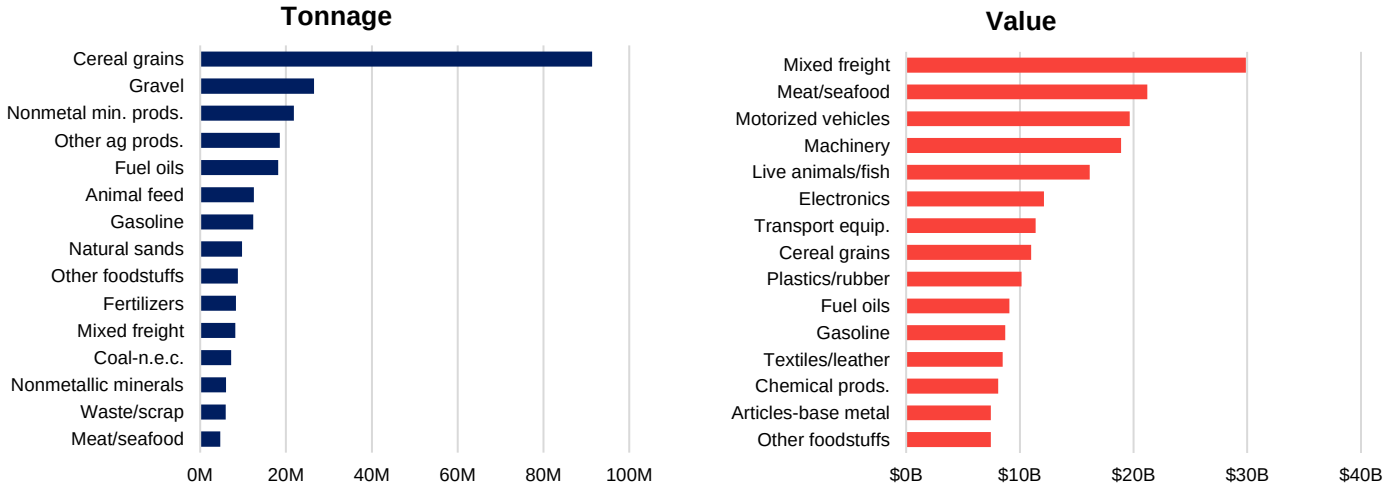
Source: CPCS Analysis of FAF 5.

D.4 Modal Profiles

Truck

Truck-based freight flows constitute the majority of Kansas' freight traffic, moving 63.1 percent of freight goods by tonnage and 75.0 percent of freight goods by value to, from, and within the state. As detailed in Figure D-16, top commodities carried by truck include cereal grains (91.3 million tons), gravel (26.5 million tons), and nonmetal mineral products (21.8 million tons). Truck also transports high-value goods, such as mixed-freight ($29.9 billion), meat/seafood ($21.2 billion), and motorized vehicles ($19.7 billion).

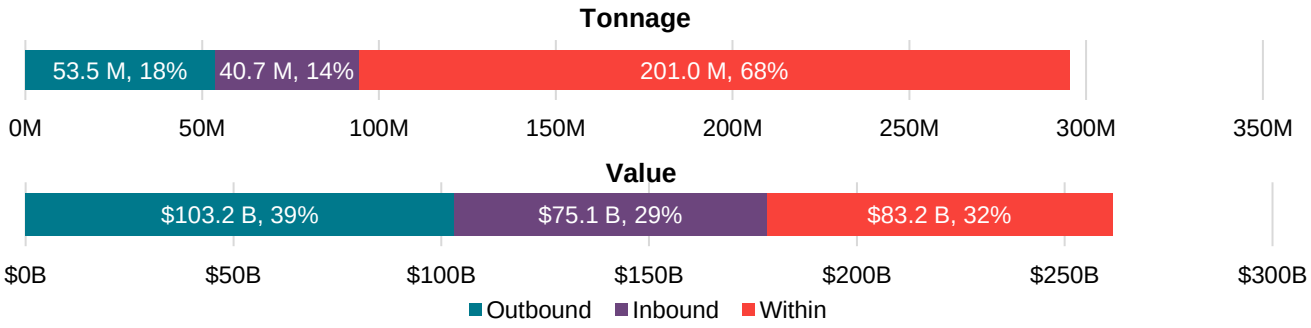
Figure D-16: Truck Tonnage and Value by Top Commodity (2017)



Source: CPCS Analysis of FAF 5.

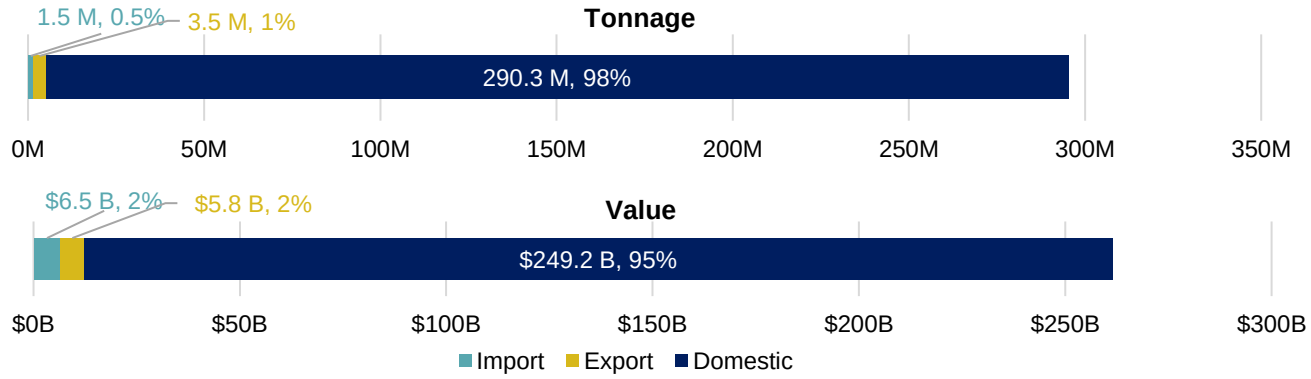
While high-tonnage goods primarily move within Kansas (68 percent), high-value goods move inbound to or outbound from (68 percent) the state (Figure D-17). When considering trade type, almost all truck movements in the state – 98 percent by tonnage and 95 percent by value – are linked to domestic goods movement (Figure D-18).

Figure D-17: Truck Tonnage and Value by Direction (2017)



Source: CPCS Analysis of FAF 5.

Figure D-18: Truck Tonnage and Value by Trade Type (2017)

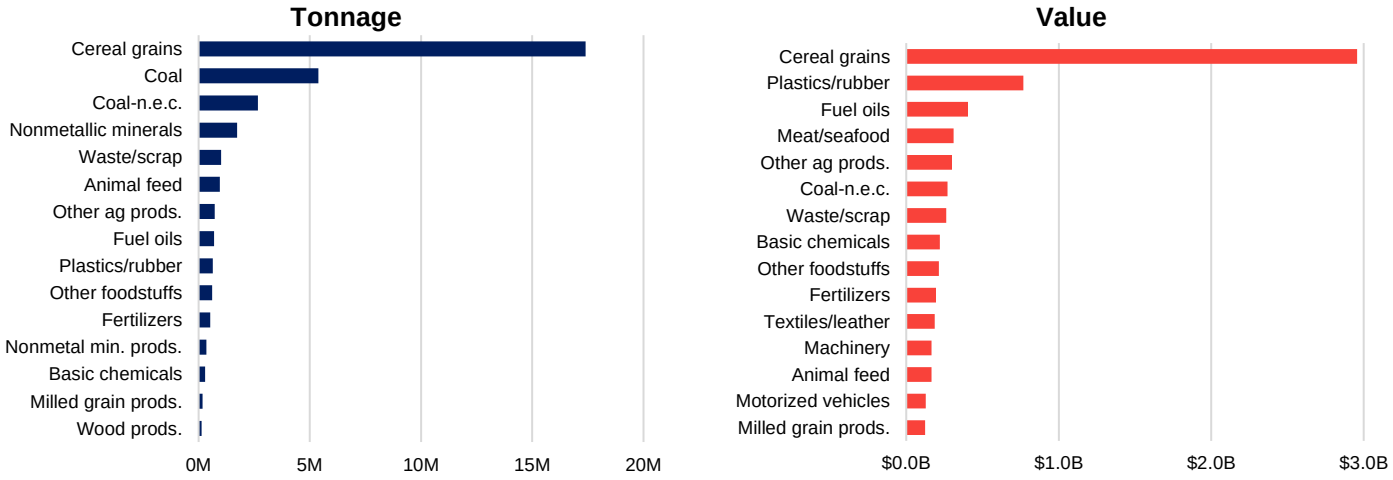


Source: CPCS Analysis of FAF 5.

Rail

With over 4,600 active miles of railroad state, rail is another key mode of freight transportation in Kansas, carrying nearly 34 million tons (7.26 percent) of goods worth over $7.3 billion (2.10 percent) goods in 2017. Figure D-19 identifies the top 15 commodities carried by rail by volume and value. The top commodities transported by rail include cereal grains (17.4 million tons), coal (5.4 million tons), and coal n.e.c. (2.7 million tons) by tonnage. When measured by value, cereal grains ($2.96 billion) remain the top commodity moved by rail, followed by plastics/rubber ($0.8 billion) and fuel oils ($0.4 billion).

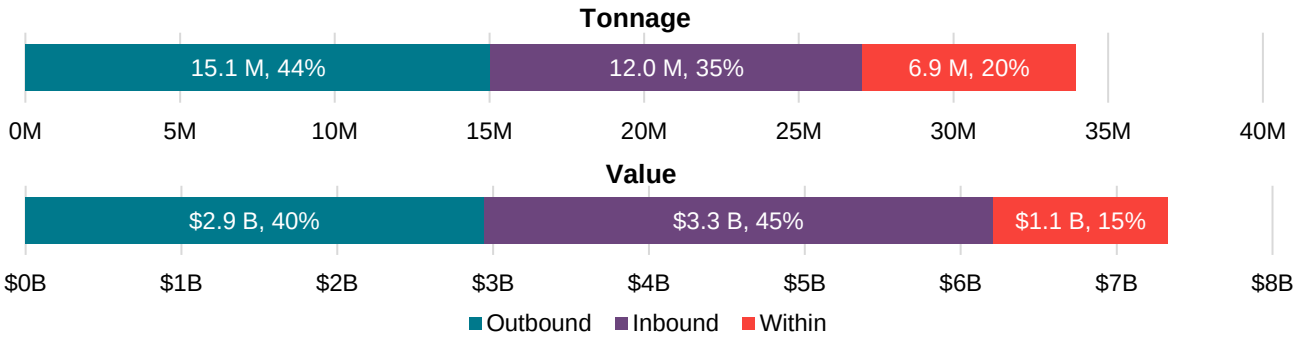
Figure D-19: Rail Tonnage and Value by Top Commodity (2017)



Source: CPCS Analysis of FAF 5.

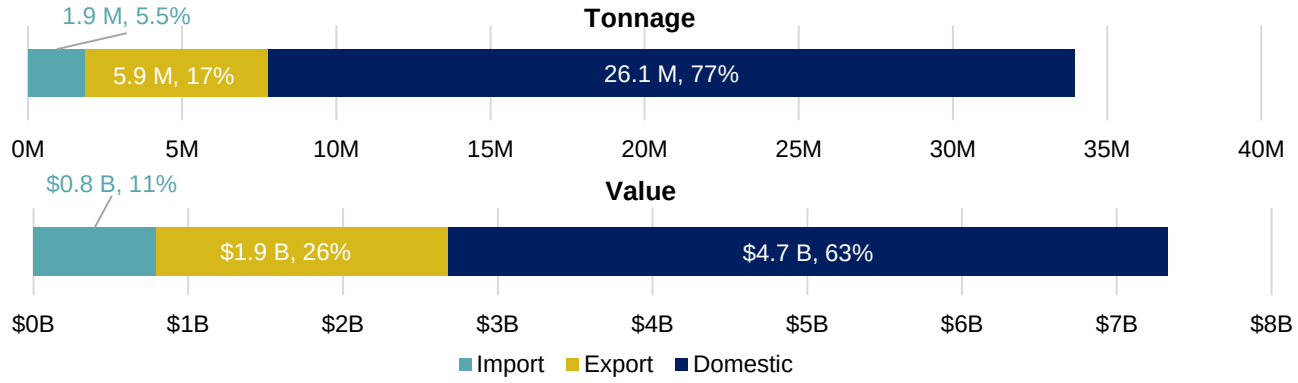
Commodities carried by rail in Kansas primarily travel to or from the state – 80 percent by tonnage and 85 percent by value (Figure D-20). Kansas is a major grain-producing state, with cereal grains making up over 91 percent of all rail movements, by volume. When evaluating trade type, domestic trade accounts for the majority (77 percent by volume and 63 percent by value) of rail movements in Kansas (Figure D-21). Among international movements, a larger share consists of export goods.

Figure D-20: Rail Tonnage and Value by Direction (2017)



Source: CPCS Analysis of FAF 5.

Figure D-21: Rail Tonnage and Value by Trade Type (2017)



Source: CPCS Analysis of FAF 5.

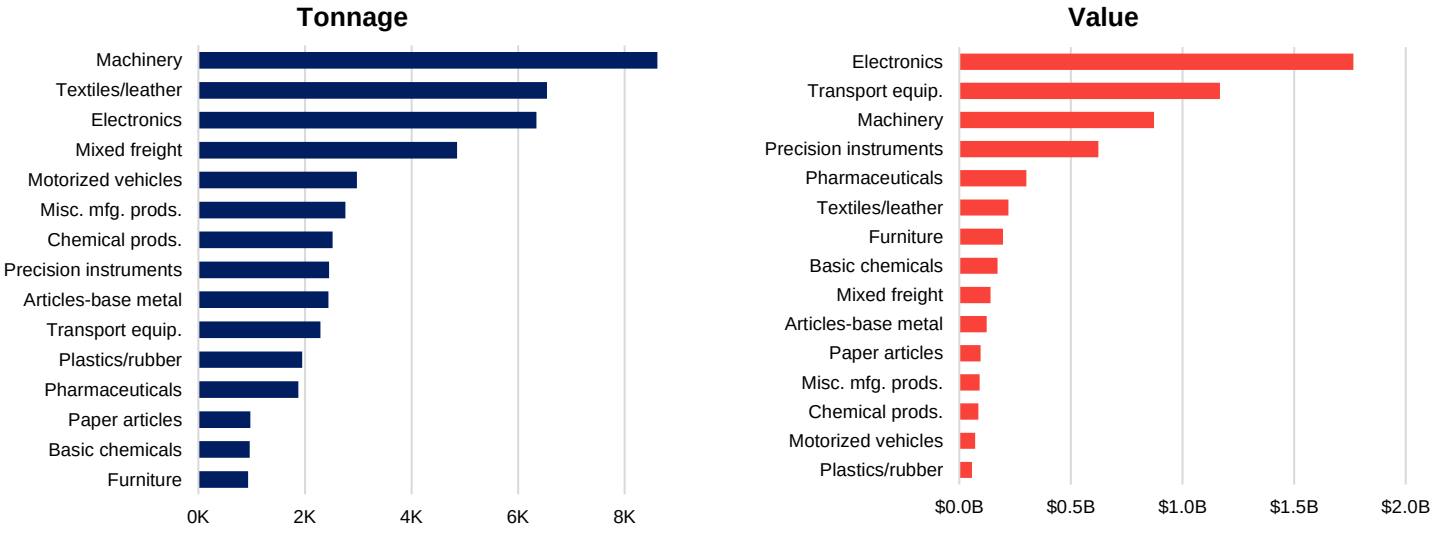
Waterways

Kansas' freight transported by water moves through Marine Highway M-29 on the Missouri River. The only commodity moved by water in Kansas in 2017 was crude petroleum, with 18 thousand tons of crude worth nearly $5.7 million transported from Kansas to Illinois.

Air

Commodities moved by air are often lightweight, time-sensitive, and high-value. The top 15 commodities transported by air are detailed in Figure D-22. Machinery (8,600 tons), textile/leather (6,500 tons), and electronics (6,300 tons) are the top three commodities moved by air, when measured by volume, while electronics ($1.7 billion) and machinery ($0.87 billion) are the top commodities carried by air in Kansas when measured by value.

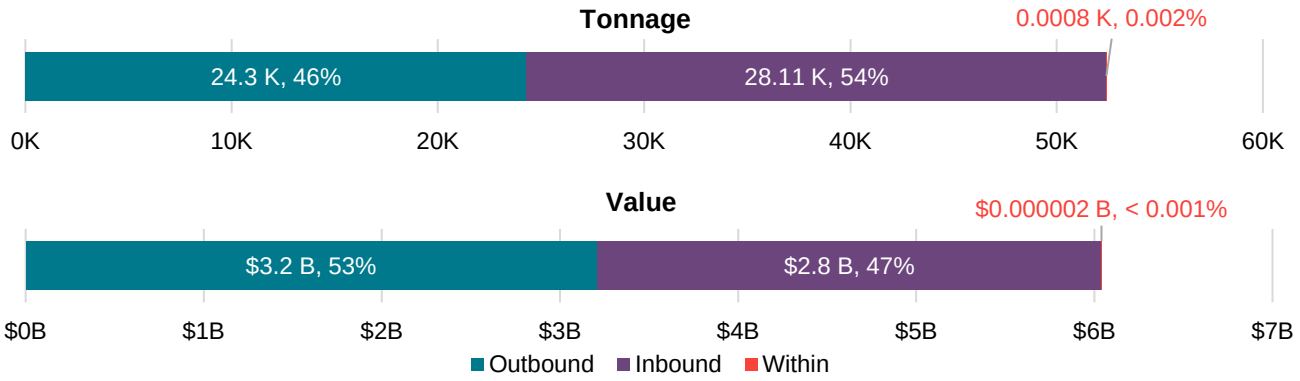
Figure D-22: Air Tonnage and Value by Top Commodity (2017)



Source: CPCS Analysis of FAF 5.

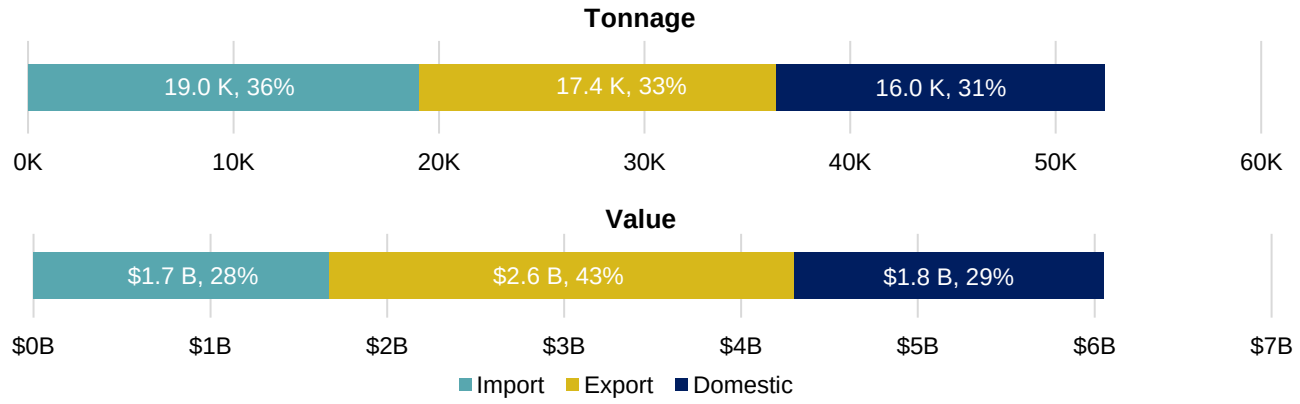
Air is typically the mode of choice for longer-distance freight movements, as shorter-distance freight movements by air are not cost-effective given air cargo's high cost. Over 99.99 percent of air cargo handled in Kansas is transported to and from other US states and international locations (Figure D-23). Air cargo transported in Kansas has both international and domestic origins and destinations, but international movements make up a larger share – 69 percent of air cargo movements in the state by value, and 71 percent by value (Figure D-24).

Figure D-23: Air Tonnage and Value by Direction (2017)



Source: CPCS Analysis of FAF 5.

Figure D-24: Air Tonnage and Value by Trade Type (2017)

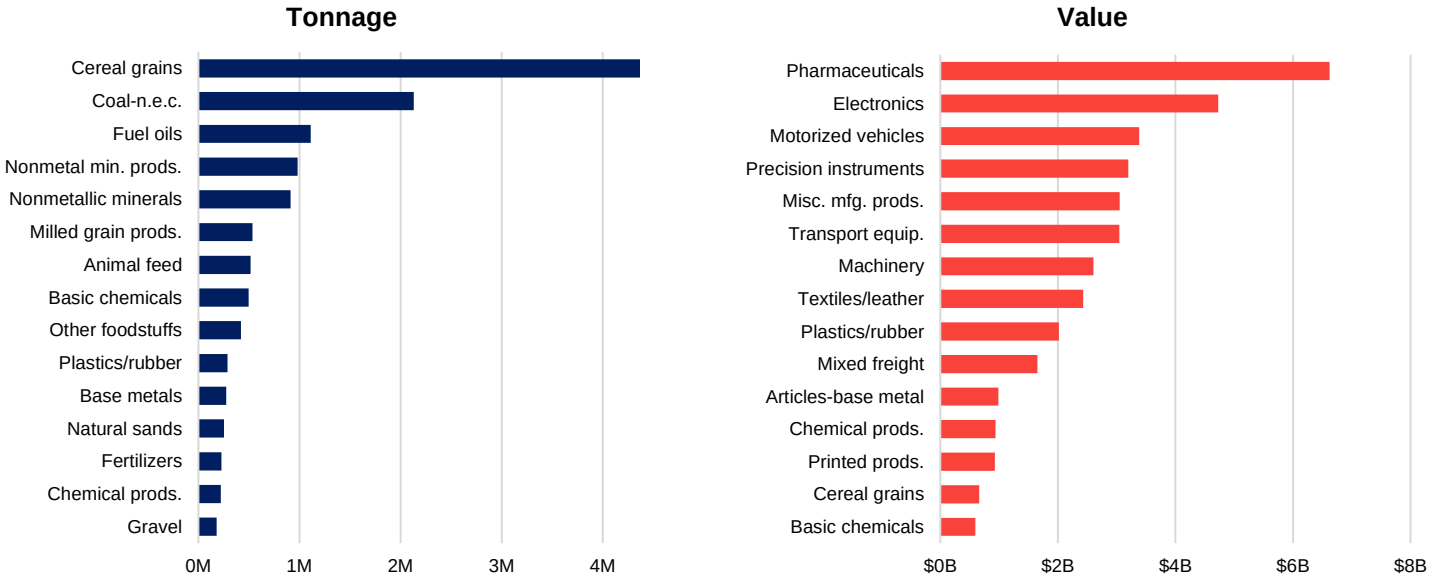


Source: CPCS Analysis of FAF 5.

Multiple Modes

The classification of movements by multiple modes includes shipments by water-rail, truck-rail intermodal, and truck-water, as well as by parcel delivery services, US Postal Service, or couriers, such as UPS (less than or equal to 150 pounds).[3] As demonstrated in Figure D-25, the top commodity carried by multiple modes is cereal grains (4.37 million tons) by tonnage, but pharmaceuticals ($6.6 billion) by value.

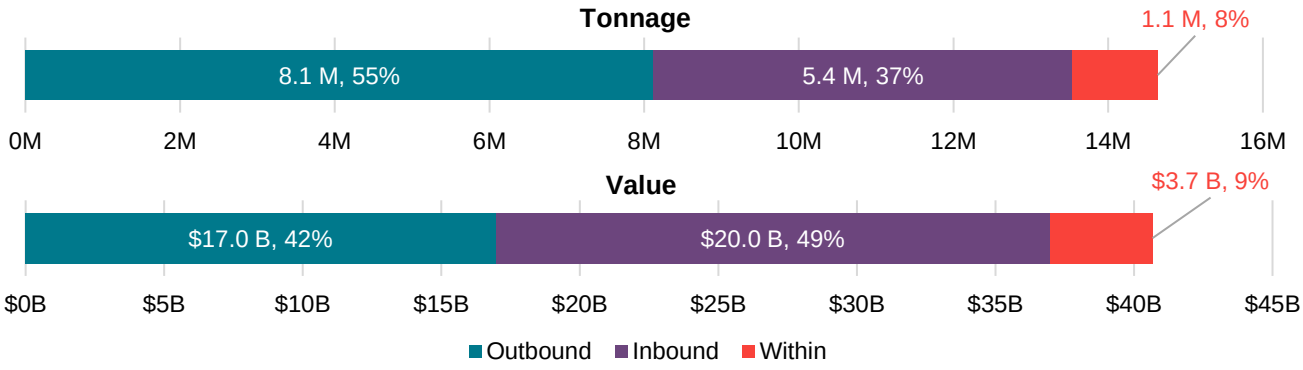
Figure D-25: Multiple Modes Tonnage and Value by Top Commodity (2017)



Source: CPCS Analysis of FAF 5.

Multiple modes provide cost-effective solutions to long-distance (water-rail and truck-rail) and high-value (truck-air) freight transportation needs. Given this, the majority of goods moved by multiple modes – 92 percent by volume and 91 percent by value – travel inbound to or outbound from Kansas (Figure D-26). Goods moved by multiple modes primarily have domestic origins or destinations, rather than international origins or destinations. Domestic movements make up 90 percent of Kansas' multiple modes movements by tonnage and 98 percent by value (Figure D-27).

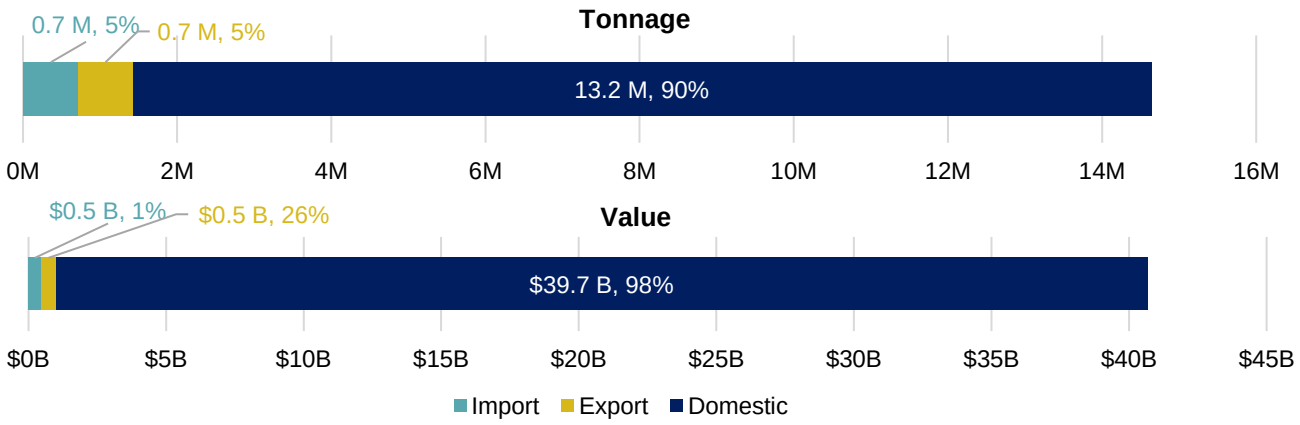
Figure D-26: Multiple Modes Tonnage and Value by Direction (2017)



Source: CPCS Analysis of FAF 5.

[3] Freight Analysis Framework Version 5. User's Guide for Release 5.0. https://www.bts.gov/sites/bts.dot.gov/files/2021-02/FAF5-User-Guide.pdf

Figure D-27: Multiple Modes Tonnage and Value by Trade Type (2017)

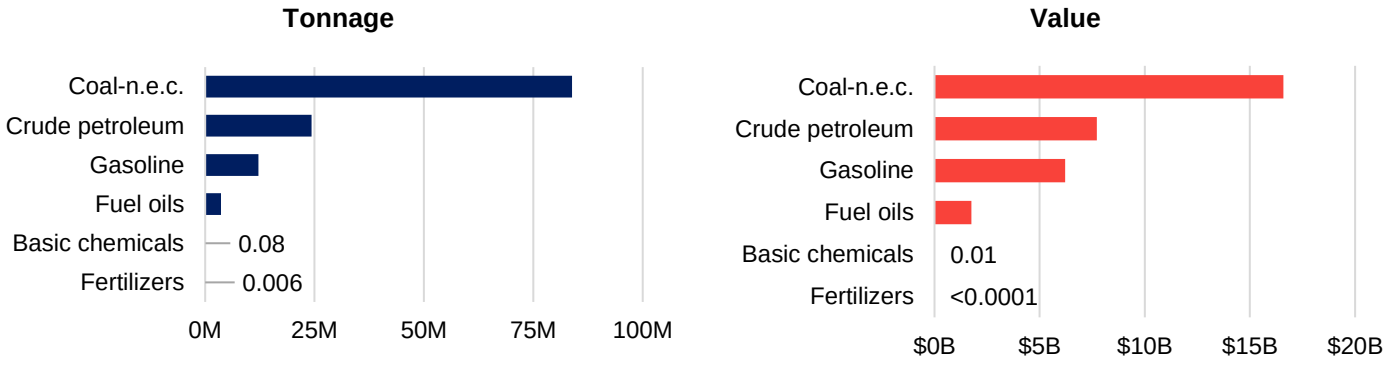


Source: CPCS Analysis of FAF 5.

Pipeline

Kansas' pipeline system primarily carries energy resources and basic chemicals, with coal n.e.c. accounting for 67 percent of total tonnage and 51 percent of total value (Figure D-28).

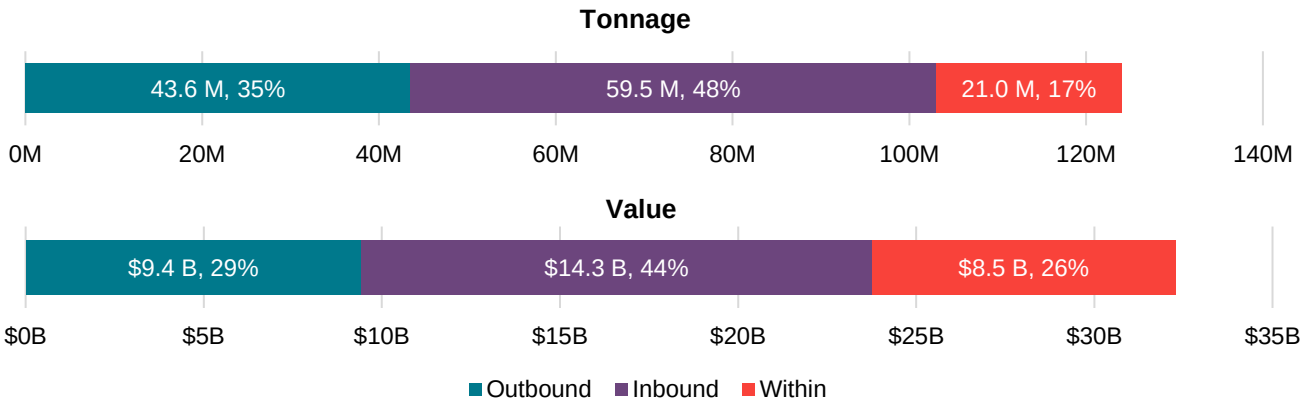
Figure D-28: Pipeline Tonnage by Top Commodity (2017)



Source: CPCS Analysis of FAF 5.

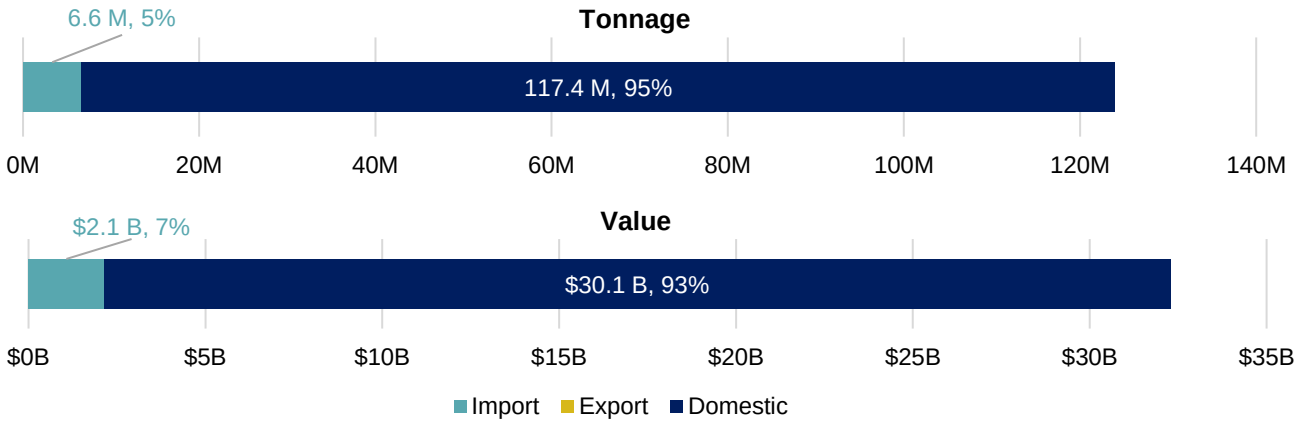
About 16.9 percent of pipeline flows by volume or 26.4 percent of flows by value stayed within Kansas, while the remaining volume or value flowed to/from other states (Figure D-29). The majority of freight movements (94.7 percent) by pipeline remain within the US, with only 5.3 percent of flows (crude petroleum imports from Canada) originating or terminating in a foreign country (Figure D-30).

Figure D-29: Pipeline Tonnage by Direction (2017)



Source: CPCS Analysis of FAF 5.

Figure D-30: Pipeline Tonnage by Trade Type (2017)



Source: CPCS Analysis of FAF 5.

D.5 Top Commodities

To further understand commodity flows in Kansas, this section examines the movements of key commodities through the flows of four commodity groups tailored to Kansas – cereal grains, energy, agriculture, and foodstuffs (non-cereal grains), and manufacturing (Figure D-31). As shown in Figure D-32, these four groups account for 79 percent in tonnage and 75 percent in value of Kansas' total freight flows.

Figure D-31: Commodity Group and Commodities

Commodity Group	Key Commodities	
Cereal Grains	Cereal grains	
Energy	Coal	Fuel oils
	Crude petroleum	Coal – n.e.c.
	Gasoline	Basic chemicals*
Agriculture and foodstuffs (non-cereal grains)	Live animals/fish	Milled grain products
	Other agricultural products	Other foodstuffs
	Animal feed	Fertilizers
	Meat/seafood	
Manufacturing	Machinery	Transport equipment
	Electronics	Precision instruments
	Motorized vehicles	Mixed freight

*Note: Basic chemicals is considered part of the energy commodity group since basic chemicals include energy sources such as hydrogen and industrial gases according to the Standard Classification of Transported Goods (SCTG).

Figure D-32: Percentage of Kansas-Based Tonnage and Value by Commodity (2017)

Commodity Group	Tonnage 2017 (Million Tons)	Percentage of Total Tonnage	Value 2017 (Billion $)	Percentage of Total Value
Cereal Grains	113.08	24.2%	14.60	4.2%
Energy	178.08	38.1%	58.53	16.8%
Agriculture and foodstuffs (non-cereal grains)	64.16	13.7%	69.19	19.8%
Manufacturing	14.07	3.0%	117.98	33.8%
Total	369.39	79.0%	260.3	74.6%

Source: CPCS Analysis of FHWA FAF 5.

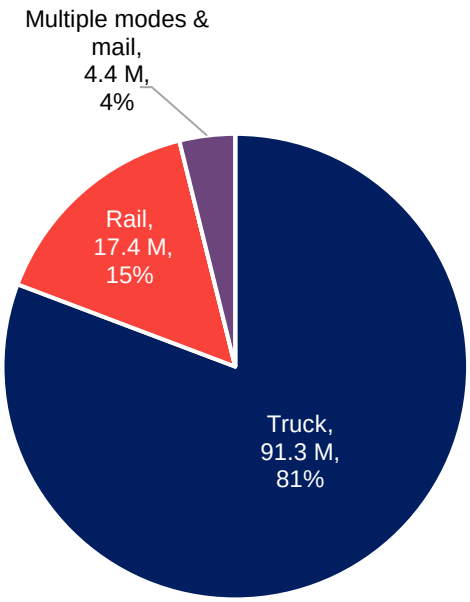
Cereal Grains

Kansas is a top US producer of agricultural commodities such as wheat, corn, and sorghum. Cereal grains account for 24 percent of tonnage and 4 of commodity value in Kansas. The top counties in the state shipping cereal grains by tonnage include Sedgwick, Finney, and Haskell Counties, and the top counties receiving cereal grains by tonnage include Sedgwick, Shawnee, and Butler Counties.

Figure D-33 demonstrates the movement of cereal grain volumes by mode. Truck is the dominant mode of transportation, transporting 81 percent of total cereal grain volumes to and from Kansas. Rail moves the second-largest share of cereal grain, accounting for over 15 percent of the total tonnage.

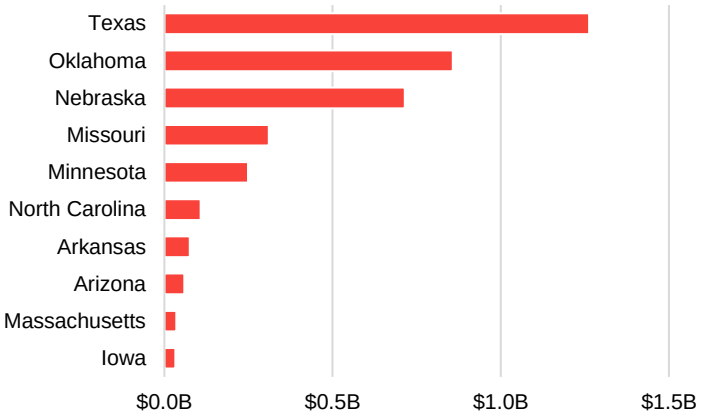
Figure D-34 and Figure D-35 illustrate Kansas' trading relationship with other US states and foreign regions for cereal grains. Within the US, Texas ($1.3 billion), Oklahoma ($0.9 billion), and Nebraska ($0.7 billion) are Kansas' top three cereal grain trading partners by value. Internationally, Kansas trades the highest value of cereal grains with Mexico ($461.2 million) and Africa ($376.0 million).

Figure D-33: Total Tonnage by Mode – Cereal Grains (2017)



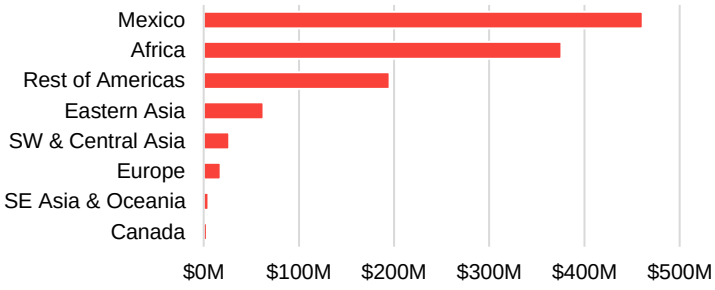
Source: CPCS Analysis of FAF 5.

Figure D-34: Top 10 Domestic Trade Partners by Value – Cereal Grains (2017)



Source: CPCS Analysis of FAF 5.

Figure D-35: Foreign Trade Partners by Value – Cereal Grains (2017)



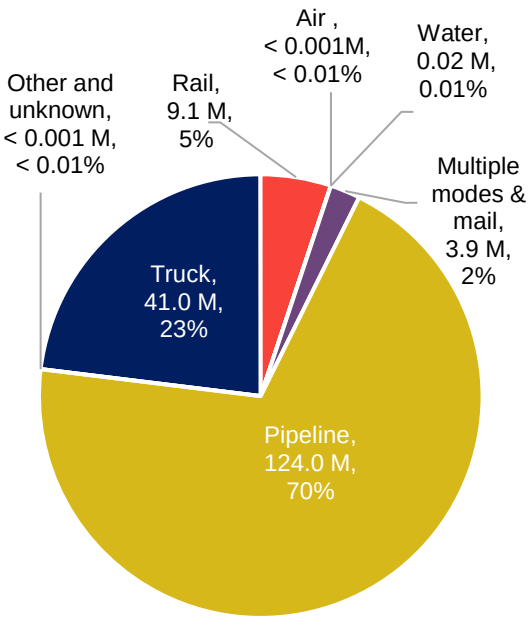
Source: CPCS Analysis of FAF 5.

Energy

The energy commodity group includes coal, crude petroleum, gasoline, fuel oils, coal n.e.c., and basic chemicals. This commodity group makes up 38 percent of Kansas' total freight tonnage and 17 percent of total freight value. Pipeline moves almost 70 percent of energy products in Kansas. Truck is also crucial, moving 23 percent of total energy commodities by tonnage in the state (Figure D-36).

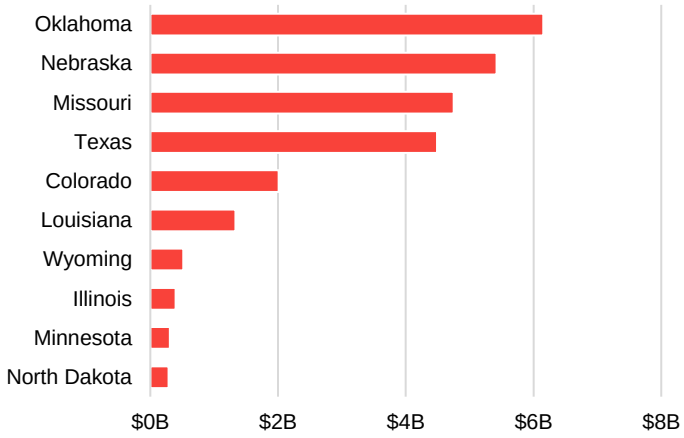
Kansas' top domestic trade partners for energy commodities by value are Oklahoma ($6.2 billion), Nebraska ($5.4 billion), and Missouri ($4.75 billion) in terms of energy commodities (Figure D-37). Oklahoma primarily exports coal n.e.c. products (includes packaged fuel, powdered fuel, and other products of petroleum and coal, not elsewhere classified) to Kansas, with $5.2 billion moved from Oklahoma to Kansas in 2017. Canada is Kansas' top foreign trading partner for energy commodities, by value (Figure D-38). Among the $2.2 billion of energy products moved between Kansas and Canada, crude petroleum exported from Canada accounts for 97 percent ($2.1 billion) of these movements by value.

Figure D-36: Total Tonnage by Mode – Energy (2017)



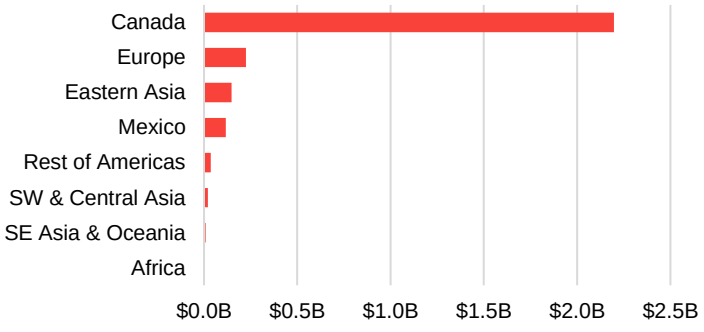
Source: CPCS Analysis of FAF 5. Note: Air includes truck-air.

Figure D-37: Top 10 Domestic Trade Partners by Value – Energy (2017)



Source: CPCS Analysis of FAF 5.

Figure D-38: Foreign Trade Partners by Value – Energy (2017)



Source: CPCS Analysis of FAF 5.

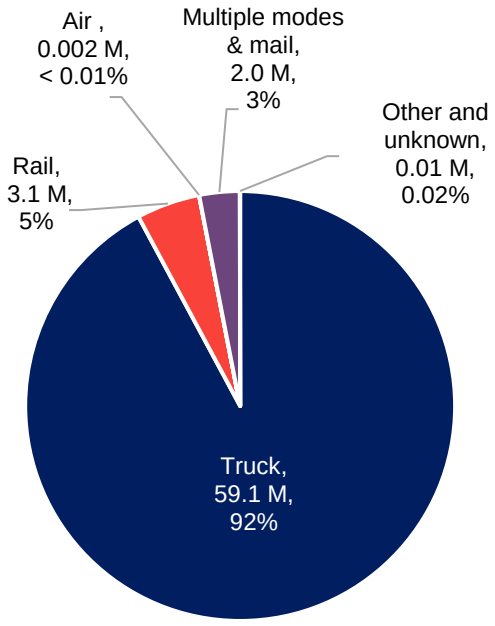
Agriculture and foodstuffs (non-cereal grains)

In addition to cereal grains, Kansas produces many other agricultural and food products, such as live animals and fish, meat and seafood, fertilizers, and animal feed. The agriculture and foodstuffs commodity group includes all agricultural and food products, with the exception of cereal grains.

The agriculture and foodstuffs commodity group makes up 14 percent of freight flows in Kansas by tonnage and 20 percent by value. As shown in Figure D-39, truck is the main mode of transportation for agriculture and foodstuffs commodities, accounting for 92 percent of total commodity group movements by tonnage. Rail also transports 3.1 million tons of agriculture and foodstuffs commodities, which is equivalent to nearly 5 percent of total tonnage.

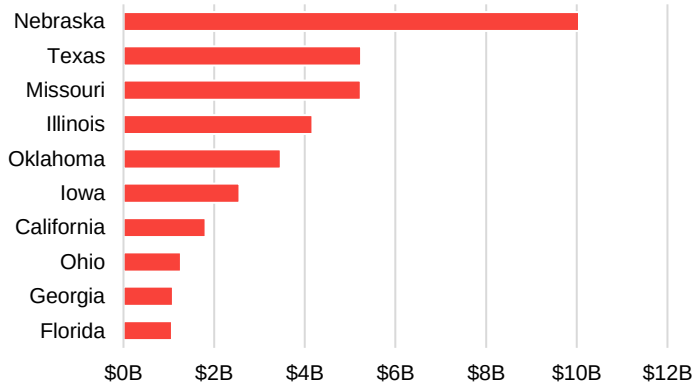
Kansas' top domestic trade partners for agriculture and foodstuffs commodities by value (Figure D-40) are Nebraska ($10.1 billion), Texas ($5.2 billion), and Missouri ($5.2 billion). Kansas exports $5.1 billion of live animals and fish products to Nebraska, amounting to over half of the total agriculture and foodstuffs value traded between the two states. Exports make up nearly 87 percent of international movements of agriculture and foodstuffs in Kansas. Eastern Asia is Kansas' top trading partner, with $1.4 billion in agriculture and foodstuffs commodities traded (Figure D-41).

Figure D-39: Total Tonnage by Mode – Agriculture and Foodstuffs (non-cereal grains) (2017)



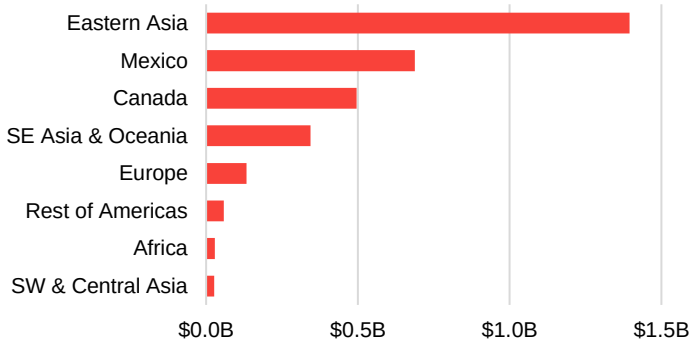
Source: CPCS Analysis of FAF 5. Note: Air includes truck-air.

Figure D-40: Top 10 Domestic Trade Partners by Value – Agriculture and Foodstuffs (non-cereal grains) (2017)



Source: CPCS Analysis of FAF 5.

Figure D-41: Foreign Trade Partners by Value – Agriculture and Foodstuffs (non-cereal grains) (2017)



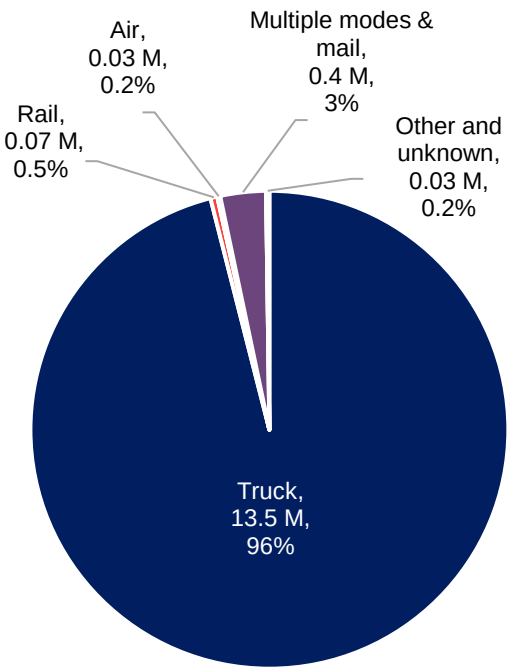
Source: CPCS Analysis of FAF 5.

Manufacturing

The manufacturing commodity group consists of machinery, electronics, motorized vehicles, transport equipment, precision instruments, and mixed freight. These commodities are often low-volume and high-value. The Kansas freight system carried 14.7 million tons worth nearly $118 billion in manufacturing goods, accounting for 3 percent of the state's total freight tonnage and 34 percent of total freight value in Kansas.

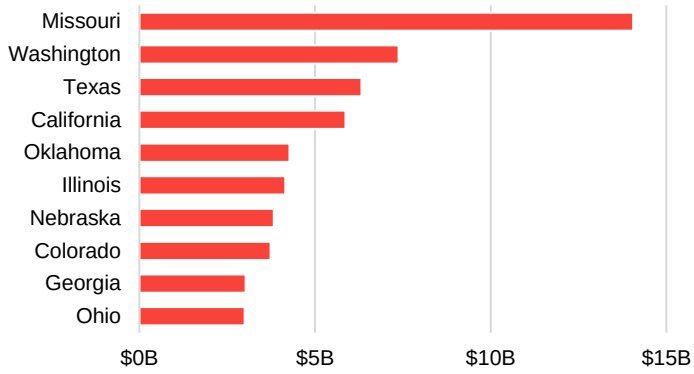
Truck is the dominant mode of transportation for manufacturing products, carrying 96 percent of manufacturing products by volume (Figure D-42). Kansas' top domestic trade partners for manufacturing products by value (Figure D-43) are Missouri ($14.1 billion), Washington ($7.4 billion), and Texas ($6.3 billion). Kansas has a mature aerospace manufacturing industry, with $6.2 billion in transportation equipment making up nearly 84 percent of all goods, by value, moved from Kansas to Washington. Internationally, Kansas' major trading partners include Canada, Eastern Asia, and Europe, trading more than $2 billion with each of these regions (Figure D-44).

Figure D-42: Total Tonnage by Mode – Manufacturing (Million Tons) (2017)



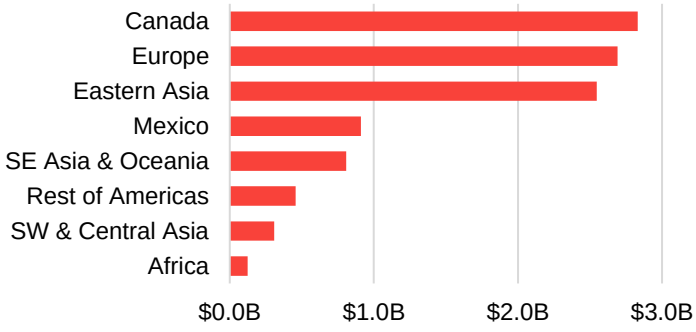
Source: CPCS Analysis of FAF 5. Note: Air includes truck-air.

Figure D-43: Top 10 Domestic Trade Partners by Value – Manufacturing (2017)



Source: CPCS Analysis of FAF 5.

Figure D-44: Foreign Trade Partners by Value - Manufacturing (2017)



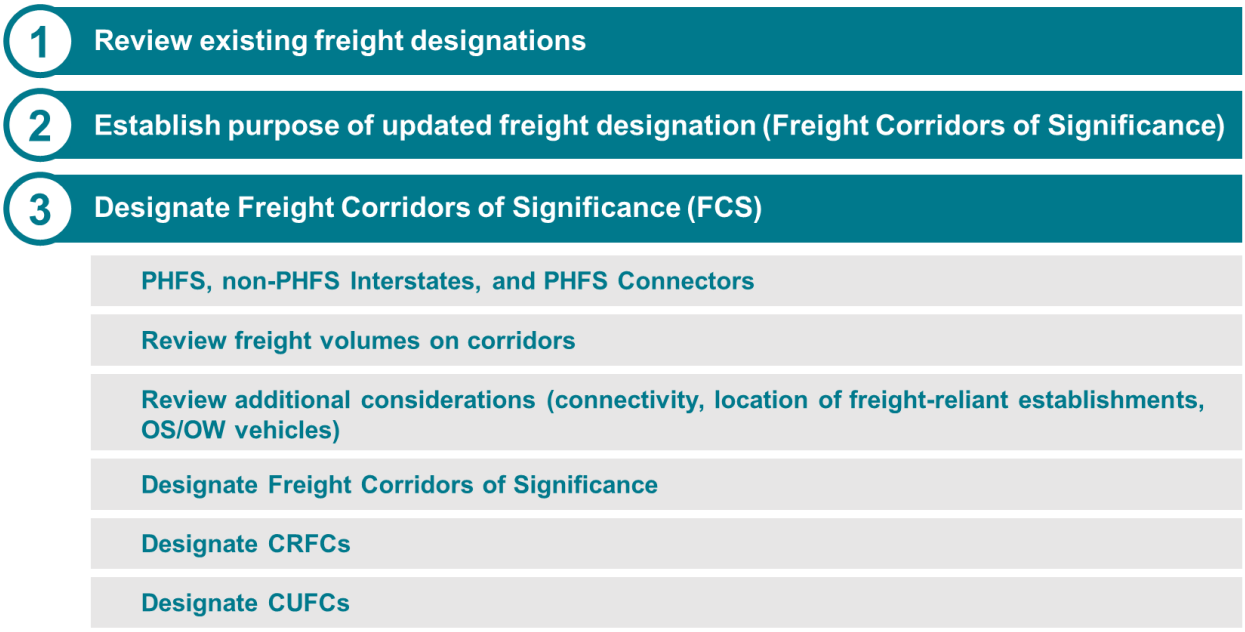
Source: CPCS Analysis of FAF 5.

Appendix E. Designating Kansas' Freight Corridors of Significance

E.1 Introduction

As part of the Kansas Statewide Freight Plan Update, KDOT engaged in a process (Figure E-45) to designate Kansas' highway freight network. This designated freight network, which represents the most important roadways in the state, will be referred to as Kansas' Freight Corridors of Significance (FCS).

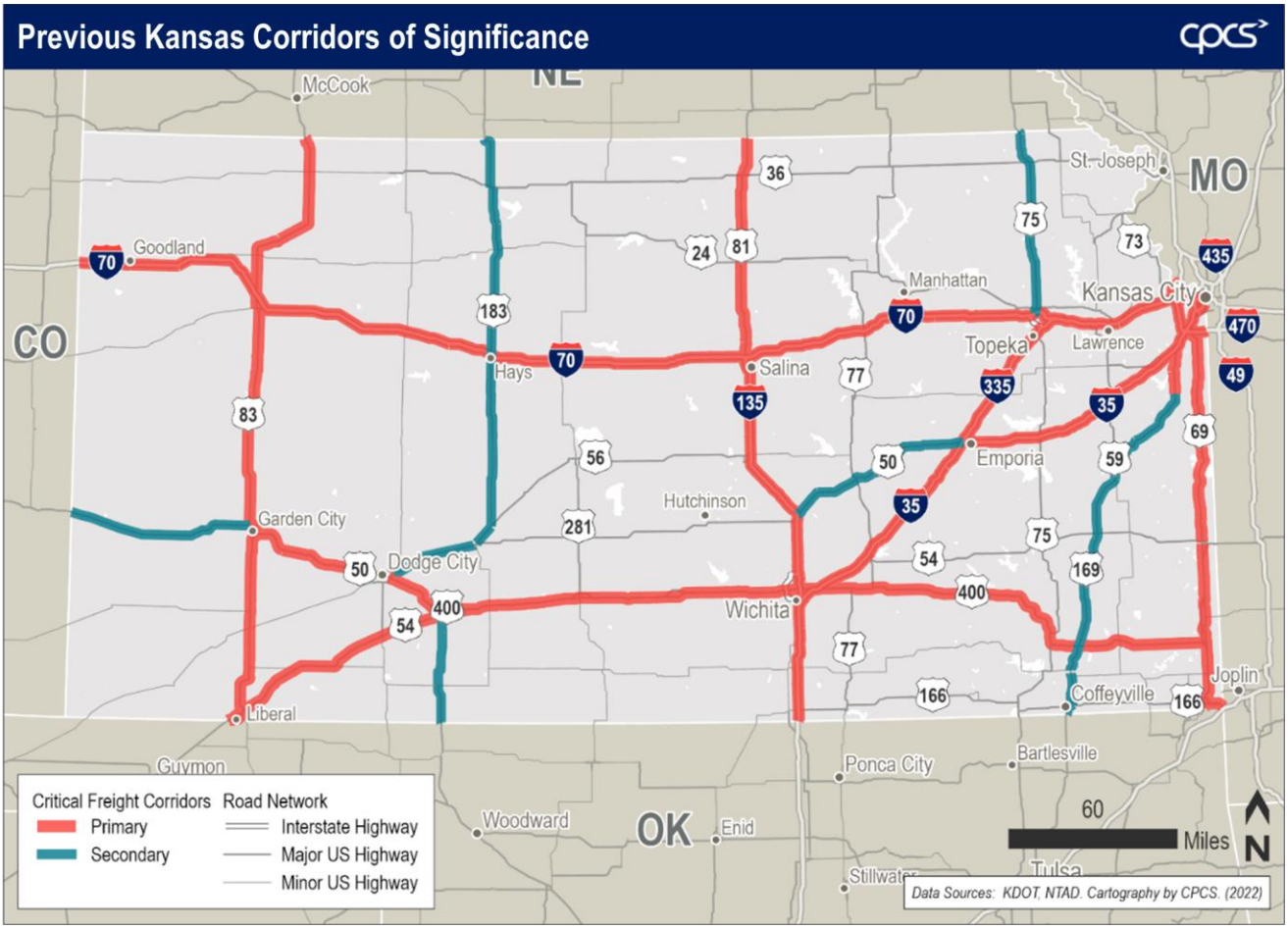
Figure E-45: Process to Designate Kansas' Freight Corridors of Significance



E.2 Previous Kansas Freight Corridors of Significance

Kansas' previous Freight Corridors of Significance designation was built on the NHFN as a backbone and adds routes of statewide and regional performance. The Kansas Freight Corridors of Significance were approved by the KFAC in 2014 and documented in Kansas' previous Statewide Freight Plan (2017). Figure E-46 illustrates these corridors, which are classified as either primary or secondary corridors. Information about the process to classify primary and secondary corridors is not documented in the 2017 Statewide Freight Plan.

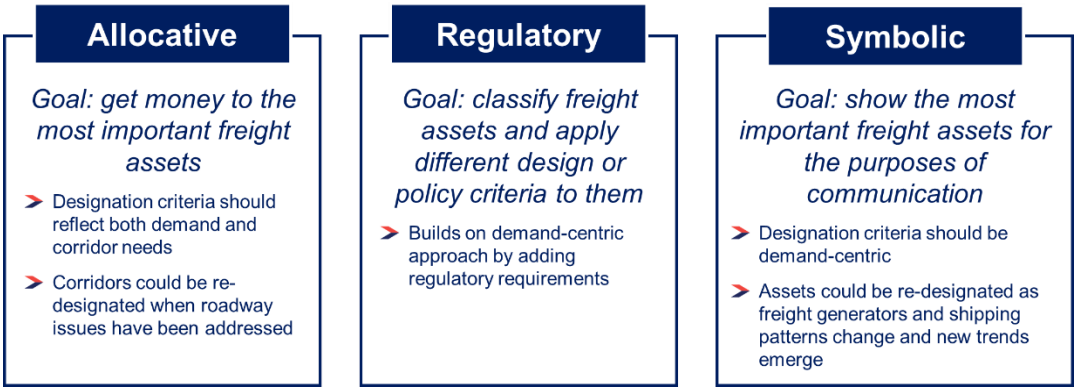
Figure E-46: Previous Freight Corridors of Significance (2014)



E.3 Establish Purpose of Updated Freight Designation

A DOT may designate a freight network to support a range of goals. The Kansas FCS may be used to support allocative, regulatory, and/or symbolic goals, as detailed in Figure E-47.

Figure E-47: Potential Freight Network Designation Applications



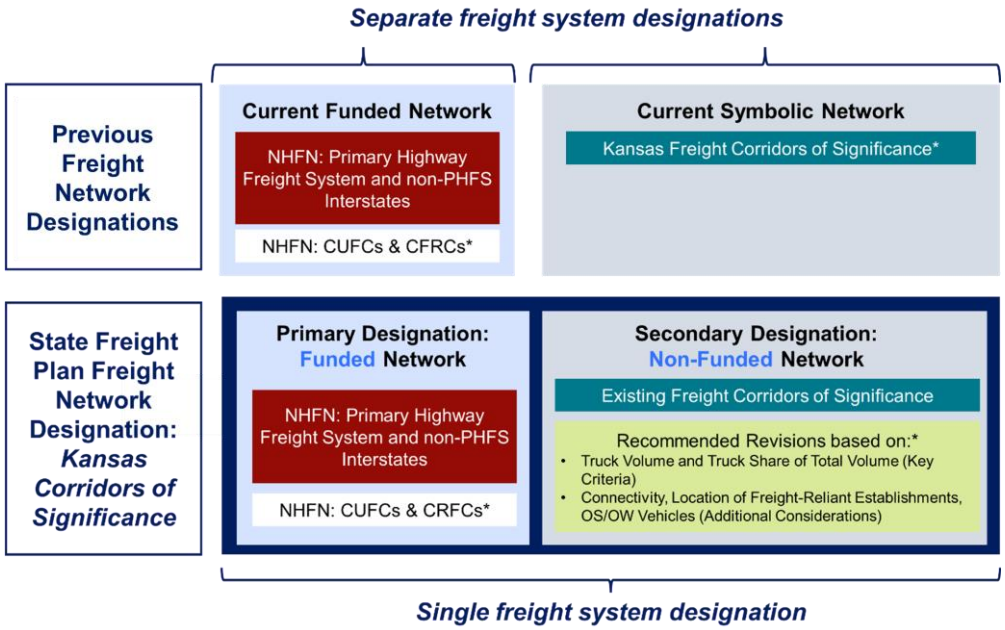
Source: CPCS

As part of the State Freight Plan Update, KDOT has merged its two freight networks into a *single* freight network, called the Kansas Freight Corridors of Significance (FCS), which includes the NHFN, as well as other key freight corridors in the state. This update is illustrated in Figure E-48.

KDOT has determined that the updated FCS will primarily be designated for symbolic purposes, serving as a single source of identification for Kansas' most important freight roadways. This symbolic designation provides information to KDOT, sister agencies, local agencies, the private sector, and the public.

Within the FCS, KDOT will also use select corridors for allocative purposes. Specifically, the NHFN corridors will have allocative purposes through ties to federal funding. These corridors have been designated as the FCS Primary (Funded) Network. The remaining corridors on the FCS, which are not tied to funding, have been designated as the Secondary (Non-Funded) Network.

Figure E-48: Freight Network Designation Approach



Source: CPCS. Note: *Updated by KDOT as part of the State Freight Plan process.

E.4 Designate Kansas' Freight Corridors of Significance

The process to update Kansas' FCS builds off existing National Networks and previously designated State Freight Networks.

Primary Highway Freight System + non-PHFS Interstates + PHFS Connectors

Kansas' PHFS, non-PHFS Interstates, and PHFS Connectors have remained the same, as federally designated by FHWA.

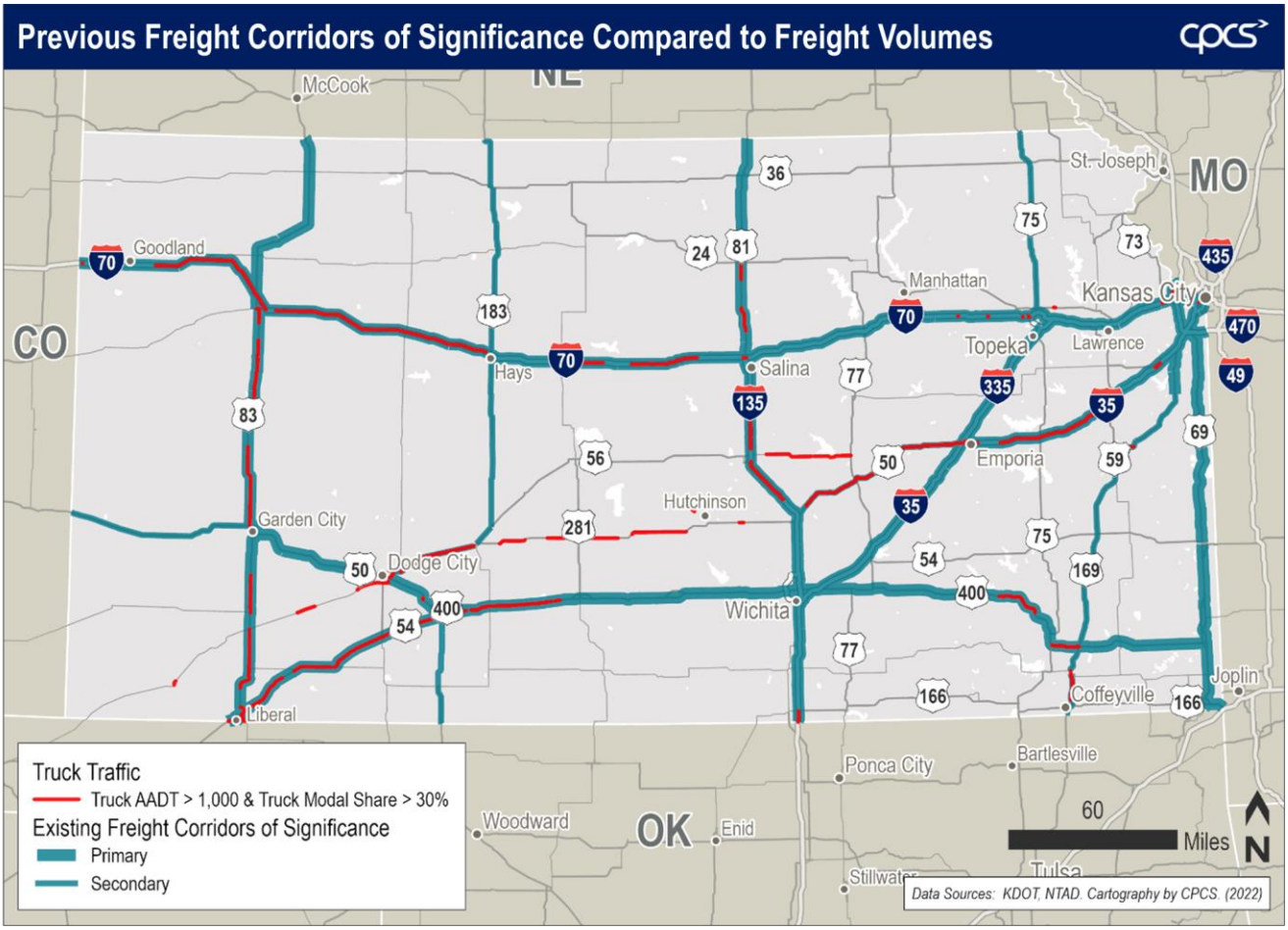
Review Freight Volumes on Corridors

To identify additional corridors to be included in the updated FCS designation, KDOT reviewed truck volumes – through truck[4] AADT and truck share of total AADT – on Kansas' corridors. Corridors identified with high freight volumes, and therefore designated as a freight corridor of significance, met the following criteria:

1. Truck AADT greater than 1,000; *and*
2. Truck share of total traffic greater than 30 percent.

Figure E-49 illustrates Kansas' previous FCS, overlaid with high freight volume corridors.

Figure E-49: Previous Freight Corridors of Significance Compared to Freight Volumes



[4] Truck includes both combination trucks and single-unit trucks/buses

Designate Freight Corridors of Significance (not inclusive of CUFCs and CRFCs)

Building off the existing National (PHFS, non-PHFS Interstates, and PHFS Connectors) and previous State (FCS) designations, select corridors were recommended for addition to the FCS, based on a review of freight volumes. One corridor was also recommended for removal. Connectivity – the corridor's role in supporting a linked network that connects all parts of the state – was further considered during the designation process. These corridors are shown in Figure E-50.

- PHFS, non-PHFS Interstates, and PHFS Connectors are shown in red
- Previous Freight Corridors of Significance are shown in teal
- Corridors recommended for addition to the FCS are shown in yellow
- Corridor recommended for removal from the FCS is shown in brown

The factor of connectivity – linkage to other significant freight corridors to develop a seamless network – was also taken into consideration when designating the network.

Those corridors tied to NHFN funding will be classified as part of the Primary (Funded) Network, while the remaining corridors will be classified as the Secondary (Non-Funded) Network. Note that the designation and classification of CRFC and CUFCs occurred in later stages, and these were integrated into the final Primary (Funded) Network of the FCS.

Figure E-50: Recommended Freight Corridors of Significance (Not Inclusive of CUFCs and CRFCs)

Additional factors considered as part of the designation process include the location of existing freight-reliant establishments (Figure E-51) and major new/planned freight facilities (Figure E-52), as well as oversize/overweight (OS/OW) truck routing, based on 2021 permits (Figure E-53).

Figure E-51: Existing Freight-Reliant Establishments

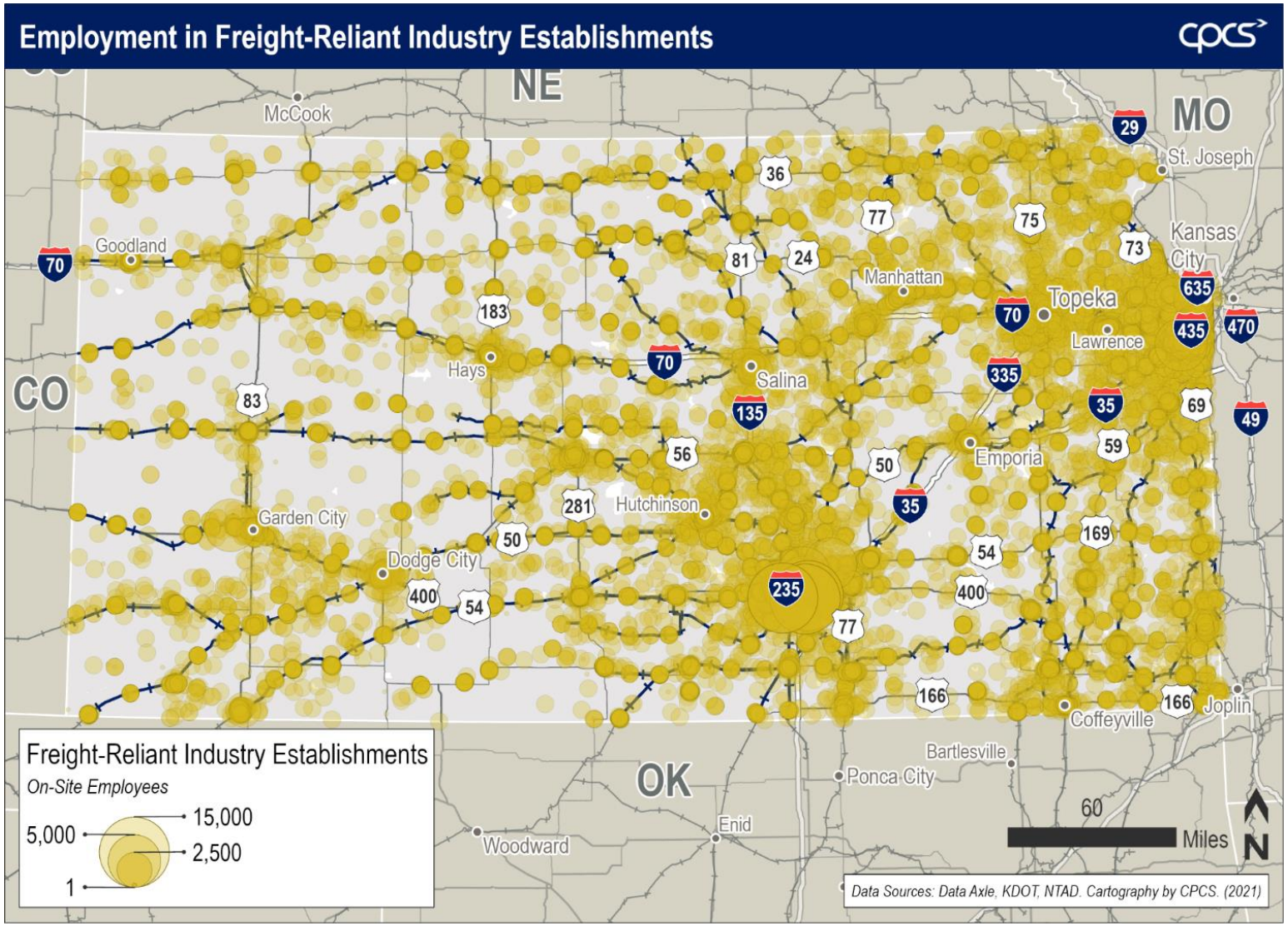


Figure E-52: Major New/Planned Freight Facilities

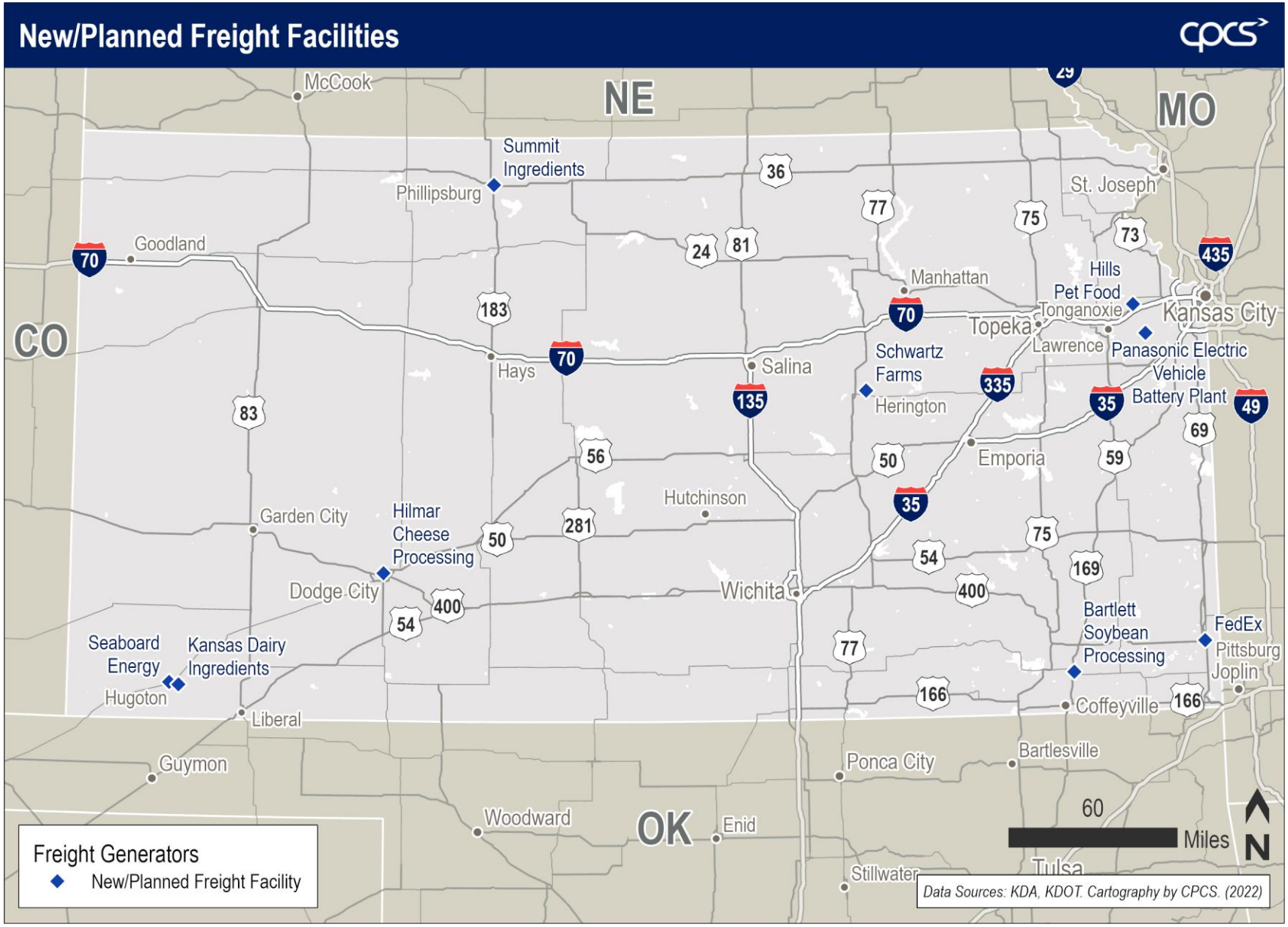
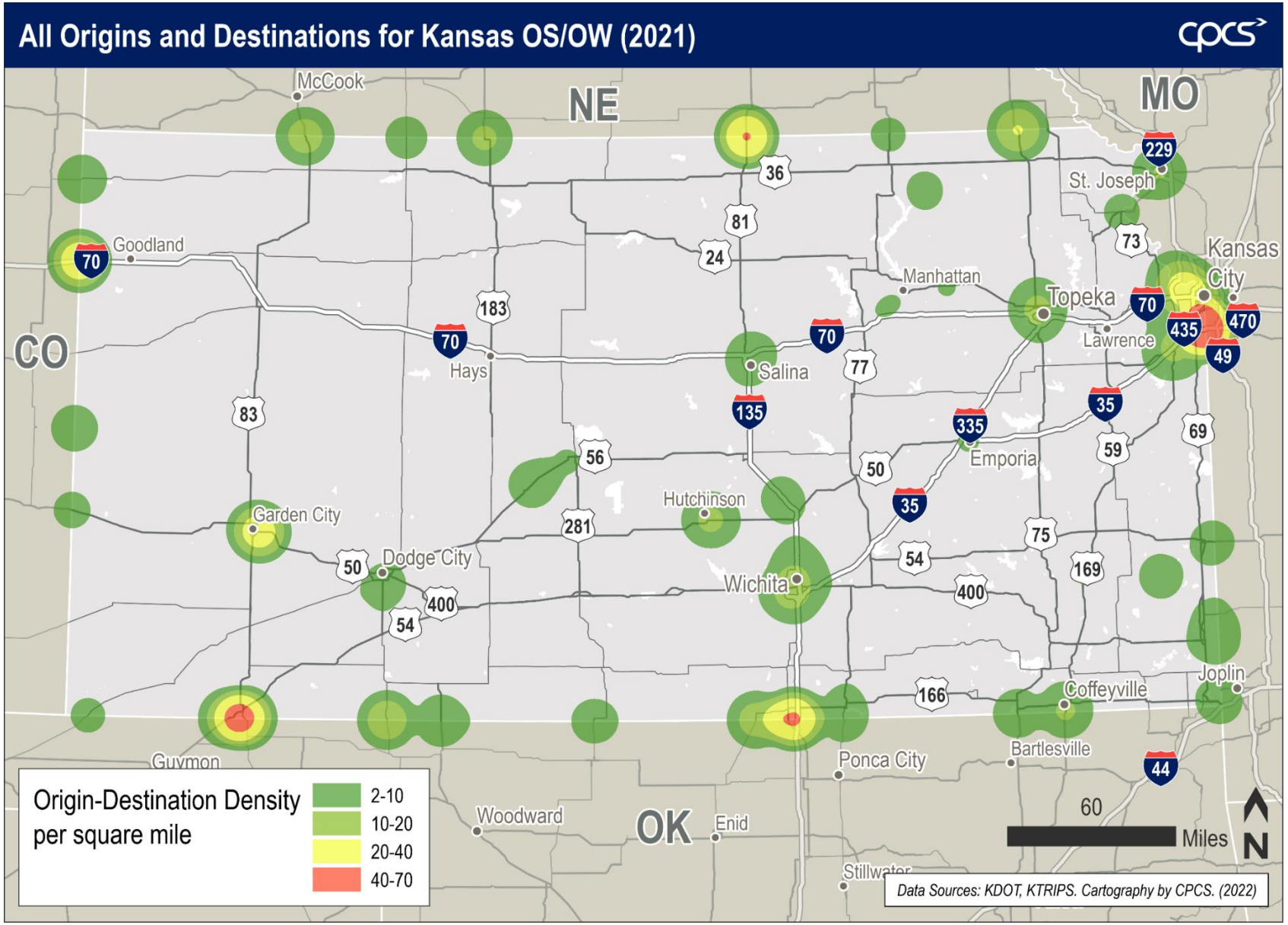


Figure E-53: Origins and Designations for Kansas OS/OW Permits in 2021



Designate Kansas' CRFCs

CRFCs are designated to highlight the most significant rural freight routes in the state. Projects located on these designated routes may also become eligible for NHFP funding. As a rural state, Federal legislation allows Kansas to designate up to 600 miles of CRFCs.[5,6] This mileage must be shared among all rural areas in the state.

KDOT has updated the designation of Kansas CRFCs based on the following criteria:

- Located in a rural area
- High truck traffic volumes
- Supports a linked network that connects all parts of the state
- Connectivity to key freight infrastructure and/or establishments

CRFC designation underwent an iterative process that included feedback from KFAC and KDOT. Figure E-54 illustrates the corridors initially identified for CRFC consideration, and Figure E-55 illustrates the updates made based on feedback, with high freight volumes highlighted.

Figure E-54: Corridors Recommended for CRFC Consideration – Initial Iteration

[5] 23 US Code § 167 - National highway freight program. https://www.law.cornell.edu/uscode/text/23/167. "Rural states.--Notwithstanding paragraph (2), a State with a population per square mile of area that is less than the national average, based on the 2010 census, may designate as critical rural freight corridors a maximum of 600 miles of highway or 25 percent of the primary highway freight system mileage in the State, whichever is greater." Accessed July 7, 2022.

[6] Table of National Highway Freight Network Mileages by State, FHWA. https://ops.fhwa.dot.gov/freight/infrastructure/nfn/maps/nhfn_mileage_states.htm. Accessed July 7, 2022.

Figure E-55: Corridors Recommended for CRFC Consideration – Final Iteration

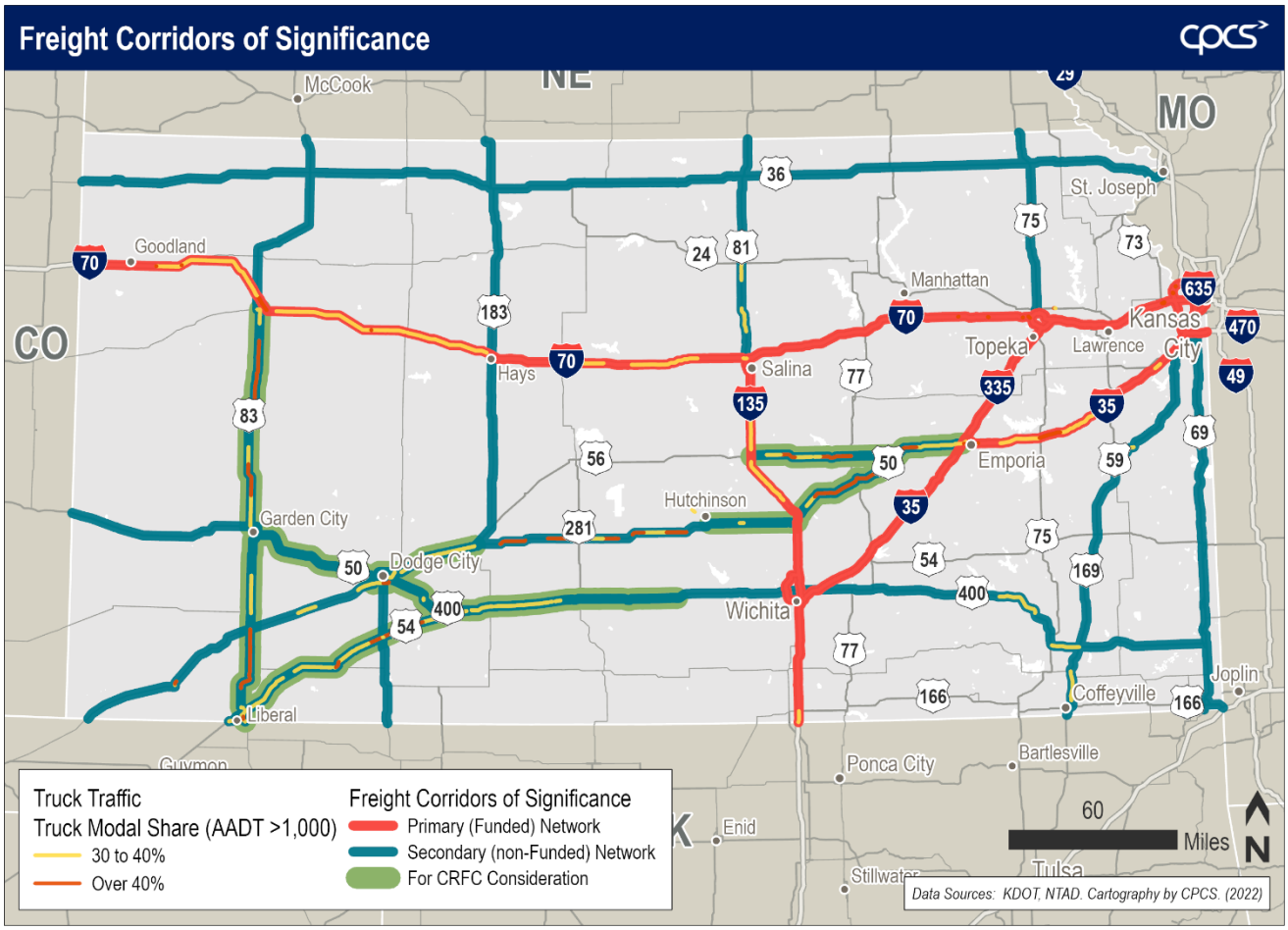


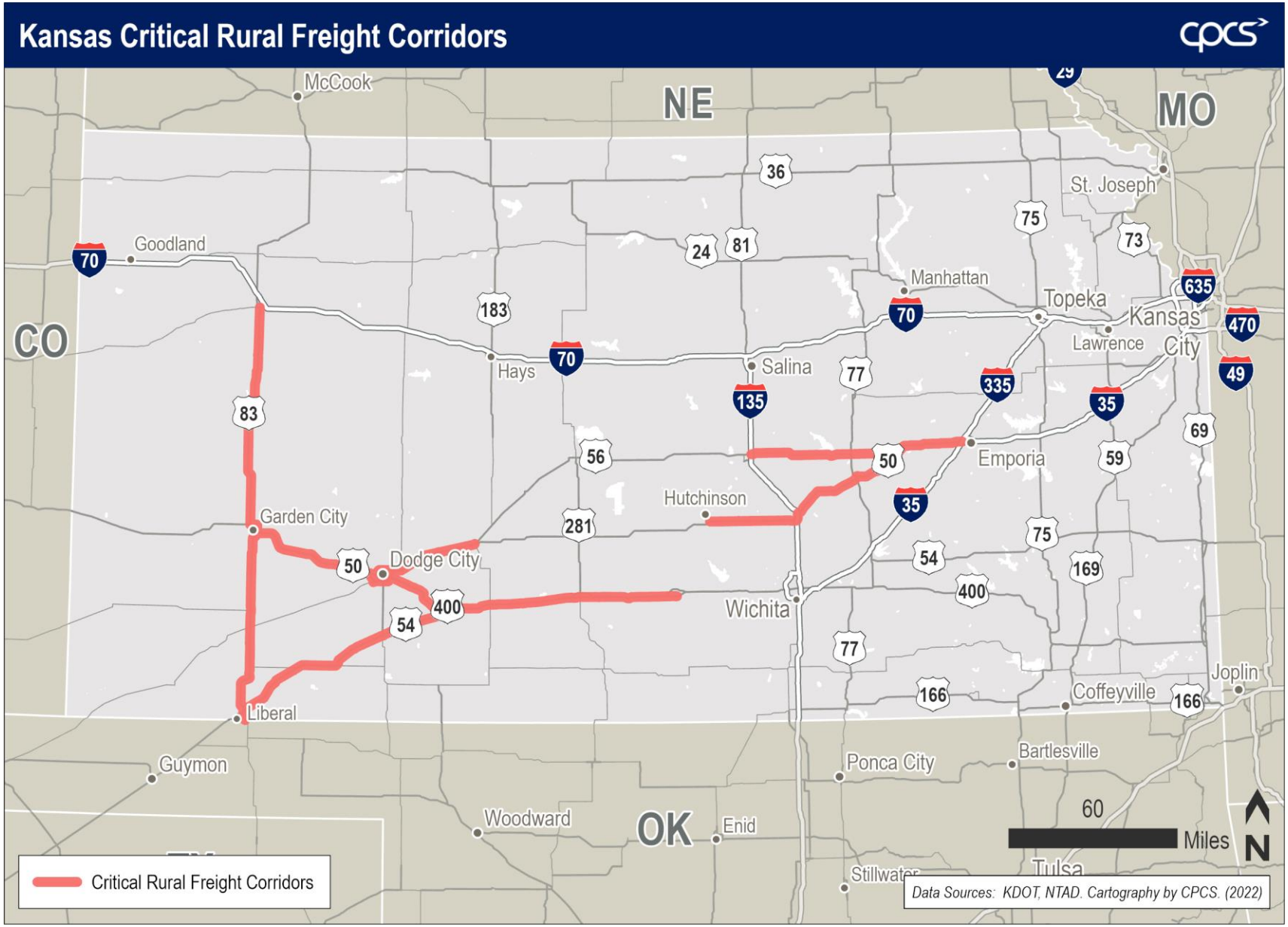
Figure E-56 details the final routes selected for CRFC designation in Kansas, also mapped in Figure E-57. These routes were then also designated to the final Primary (Funded) Network of the Kansas FCS.

Figure E-56: Final CRFC Routes

Route No.	Start Point	End Point	Length (Miles)
US 50	Dodge City	Kinsley	40.09
US 50	Hutchinson	Newton/I-135	31.19
I-135	Interchange US 50/ US 135 South	Interchange US 50/ US 135 East	2.11
US 50	Garden City	Dodge City	86.53
US 50	Newton	Emporia	68.52
US 54	Liberal	Bucklin	81.90
US 56	McPherson	US 50 near Elmdale	52.77
US 83	Oakley	KS-OK state line near Liberal	148.41
US 400	Mullinville	Kingman	86.90
TOTAL			598.41

Source: KDOT

Figure E-57: Final CRFC Network



Designate Kansas' CUFCs

CUFCs are designated to highlight the most significant urban freight routes in the state. Projects located on these designated routes may become eligible for NHFP funding. Federal legislation allows Kansas to designate 150 miles of CUFCs within the state. This mileage must be shared among all urban areas in the state.

KDOT has updated the designation of Kansas CUFCs with input from planning organizations in Kansas, including:

- Mid-America Regional Council (MARC)
- Lawrence-Douglas County Metropolitan Planning Organization (LDCMPO)
- Wichita Area Metropolitan Planning Organization (WAMPO)
- Metropolitan Topeka Planning Organization (MTPO)
- St. Joseph Area Transportation Study Organization (SJATSO)
- Flint Hills Metropolitan Planning Organization (FHMPO)

KDOT has asked MPOs to consider the following 23 U.S.C. 167(f) requirements when identifying corridors for consideration.

A public road designated as a CUFC must be in an urbanized area and meet one or more of the following four elements:

1. *connects an intermodal facility to:*
   - *the Primary Highway Freight System (PHFS) (see Figure 2);*
   - *the Interstate System; or*
   - *an intermodal freight facility;*
2. *is located within a corridor of a route on the PHFS and provides an alternative highway option important to goods movement;*
3. *serves a major freight generator, logistic center, or manufacturing and warehouse industrial land; or*
4. *is important to the movement of freight within the region, as determined by the MPO or the State.*

Figure E-58 on the next page details the final routes selected for CUFC designation in Kansas, also mapped in Figure E-59. These routes were then also designated to the final Primary (Funded) Network of the Kansas FCS.

Figure E-58: Final CUFC Routes

Urban Area	Route	Start and End Points	Length (Miles)
FHMPO	US 24 (near Perry, KS)	Manhattan (Fort Riley Rd) to K-99	13.96
WAMPO	K-254	I-135 to 127th St. E	8.38
WAMPO	W Southwest	I-235 to West St.	0.63
WAMPO	K-96	US-54/400 to I-135	10.58
WAMPO	Southeast Blvd.	US-54/400 to I-135	2.95
WAMPO	MacArthur Rd.	I-235 to K-15	2.55
WAMPO	US-54/400	231st St. W to 135th St. W	5.96
WAMPO	US-54/400	I-35 Interchange to Meadowlark Rd.	5.06
WAMPO	West St.	K-42 to I-235	1.40
Lawrence MPO	US 40/KS-10	I-70 to E 23rd St	12.80
MARC	Desoto, Johnson County	83rd St. Bridge Replacement over the BNSF & US Army RR	0.25
MARC	Olathe, Johnson County	I-35 & 199th St. Interchange	1
MARC	UG, Wyandotte County	Bridge Replacement 311 on Thron Dr	0.1
MARC	UG, Wyandotte County	Bridge Replacement Kansas Ave. Bridge from Berger Ave. to MO state line	0.5
MARC	Johnson County	Kansas River Bridge at De Soto, KS	1
MARC	Lenexa, Johnson County	95th from Renner to Loiret	1
MARC	Shawnee, Johnson County	Shawnee Mission Pkwy I-435 to K-7	3.75
MARC	Shawnee, Johnson County	Shawnee Mission Pkwy Pflumm Rd to I-435	2.5
MARC	UG, Wyandotte County	Turner Digital K-32 to Leavenworth Rd	4
MARC	I-435 to Eudora (Church St. Exit)		12.27
TOTAL			90.64

Source: KDOT

Final Freight Corridors of Significance

Figure E-60 on the following page maps the final designated Kansas Freight Corridors of Significance.

Figure E-59: Final CUFC Network

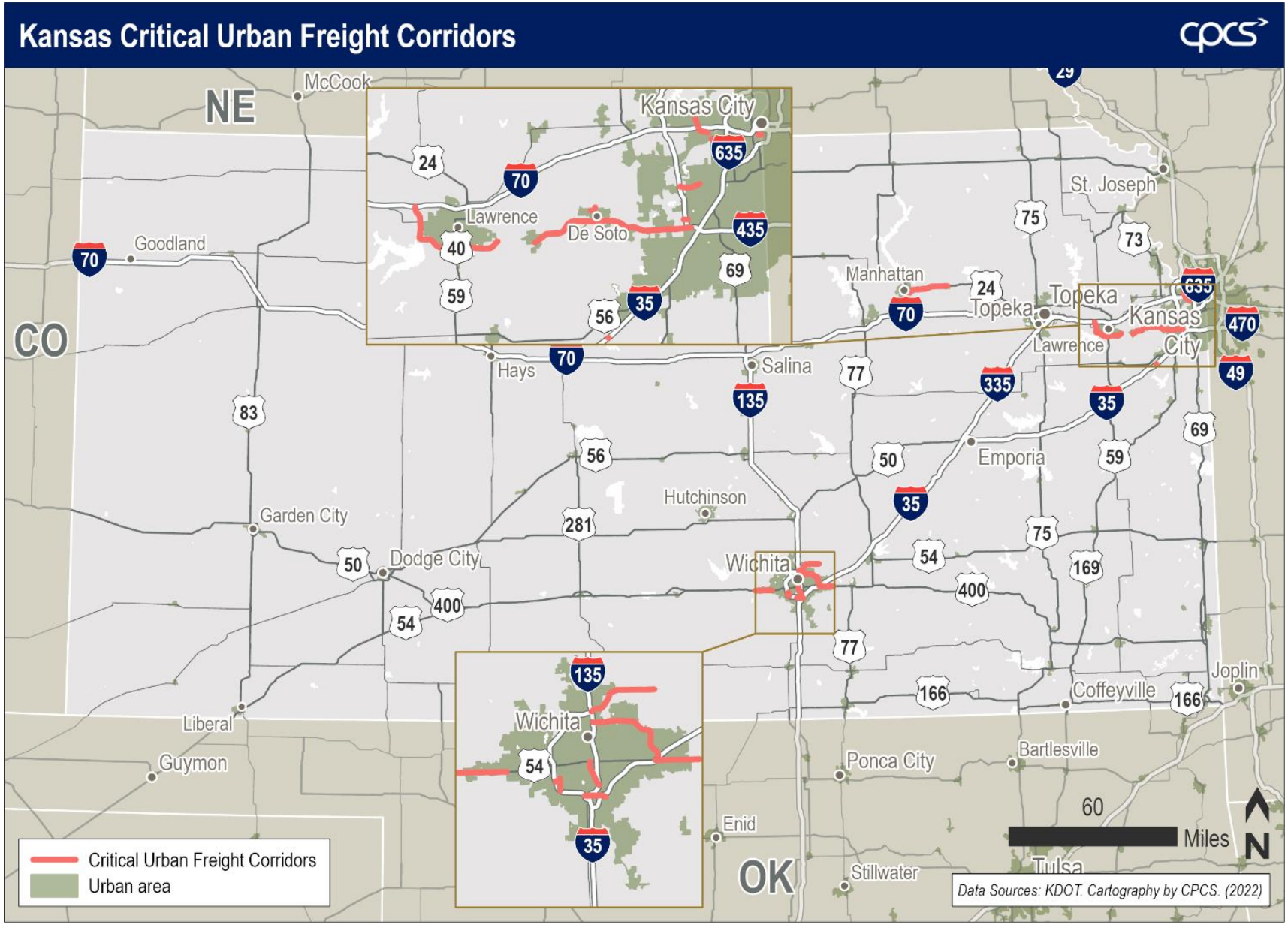


Figure E-60: Final Freight Corridors of Significance

Appendix F. Truck Parking Inventory, Assessment, and Opportunities

F.1 Truck Parking Inventory

Truck parking must be available for freight operations to run smoothly, as truck drivers require access to safe and secure truck parking to meet federal hours-of-service requirements,[7] access basic amenities, and stage as they wait for pick-up/drop-off appointments. Truck parking shortages are a major concern nationwide. If truck drivers are unable to find safe and adequate parking, they may have to drive extended hours, potentially when tired, or may park their truck at unsafe, undesignated locations, such as along roadway shoulders or on/off ramps.

Kansas is home to 167 truck parking locations that offer over 5,000 truck parking spaces.

Among the 167 truck parking locations in Kansas, 22 percent are public rest areas and 78 percent are private truck stops.[8] Private truck stops provide 4,680 spaces, making up over 93 percent of all truck parking spaces in the state. This includes truck stops located along the Kansas Turnpike. Public rest areas provide the remaining 334 spaces, making up 7 percent of Kansas' truck parking spaces. This information is further detailed in Figure F-61 below.

Crowd-sourced Truck Parking Data

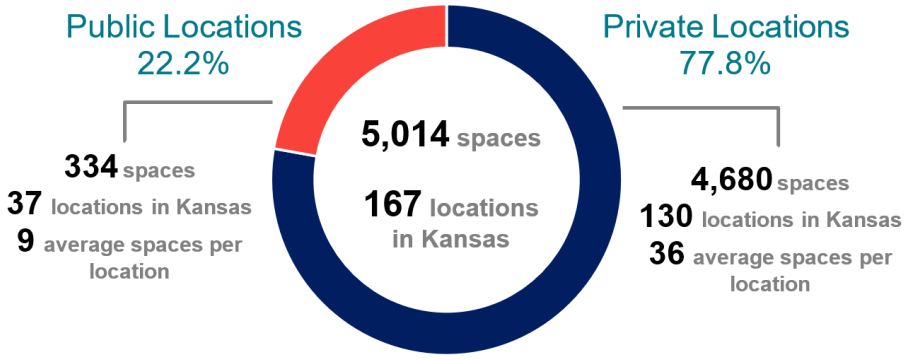
The Kansas truck parking inventory was developed using data from KDOT and Trucker Path.

Trucker Path is a smartphone application that relies on crowdsourced data from almost one million drivers to visually identify and communicate truck parking availability to other drivers. Trucker Path collects and provides information including truck parking location, parking space availability, amenities, and directions, among other information.

An additional 88 locations, providing nearly 3,400 truck parking spaces, are located outside of Kansas, but within 20 miles of the state's border.

Figure F-62 maps truck parking locations in Kansas, as well as locations within 20 miles of the Kansas border. Truck parking locations are further classified as either public or private locations. Figure F-63 further illustrates the concentration of spaces at truck parking locations in and surrounding Kansas. As shown, truck parking spaces are typically concentrated around major urban areas and along key freight corridors.

Figure F-61: and Private Truck Parking Locations in Kansas



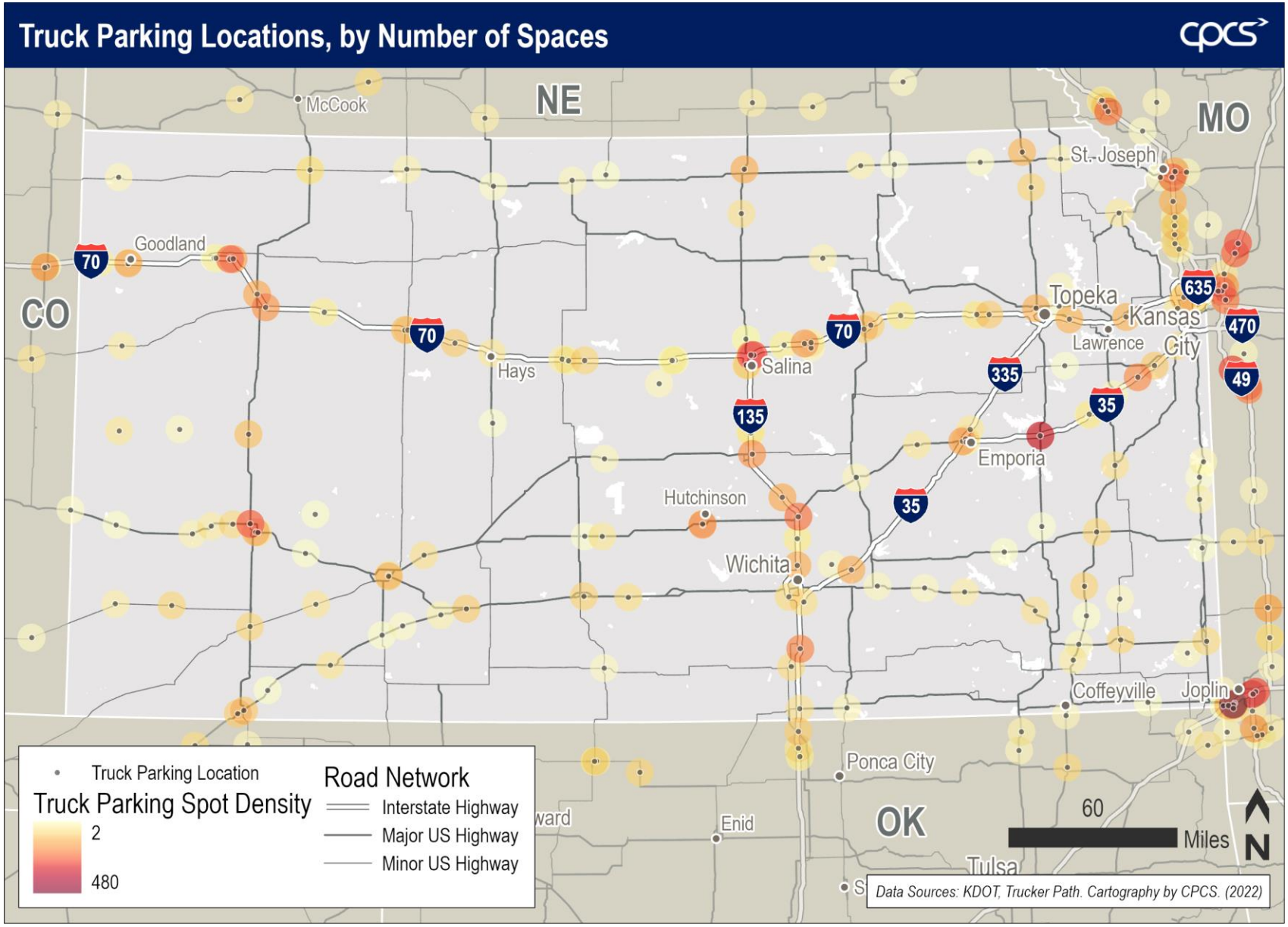
Source: KDOT, Trucker Path, 2021. Analysis by CPCS, 2021.

[7] FMCSA, Summary of Hours of Service Regulations, March 28, 2022, https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations#:~:text=14%2DHour%20Limit,extend%20the%2014%2Dhour%20period.

[8] This does not include informal truck parking locations where truck parking is not the primary business purpose, such as restaurants or retail parking lots and vacant lots, as truck parking at these locations is subject to change.

Figure F-62: Public and Private Truck Parking Locations (Map)

Figure F-63: Truck Parking Locations, by Number of Spaces (Map)



F.2 Truck Parking Utilization

Truck parking utilization provides information about the number of trucks parked at a truck parking location, compared to the number of truck parking spaces provided at the location. The truck parking utilization analysis was informed by Kansas' Truck Parking Information Management System (TPIMS), which collects information about truck parking utilization at 18 truck parking locations in Kansas, and a full year of data from TruckerPath, a crowd-sourced application that collects information from truck drivers on the availability of spaces at truck parking locations ("lots" of spaces available, "some" spaces available, or "full" location).

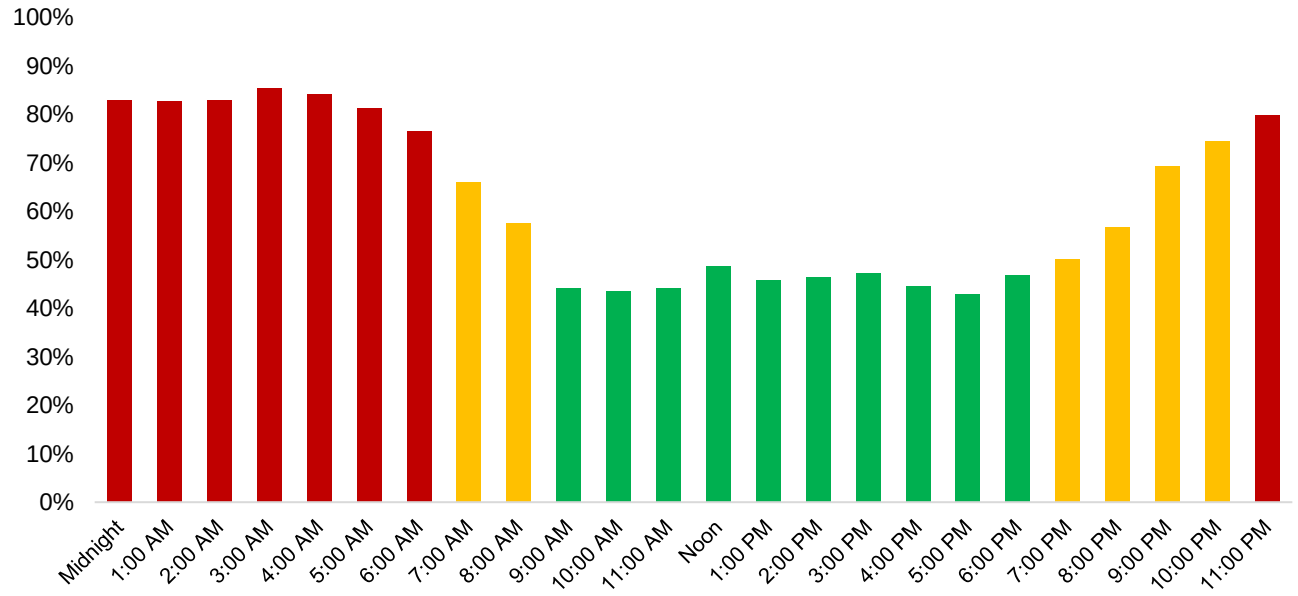
MAASTO TPIMS

The Mid America Association of State Transportation Officials (MAASTO) has developed a regional Truck Parking Information System (TPIMS) to collect and broadcast real-time truck parking availability to drivers in Indiana, Iowa, Kansas, Kentucky, Minnesota, Iowa, and Wisconsin. The project was funded through a $25 million federal Transportation Investment Generating Economic Recovery (TIGER) grant, in combination with matching state funds, with the goal of enabling drivers to proactively plan their routes and make safer, more efficient parking decisions.[9]

Truck parking utilization is highest in Kansas during the overnight and early morning hours, peaking at 85.4 percent from 3:00 to 4:00 am.

As shown in Figure F-64, truck parking utilization continues to decline throughout the day, before increasing again during evening hours as drivers look for overnight parking.

Figure F-64: Statewide Truck Parking Utilization

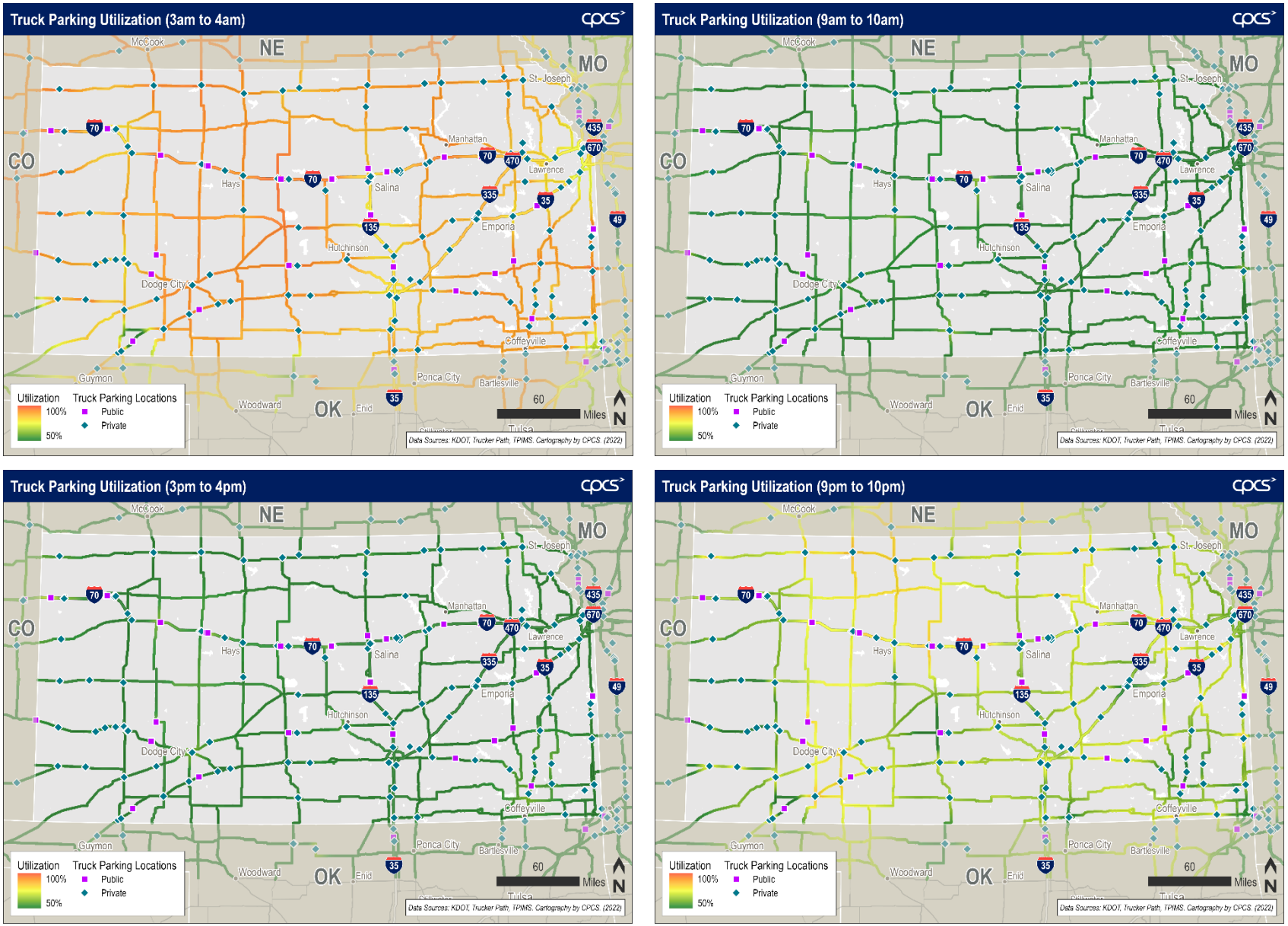


Source: CPCS Analysis of TruckerPath, MAASTO Truck Parking Information System (TPIMS)

Figure F-65 further demonstrates these trends through an illustration of corridor-based utilization of public and private truck parking facilities during select hours. Note that the maps show truck parking utilization on all Interstates and U.S. highways in Kansas, as well as select state routes along which truck parking facilities are located. Areas of low utilization (50 percent and below) to high utilization (100 percent) are shown on a scale of green (low utilization) to yellow (medium utilization) to red (high utilization).

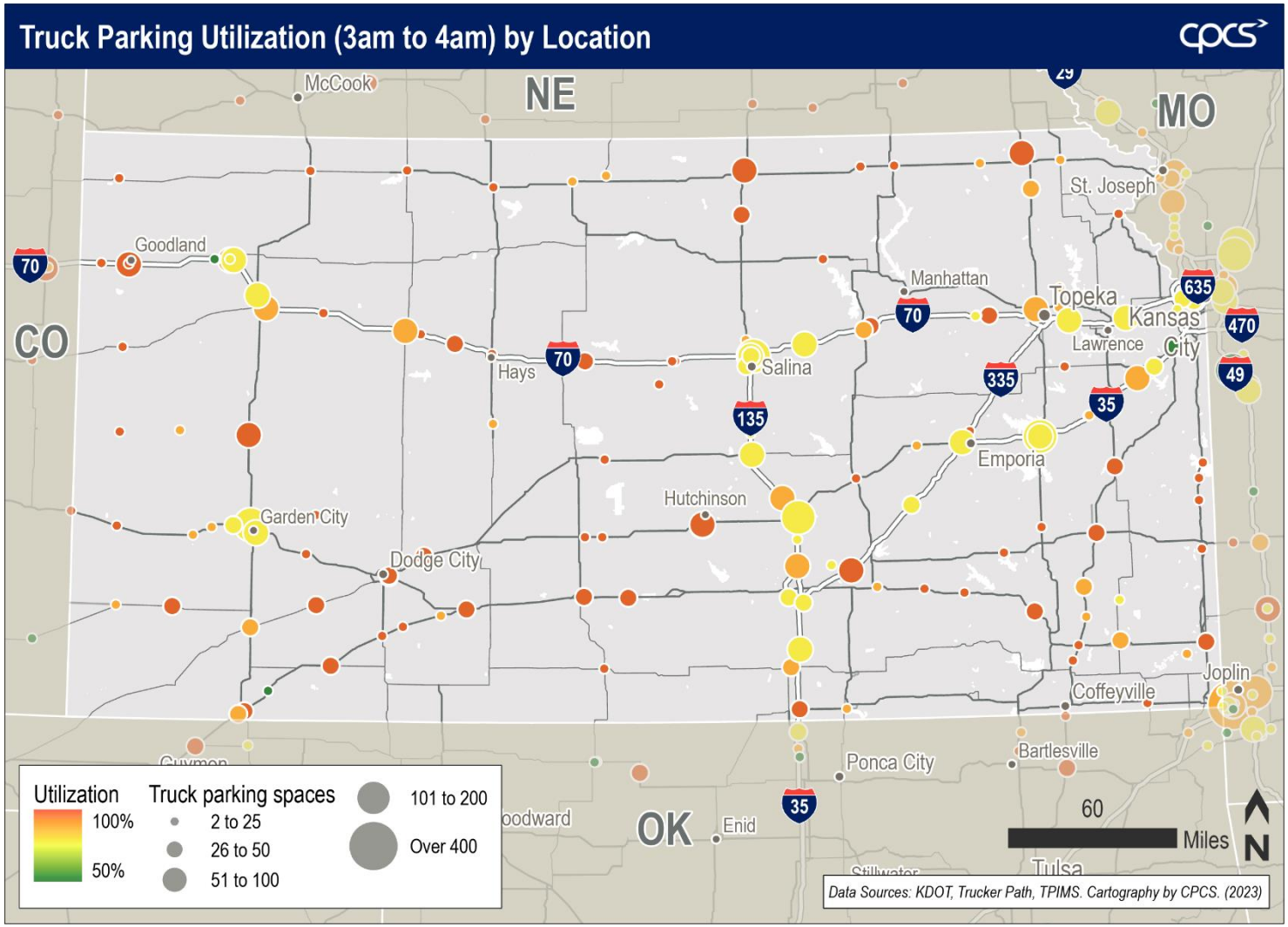
[9] MAASTO, Trucks Park Here

Figure F-65: Truck Parking Utilization by Hour, Statewide Corridors



During the peak statewide truck parking utilization hour of 3 to 4 am (Figure F-66), about half of the state's truck parking locations experience utilization of 90 percent or higher. Several public rest areas along I-70 (Russell EB and WB, Ellsworth WB, Manhattan WB, Ogallah WB, Goodland EB, and Grainfield EB) – all of which provide 10 or fewer truck parking spaces – are fully utilized during this time. Private truck stops that experience the highest utilization during this time are scattered across the state and range in size. Often, these highly utilized truck stops are located near freight facilities or on key US or state routes.

Figure F-66: Truck Parking Utilization (3 to 4 am), by Location



F.3 Truck Parking Needs and Issues

Jason's Law

The Jason's Law Truck Parking Survey was established under the Moving Ahead for Progress in the 21st Century (MAP-21) Act in 2012 to provide a "national priority on addressing the shortage of long-term parking for commercial motor vehicles on the National Highway System."[10] As a result, USDOT was required to conduct a survey and comparative assessment, in consultation with state motor carrier representatives, 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; and 3) Develop a system of metrics to measure the adequacy of commercial motor vehicle parking facilities in each state.[11]

2015 Truck Parking Survey

In 2015, FHWA, in collaboration with public and private stakeholders, developed and distributed a survey to each state's DOT and commercial motor carrier safety officials. FHWA also sought survey input from the trucking industry, including drivers, logistics personnel, and truck stop owners and operators. As reported by the Jason's Law 2015 survey, Kansas ranked among the top 12 states mentioned by American Trucking Association (ATA) drivers and professionals, as well as by the Owner Operator Independent Drivers Association (OOIDA), with a sufficient supply of truck parking.[12]

2019 Update

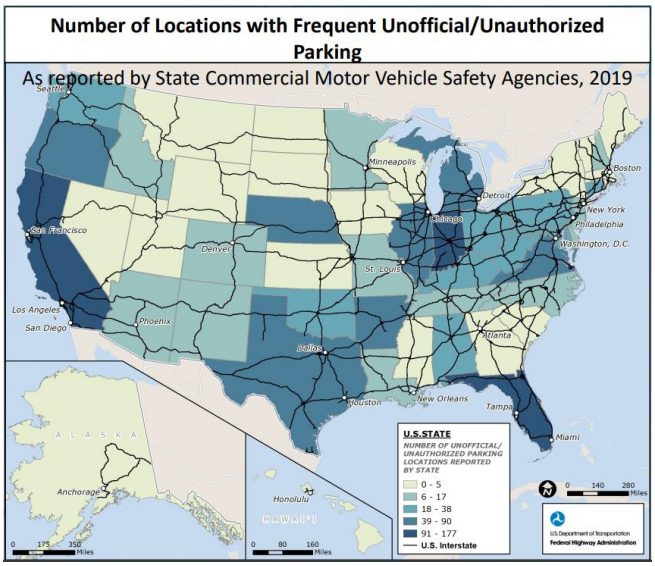
In 2019, FHWA updated the Jason's Law Survey. This effort included further identification of truck parking locations, use, shortages, and unofficial parking, with survey input from state DOTs, motor vehicle safety enforcement agencies, truck drivers and operations managers, truck stop owners and operators, and port authorities.

As shown in Figure F-67, state safety enforcement agencies provided input on locations of frequent illegal parking. Compared to other states, Kansas has fewer locations that experience frequent undesignated, or unofficial, truck parking.[13] Input from Kansas safety enforcement personnel specified three locations on and near US 50 and US 83 in Finney County as locations of frequent unofficial truck parking.[14] However, the fact that survey input from Kansas was limited to one county indicates that these results may not be representative of undesignated truck parking statewide.

As part of the survey update, truck drivers were asked to cite truck parking shortages by state. As displayed in Figure F-68, up to a quarter of truck drivers that responded to the survey cited Kansas as a state with truck parking shortages. While fewer drivers cite shortages in Kansas compared to other states, particularly in the Southeast and along the eastern coast, truck driver input indicates there still exist truck parking shortages in Kansas.

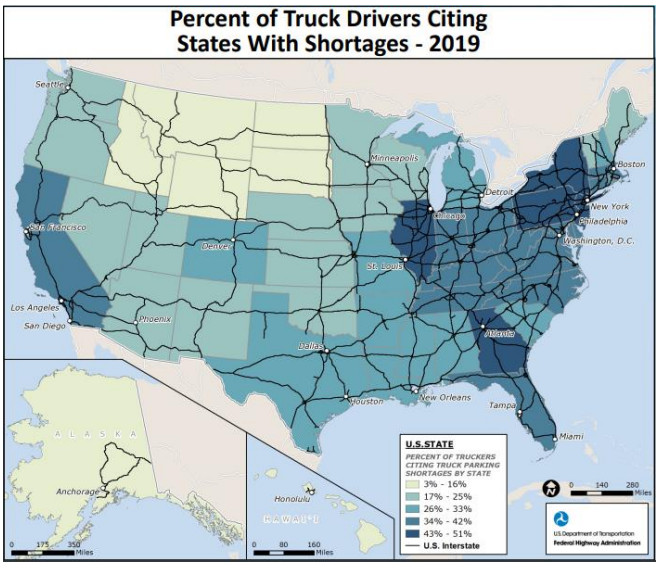
[10] United States Public Law 112-141 Section 1401.
[11] USDOT, FHWA, Jason's Law Truck Parking Survey Results and Comparative Analysis, August 2015, https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/jasons_law.pdf
[12] USDOT, FHWA, Jason's Law Truck Parking Survey Results and Comparative Analysis, August 2015, https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/jasons_law/truckparkingsurvey/jasons_law.pdf
[13] USDOT, FHWA, Jason's Law Commercial Motor Vehicle Parking Survey and Comparative Assessment, December 2020, https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/workinggroups/2020/mtg/jasons_law_results.pdf
[14] USDOT, FHWA, Jason's Law 2019, Truck Parking Survey for Kansas Enforcement Agencies.

Figure F-67: State Safety Agency Reports of Frequent Unofficial/Unauthorized Parking (2019)



Source: FHWA, Jason's Law Commercial Motor Vehicle Parking Survey and Comparative Assessment, December 2020, p. 11.

Figure F-68: Truck Driver Reports on States With Truck Parking Shortages (2019)



Source: FHWA, Jason's Law Commercial Motor Vehicle Parking Survey and Comparative Assessment, December 2020, p. 15.

Kansas State Freight Plan Outreach

As part of the Kansas State Freight Plan, KDOT sought feedback from stakeholders, through KFAC meetings and through industry consultations, to better understand the state's existing truck parking needs and issues.

Some freight stakeholders have noted that compared to other states, Kansas does a sufficient job of providing truck parking to drivers. However, other freight stakeholders indicate there are not enough truck parking spaces within Kansas to accommodate needs. Truck drivers need parking not just to meet long off-duty requirements (10 hours), but also to meet 30-minute driving break requirements.[15] Representatives from the Kansas Motor Carriers Association (KMCA) noted that while they have not surveyed members recently on locations in the state with the top truck parking issues, areas of undesignated parking include, but are not limited to, I-70 (along on/off ramps) and Garden City, located in Finney County. Specifically, livestock, dairy, and manufacturing activity attracts trucks, which park on the side of the road in the area.[16] I-35 and US 196, in addition to industrial last-mile roads generally, were identified by stakeholders as other corridors with a high demand for truck parking.[17]

KFAC members suggested the following future steps to obtain better insight into Kansas' truck parking needs and issues:

- Survey KMCA members to obtain input on top truck parking issues.
- Inventory locations that prohibit truck parking on streets, to identify where additional parking may be needed.
- Explore opportunities to integrate truck parking considerations into new economic developments, so that truck parking is provided prior to, rather than after, the construction of new major freight hubs.

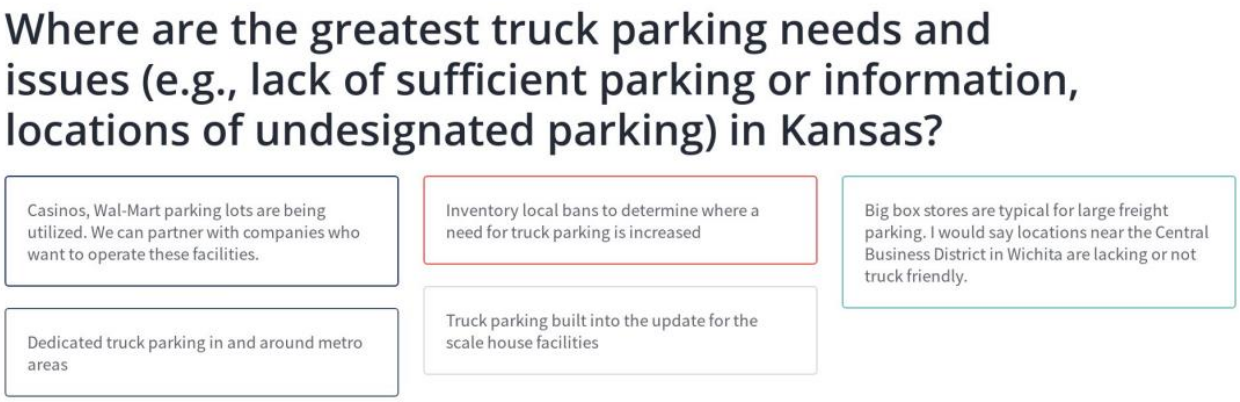
[15] FMCSA, Summary of Hours of Service Regulations, Updated March 28, 2022, https://www.fmcsa.dot.gov/regulations/hours-service/summary-hours-service-regulations.

[16] KFAC Meeting 3, October 19, 2022.

[17] Kansas State Freight Plan consultations with freight carriers.

Figure F-69 displays some of the input received from KFAC members through meeting polling.

Figure F-69: KFAC Input on Truck Parking



Kansas Statewide Freight Network Truck Parking Plan

KDOT and KTA conducted the Kansas Statewide Freight Network Truck Parking Plan in 2015. The Plan identified locations of undesignated parking in Kansas, based on a field review conducted along Kansas' previous Freight Corridors of Significance, between the hours of 10 pm and 6 am during the week of March 16 – 20, 2015.[18]

The study reported that a significant number of drivers report parking in illegal locations, some of which can be unsafe, particularly around urban areas. Illegal truck parking was also reported along on/off ramps. Figure F-70 displays the locations of illegal parking identified by the field review. The study also identified instances of trucks parked at unmarked spaces within rest areas, indicating over-utilization of the parking facility. As shown in Figure F-71, several locations on key freight routes and near urban areas were fully or over utilized at the time of the field survey.

Figure F-70: Locations of Illegal Parking (2015)

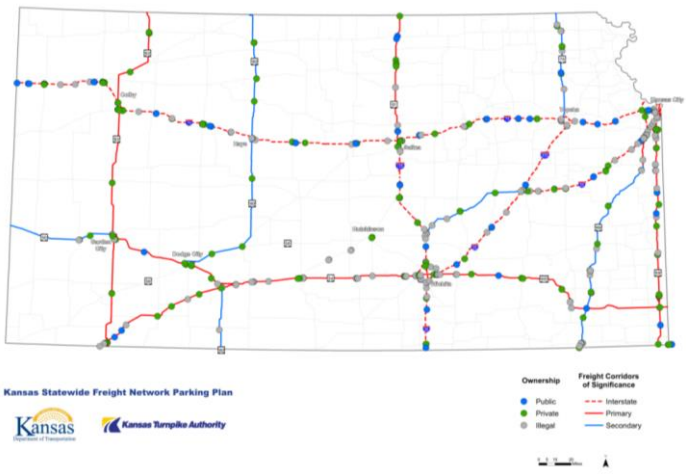
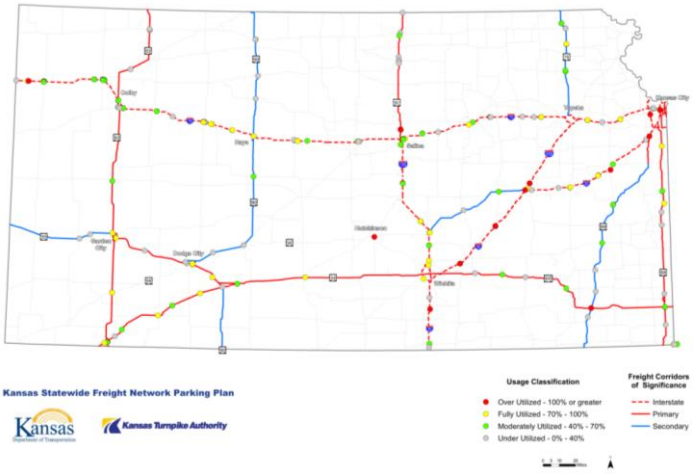


Figure F-71: Truck Parking Facility Utilization (2015)



Source: KDOT and KTA, Kansas Statewide Freight Network Truck Parking Plan, February 2016, p. 2-9 and p. 2-12.

The following page provides additional information about the Plan.

[18] KDOT and KTA, Kansas Statewide Freight Network Truck Parking Plan, February 2016, https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/Kansas_Statewide_Freight_Network_Truck_Parking_Plan_2015_2016.pdf

Kansas Statewide Freight Network Truck Parking Plan

In 2015, KDOT and KTA conducted a study to inventory public and private truck parking locations, capacity, and use; assess physical barriers, regulations, policies, and information needs affecting truck parking choices; and identify opportunities to improve truck parking capacity and services to benefit safety, efficiency, and economic growth throughout Kansas. Throughout the study, KDOT and KTA coordinated with a Technical Advisory Panel of public and private sector freight stakeholders, convened to guide and provide feedback on study findings and results.

Inventory of Assets and Use: The study compiled a detailed truck parking inventory of the Kansas Primary and Secondary Freight Networks, which included assessing both legal/formal and illegal/informal truck parking use throughout Kansas. Data was gathered via a desktop Google Earth aerial review, followed by a field review of truck parking utilization and field verification of illegal truck parking locations, with data collected between the hours of 10 pm and 6 am during the week of March 16 – 20, 2015. This informed the identification of opportunity zones – locations with frequent parking shortages and related issues – within Kansas to focus efforts.

Literature Review and Peer Interviews: The study included a national review of truck parking study and consultations with peer agencies to understand the need for truck parking, relevant decision factors, and best practices.

Survey Truck Drivers on Factors Affecting Truck Parking Decisions: An electronic survey was distributed to truckers operating within and through Kansas. The nearly 750 completed surveys provided information on factors impacting truckers' decision-making process regarding parking, including location, type (legal/formal versus illegal/informal), routing, regulatory requirements, costs, security, amenities, OS/OW requirements, and ownership (public versus private).

Analysis of Freight Movements, Trends, and Regulations Affecting Parking Demand: Truck GPS data from ATRI, spanning four two-week periods in 2014, was also analyzed to better understand truck movements and stops in Kansas, including locations of high truck activity and stops. Future truck volumes were also analyzed to provide insight into the expected growth in demand for truck parking. The study further considered other policy and freight trends expected to impact truck parking in the future.

Recommendations: The above activities resulted in an understanding of Kansas' truck parking conditions, usage characteristics, and needs, and informed the development of truck parking recommendations and implementation strategies. Note that the plan took a multi-layered approach to address truck parking needs that was not focused on the construction of new public truck parking facilities, but rather on improving utilization of existing truck parking facilities, disseminating real-time truck parking availability, adding capacity through improvements to existing public facilities, seeking public-private partnerships, and advancing policies to address truck parking issues and needs.

The study further evaluated strategies to improve truck parking information and sharing, as well as strategies to add or improve parking assets, which would involve infrastructure and ITS investments by KDOT and KTA on their owned and operated facilities, for implementation. This involved identifying qualifying locations, based on unique selection criteria, for each tactic. Then, a benefit-cost analysis (BCA) was conducted for each potential site, corridor, or area to evaluate how well they improved Kansas freight truck parking and provided other benefits, compared to their implementation and other costs. Strategies were then prioritized into the final tiered recommendations, detailed in Figure F-72.

Figure F-72: Kansas Statewide Freight Network Truck Parking Plan Recommendations

Tier 1
• Add static and dynamic parking information signs on eastern and western segments of the primary freight network. • Add parking capacity at selected locations in the network where parking demand is greatest and lots are at maximum capacity during peak truck parking periods.
Tier 2
• Add static and dynamic parking information signs on central segments of the primary and secondary freight network. • Add parking capacity at selected locations where other parking alternatives do not currently exist
Tier 3
• Add static and dynamic parking information signs on network segments with lower parking demand. • Add parking capacity at locations where other parking options don't readily exist. • Create parking partnerships with public- and private-sector entities. • Develop pro-parking policies at state and regional levels

Summary of Needs and Issues

The strengths, weaknesses, and threats for truck parking in Kansas have been identified (Figure F-73) based on an evaluation of the state's truck parking existing supply and utilization, KFAC and industry input, and relevant completed truck parking efforts, namely the FHWA Jason's Law Survey and Assessment, as well as the Kansas Statewide Freight Network Truck Parking Plan. This analysis supported the identification of opportunities identified in the following section.

Figure F-73: Truck Parking SWOT

Strengths	Weaknesses
• Statewide utilization at truck parking facilities remains below 90 percent at peak utilization hour. • Compared to other states nationwide, truck parking issues are less prevalent in Kansas.	• About half of truck parking locations in Kansas individually experience utilization of 90 percent or higher at the state's peak utilization hour, with several smaller public rest areas – all on I-70 – fully utilized. • Kansas enforcement identified roadway shoulders in Finney County as locations of frequent illegal truck parking. • Truck drivers cite shortages of truck parking in Kansas. • Industry stakeholders identify a high demand for truck parking, with a presence of undesignated parking, on key freight corridors (e.g., I-35, I-70, US 169) and last-mile roads (e.g., near Garden City, Edgerton).
Threats	
• Private sector workforce challenges are exacerbated by unique, industry-specific work conditions (e.g., stress finding truck parking). • Expected growth in freight traffic on Kansas' highways will drive an increased demand for truck parking.	

Although stakeholders identify fewer truck parking issues in Kansas compared to other states nationwide, there still exists a shortage of adequate truck parking in the state, particularly along Interstates and near major freight establishments.

This shortage is evidenced by the presence of undesignated parking in Kansas, driven by high truck traffic on key freight corridors and near freight hubs – notably on I-35, I-70, and US 169, as well as near high concentrations of freight establishments in Garden City and Edgerton. On key freight corridors, demand for truck parking arises from the need for truck drivers to meet federal HOS requirements. Meanwhile, the demand for truck parking on last-mile roads near freight establishments results from the need for staging, with truck drivers parking as close to their pick-up/drop-off location as possible, to ensure they meet their shipper/receiver appointment time.

F.4 Truck Parking Opportunities

Based on the needs and issues identified through a review of existing truck parking efforts completed by USDOT and in Kansas, as well as additional analysis and stakeholder outreach conducted as part of the Kansas State Freight Plan, KDOT has identified freight policy, program, and project opportunities related to advancing truck parking in the state.

Policy and Program Opportunities

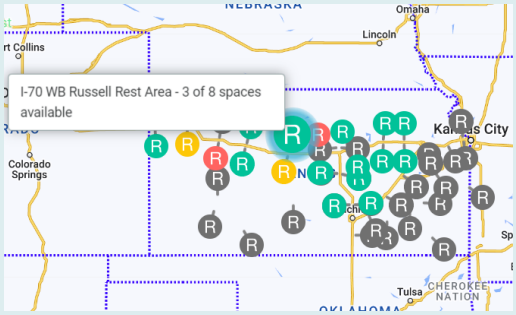
One of the policy and program opportunities identified by KDOT as part of this Plan focuses on **improving the safety and efficiency of freight system operations,** supporting KDOT's safety and security, transportation system management, asset preservation, and freight and economic vitality goals. To support this opportunity, the Plan identifies the following truck parking-related actions:

- Work with the trucking industry, freight industry, and local agencies to identify opportunities to expand truck parking capacity where needed, including at locations of new or expanded freight facilities
- Maintain and improve Kansas' Truck Parking Information Management System (TPIMS)

Truck Parking Information Management System (TPIMS)

TPIMS aggregates real-time truck parking availability data and disseminates this information to truck drivers. Data is collected from truck parking facilities using ITS devices, such as cameras and sensors, and shares information with truck drivers through DMS, online dashboards, mobile applications, and in-cab applications.

Figure F-74: Kansas TPIMS



Source: KanDrive

A 2018 Trucker Path survey found that nearly half of drivers spend an hour or more a day searching for truck parking.[19] TPIMS saves drivers time by closing the information gap between truck parking supply and demand. This not only improves the quality of life for truck drivers but also reduces the impact these operations have on surrounding communities. When drivers are able to find safe and adequate parking quickly, they do not need to drive in circles searching for parking, or parking in undesignated locations. Truck parking solutions, such as TPIMS, support a freight system that operates more efficiently, safely, and unobtrusively.

KDOT led MAASTO to secure a $25 million TIGER grant to develop a regional TPIMS system. The system, which began implementation in 2017, provides a coordinated truck parking management system across eight MAASTO states. In Kansas, DMS update every 5 minutes to inform truck drivers

[19] Trucker Path, Truck Parking Report, July 2018, http://files.truckerpath.com/web/trucker-path-parking-white-paper-2018.pdf

about available truck parking at 18 rest areas along I-70. This information is gathered automatically using 3D images at truck parking facilities.[20]

Project Opportunities

In addition to the freight projects identified by KDOT for NFHP funding, KDOT has identified other project opportunities to consider providing support to. These opportunities may address freight transportation needs in Kansas but remain in the concept phase, with project details – including location – yet to be determined. The range of opportunities includes the construction of new and/or expansion of truck parking, in order to enhance truck parking facility options in Kansas. This would support KDOT's goal areas of transportation system management, freight and economic vitality, stewardship, and workforce. Additional availability of safety and adequate truck parking can help assure a safe environment for truck drivers and the general driving public.

Figure F-75 provides cost ranges for the project types and components that may be involved in a truck parking installation. The costs within the table do not include the cost of right-of-way (ROW) acquisitions. ROW can be more costly in urban versus rural areas.

Figure F-75: Truck Parking Cost Estimates

Project Type	Cost Range	Project Components
Expand existing truck parking lot	$15,000 - $30,000 per stall	Design and construction for heavy-duty pavement, drainage, striping, lighting, and fencing
Construct new truck parking lot*	$20,000 to $35,000 per stall	Design and construction for heavy-duty pavement, drainage, striping, lighting, fencing, and driveways

Source: TranSystems, Recent project bid prices, KDOT standard practice. *Note: ROW acquisition is not included in the cost estimate.

[20] FHWA, USDOT, National Coalition on Truck Parking: Technology and Data Working Group – Truck Parking Availability Detection and Information Dissemination. https://ops.fhwa.dot.gov/freight/infrastructure/truck_parking/workinggroups/technology_data/product/best_practices.htm; KDOT, Truck Parking Information Management System project underway, 2017. http://ksdot.org/Assets/wwwksdotorg/Headquarters/PDF_Files/pressrelease2017/TPIMS_Release.pdf; KDOT, MAASTO TPIMS Project. https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burRail/Rail/Documents/TPIMS_Summary.pdf

Appendix G. Rail-Served Multimodal Facilities

This appendix details the rail-served multimodal facilities in Kansas.

G.1 Intermodal Terminals

Intermodal terminals transfer containers between rail and other modes, with goods staying in the same container. There is one Class I intermodal terminal in Kansas – Logistics Park Kansas City, which is located in Edgerton and is owned and operated by BNSF. Three additional Class I intermodal terminals are located across the state border in Kansas City, MO – the KCS International Freight Gateway, the UP Kansas City Intermodal Terminal, and the NS Kansas City Intermodal Terminal. These intermodal terminals are detailed in Figure G-76.

Figure G-76: Intermodal Terminals in Kansas and Kansas City

Railroad	Facility Name	Location	Type	Commodities
BNSF	Logistics Park Kansas City (LPKC)	Edgerton, KS	Intermodal	Shipping Containers and Various Commodities
KCS	International Freight Gateway (IFG)	Kansas City, MO	Intermodal, Automotive	Motor Vehicles, Shipping Containers, All Commodities.
UP	Kansas City Intermodal Terminal	Kansas City, MO	Intermodal	Shipping Containers and All Commodities

Source: BNSF Railway, Facilities, http://www.bnsf.com/ship-with-bnsf/support-services/facility-listings.page; KCS, Network Map, https://www.kcsouthern.com/en-us/why-choose-kcs/our-network/network-map; KCS, U.S. Intermodal Ramps, June 2021, https://kcsouthern.com/pdf/kcsr-intermodal-ramps/kcsr-us-intermodal-ramps.pdf; UP, Intermodal Facilities Map & Profiles, https://www.up.com/customers/premium/intmap/index.htm.

Logistics Park Kansas City (LPKC), located in Edgerton, KS, is served by the BNSF Emporia subdivision. LPKC provides domestic and international intermodal service, as well as direct-rail/carload service. Customers including Amazon, Hostess, and UPS have operations at LPKC.[21] The park was designed with the capacity to handle 500,000 annual container lifts, with BNSF indicating the terminal will be able to handle 1.5 million lifts per year at full buildout.[22]

International Freight Gateway (IFG), located in Kansas City, MO, is served by KCS. IFG has container-on-flatcar (COFC), trailer-on-flatcar (TOFC), and automotive intermodal capabilities. IFG has a lift capacity of 96,000. In 2020, the terminal handled a total of 23,635 intermodal lifts and 40,491 finished vehicles.[23]

UP Kansas City Intermodal Terminal, located in Kansas City, MO, is served by UP. The intermodal terminal has COFC and TOFC capabilities.[24]

[21] Logistics Park Kansas City, https://www.logisticsparkkc.com/.
[22] Progressive Railroading, Kansas logistics park offers big intermodal-growth potential for BNSF, January 2017.
[23] KCS, U.S. Intermodal Ramps, June 2021, https://kcsouthern.com/pdf/kcsr-intermodal-ramps/kcsr-us-intermodal-ramps.pdf
[24] UP, Kansas City Intermodal Terminal, https://www.up.com/customers/premium/intmap/kc/index.htm

G.2 Transload Facilities

Transload facilities transfer products between rail and other modes by loading and unloading goods, with the transfer depending on the type of goods. Transload facilities encompass a range of facilities, including but not limited to bulk transload terminals, warehousing and storage facilities, and rail sidings that allow for the direct transfer of cargo. Class I railroads operate eight transload facilities within Kansas, with four BNSF transload facilities and four UP transload facilities. Kansas' Class I railroads also operate 14 transload facilities across the state border in Kansas City, Missouri. These transload facilities are detailed in Figure G-77.

Figure G-77: Transload Facilities in Kansas and Kansas City

Railroad	Facility Name	Location	Type	Commodities
BNSF	Transportation Partners & Logistics	Garden City, KS	Transload	Lumber, Generators/trans, Machinery, Pipe, Rail Equipment, Bricks, Railroad Ties, Insulation/siding, Poles & Posts, Roofing Materials, Irons Structural, Plate, Wind Energy Components
BNSF	Garvey Public Warehouse	Wichita, KS	Transload	Plywood, Oriented Strand Board, Lumber, Gypsum Wallboard, Particle Board, Bricks, Railroad Ties, Roofing Materials, Ingots
BNSF	Savage Services Corp	El Dorado, KS	Transload	Bricks, Railroad Ties, Roofing Materials, Poles & Posts, Plate, Alumina, Lead, Aluminum, Zinc, Copper, Machinery, Generators/trans, Tires, Ammonia, Urea Ammonium Nitrates, Dry Phosphates, Sulphur, Urea, Liquid Phosphates, Potash, Acids, Chlorates/peroxide, Caustic Soda, Industrial Gases, Plastics Feedstocks, Intermediates, Sulfuric Acid, Alcohols/solvents, Coke-Green, Asphalt, Carbon Black, Lubes/oils/waxes, Ethanol, Dynamic, Other Lpg, Other Lpg, Polyethylene, Polyvinyl Chlor
BNSF	Harcros Chemicals	Kansas City, KS	Transload	Potash, Sulfuric Acid, Urea, Acids, Caustic Soda, Chlorates/peroxide, Intermediates, Paints/pigments, Alcohols/solvents, Canola Oil, Oil Foots, Cottonseed Oil, Soybean Oil, Vegetable Oil, Linseed/sunflower Oil
BNSF	Norag LLC	Kansas City, MO	Transload	Plywood, Gypsum Wallboard, Oriented Strand Board, Particle Board, Railroad Ties, Bars, Irons Structural, Scrap, Ingots, Pipe, Tin Plate, Irons Sheet, Plate, Dry Phosphates, Sulphur, Urea, Potash, Ethanol, Salt, Crushed Stone, Limestone, Fly Ash, Gypsum, Roofing Granules, Corn Products, Distillers, Prepared Feeds, Barley, Oats, Rye, Corn, Corn, Popcorn, Soybeans, Milo, Rice, Canola Meal, Sunflower
BNSF	Murphy Logistics Co.	Kansas City, MO	Transload	Paper Waste/scrap, Plywood, Oriented Strand Board, Gypsum Wallboard, Particle Board, Bricks, Insulation/siding, Railroad Ties, Roofing Materials, Bars, Ingots, Irons Sheet, Beer, Wine/other Beverages, Household Appliances, Printing Paper, Pulpboard, Woodpulp, Grocery Products, Canned Foods, Poles & Posts, Irons Structural, Scrap, Pipe, Tin Plate, Plate, Alumina, Lead, Aluminum, Zinc,

Railroad	Facility Name	Location	Type	Commodities
				Copper, Machinery, Government, Generators/trans, Cotton, Tires, Grass Seeds
BNSF	Metro Park Warehouse Quebec	North Kansas City, MO	Transload	Canned Foods, Grocery Products, Wine/other Beverages, Copper, Printing Paper, Beer, Pulpboard, Woodpulp, Household Appliances
BNSF	Consolidated Transfer & Warehouse	Kansas City, MO	Transload	Household Appliances, Tires, Lumber, Roofing Materials, Particle Board, Printing Paper, Pulpboard, Canned Foods, Gypsum Wallboard, Paper Waste/scrap, Plywood, Oriented Strand Board, Bricks, Railroad Ties, Insulation/siding, Poles & Posts, Bars, Irons Structural, Scrap, Ingots, Pipe, Tin Plate, Irons Sheet, Plate, Alumina, Aluminum, Copper, Lead, Zinc, Machinery, Generators/trans, Woodpulp, Cotton, Grass Seeds, Scoria/pumice, Salt, Sand, Crushed Stone, Con Sand & Gravel, Granite, Roofing Granules,
BNSF	Midwest Reload	Kansas City, MO	Transload	Irons Sheet, Irons Structural, Ingots, Bars, Pipe, Plate, Tin Plate, Alumina, Aluminum, Rail Equipment, Generators/trans, Spec Rail Proj, Government, Plywood, Oriented Strand Board, Lumber, Bricks, Poles & Posts, Printing Paper
KCS	Quality Carriers	Kansas City, MO	Transload	Bulk Materials, Liquids/Oil
KCS	Central Missouri Reload (E 14 Terrace)	Kansas City, MO	Transload	Paper & Forest Products, Metals/Steel, Aluminum
KCS	Central Missouri Reload (St John Ave)	Kansas City, MO	Transload	Paper & Forest Products, Metals/Steel, Aluminum
KCS	Wagner Industries	Kansas City, MO	Transload	Paper & Forest Products, General Merchandise
KCS	Metro Park Warehouse	Kansas City, MO	Transload	Paper & Forest Products, Grocery Products, Candy, Appliances, Alcoholic Beverages
KCS	Standard Transportation	Webb City, MO	Transload	Paper & Forest Products, Metal/Steel
UP	Loup Network Partner (2223)	Kansas City, KS	Transload	Food, Hazmat-Liquid, Liquid Bulk
UP	Loup Network Partner (52341)	Kansas City, KS	Transload	Aggregate, Dry Bulk, Equipment/ Machinery, Ferrous Metals, Food, Food-Refrig/Frozen, Liquid Bulk, Lumber, Merchandise, Non-Ferrous Metals, Over Dimensional, Paper, Plastics
UP	Loup Network Partner (29)	El Dorado, KS	Transload	Dry Bulk, Ferrous Metals, Hazmat-Dry, Hazmat-Liquid, Liquid Bulk, Lumber, Non-Ferrous Metals, Paper, Plastics

Railroad	Facility Name	Location	Type	Commodities
UP	Loup Network Partner (23921)	Pittsburg, KS	Transload	Equipment/Machinery, Ferrous Metals, Food, Hazmat-Liquid, Liquid Bulk, Lumber, Merchandise, Non-Ferrous Metals, Over Dimensional, Paper, Plastics
UP	Loup Network Partner (51982)	Kansas City, MO	Transload	Food, Food-Refrig/Frozen
UP	Loup Network Partner (73505)	Kansas City, MO	Transload	Aggregate, Dry Bulk, Equipment/ Machinery, Ferrous Metals, Food, Hazmat-Dry, Hazmat-Liquid, Liquid Bulk, Lumber, Non-Ferrous Metals, Over Dimensional, Plastics
UP	Loup Network Partner (157)	Kansas City, MO	Transload	Aggregate, Equipment/Machinery, Food, Merchandise, Non-Ferrous Metals, Paper, Plastics
K&O	Great Bend Transload Facility	Great Bend, KS	Transload	Wind Energy Components, Cement, Aggregate

Source: BNSF Railway, Maps and Shipping Locations, Premier Transload Map, https://www.bnsf.com/ship-with-bnsf/maps-and-shipping-locations/transload/transload-network-map.html; KCS, Network Map, https://www.kcsouthern.com/en-us/why-choose-kcs/our-network/network-map; Loup Logistics; UP, LOUP, Transload Facility Search Map, https://www.louplogistics.com/sps/jas/index.html; Great Bend Transload Facility, https://www.gbedinc.com/great-bend-transload-facility

G.3 Automotive Facilities

Automotive facilities connect vehicle assembly or distribution facilities to the rail system. Kansas' Class I railroads operate three automotive facilities in Kansas City, KS, and one automotive facility in Kansas City, MO. These facilities serve various automotive customers, including Ford, General Motors, and Toyota, among others. These automotive facilities are detailed in Figure G-78.

Figure G-78: Automotive Facilities in Kansas and Kansas City

Railroad	Facility Name	Location	Type	Commodities
BNSF	Kansas City Vehicle Facility (Argentine)	Kansas City, KS	Automotive	Motor Vehicles. Provides loading for Ford, and unloading for Kia, Honda, Hyundai, Mazda, Subaru, and Toyota.
KCS	International Freight Gateway – IFG	Kansas City, MO	Intermodal, Automotive	Motor Vehicles, Shipping Containers, All Commodities. Provides loading for Ford.
UP	Kansas City Vehicle Facility (Fairfax)	Kansas City, KS	Automotive	Motor Vehicles. Provides loading for General Motors.
UP	Kansas City Vehicle Facility (Muncie)	Kansas City, KS	Automotive	Motor Vehicles. Provides loading for Ford, and unloading for Chrysler, Nissan, and Toyota.

Source: Association of American Railroads, Automotive Facility Guide, January 2019, https://aar.com/standards/pdfs/2019%20AAR%20Terminal%20Guide%20Master%201.1.19.pdf; BNSF Railway, Automotive Map, April 2015, https://bnsf.com/bnsf-resources/images/ship-with-bnsf/maps-and-shipping-locations/automotive-map-0.png; BNSF Railway, Facilities, http://www.bnsf.com/ship-with-bnsf/support-services/facility-listings.page; KCS, Network Map, https://www.kcsouthern.com/en-us/why-choose-kcs/our-network/network-map; KCS, U.S. Intermodal Ramps, June 2021, https://kcsouthern.com/pdf/kcsr-intermodal-ramps/kcsr-us-intermodal-ramps.pdf; UP, Automotive Facilities, https://www.up.com/customers/premium/facility_profiles/index.htm.

G.4 Maritime Facilities

Port KC is an inland port located in Kansas City, MO that provides connections to the road, rail, and waterway systems across the Kansas state border. In 2017, a rail spur was constructed to connect the port to Union Pacific, providing direct rail service to the port. The port also connects goods to the Missouri River system.[25]

G.5 Grain Elevators

Agriculture is a key freight industry for Kansas, with top commodities such as wheat, corn, and sorghum moving along Kansas' rail network. Grain elevators are critical to the storage, handling, and movement of these key agricultural commodities throughout Kansas.

There are 590 grain elevators in Kansas, 258 of which (44 percent) are operating with US Department of Agriculture (USDA) licenses, while the rest are licensed by KDA. KDA requires that any grain storage facility for public use be licensed by either the state or federal government. Grain elevators with USDA licenses are subject to federal regulations and are not required to obtain a state license.[26] Moundridge in McPherson has the highest number of grain elevators (41), followed by Oakley in Logan County with 29 elevators, Parsons in Labette County with 25 elevators, and Beloit in Mitchell County with 19 elevators.

An estimated 55 percent of grain elevators in Kansas have rail access. Figure G-79 lists the grain elevators in the state that are served by BNSF and UP railroads. BNSF trains provide rail access for 47 grain elevators in Kansas, while UP trains serve 65 shuttle train elevators.[27] Other railroads that serve grain elevators in Kansas include CVR, K&O, KYLE, SKOL, and Wichita Terminal Association Railroad. Figure G-80 presents a map of the density of grain elevators in Kansas and the rail system that serves them.

Figure G-79: Kansas Grain Elevators Served by Class I Railroads

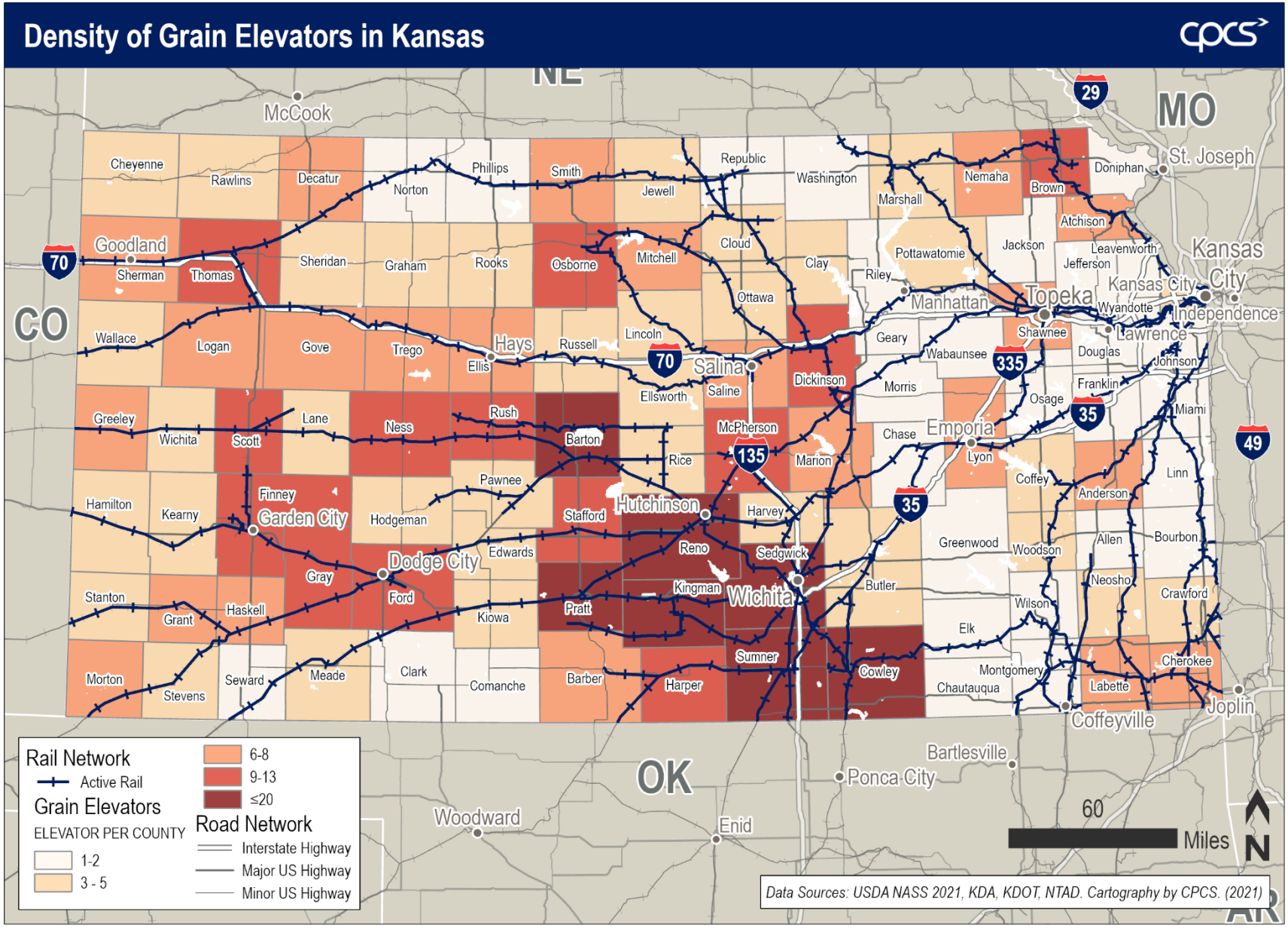
Company	City	Railroad
Agmark	Beloit	BNSF
Alida Pearl Coop Assn	Chapman	UP
Alma Cooperative Oil Assn	Alma	UP
Agri Trails Coop	Hope	BNSF, UP
Alliance Ag & Grain Llc	Spearville	BNSF, UP
Bartlett Coop Assn	Bartlet	UP
Beachner Grain Inc	Parson	BNSF, UP
Beachner Grain Inc	Wichita	BNSF
Blair Milling & Elev Co Inc	Atchison	UP
Blair Milling & Elev Co Inc	Seneca	UP
Cairo Coop Equity Exchange	Cunningham	UP
Cornerstone Ag Llc	Colby	UP
Dodge City Coop Exchange	Dodge City	BNSF, UP
Elbing Grain Llc	Elbing	UP

[25] Port KC, Transportation, https://portkc.com/transportation/port-of-kansas-city/
[26] Kansas Department of Agriculture, Grain Warehouse Program, 2021. https://agriculture.ks.gov/divisions-programs/grain-warehouse
[27] Kansas Department of Revenue, Grain Elevator Appraisal Guide for the State of Kansas, 2021, https://www.ksrevenue.org/pdf/2021KSGrainElevatorGuide.pdf

Company	City	Railroad
Ellsworth Coop (The)	Ellsworth	UP
F & F Feeds Inc	Emporia	BNSF
Farmers Coop Assn	Columbus	BNSF
Farmers Coop Assn	Manhattan	UP
Farmers Coop Grain Co	Caldwell	UP
Farmers Union Coop Co	Spring Hill	BNSF
Fleming Feed & Grain Co Inc	Leon	BNSF
Fowler Equity Exchange	Fowler	UP
Frontier Ag Inc	Oakley	UP
Grain Craft	Kansas City	BNSF
Grain Products Co	Dodge City	BNSF
Grangers Coop Assn	Lebo	BNSF
Guetterman Brothers Elevator Inc	Bucyrus	UP
Hi Plains Coop Assn	Colby	UP
Jackson Farmers Inc	Holton	UP
Jean Istas Dba Aurora Grain Co	Aurora	BNSF
Kanza Cooperative Association	Iuka	BNSF, UP
Leroy Coop Assn	Leroy	UP
Lewis Seed & Fertilizer Inc Dba Home City Grain	Home	UP
Minneola Coop Inc	Minneola	UP
Morrill Elevator Inc	Morrill	UP
Murphy's Llc	Lebo	BNSF
Offerle Co-Op Grain & Supply Co	Offerle	BNSF, UP
Producers Coop Assn	Girard	BNSF
Reading Grain & Lumber Inc	Reading	BNSF
Scoular Company	Salina	BNSF, UP
Stafford Co Flour Mills Co	Hudson	BNSF
Team Marketing Alliance Llc	Moundridge	BNSF, UP
Turon Mill & Elevator Inc	Turon	UP
Topeka Terminal Llc	Topeka	BNSF
Two Rivers Consumers Coop Assn	Arkansas City	BNSF
United Ag Service Inc	Gorham	UP
Valley Co-Op Inc	Winfield	BNSF
Winona Feed & Grain Inc	Winona	UP

Source: Kansas Department of Revenue, Grain Elevator Appraisal Guide for the State of Kansas, 2021.

Figure G-80: Density of Grain Elevators in Kansas



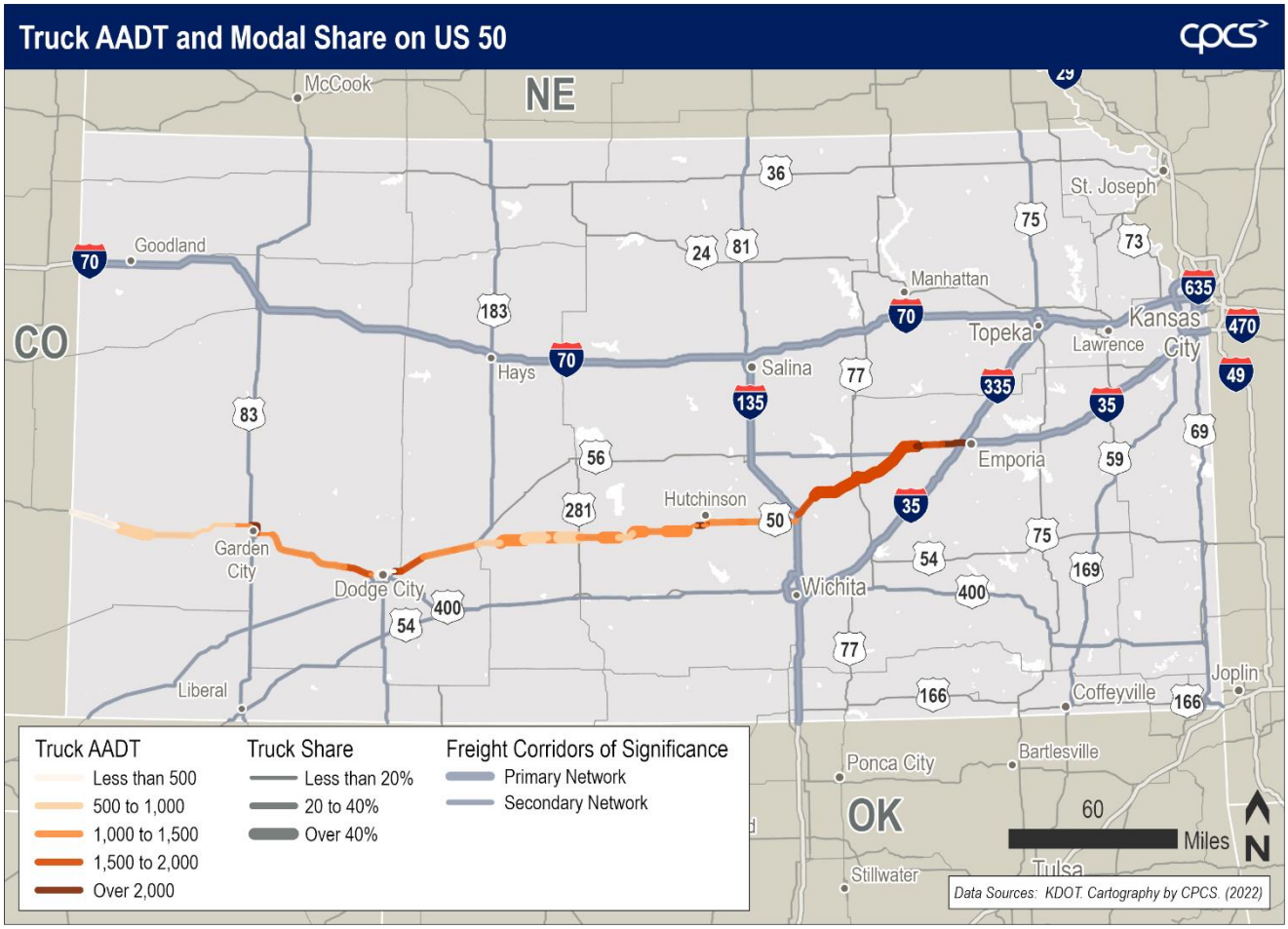
Appendix H. Corridor Case Studies

This section provides an analysis of five non-Interstate corridors in Kansas to understand the needs of corridors with high heavy vehicle use, and to demonstrate how corridor analysis results could be used in future KDOT decision-making. Two of the case study corridors are CRFCs and provide critical connections between the state's Interstates and freight facilities. Three additional corridors were selected based on their importance to current or expected future freight movements in the state.

H.1 US 50

US 50 is a major east-west highway that stretches 3,073 miles from Interstate 80 in West Sacramento, CA, to Maryland Route 528 in Ocean City, Maryland. The route enters Kansas from Hamilton County and terminates at Interstate 35 in Emporia after traveling 447.9 miles through Garden City, Dodge City, and Hutchinson. As shown in Figure H-81, the truck traffic on the portion of US 50 between Marion County and Chase County, as well as the segment between Edwards County and Reno County exceeded 40 percent of the total traffic in 2019. The average truck AADT on US 50 was 1,285, with the highest AADT in Lyon County (2,585) and the lowest AADT in Ford County (415). This information provided validation to the concept of US 50 being used by trucks to bypass the Kansas Turnpike (I-35 between Emporia and Wichita).

Figure H-81: Truck AADT and Truck Share of Total Volume on US 50 (2019)

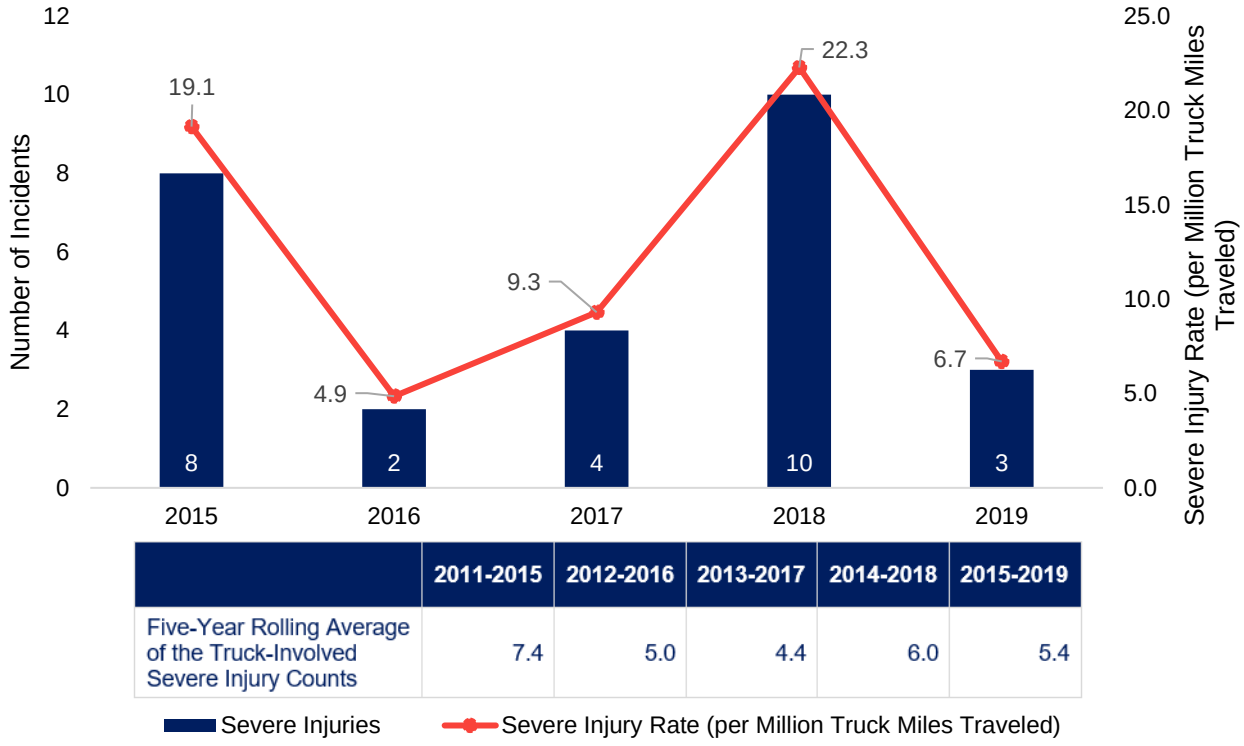


Safety and Security

Roadway

The trends of truck-involved severe injuries and fatalities rates on US 50 do not demonstrate clear patterns between 2015 and 2019. The severe injury rate peaked at 22.3 in 2018, while the fatality rate was the highest in 2017 at 23.3. The severe injury and fatality counts also fluctuated during the five years, with the counts peaking in 2018 and 2017, respectively (Figure H-82 and Figure H-83). When looking at the five-year rolling average, the severe injury counts decreased between 2015 and 2017, then increased in 2018 before dropping in 2019 again. The five-year rolling average of the fatality counts demonstrates a growing trend during the five years, increasing from 1.4 to 5.4.

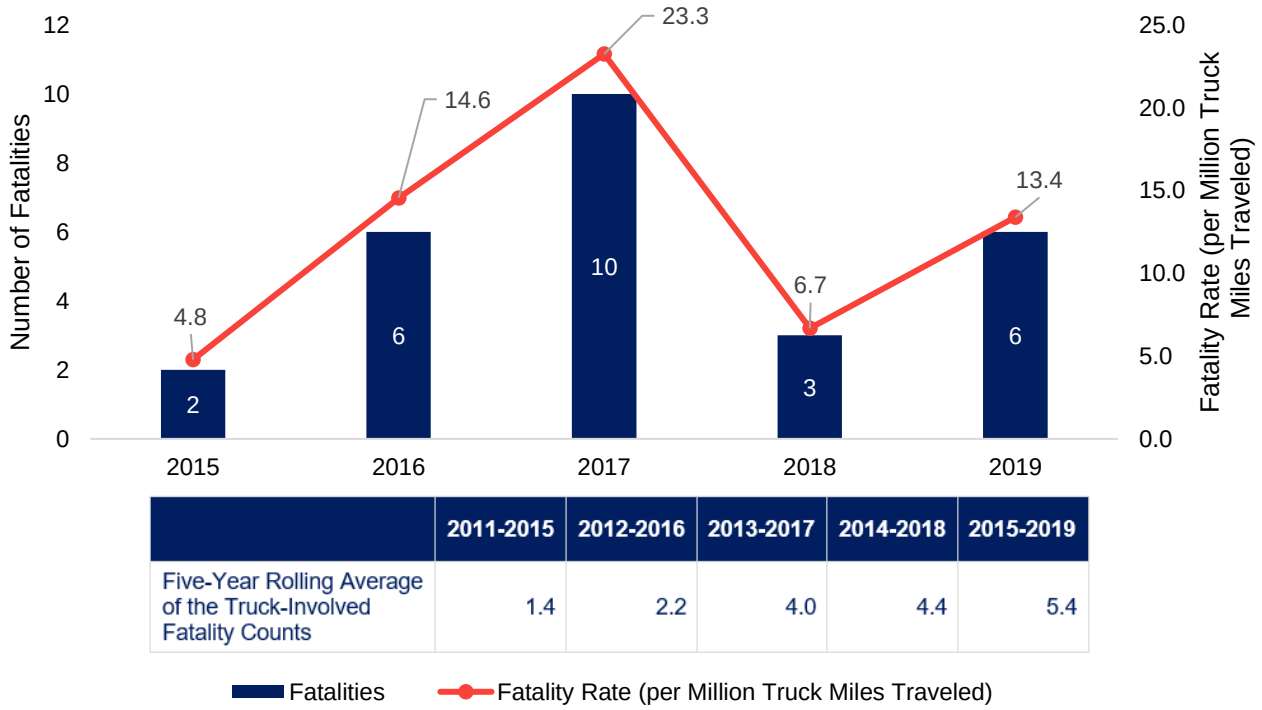
Figure H-82: Number and Rate of Truck-Involved Severe Injuries on US 50 (2015-2019)



	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Severe Injury Counts	7.4	5.0	4.4	6.0	5.4

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Figure H-83: Number and Rate of Truck-Involved Fatalities on US 50 (2015-2019)



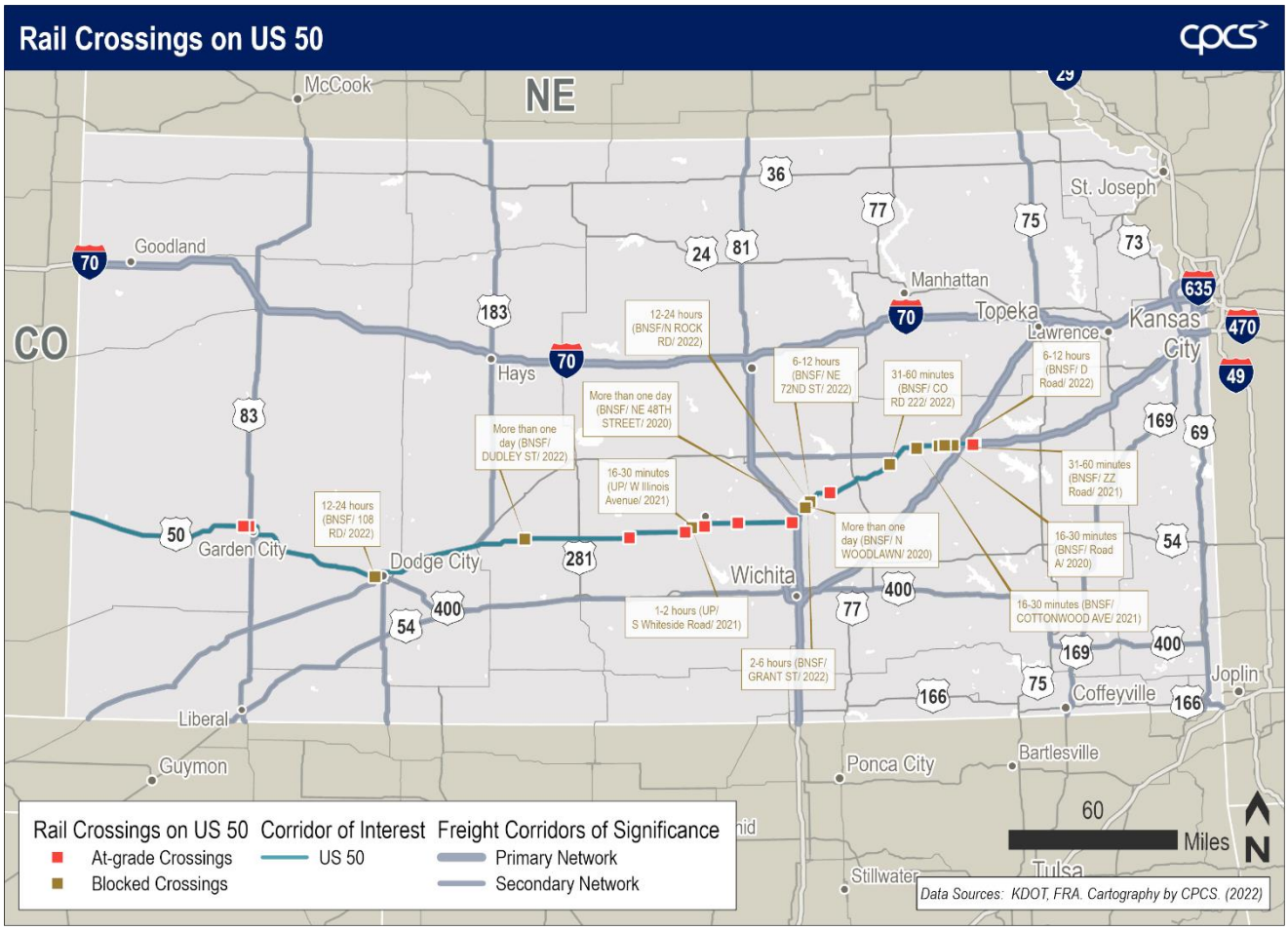
	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Fatality Counts	1.4	2.2	4.0	4.4	5.4

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Rail Crossings

Figure H-84 illustrates the 12 at-grade crossings on US 50 and the 14 blocked crossing incidents that occurred near or along the corridor since 2020. The grade crossings include five in Reno County, three in Lyon County, two in Finney County, and one each in Marion and Harvey County. Blocked crossings hinder commercial, private, and emergency service vehicles and pose safety threats to pedestrians and drivers. Three out of the 14 blocked crossing incidents near or on US 50 lasted more than one day. The incidents have also become more frequent over the years, from three in 2020 to six during the first seven months of 2022.

Figure H-84: Number of At-Grade Crossings and Blocked Crossings near US 50 (2020 – July 2022)



Transportation System Management

Oversize/Overweight Truck Routing

KDOT issues oversize/overweight (OS/OW) permits to vehicles that intend to travel on Kansas' roadways and exceed the legal size and weight limits. The following OS/OW permit volume analysis investigated six commodity groups that are critical to Kansas' economy, including wind energy components, energy (excluding wind energy), agriculture, manufactured goods, military freight, and containers. The other commodities contain general freight, general construction equipment, and road/highway construction equipment.

Among the 224,889 OS/OW permits that were issued to travel on Kansas' roadways between 2019 and 2021, 66,194 (29.4 percent) traveled on US 50. As detailed in Figure H-85, the wind energy component was the top commodity group carried by permitted loads traveling on US 50, accounting for 63.4 percent (25,730) of the total permit volume moving this commodity in Kansas. Additionally, over a quarter of the OS/OW permits to transport containers (48.3 percent), agriculture (27.9 percent), and military freight (25.7 percent) in Kansas traveled on US 50.

Figure H-85: OS/OW Permit Volume on US 50 by Select Commodity Group (2019 - 2021)

Commodity Group	OS/OW Permit Volume	Share of KS OS/OW Permit Volume
Wind Energy Component	25,730	63.4%
Energy (Excluding Wind Energy)	5,183	21.8%
Agriculture	5,442	27.9%
Manufactured Goods	3,144	20.4%
Military Freight	580	25.7%
Containers	98	48.3%
All other commodities on US 50	26,017	21.1%
Total	66,194	29.4%

Source: CPCS Analysis of K-TRIPS OS/OW Data

Understanding the travel patterns of OS/OW movements can help select and prioritize roadway maintenance and improvement projects. Figure H-86 shows the origins and destinations of the OS/OW permitted load traveling on US 50 between 2019 and 2021. While US 50 did not experience high OS/OW truck volumes during the three years, the corridor supported OS/OW trucks moving from and to a wide range of locations across the state. Garden City had the highest density of origins and destinations for OS/OW trips that traveled on US 50. Other major hot spots included the Hutchinson/Wichita region, Kansas City region, US 56 in Barton County, and Emporia. Additionally, OS/OW trucks traveling on US 50 also originated from or destinated in highway intersection areas, for instance, the interchange of US 50 and US 283, US 54 and US 283, and US 50 and Interstate 135. Furthermore, smaller origin and destination clusters were located in Thomas, Marshall, Jefferson, Pratt, Allen, and Bourbon Counties.

The origins and destinations of trucks carrying wind energy components on US 50, shown in Figure H-87, are similar to the overall OS/OW origins and destinations. Garden City had the highest truck origin and destination density, followed by Hutchinson between 2019 and 2021. Other clusters included but were not limited to Thomas, Marshall, and Allen Counties, as well as Emporia and Kansas City.

Figure H-86: Origins and Destinations for OS/OW Permits Traveling on US 50 (2019-2021)

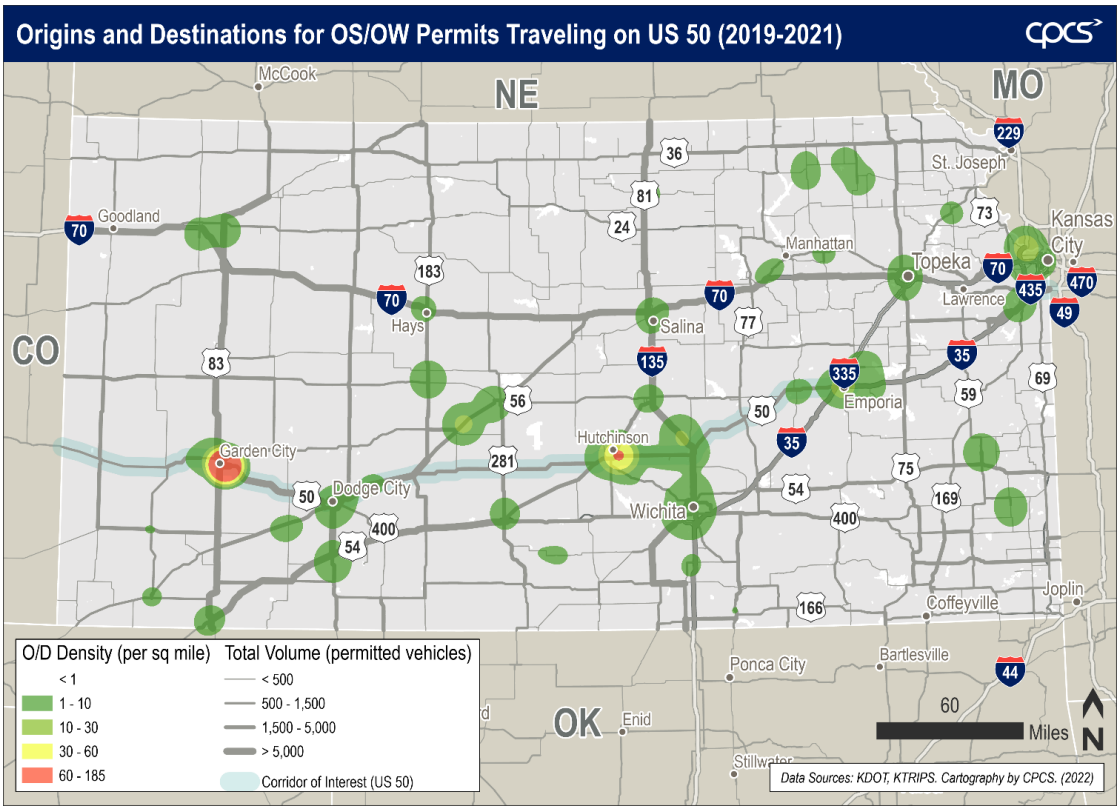
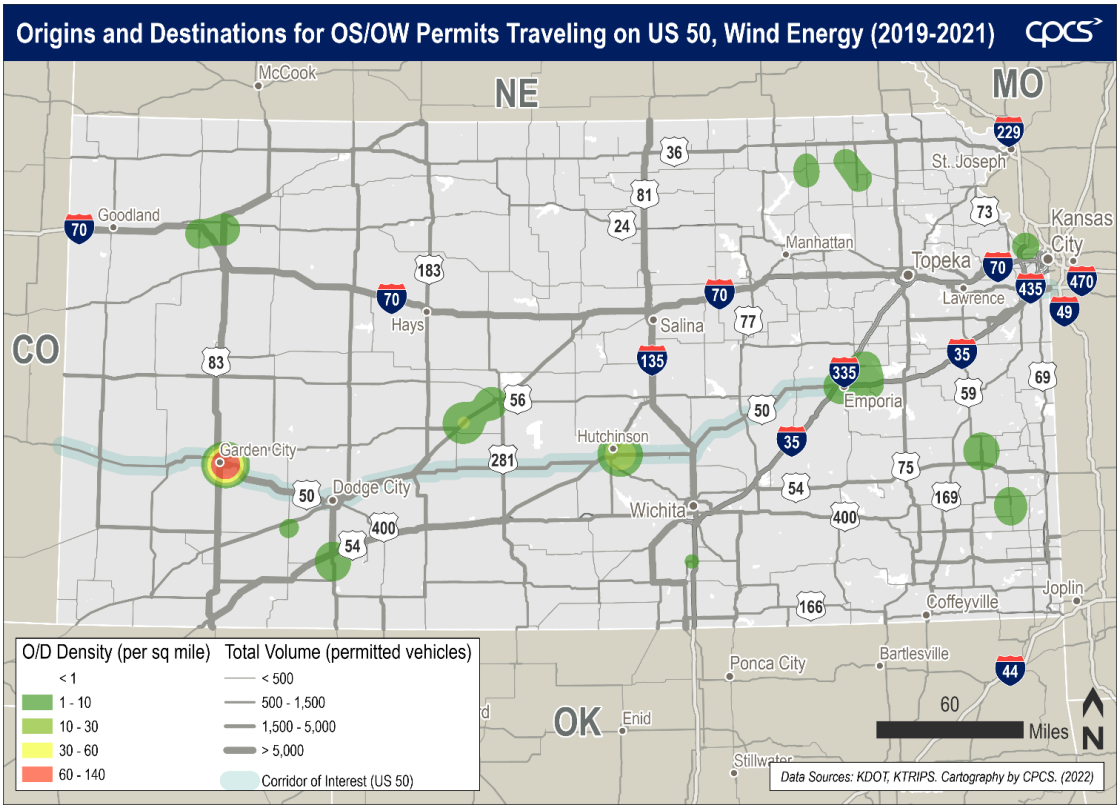


Figure H-87: Origins and Destinations for OS/OW Permits Traveling on US 50, Wind Energy (2019-2021)



Speed Score

Speed Score is a measure that indicates the efficiency of roadway segments by comparing actual speed to the free-flow speed of each segment, as shown in the equation. The higher the Speed Score, the closer the actual speed is to the free-flow speed.[28]

$$\textbf{\textit{Truck Speed Score}} = \frac{\textbf{\textit{Average Truck Speed}}}{\textbf{\textit{Free-Flow Speed}}} \qquad \textbf{(Equation 1)}$$

As shown in Figure H-88, trucks traveling on most segments of US 50 reached more than 80 percent of the free-flow speeds. The exceptions include portions of US 50 near Cimarron, near Hutchinson, and near Emporia, with speed scores lower than 80.

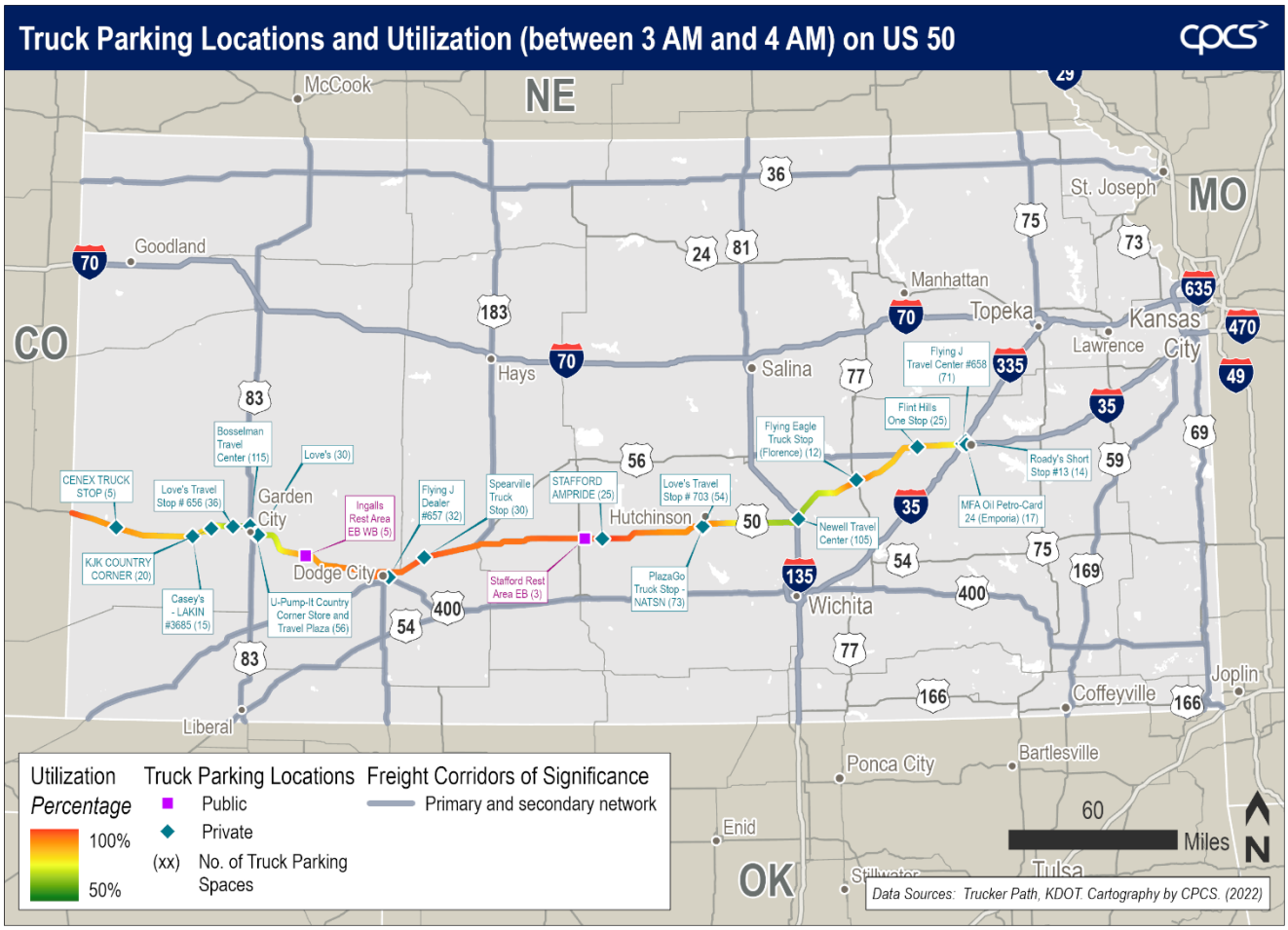
Figure H-88: Speed Score – US 50 (2019)

[28] The free-flow speed is calculated by the CATT Lab using the 95th percentile of the speeds between 10 PM and 5 AM. The reference speed is calculated over a 6-month period starting April 1st, 2017 – September 30th, 2017.

Truck Parking Utilization

There are 20 truck parking locations – including two public rest areas and 18 private truck stops – along US 50[29] in Kansas, providing a total of 743 truck parking spaces along the corridor (Figure H-89). Statewide truck parking utilization peaks from 3-4 AM. During this time, truck parking utilization along US 50 is highest between Dodge City and Hutchinson, as well as near the state's eastern border with Colorado. Meanwhile, in and near Garden City, where there is a higher concentration of truck parking facilities, truck parking utilization across the facilities remains lower. However, as part of a 2019 FHWA survey,[30] Kansas enforcement identified the shoulder of US 50 westbound, at milepost 71, as well as Harvest Street just off US 50 at milepost 71 (where Love's travel stop is located) as locations of frequent illegal truck parking in the state.

Figure H-89: Truck Parking Utilization on US 50



[29] Within 2 miles of the corridor.

[30] In 2019, as part of Jason's Law, FHWA distributed a truck parking survey for state enforcement agencies, asking them to identify location of frequent illegal truck parking. Three locations, all located in Finney County, were identified for Kansas.

Asset Preservation

Pavement and Bridge Conditions

The pavement on US 50 is mostly in good (59.3%) or fair condition (40.4%). The 0.3% of the pavement that is in poor condition is located near Garden City, Dodge City, Kinsley, Newton, Florence, and Emporia (Figure H-90).[31]

The 193 bridges on US 50 are all well-maintained, with 83.2 percent in good condition and 16.8 percent in fair condition by deck area. The average age of those bridges is 53 years old, which suggests the need for more maintenance soon.

Figure H-90: Pavement in Poor Condition on US 50 (2021)

[31] 0.07 percent of pavement on US 50 has no condition data.

Freight and Economic Vitality

Commodity Flow

US 50 supported the movements of 58.9 million tons of freight from or to Kansas by truck. Additionally, 16.8 million tons of truck-based freight passed through US 50 with origins and destinations outside Kansas (Figure H-91).

For all commodity movements using the corridor, Figure H-92 lists the top five truck-transported commodities on US 50 by volume in 2017 and 2045. When measured by volume, the top five commodities include cereal grains (7.1 million tons), fuel oils (6.6 million tons), non-metallic (4.9 million tons), other foodstuffs (4.9 million tons), and pharmaceutical products (4.6 million tons). Except for fuel oils, the top commodities are forecast to grow between 2017 and 2045, with pharmaceutical products experiencing the largest growth at 153.3 percent.

Figure H-91: Tonnage Transported on US 50 (2017)

	Tonnage (Million)
Originate/End in Kansas	58.9
Pass-Through	16.8

Source: FAF 5 Disaggregation by CPCS.

Figure H-92: Tonnage Transported on US 50 by Top Commodity (2017 v. 2045)

Top Commodity	2017 Tonnage (Million)	2045 Forecast Tonnage (Million)
Cereal Grains	7.1	7.7
Fuel Oils	6.6	3.6
Non-Metallic	4.9	6.6
Other Foodstuffs	4.9	6.9
Pharmaceutical Products	4.6	11.7

Source: FAF 5 Disaggregation by CPCS and FAF 5.3 Forecast.

Freight-Reliant Establishments and Employment

Freight-reliant industries include agriculture, construction, manufacturing, mining, retail trade, transportation, utility, and wholesale. Figure H-93 illustrates the density of freight-reliant business along US 50. Five primary clusters include Garden City, Dodge City, Hutchinson, Newton, and Emporia.

As detailed in Figure H-94, 3,509 freight-reliant establishments employed 42,784 people within a 5-mile radius of US 50 as of 2021, accounting for 6.9 percent and 7.2 percent of the total freight-reliant businesses and employment in Kansas, respectively. The retail trade establishments (1,410) made up 40 percent of the total freight-reliant business count along the corridor. When analyzed by employment, manufacturing (16,208) had the largest employment along the corridor, followed by retail trade (13,463). Furthermore, 12.2 percent of the agricultural employment in Kansas falls into the five-mile radius of US 50, followed by manufacturing (9.8 percent) and utility (7.3 percent).

Figure H-93: Freight-Reliant Establishments near US 50 (2021)

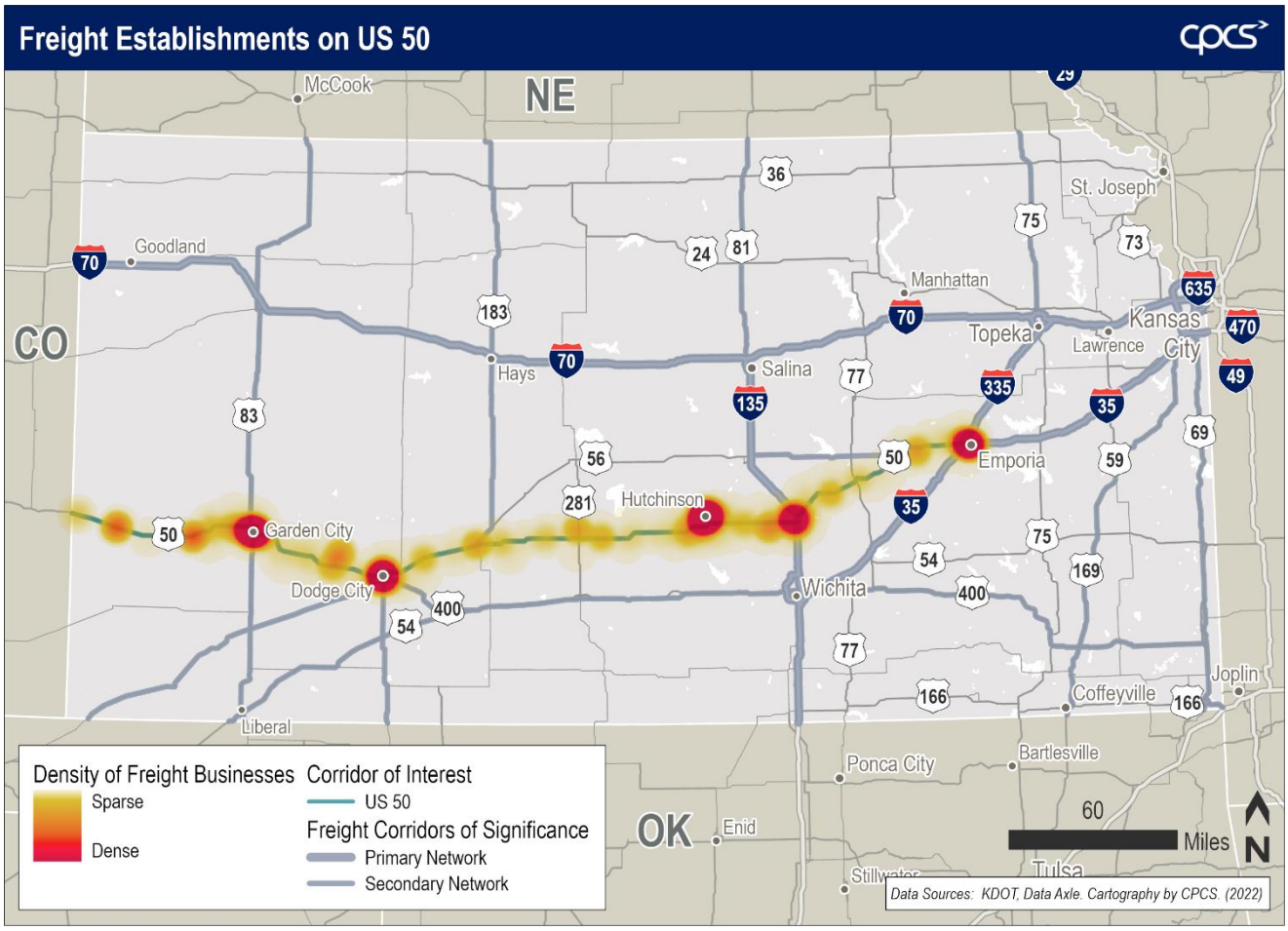


Figure H-94: Freight-Reliant Establishment and Employment Count near US 50 (2021)

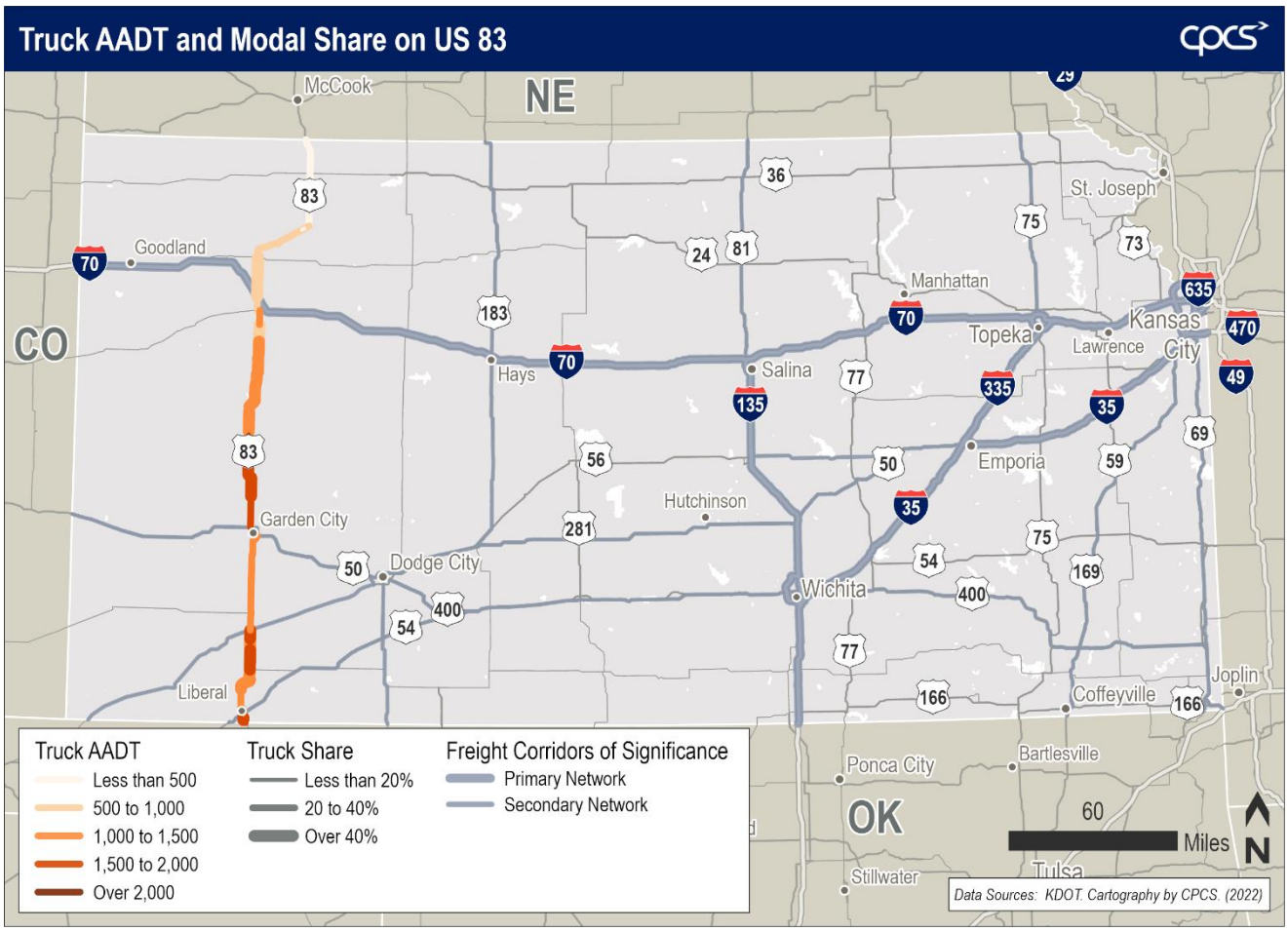
Freight-Reliant Industry	Establishment Count	% of Total Freight-Reliant Establishments in KS by Industry	Employment Count	% of Total Freight-Reliant Employment in KS by Industry
Agriculture	239	7.2%	1,602	12.2%
Construction	709	5.4%	4,101	4.8%
Manufacturing	319	6.8%	16,208	9.8%
Mining	41	6.6%	239	5.2%
Retail Trade	1,410	7.3%	13,463	6.9%
Transportation	374	8.2%	2,815	6.4%
Utility	28	7.1%	463	7.3%
Wholesale	389	8.0%	3,893	5.0%
TOTAL	3,509	6.9%	42,784	7.2%

Source: CPCS Analysis of Data Axle (2021)

H.2 US 83

US 83 is a north-south US highway that stretches 1,885 miles from the Canadian border in Westhope, North Dakota, to the Mexico border in Brownsville, Texas, traversing North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. US 83 enters Kansas in Decatur County and exits the state in Seward County after traveling 240 miles through major cities, including Garden City and Liberal.[32] US 83 had an average truck AADT of 1,107 in 2019, with the highest in Seward County and the lowest in Decatur County. As shown in Figure H-95, the truck traffic shares on the segments from north of Liberal to Sublette, from north of Garden City to Oakley, and from Interstate 70 to US 24 exceed 40 percent.

Figure H-95: Truck AADT and Truck Share of Total Volume on US 83 (2019)



Safety and Security

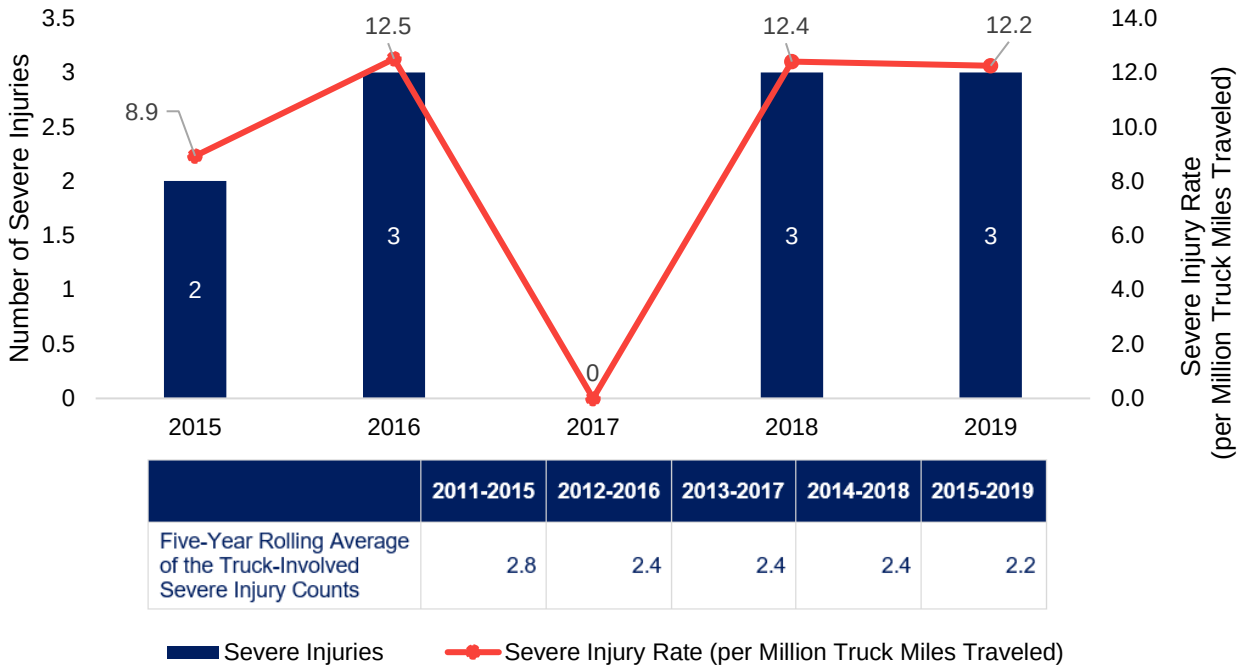
Roadway

As shown in Figure H-96, truck-involved accidents caused 11 severe injuries and 12 fatalities on US 83 between 2015 and 2019. After a decrease to zero incidents in 2017, the number and rate of truck-involved severe injuries remained steady between 2018 and 2019. The five-year rolling average

[32] US 83, Mid-America Freight Coalition. https://midamericafreight.org/index.php/rfs/network-inventory/corridors/profiles-2/us-83/

indicates a slight drop in truck-involved serious injury counts over the five years, decreasing from 2.8 to 2.2.

Figure H-96: Number and Rate of Truck-Involved Severe Injuries on US 83 (2015-2019)

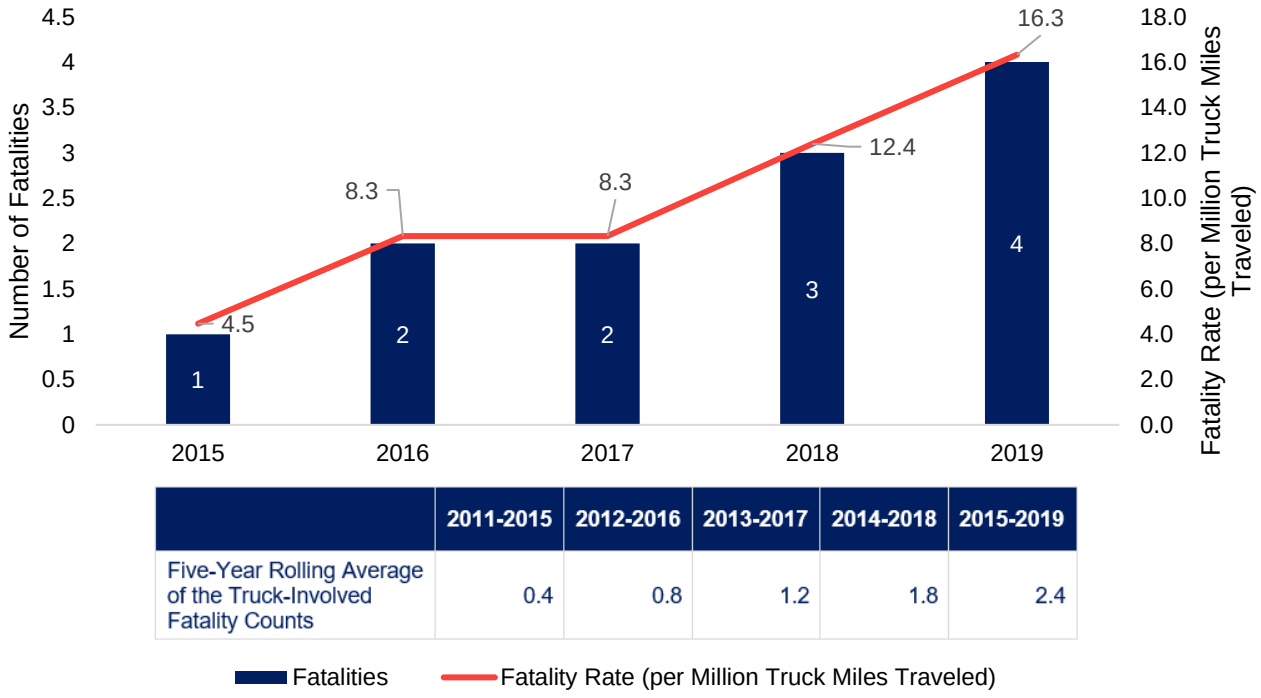


	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Severe Injury Counts	2.8	2.4	2.4	2.4	2.2

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

The number and rate of truck-involved fatalities on US 83 show increasing trends between 2015 and 2019. Figure H-97 demonstrates the number and rate of fatalities peaked in 2019 at 4 and 16.3 fatalities per million truck miles traveled, respectively. The five-year rolling average of the truck-involved fatality counts depicts the same increasing trend, showing the rolling average of truck-involved fatalities grew from 0.4 to 2.4 over the five years.

Figure H-97: Number and Rate of Truck-Involved Fatalities on US 83 (2015-2019)



	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Fatality Counts	0.4	0.8	1.2	1.8	2.4

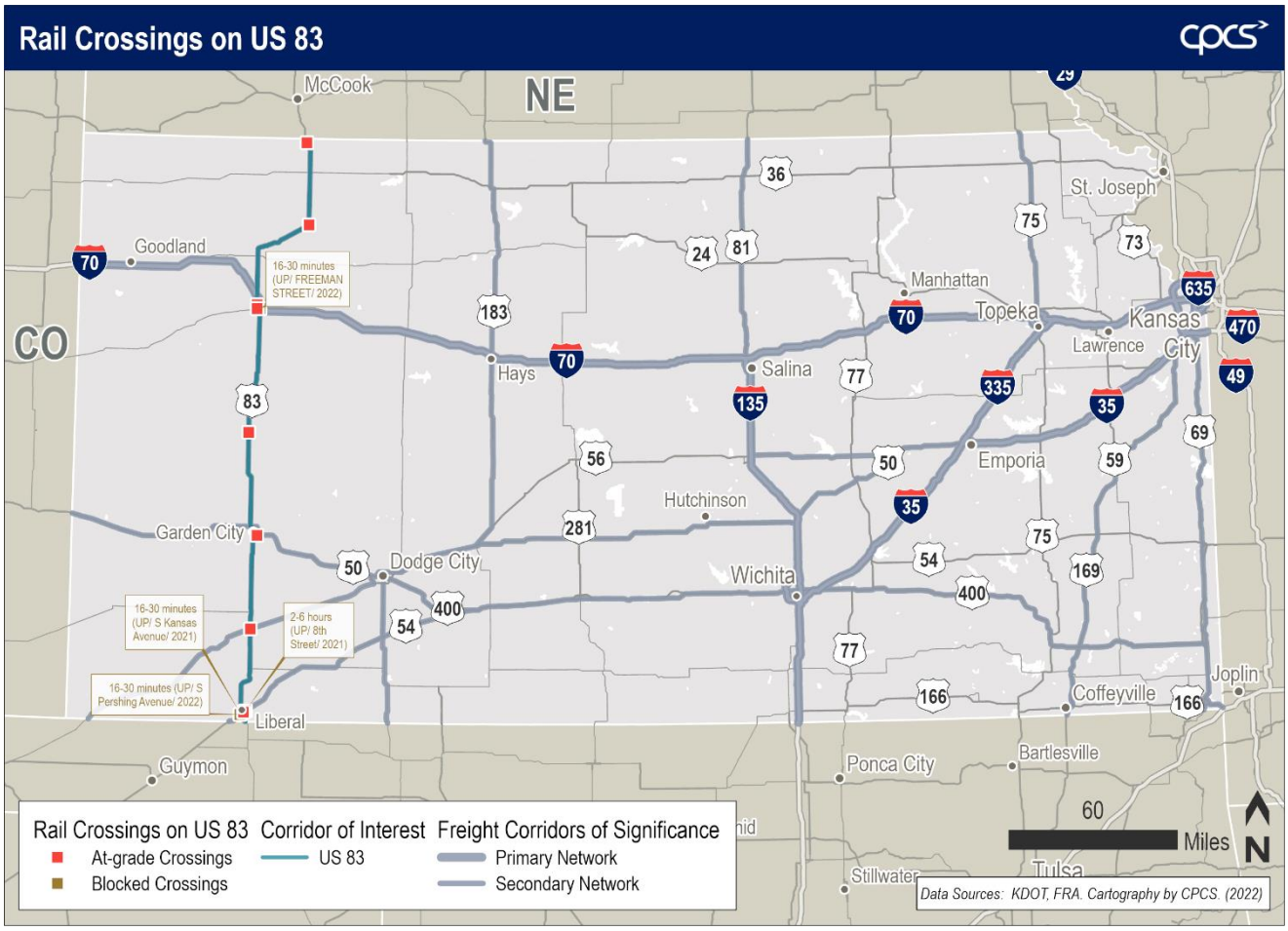
Fatalities — Fatality Rate (per Million Truck Miles Traveled)

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Rail Crossings

Highway-rail at-grade crossings pose safety concerns for pedestrians and motor drivers. Nine at-grade crossings are located along US 83, including two in Scott County and one each in Decatur, Finney, Haskell, Logan, Seward, Sheridan, and Thomas County. In addition to the at-grade crossings, blocked crossings may pose another potential threat to the safety and efficiency of roadways and railroads. According to FRA's Blocked Incident Reporters, four blocked crossing incidents have occurred along US 83 since 2020, three of which were at three different Union Pacific (UP) crossings in Liberal, and one of which was at a UP crossing in Oakley (Figure H-98).

Figure H-98: Number of At-Grade Crossings and Blocked Crossings near US 83 (2020 – July 2022)



Transportation System Management

Oversize/Overweight Truck Routing

Between 2019 to 2021, 22.5 percent (50,590) of OS/OW permits were issued to use US 83. Figure H-99 details the number of those issued permits by select commodity groups. Wind energy components and energy (excluding wind energy) are the top two commodity groups carried by the OS/OW trucks moving on US 83 during the three years, accounting for 41.1 percent and 48.5 percent of the total OS/OW trucks carrying the two commodity groups in Kansas, respectively.

Figure H-99: OS/OW Permit Volume on US 83 by Select Commodity Group (2019 - 2021)

Commodity Group	OS/OW Permit Volume	Share of KS OS/OW Permit Volume
Wind Energy Component	16,676	41.1%
Energy (Excluding Wind Energy)	10,920	45.9%
Agriculture	3,012	15.5%
Manufactured Goods	2,036	13.2%
Military	369	16.4%
Containers	6	3.0%
All other commodities on US 83	17,571	14.3%
Total	50,590	22.5%

Source: CPCS Analysis of K-TRIPS OS/OW Data

As shown in Figure H-100, US 83 is a key north-south corridor that supported a large number of OS/OW movements between 2019 and 2021. The origins and destinations of the permitted loads traveling on US 83 had the highest density in Garden City, with multiple other clusters located along US 83 and the adjacent US 160 and US 56. The origin and destination hot spots also appeared in urban areas, including Dodge City, Goodland, Salina, Hutchinson, Wichita, Emporia, Topeka, and Kansas City. Furthermore, a few smaller clusters were located in Marshal County near Blue Rapids and Frankfort, US 183 in Rush County, US 56 in Barton County, and US 59 in Allen County, suggesting some truck-reliant economic activities occurred in those areas.

Figure H-101 demonstrates the origins and destinations of the permitted loads that transported wind energy components using US 83 between 2019 and 2021. Garden City was the most popular origin and destination for those movements, followed by a few clusters in the Hutchinson area and Barton County, as well as near Interstate 70. Additionally, smaller origin and destination clusters were located on US 283 south of Dodge City, KS 99 south of Frankfort, KS 170 east of Interstate 335, and US 59 north of US 54.

Figure H-100: Origins and Destinations for OS/OW Permits Traveling on US 83 (2019-2021)

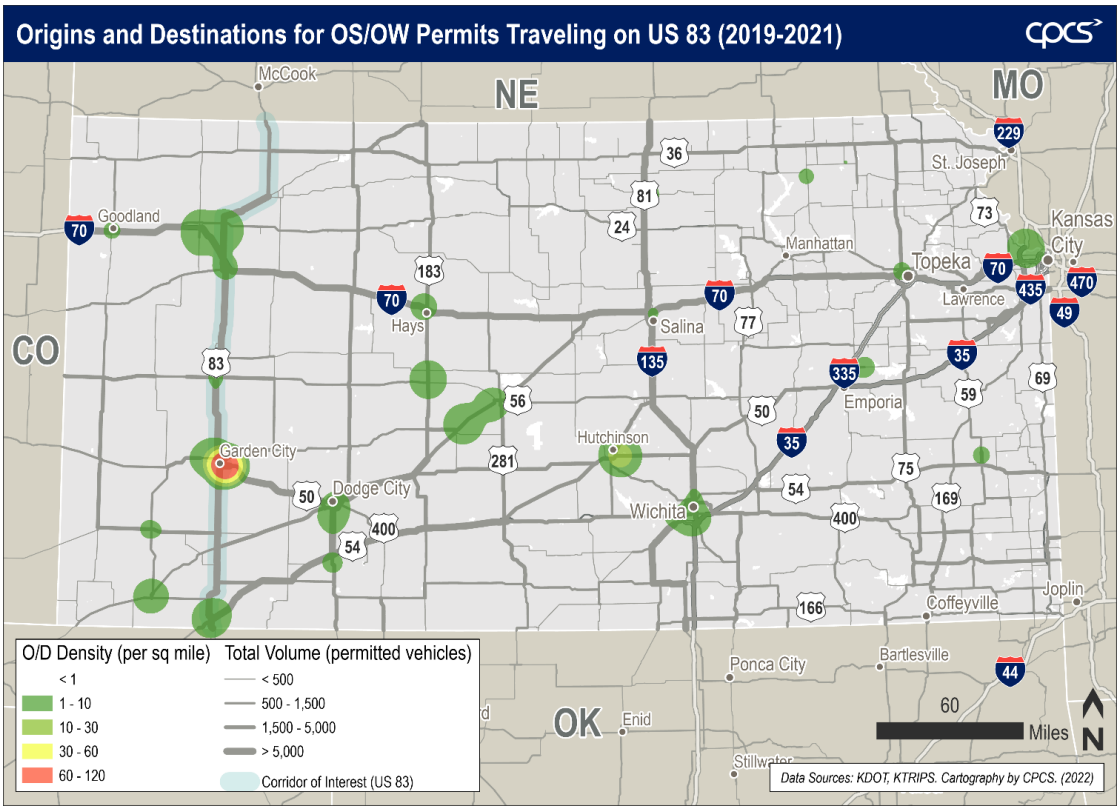
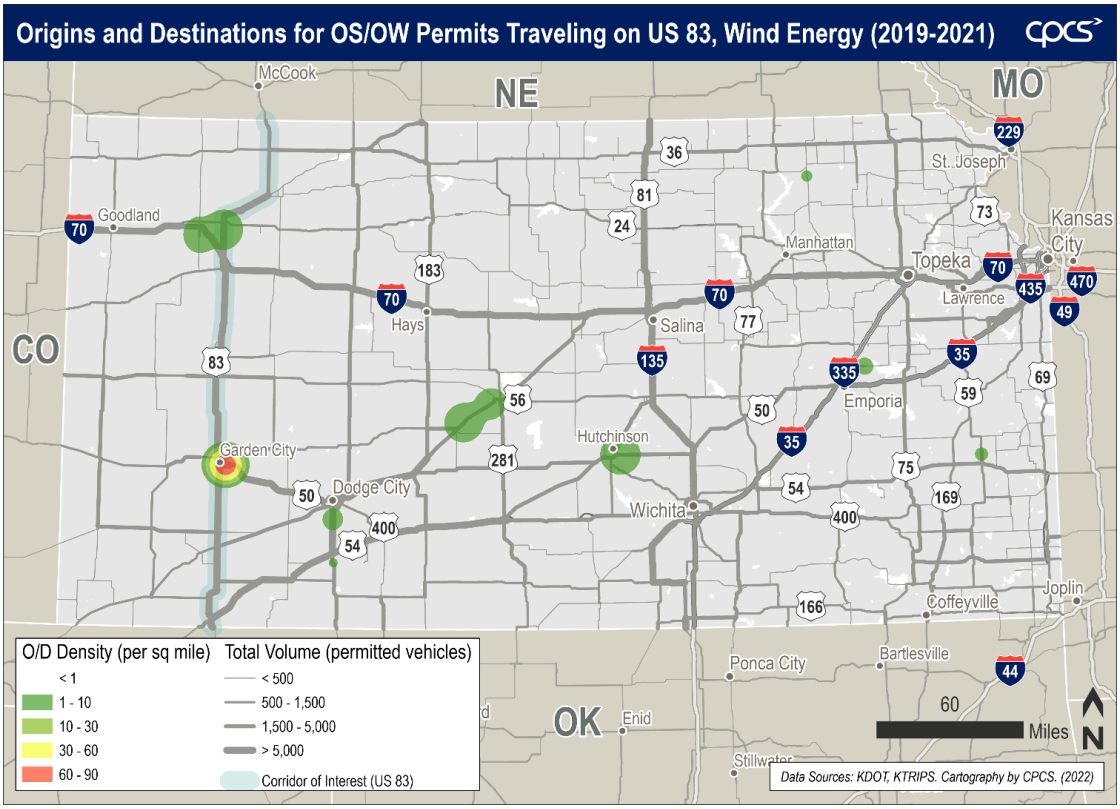


Figure H-101: Origins and Destinations for OS/OW Permits, Wind Energy (2019-2021)

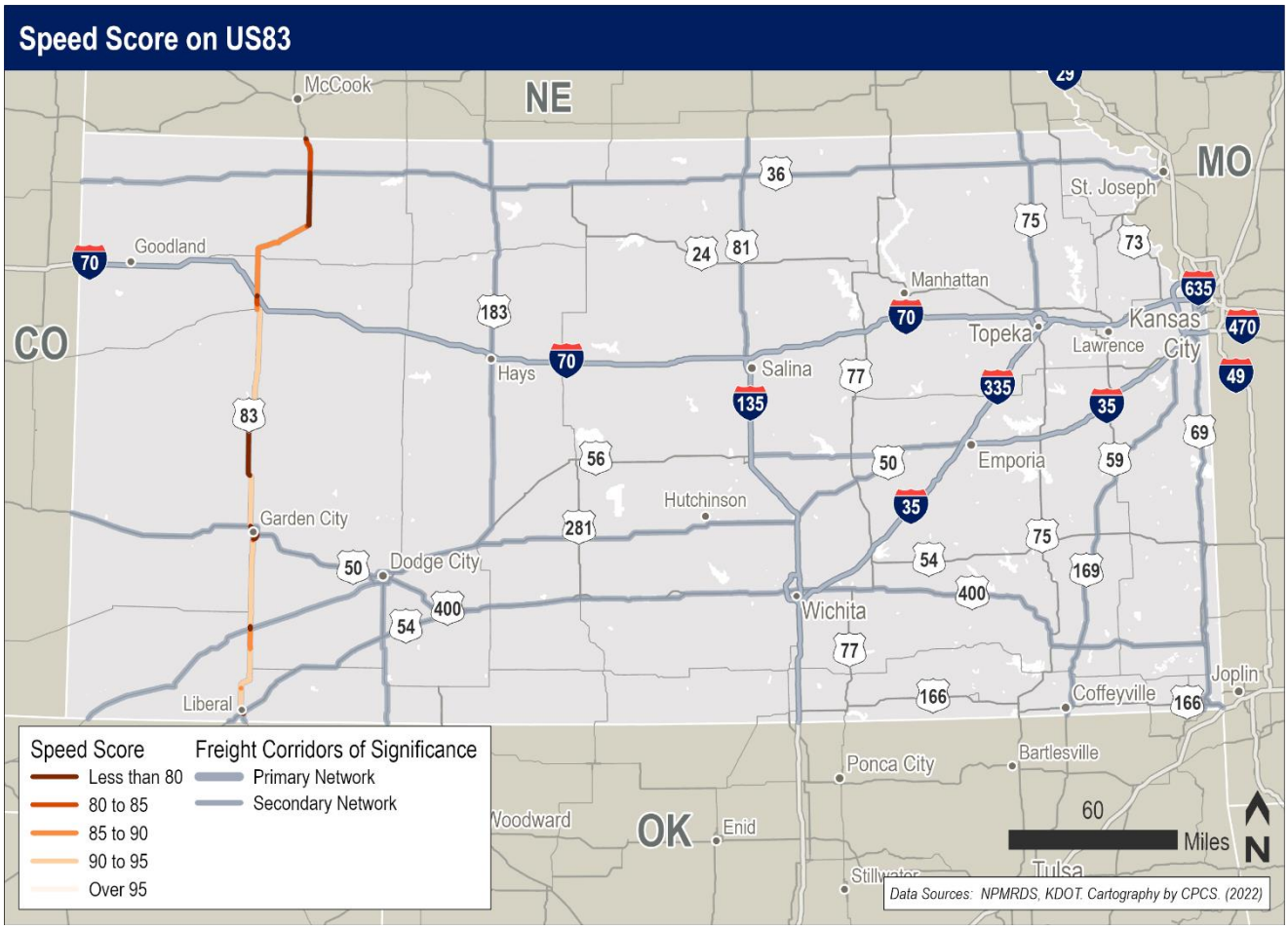


Speed Score

Speed Score is a measure that indicates the efficiency of roadway segments by comparing actual speed to the free-flow speed of each segment, as shown in the equation. The higher the Speed Score, the closer the actual speed is to the free-flow speed.

The truck speeds on the majority of US 83 reached at least 80 percent of the free-flow speed in 2019, except for the portion in Scott County shown in dark red in Figure H-102.

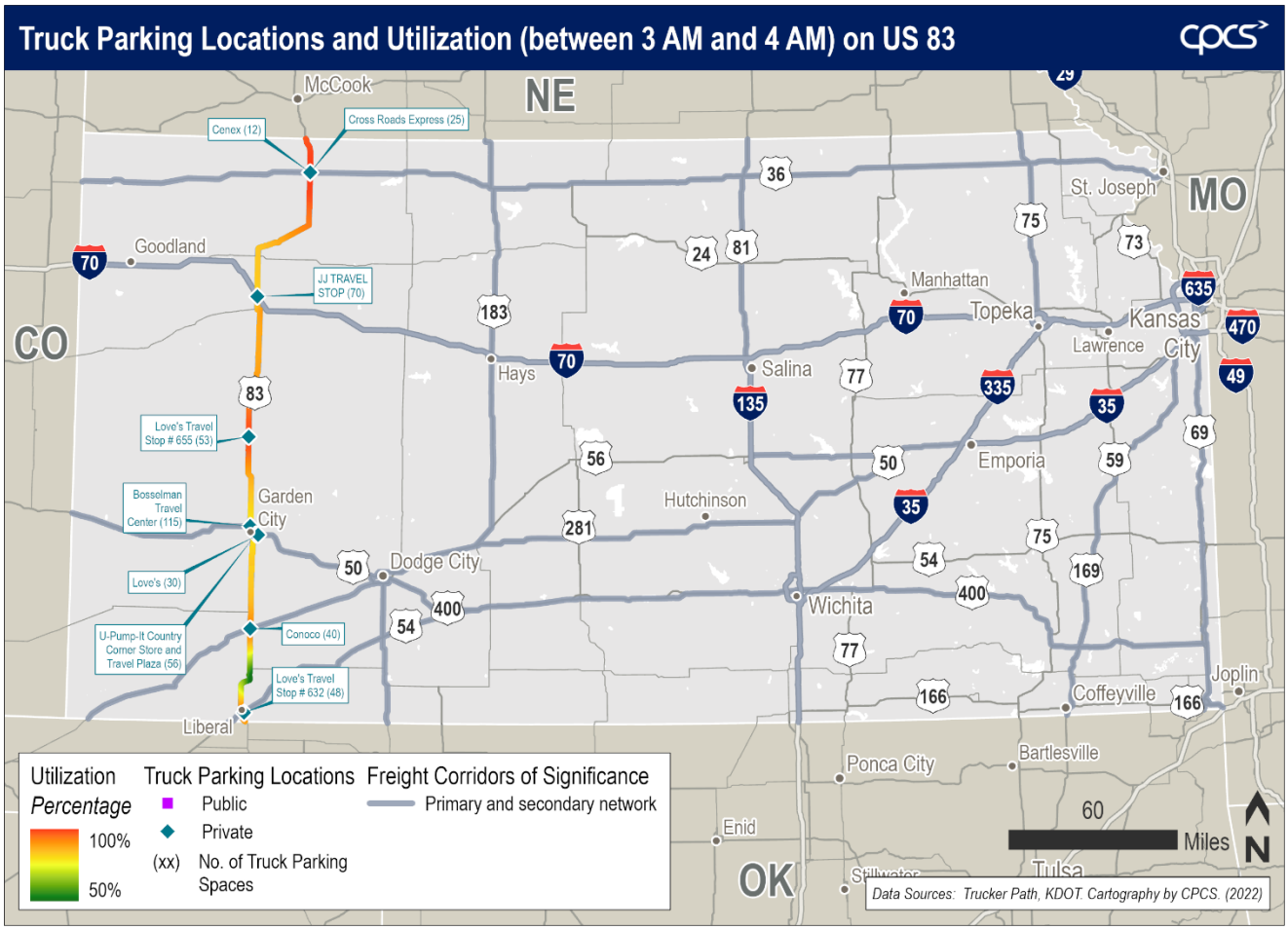
Figure H-102: Speed Score – US 83 (2019)



Truck Parking Utilization

There are nine truck parking locations – all of which are private truck stops – along US 83 in Kansas, providing a total of 449 truck parking spaces along the corridor (Figure H-103). Statewide truck parking utilization peaks from 3-4 AM. During this time, truck parking utilization along US 83[33] is highest at the state's northern Nebraska border, as well as near the Love's in Scott City. Meanwhile, in and south of Garden City, where there is a higher concentration of truck parking facilities, truck parking utilization across the facilities remains lower. However, as part of a 2019 FHWA survey,[34] Kansas enforcement identified the shoulder of US 83 southbound, at milepost 74, as a location of frequent illegal truck parking in the state.

Figure H-103: Truck Parking Utilization on US 83



[33] Within 2 miles of the corridor.

[34] In 2019, as part of Jason's Law, FHWA distributed a truck parking survey for state enforcement agencies, asking them to identify location of frequent illegal truck parking. Three locations, all located in Finney County, were identified for Kansas.

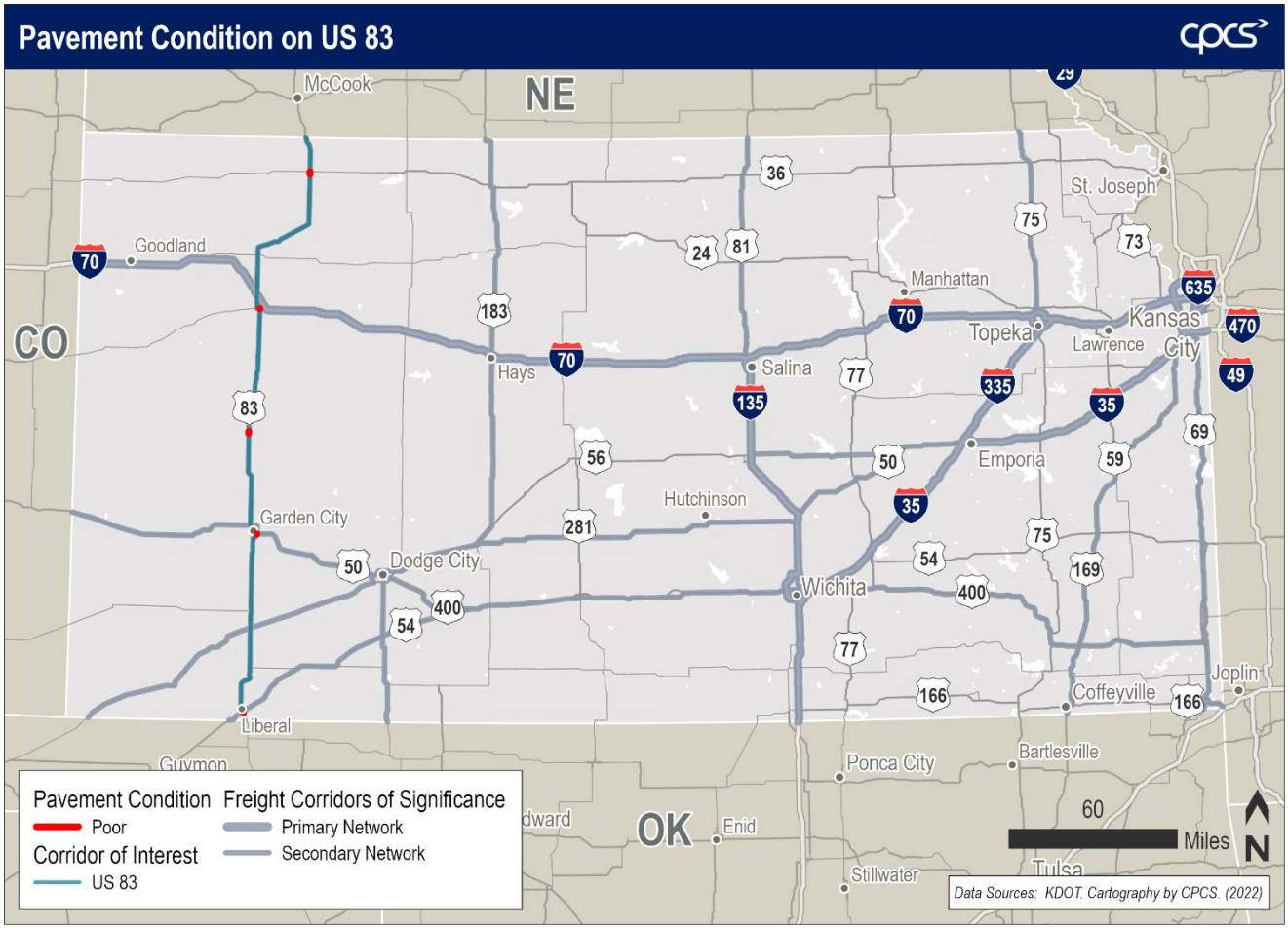
Asset Preservation

Pavement and Bridge Conditions

The pavement on US 83 is generally well-maintained, with 79.0 percent in good condition and 19.8 percent in fair condition. As shown in Figure H-104, the segments of US 83 with poor pavement condition are in Oberlin, Oakley, Scott City, and Garden City.

The average age of the 35 bridges on US 83 is 43 years. All bridges are in good or fair condition, of which 90.5 percent are in good condition, and 9.5 percent are in fair condition by deck area.

Figure H-104: Pavement in Poor Condition on US 83 (2021)



Freight and Economic Vitality

Commodity Flow

A total of 7.2 million tons of freight originating in or destinated for Kansas moved along US 83 in 2017. Another 0.8 million tons of truck-based freight passed through Kansas using US 83 (Figure H-105).

For all commodity movements using the corridor, Figure H-106 identifies the top five commodities transported by trucks using US 83 by volume in 2017 and 2045. Cereal grains (2.9 million tons), live animals/fish (0.7 million tons), animal feed (0.7 million tons), other foodstuffs (0.5 million tons), and fuel oils (0.5 million tons) are the top five commodities by volume. All commodities except fuel oil are expected to grow in volume in 2045.

Figure H-105: Tonnage Transported on US 83 (2017)

	Tonnage (Million)
Originate/End in Kansas	7.2
Pass-Through	0.8

Source: FAF 5 Disaggregation by CPCS.

Figure H-106: Tonnage Transported on US 83 by Top Commodity (2017 v. 2045)

Top Commodity	2017 Tonnage (Million)	2045 Forecast Tonnage (Million)
Cereal Grains	2.9	3.2
Live Animal/fish	0.7	2.0
Animal Feed	0.7	1.1
Other Foodstuffs	0.5	0.8
Fuel Oils	0.5	0.3

Source: FAF 5 Disaggregation by CPCS and FAF 5.3 Forecast.

Freight-Reliant Establishments and Employment

Freight-reliant industries include agriculture, construction, manufacturing, mining, retail trade, transportation, utility, and wholesale. Figure H-107 highlights the freight-reliant establishment clusters along US 83, showing that the primary clusters are around urban areas, including Liberal and Garden City. A few secondary clusters along US 83 appear in Oberlin, Oakley, Scott City, and Sublette. Except for Scott City, all the other clusters are served by at least one other US or Interstate highway.

Figure H-108 shows that 1,461 freight-reliant establishments employed 13,969 people within a 5-mile radius of US 83 in 2021, accounting for 2.9 percent and 2.4 percent of the total freight-reliant businesses and employment in Kansas, respectively. The retail trade sector had the highest number of establishments (566) along the corridor, followed by construction (291) and transportation (173). When analyzed by employment, the retail trade businesses hire the most people (4,862) along the corridor, followed by manufacturing (3,479) and construction (1,692).

Figure H-107: Freight-Reliant Establishments near US 83 (2021)

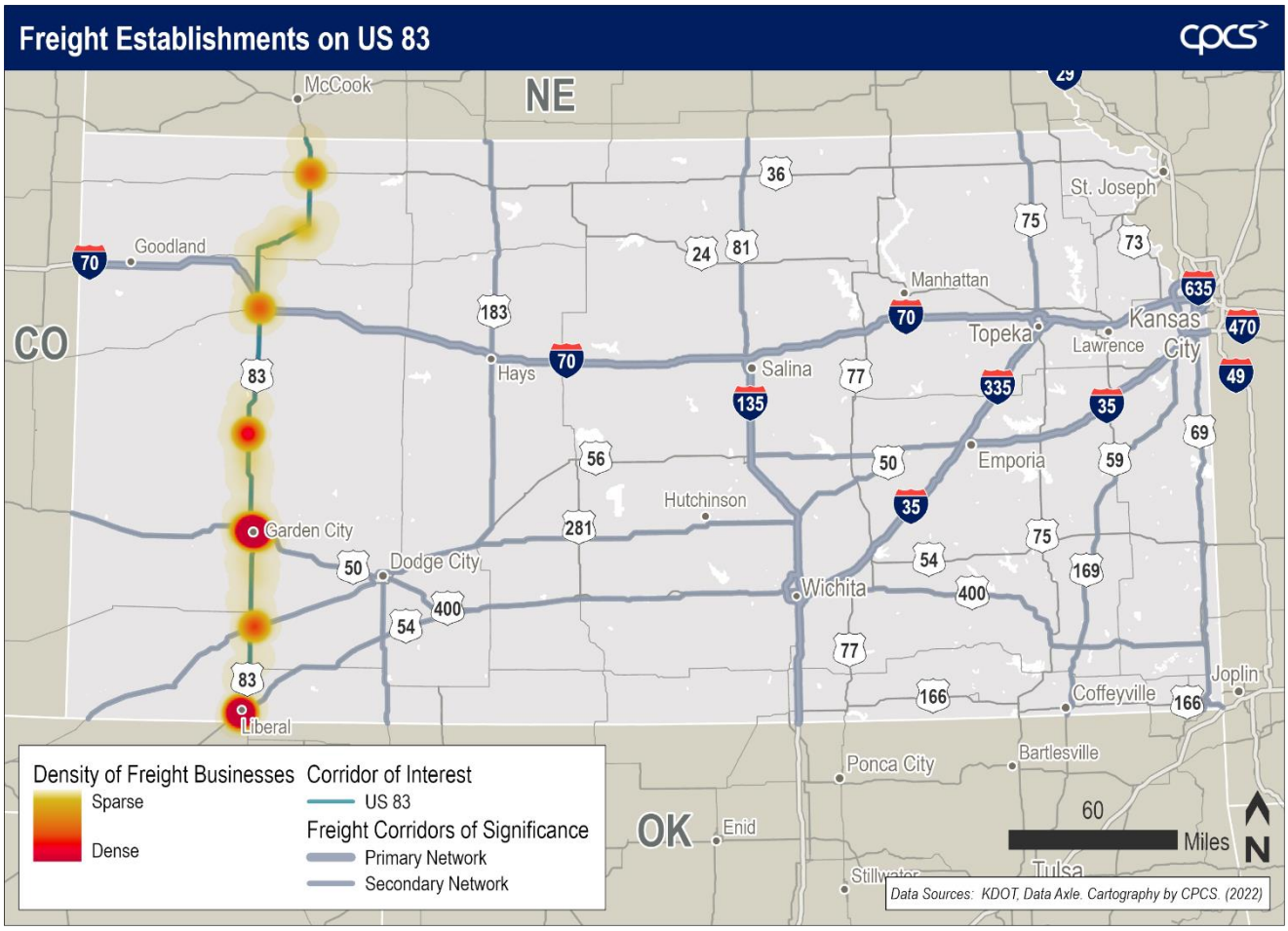


Figure H-108: Freight-Reliant Establishment and Employment Count near US 83 (2021)

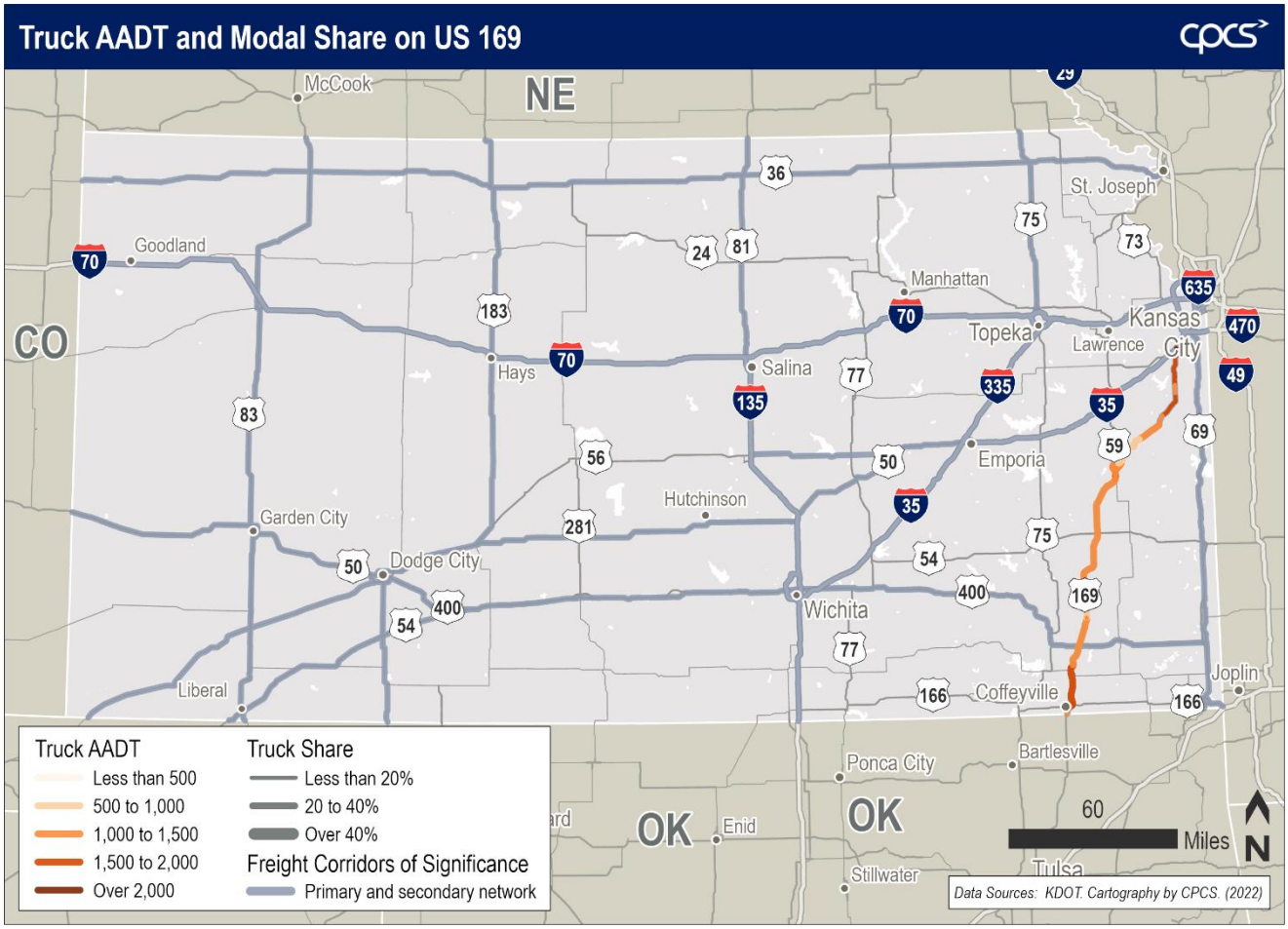
Freight-Reliant Industry	Count of Establishments Near US 83	% of Total Freight-Reliant Establishments in KS by Industry	Count of Employment Near US 83	% of Total Freight-Reliant Employment in KS by Industry
Agriculture	115	3.5%	642	4.9%
Construction	291	2.2%	1,692	2.0%
Manufacturing	105	2.2%	3,479	2.1%
Mining	20	3.2%	121	2.6%
Retail Trade	566	2.9%	4,862	2.5%
Transportation	173	3.8%	1,178	2.7%
Utility	9	2.3%	348	5.5%
Wholesale	182	3.7%	1,647	2.1%
TOTAL	1,461	2.9%	13,969	2.4%

Source: CPCS Analysis of Data Axle (2021)

H.3 US 169

US 169 provides a direct connection between Kansas City and Tulsa in Oklahoma. Stretching 149 miles in length, the corridor is part of the NHS and carried around 1,400 daily truck traffic in 2019, with the highest AADT near the City of Coffeyville (2,325) and the lowest AADT in Neosho County (897). As shown in Figure H-109, the truck traffic shares on the segments near Garnett City in Anderson County exceed 40 percent. US 169 is expected to experience a further increase in freight traffic as it provides crucial access for the new Bartlett Soybean Crushing Facility in Cherryvale that is under development (see section 2.4 for more detail).

Figure H-109: Truck AADT and Truck Share of Total Volume on US 169 (2019)

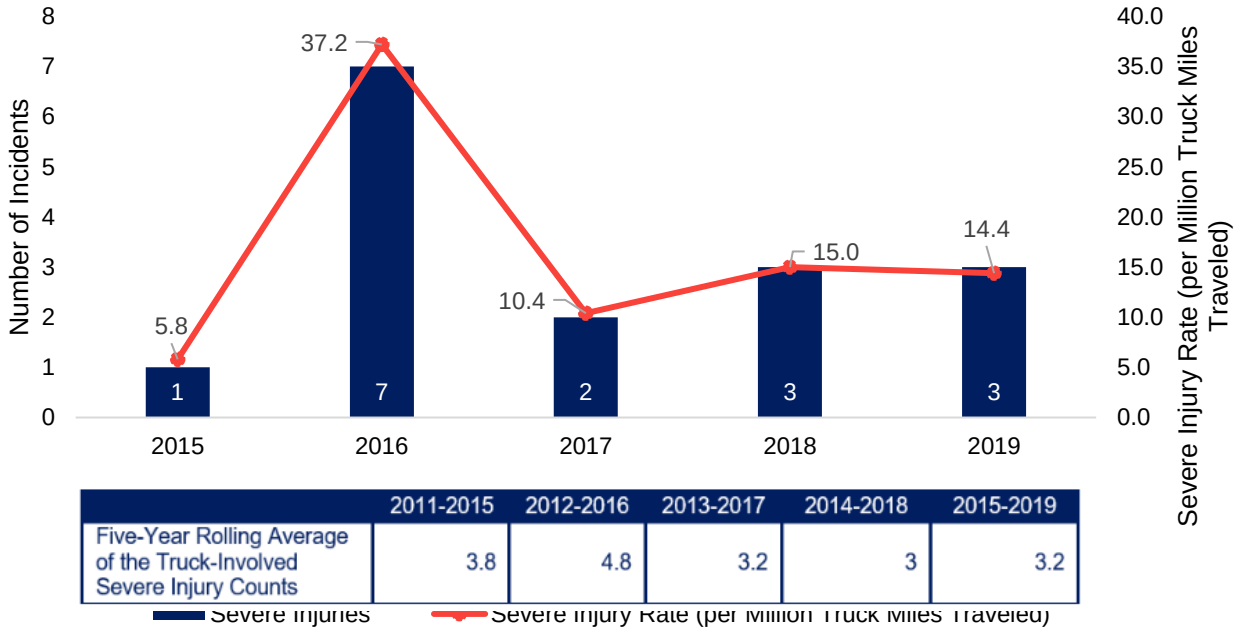


Safety and Security

Roadway

Truck-involved accidents caused 16 severe injuries and 15 fatalities on the US 169 corridor between 2015 and 2019. After a temporary increase in 2016, the severe injury rate returned to around 15 severe injuries per million truck miles traveled in 2019 (Figure H-110). Fatality rates showed a steady decrease while five-year rolling average fatality counts showed an upward trend from 1.8 (2011-2015) to 3 (2015-2019) (Figure H-111).

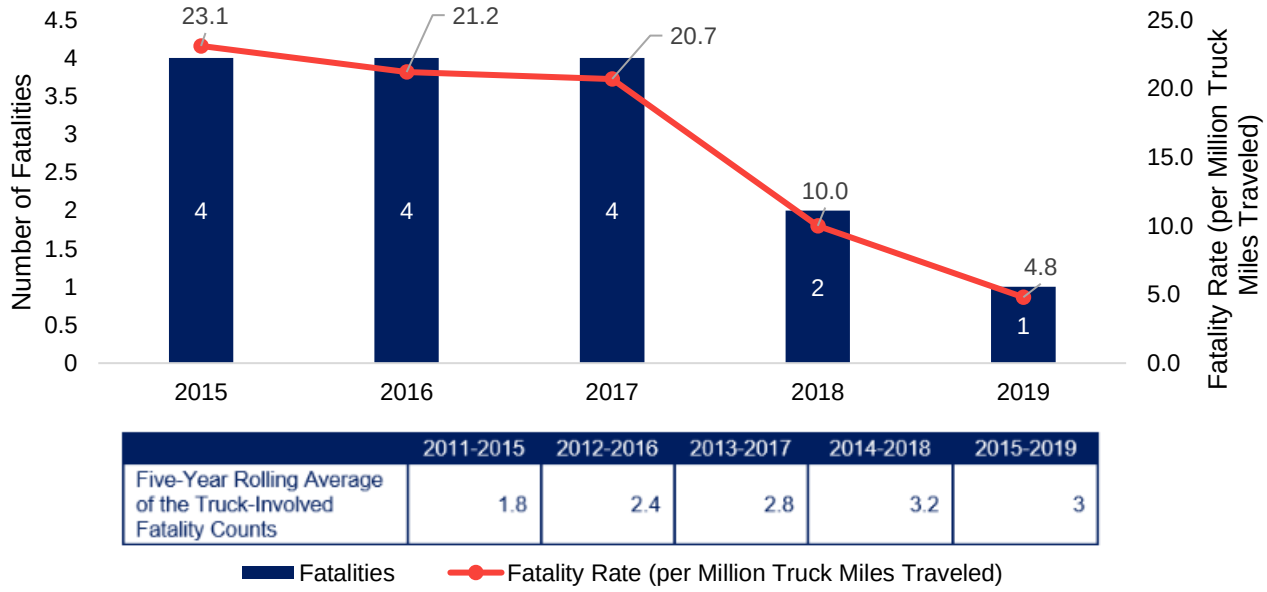
Figure H-110: Number and Rate of Truck-Involved Severe Injuries on US 169 (2015-2019)



	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Severe Injury Counts	3.8	4.8	3.2	3	3.2

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Figure H-111: Number and Rate of Truck-Involved Fatalities on US 169 (2015-2019)



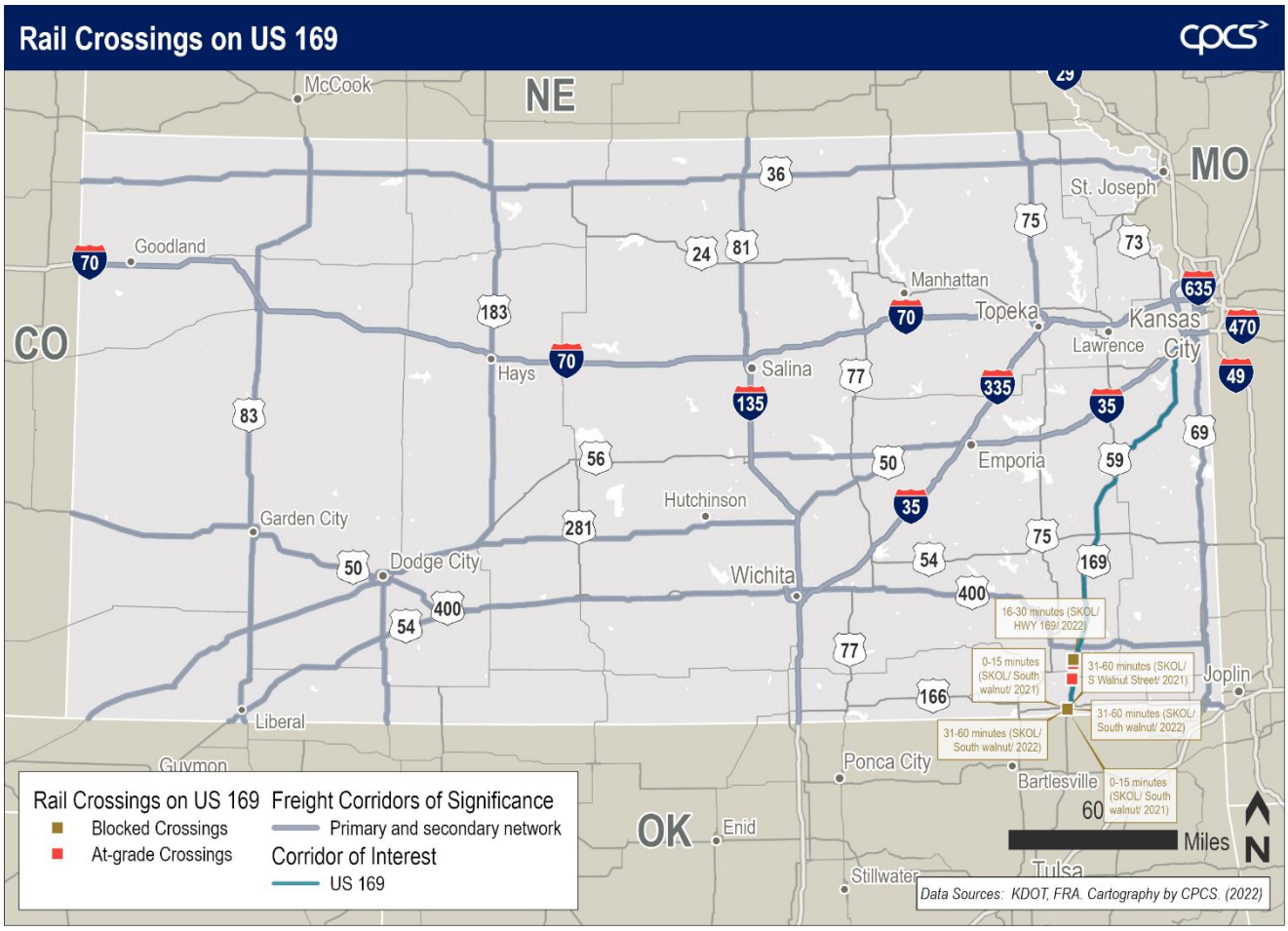
	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Fatality Counts	1.8	2.4	2.8	3.2	3

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Rail Crossings

All seven at-grade crossings on US 169 are in Montgomery County, with four crossings clustered within 700 ft in the City of Coffeyville, east of the UPRR Coffeyville Yard. There were six blocked crossing incidents recorded near or along the US 169 corridor since 2020, with five incidents recorded at the crossings cluster in the City of Coffeyville. Figure H-112 illustrates the at-grade crossings and blocked crossing incidents near or along US 169.

Figure H-112: Number of At-Grade Crossings and Blocked Crossings near US 169 (2020 – July 2022)



Transportation System Management

Oversize/Overweight Truck Routing

Between 2019 and 2021, 17,696 OS/OW permits were for vehicles traversed through US 169, accounting for 7.9 percent of the permits issued statewide. Figure H-113 lists the issued permit volume on US 169 by the six select commodity groups, of which 21.2 percent of the OS/OW container loads (43) in Kansas traveled on US 169.

Figure H-113: OS/OW Permit Volume on US 169 by Select Commodity Group (2019 - 2021)

Commodity Group	OS/OW Permit Volume	Share of KS OS/OW Permit Volume
Wind Energy Component	2,649	6.5%
Energy (Excluding Wind Energy)	1,503	6.3%
Agriculture	695	3.6%
Manufactured Goods	1,362	8.8%
Military Freight	155	6.9%
Containers	43	21.2%
All other commodities on US 169	11,289	9.2%
Total	17,696	7.9%

Source: CPCS Analysis of K-TRIPS OS/OW Data
Note: The OS/OW permit volumes include permits issued to trucks traveling on the entire US 169.

Overall, most segments of US 169 supported 500 to 1,500 OS/OW vehicles, while the portion south of Chanute in Neosho County experienced more permitted loads (1,500 – 5,000) during the three years. As illustrated in Figure H-114 most of the OS/OW loads on US 169 originated from or ended in the surrounding regions along the corridor. Other US 169 OS/OW loads started or terminated in Wichita, Emporia, Topeka, Crawford County, and Cherokee County. The Olathe and Parson regions generated and received the most permitted loads that moved through US 169. Figure H-115 shows that the OS/OW containers traveling through US 169 were transported from and to the Kansas City region and Emporia, possibly due to the rail terminals in the two locations.

Figure H-114: Origins and Destinations for OS/OW Permits Traveling on US 169 (2019-2021)

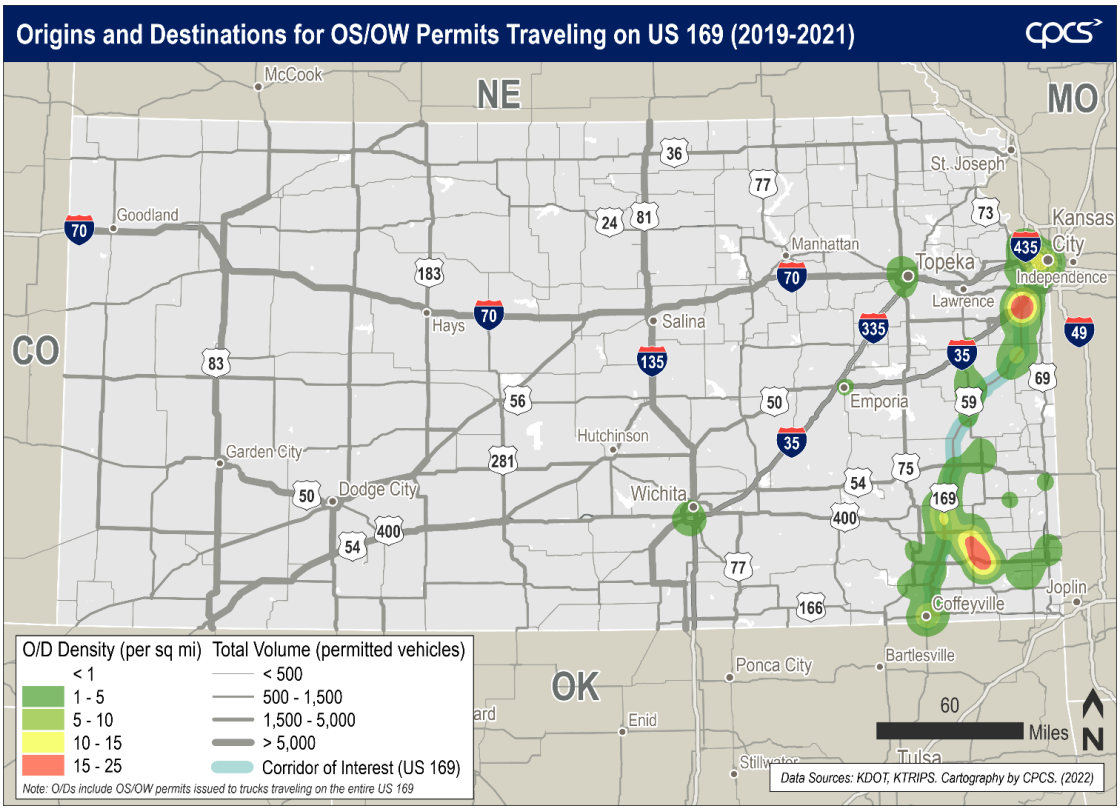
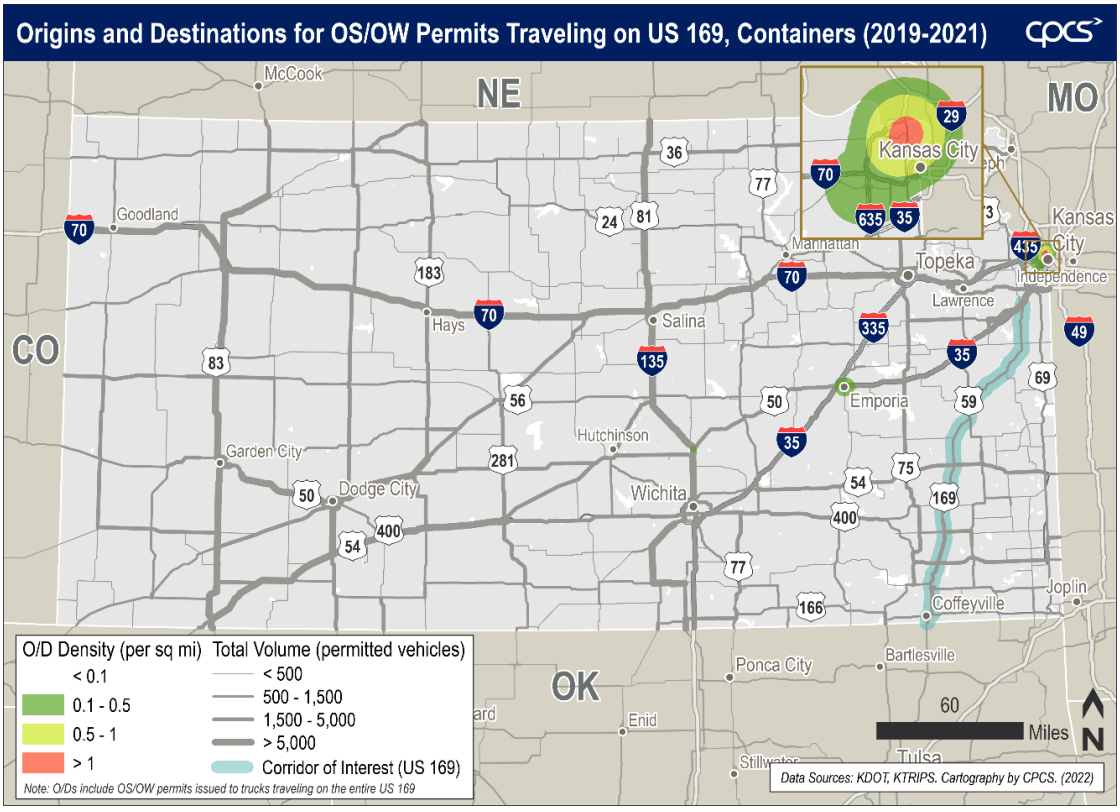


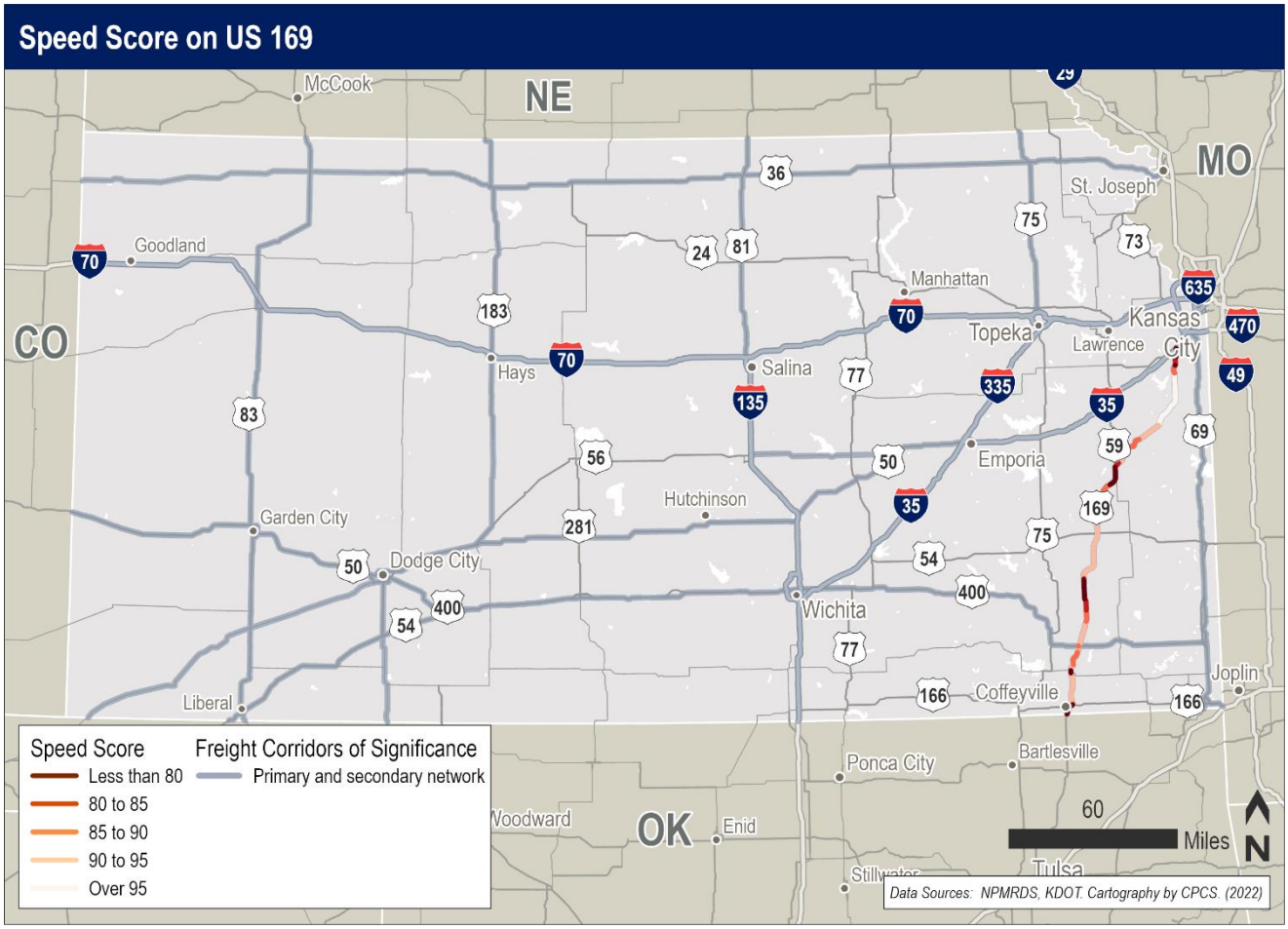
Figure H-115: Origins and Destinations for OS/OW Permits Traveling on US 169, Containers (2019-2021)



Speed Score

Speed Score is a measure that indicates the efficiency of roadway segments by comparing actual speed to the free-flow speed of each segment. The higher the Speed Score, the closer the actual speed is to the free-flow speed. The truck speeds on the majority of the US 169 corridor reached at least 80 percent of the free-flow speed in 2019, except for the portion near Thayer in Neosho County and Cherryvale in Montgomery County, shown in dark red in Figure H-116.

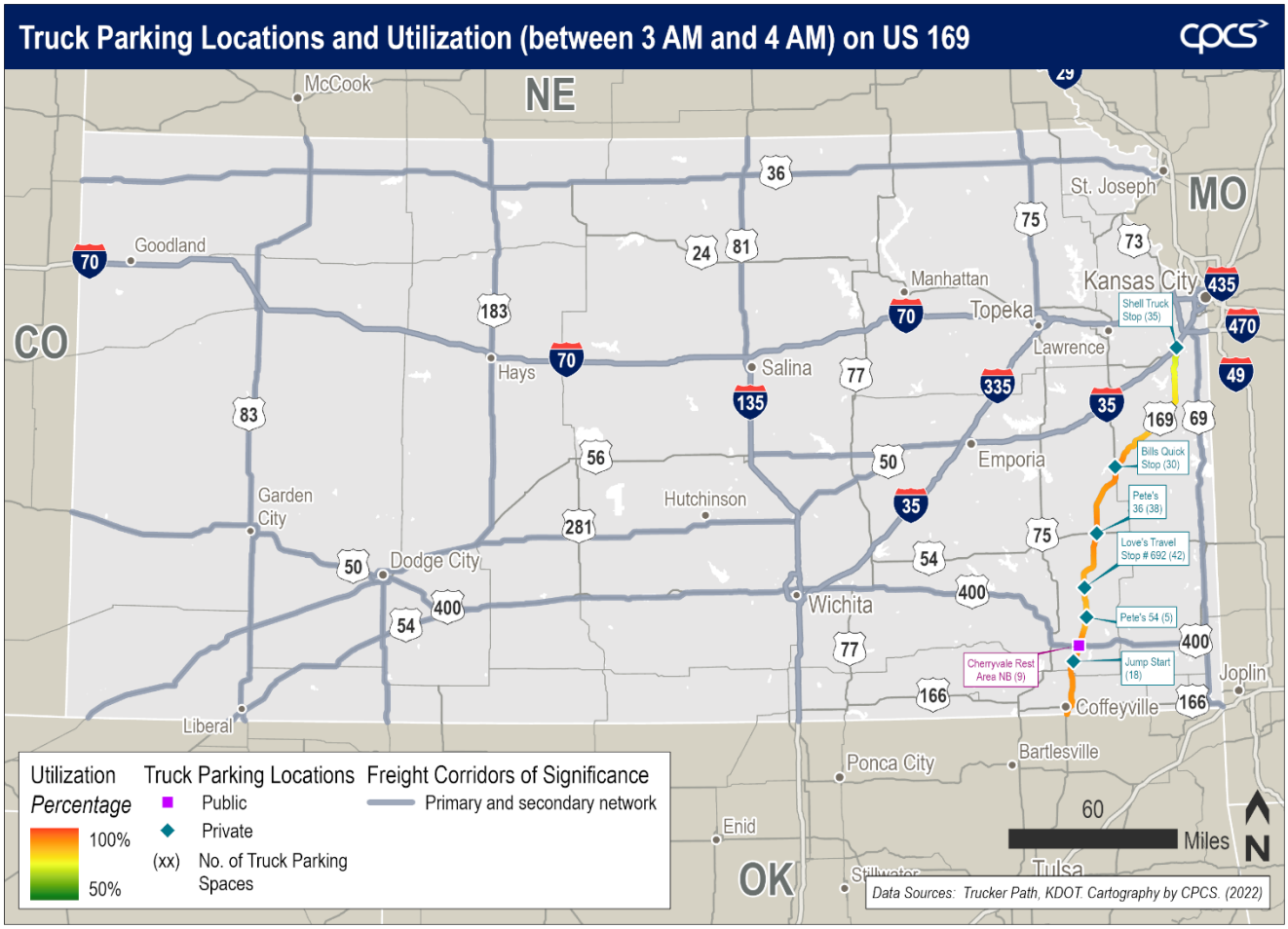
Figure H-116: Speed Score – US 169 (2019)



Truck Parking Utilization

There are seven truck parking locations – including one public rest area and six private truck stops – along US 169[35] between Olathe and Coffeyville (at the state's southern border) in Kansas, providing a total of 177 truck parking spaces along the corridor (Figure H-117). Statewide truck parking utilization peaks from 3-4 AM. During this time, truck parking utilization is relatively high along US 169 between Garnett and Cherryvale.

Figure H-117: Truck Parking Utilization on US 169



[35] Within 2 miles of the corridor.

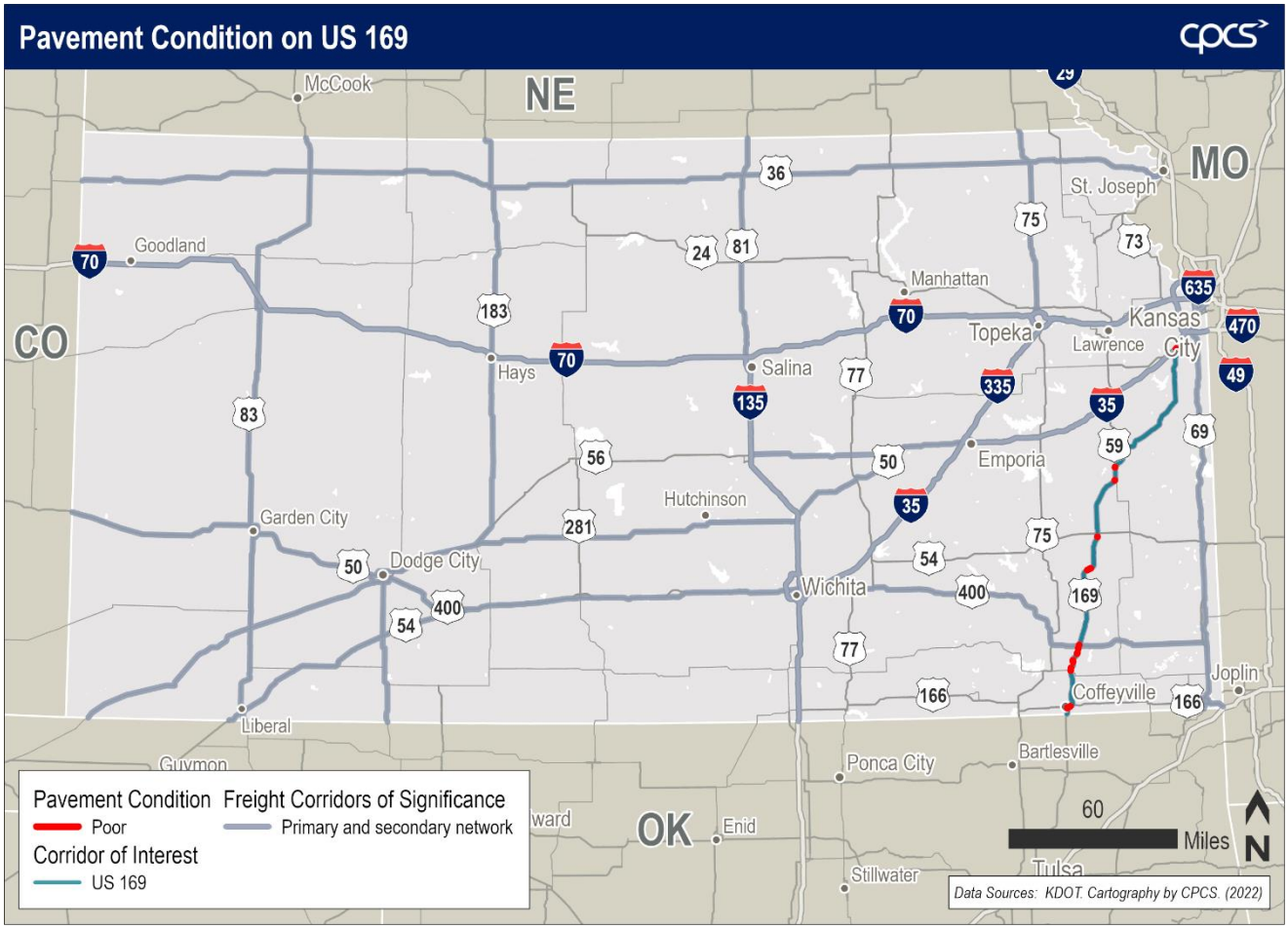
Asset Preservation

Pavement and Bridge Conditions

The pavement on the US 169 corridor is mostly in good (47.5%) or fair condition (51%) by length. Around 1.5 percent of the corridor miles in poor condition is spread throughout the corridor, with a higher concentration near the US 169 and US 400 interchange (Figure H-118).

The 84 bridges on the US 400 corridor are all well-maintained, with more than 97 percent in good condition and 2.7 percent in fair condition by deck area. The average age of those bridges is 35 years old.

Figure H-118: Pavement in Poor Condition on US 169 (2021)



Freight and Economic Vitality

Commodity Flow

The US 169 corridor experienced 28.5 million tons of goods originating in or destined for Kansas in 2017. Additionally, 0.24 million tons of truck-based freight traveled through Kansas using the US 169 corridor (Figure H-119).

For all commodity movements using the corridor, Figure H-120 lists the top five commodities traveled on the US 169 corridor in 2017, namely fuel oils (6.2 million tons), gasoline (3.5 million tons), non-metallic mineral products (2.2 million tons), coal – n.e.c. (1.9 million tons), and fertilizers (1.2 million tons). In 2045, all the top commodities, except gasoline, are expected to increase in volume.

Figure H-119: Tonnage Transported on US 169 (2017)

	Tonnage (Million)
Originate/End in Kansas	28.5
Pass-Through	0.24

Source: FAF 5 Disaggregation by CPCS.

Figure H-120: Tonnage Transported on US 169 by Top Commodity (2017 v. 2045)

Top Commodity	2017 Tonnage (Million)	2045 Forecast Tonnage (Million)
Fuel Oils	6.2	3.4
Gasoline	3.5	1.4
Non-metallic Mineral Products	2.2	3.8
Coal – n.e.c.*	1.9	2.6
Fertilizers	1.2	2.8

Source: FAF 5 Disaggregation by CPCS and FAF 5.3 Forecast.

Note: Coal n.e.c. refers to products of petroleum and coal that are not elsewhere classified, such as packaged fuel and powdered fuel.

Freight-Reliant Establishments and Employment

Freight-reliant industries include agriculture, construction, manufacturing, mining, retail trade, transportation, utility, and wholesale. Figure H-121 highlights the freight-reliant establishment clusters along the US 169 corridor, showing the most predominant cluster near Kansas City and a few secondary clusters in urban areas along the corridor.

Figure H-122 shows that 3,089 freight-reliant establishments employed 38,438 people within a 5-mile radius of the US 169 corridor in 2021, accounting for six percent of the total freight-reliant businesses and employment in Kansas. The retail trade sector had the highest number of establishments (1,095) along the corridor, followed by construction (988). When analyzed by employment, the manufacturing businesses hire the most people (12,113) along the corridor, followed by manufacturing (9,241) and wholesale (7,886).

Figure H-121: Freight-Reliant Establishments near US 169 (2021)

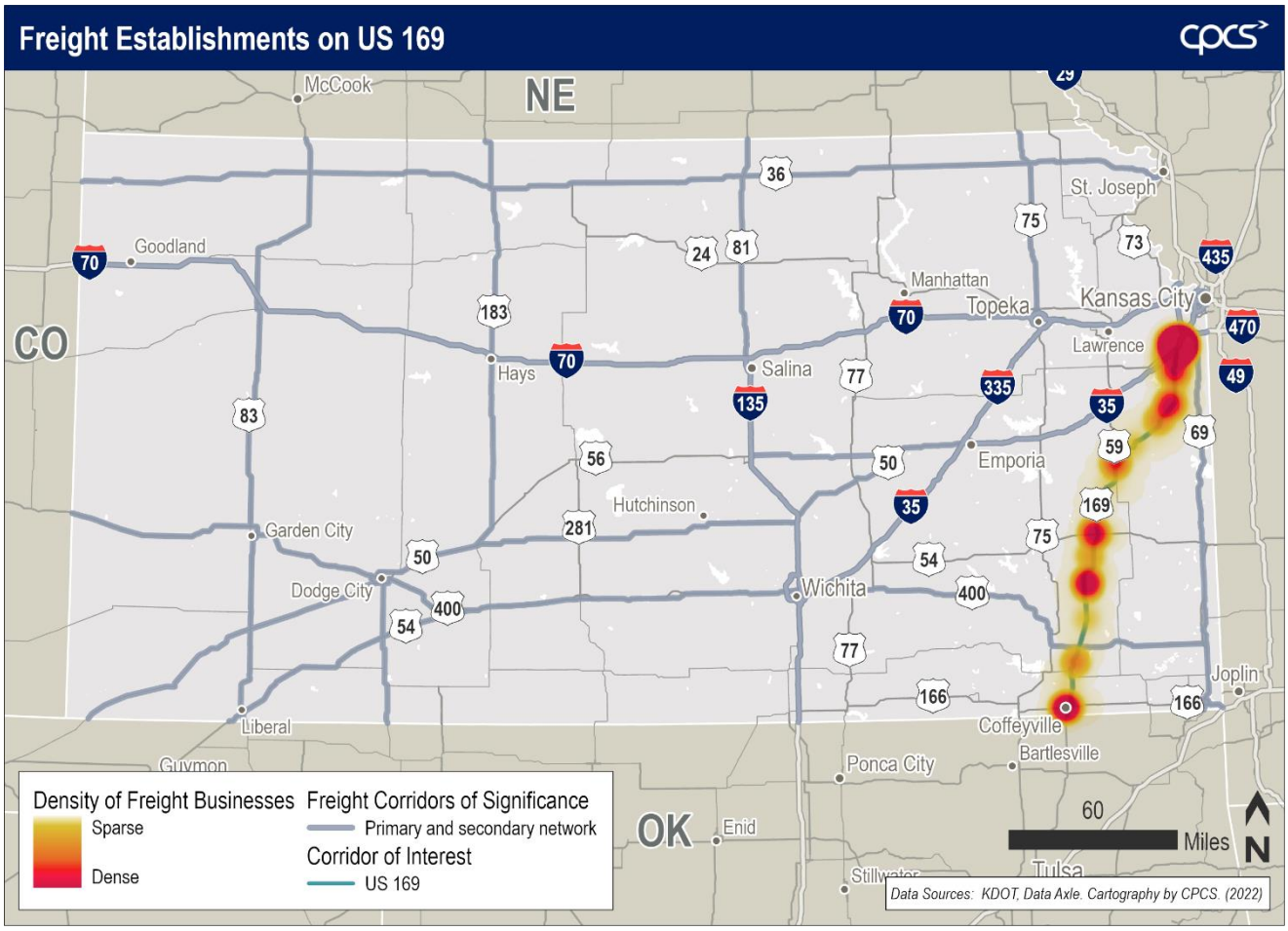


Figure H-122: Freight-Reliant Establishment and Employment Count near US 169(2021)

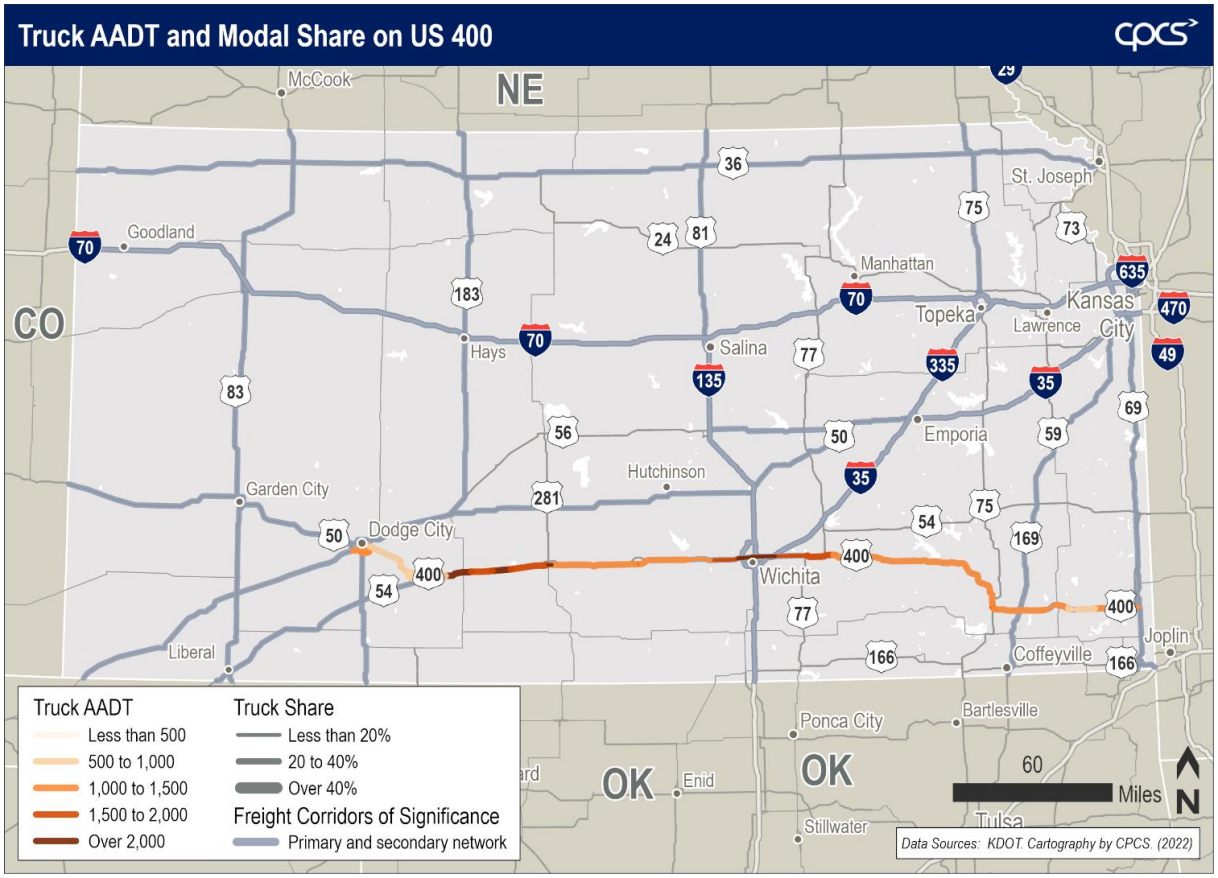
Freight-Reliant Industry	Establishment Count	% of Total Freight-Reliant Establishments in KS by Industry	Employment Count	% of Total Freight-Reliant Employment in KS by Industry
Agriculture	85	3%	490	4%
Construction	988	7%	6,351	7%
Manufacturing	326	7%	9,241	6%
Mining	25	4%	148	3%
Retail Trade	1,095	6%	12,113	6%
Transportation	277	6%	2,042	5%
Utility	18	5%	167	3%
Wholesale	275	6%	7,886	10%
TOTAL	3,089	6%	38,438	6%

Source: CPCS Analysis of Data Axle (2021)

H.4 US 400

US 400, from west of Dodge City and south of Pittsburg, is an important east-west corridor in Kansas. Stretching 326 miles in length, the corridor is part of the National Highway System (NHS) and traverses the City of Wichita, the biggest city in the State of Kansas. Historically a top route for freight movement in the state, this stretch of US 400 had average daily truck traffic of 1,400 and carried as high as 4,260 average daily trucks near Wichita in 2019. Figure H-123 shows that the truck traffic shares on the US 400 segments south of Dodge City and east of US 283 exceeded 40 percent in 2019.

Figure H-123: Truck AADT and Truck Share of Total Volume on US 400 (2019)

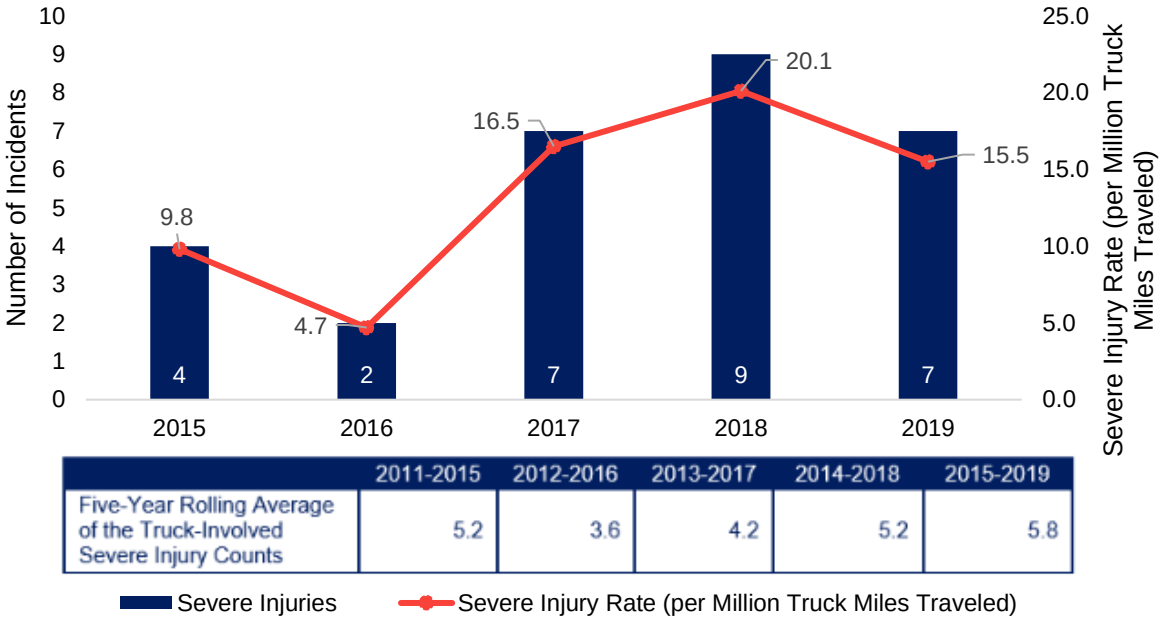


Safety and Security

Roadway

As shown in Figure H-124 and Figure H-125, truck-involved accidents caused 29 severe injuries and 31 fatalities on the US 400 corridor between 2015 and 2019. The five-year rolling average of severe injury counts temporarily decreased to below 5 (2012-2016 and 2013-2017) before eventually increasing to 5.8 (2015-2019). The five-year rolling average of fatality counts showed a steady increase, peaking at 6.2 from 2015 to 2019.

Figure H-124: Number and Rate of Truck-Involved Severe Injuries on US 400 (2015-2019)

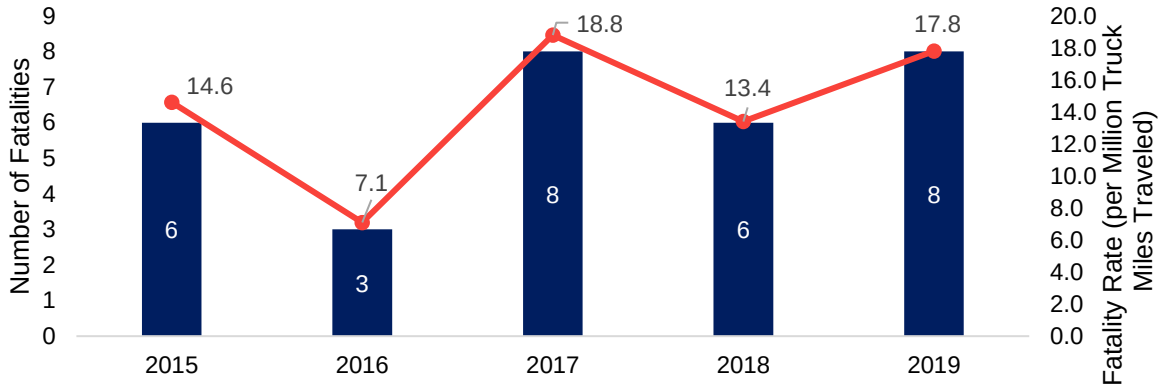


	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Severe Injury Counts	5.2	3.6	4.2	5.2	5.8

Severe Injuries — Severe Injury Rate (per Million Truck Miles Traveled)

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Figure H-125: Number and Rate of Truck-Involved Fatalities on US 400 (2015-2019)



	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Fatality Counts	3.6	3.6	5	5.2	6.2

Fatalities — Fatality Rate (per Million Truck Miles Traveled)

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Rail Crossings

Figure H-126 illustrates the seven at-grade crossings on the US 400 corridor and the two blocked crossing incidents that occurred near or along the corridor since 2020. The grade crossings include two in Ford County, two along the Cherokee/Crawford County line, and one each in Pratt, Montgomery, and Wilson County. There were two blocked crossing incidents near or along the US 400 corridor recorded on FRA's Blocked Crossing Incident Reports. One incident happened at the Ford Dodge power plant and lasted less than 15 minutes. Another incident happened three miles west of the US 400 and US 160 interchange and lasted 31-60 minutes due to a stationary train.

Figure H-126: Number of At-Grade Crossings and Blocked Crossings near US 400 (2020 – July 2022)

Transportation System Management

Oversize/Overweight Truck Routing

A total of 29,676 OS/OW permits were issued to trucks traveling on US 400 between 2019 and 2021, accounting for 13.2 percent of the total OS/OW permits issued during the three years. As shown in Figure H-127, 10,065 OS/OW permits were used for transporting wind energy components on US 400, making up almost 25 percent of the OS/OW permits that carried this commodity group statewide. Additionally, 10.7 percent and 10.3 percent of OS/OW permits that were issued for moving manufactured goods and military freight traveled on US 400.

Figure H-127: OS/OW Permit Volume on US 400 by Select Commodity Group (2019 – 2021)

Commodity Group	OS/OW Permit Volume	Share of KS OS/OW Permit Volume
Wind Energy Component	10,065	24.8%
Energy (Excluding Wind Energy)	2,408	10.1%
Agriculture	1,662	8.5%
Manufactured Goods	1,586	10.3%
Military Freight	241	10.7%
Containers	3	1.5%
All other commodities on US 400	13,711	11.1%
Total	29,676	13.2%

Source: CPCS Analysis of K-TRIPS OS/OW Data
Note: The OS/OW permit volumes include permits issued to trucks traveling on the entirety of US 400.

Figure H-128 illustrates the permitted load volume and the origins and destinations for the trucks with OS/OW permits that travel on US 400 between 2019 and 2021. The segment of US 400 between Mullinville in Kiowa County and Pratt in Pratt County experienced the most OS/OW permitted vehicles (over 5,000). Garden City and Parsons had the highest density of origins and destinations for the permitted loads. As shown in Figure H-129, most loads originating from or terminating in the two hot spots carried wind energy components. Other noticeable origins and destinations for the OS/OW loads passing through US 400 include but are not limited to Larned in Pawnee County, Wichita, the Kansas City area, and Hepler in Crawford County.

Figure H-128: Origins and Destinations for OS/OW Permits Traveling on US 400 (2019-2021)

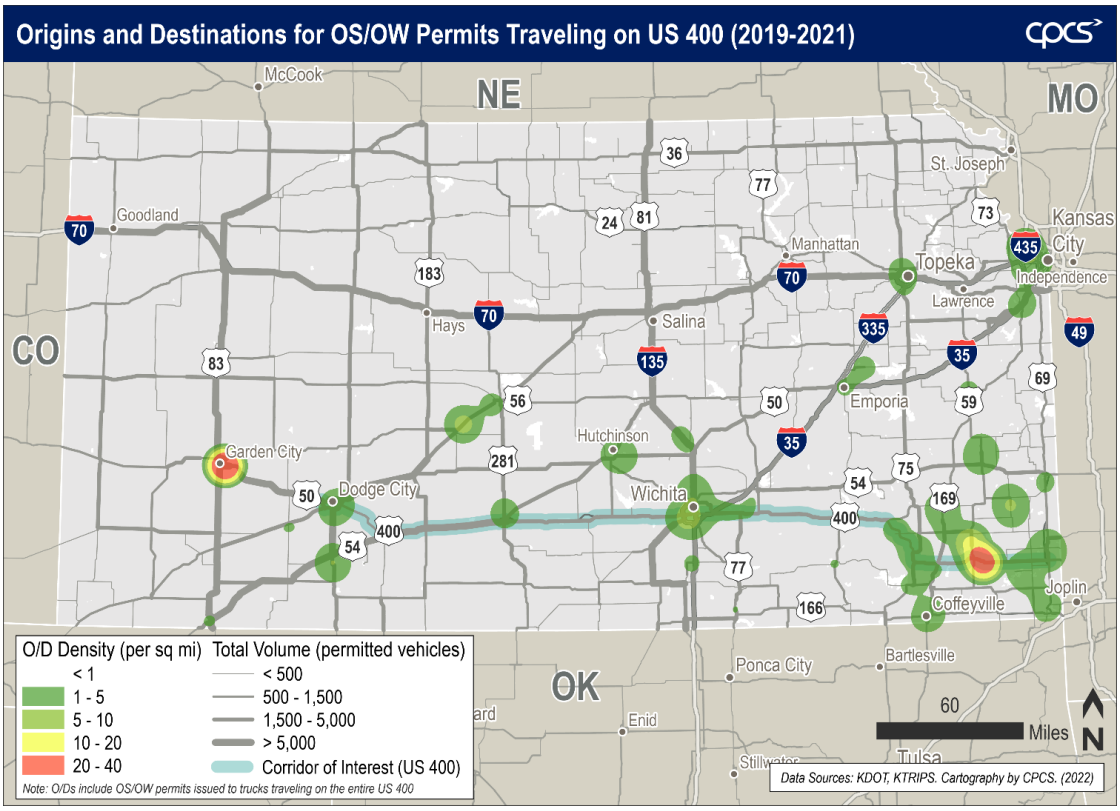
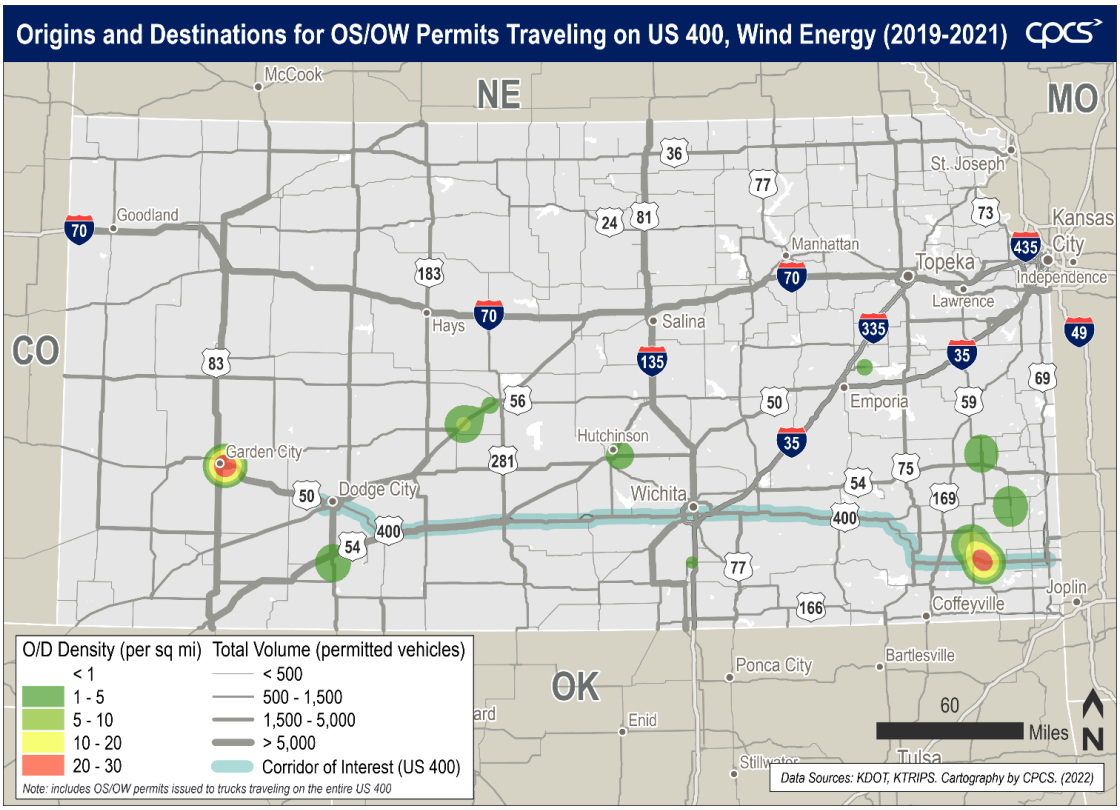


Figure H-129: Origins and Destinations for OS/OW Permits Traveling on US 400, Wind Energy (2019-2021)



Speed Score

By comparing the actual speed to the free-flow speed of each segment, the Speed Score represents the efficiency of roadways. Higher speed scores indicate the truck flows are closer to the free-flow speeds. As shown in Figure H-130, speed scores along the US 400 corridor indicated high fluctuation of actual travel speed in 2019, with high Speed Score segments immediately followed by low Speed Score segments, particularly near and to the west of Wichita.

Figure H-130: Speed Score – US 400 (2019)

Truck Parking Utilization

There are 12 truck parking locations – including two public rest areas and ten private truck stops – along US 400[36] between Dodge City and Pittsburg in Kansas, providing a total of 354 truck parking spaces along the corridor (Figure H-131). Statewide truck parking utilization peaks from 3-4 AM. During this time, truck parking utilization along US 400[37] is highest from Dodge City to Cunningham, despite the presence of five truck parking locations along this section that provide over 30 truck parking spaces each, suggesting these locations fill up quickly during overnight hours. Truck parking locations between Beaumont and the US 169/US 400 interchange also experience high utilization during this time.

Figure H-131: Truck Parking Utilization on US 400

[36] Within 2 miles of the corridor.
[37] Within 2 miles of the corridor.

Asset Preservation

Pavement and Bridge Conditions

The pavement on the US 400 corridor is mostly in good (56.8%) or fair condition (42.6%) by length. The 0.5 percent of the corridor miles in poor condition is located near Dodge City, Greensburg, Pratt, Kingman, and Wichita (Figure H-132).

The 247 bridges on the US 400 corridor are all well-maintained, with 88.3 percent in good condition and 11.7 percent in fair condition by deck area. The average age of those bridges is 36 years old.

Figure H-132: Pavement in Poor Condition on US 400 (2021)

Freight and Economic Vitality

Commodity Flow

A total of 49.3 million tons of freight originating in or destinated for Kansas moved along the portion of US 400 of interest in 2017. Another 5.6 million tons of truck-based freight passed through Kansas using the US 400 corridor (Figure H-133).

For all commodity movements using the corridor, Figure H-134 demonstrates the tonnage of the top five commodities transported by truck on the US 400 corridor. In 2017, the top five commodities by volume included coal n.e.c. (11.8 million tons), non-metallic mineral products (4.9 million tons), fuel oils (4.7 million tons), cereal grains (4.5 million tons), and gasoline (3.8 million tons). Except for fuel oils and gasoline, the volumes of the other three commodities are forecast to grow in 2045.

Figure H-133: Tonnage Transported on US 400 (2017)

	Tonnage (Million)
Originate/End in Kansas	49.3
Pass-Through	5.6

Source: FAF 5 Disaggregation by CPCS.

Figure H-134: Tonnage Transported on US 400 by Top Commodity (2017 v. 2045)

Top Commodity	2017 Tonnage (Million)	2045 Forecast Tonnage (Million)
Coal – n.e.c.*	11.8	16.2
Non-Metallic Mineral Products	4.9	6.7
Fuel Oils	4.7	2.6
Cereal Grains	4.5	4.9
Gasoline	3.8	1.6

Source: FAF 5 Disaggregation by CPCS and FAF 5.3 Forecast.
Note: Coal n.e.c. refers to products of petroleum and coal that are not elsewhere classified, such as packaged fuel and powdered fuel.

Freight-Reliant Establishments and Employment

Freight-reliant industries include agriculture, construction, manufacturing, mining, retail trade, transportation, utility, and wholesale. Figure H-135 highlights the freight-reliant establishment clusters along the US 400 corridor, showing the most predominant cluster at Wichita, and a few secondary clusters near Dodge City, Pratt, Parsons, and Pittsburg. All the freight-reliant establishment clusters along this corridor are served by at least one other US or Interstate highway.

Figure H-136 shows that 8,275 freight-reliant establishments employed 148,144 people within a 5-mile radius of the US 400 corridor in 2021, accounting for 16 percent and 25 percent of the total freight-reliant businesses and employment in Kansas, respectively, highlighting the crucial role US 400 plays in supporting Kansas's economic activities. The retail trade sector had the highest number of establishments (3,474) along the corridor, followed by construction (2,114) and manufacturing (933). When analyzed by employment, the manufacturing businesses hire the most people (65,377) along the corridor, followed by retail trade (42,360) and construction (177,03).

Figure H-135: Freight-Reliant Establishments near US 400 (2021)

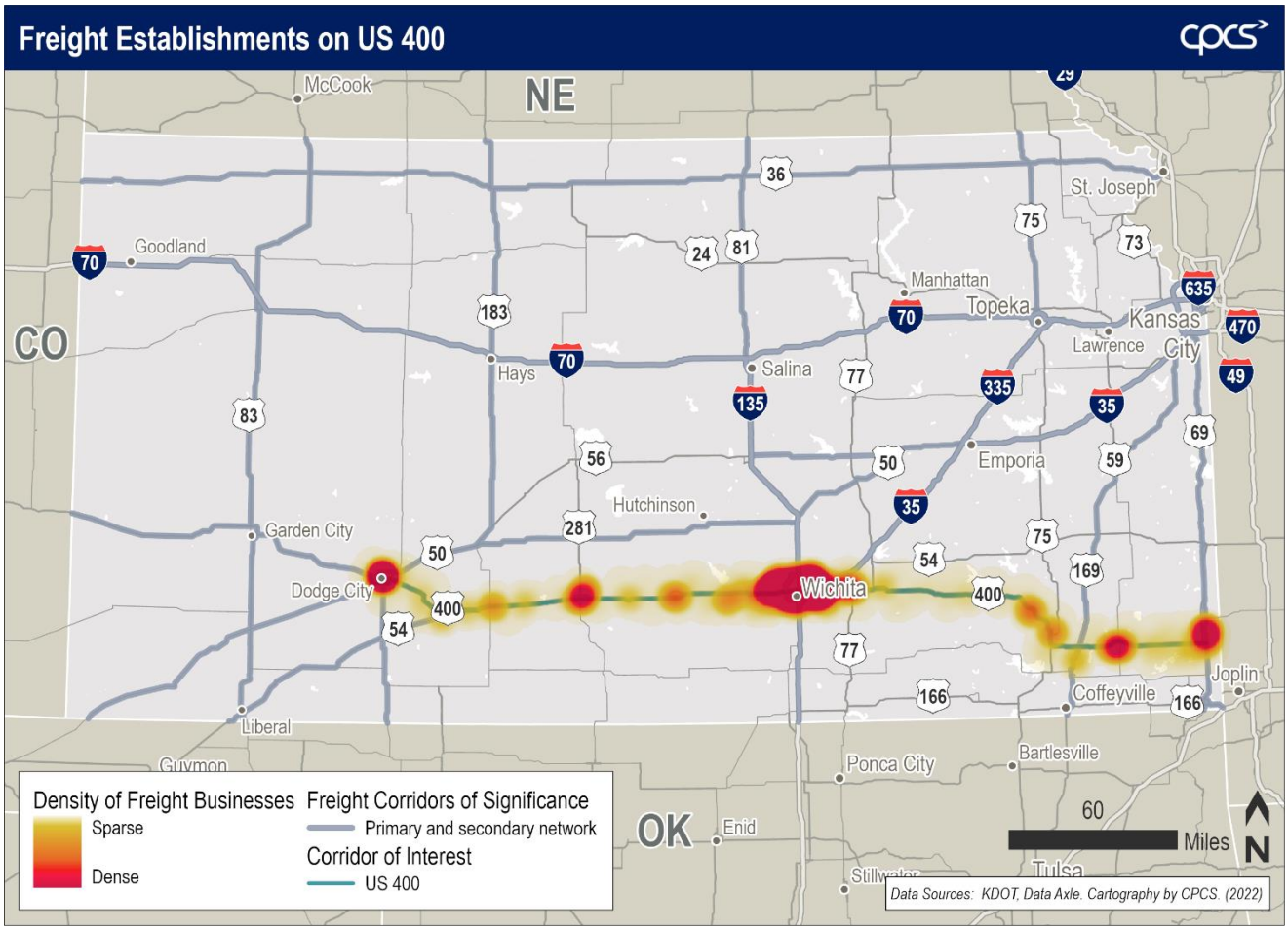


Figure H-136: Freight-Reliant Establishment and Employment Count near US 400 (2021)

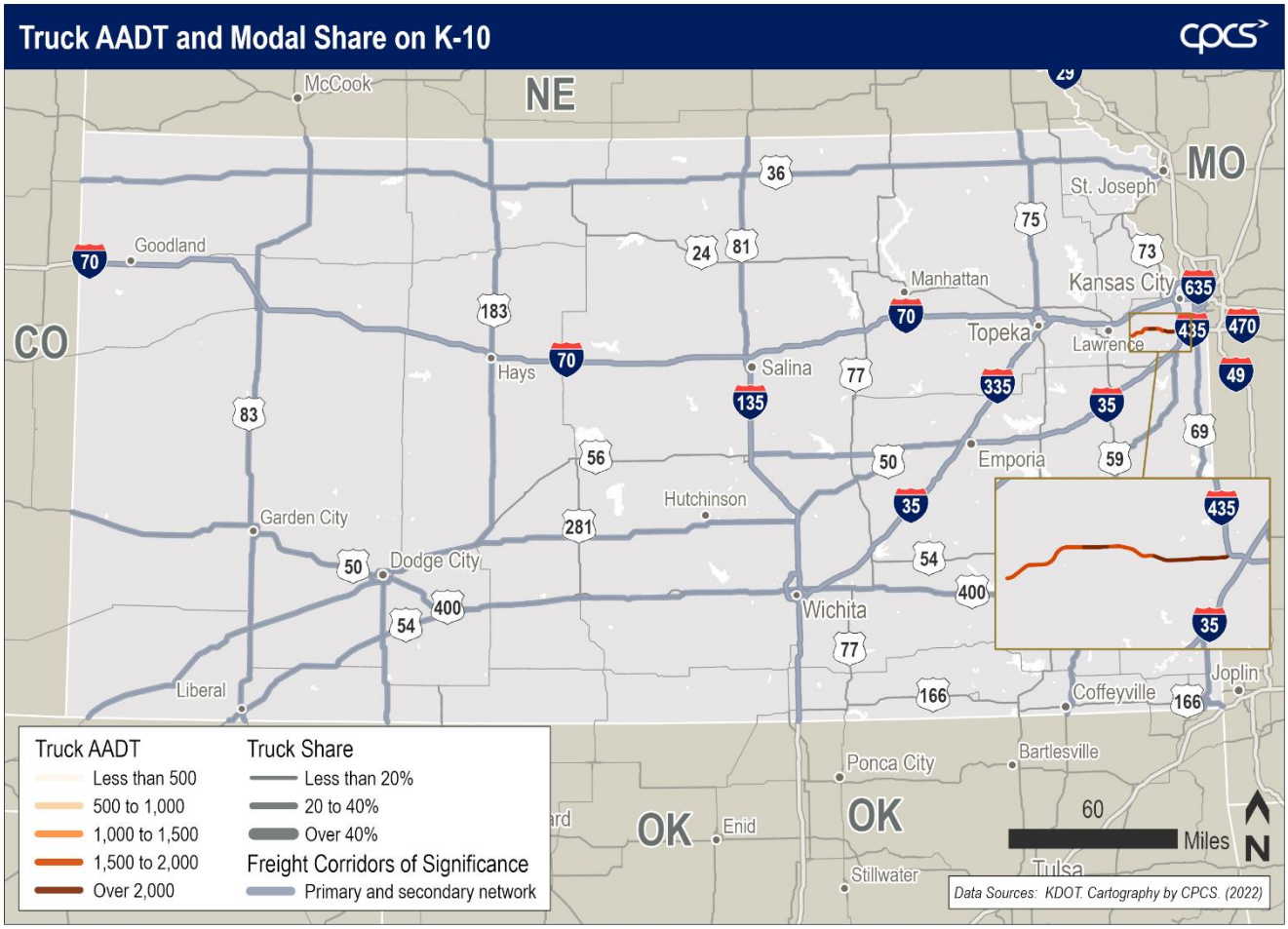
Freight-Reliant Industry	Count of Establishments Near US 83	% of Total Freight-Reliant Establishments in KS by Industry	Count of Employment Near US 83	% of Total Freight-Reliant Employment in KS by Industry
Agriculture	248	7%	919	7%
Construction	2,114	16%	17,703	21%
Manufacturing	933	20%	65,377	40%
Mining	134	21%	1,148	25%
Retail Trade	3,474	18%	42,360	22%
Transportation	599	13%	10,415	24%
Utility	35	9%	272	4%
Wholesale	738	15%	9,950	13%
TOTAL	8,275	16%	148,144	25%

Source: CPCS Analysis of Data Axle (2021)

H.5 K-10

The K-10 corridor, stretching 24 miles east of Interstate 435 is an east-west corridor that served an average of 2,250 average daily truck traffic in 2019, with the highest AADT near the east end of the corridor close to Kansas City (3,930) and the lowest AADT near the west end of the corridor (1,745). Due to the overall high traffic volume on the corridor, the truck traffic shares on this stretch of K-10 were below 40 percent in 2019 (Figure H-137). With a new Panasonic EV battery plant slated for development at the former Sunflower Army Ammunition plant south of K-10, this corridor will provide crucial access for the new jobs and freight traffic that the battery plant will bring to the area.

Figure H-137: Truck AADT and Truck Share of Total Volume on K-10 (2019)



Safety and Security

Roadway

There were no severe injuries or fatalities from truck-involved crashes on the K-10 corridor between 2015 and 2019. There was one fatality in 2019 at the K-10 and S Ridgeview Road interchange. Figure H-138 and Figure H-139 reflect the five-rolling average severe injury and fatality counts.

Figure H-138: Number and Rate of Truck-Involved Severe Injuries on K-10 (2015-2019)

	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Severe Injury Counts	0.4	0.4	0.2	0.2	0

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Figure H-139: Number and Rate of Truck-Involved Fatalities on US KS 10 (2015-2019)

	2011-2015	2012-2016	2013-2017	2014-2018	2015-2019
Five-Year Rolling Average of the Truck-Involved Fatality Counts	0	0	0	0	0.2

Source: CPCS analysis of KDOT Safety Data, 2021. Note: Truck measure includes combination trucks, single-unit trucks, and buses.

Rail Crossings

There are no at-grade rail crossings along this corridor.

Transportation System Management

Oversize/Overweight Truck Routing

Between 2019 and 2021, 15,942 OS/OW permits were issued to vehicles traveling on K-10, making up 7.1 percent of the total OS/OW permits issued in Kansas. Figure H-140 demonstrates that 23.5 percent of the OS/OW military freight loads (530) were transported through K-10 during the three years.

Figure H-140: OS/OW Permit Volume on K-10 by Select Commodity Group (2021)

Commodity Group	OS/OW Permit Volume	Share of KS OS/OW Permit Volume
Wind Energy Component	437	1.1%
Energy (Excluding Wind Energy)	1,069	4.5%
Agriculture	1,030	5.3%
Manufactured Goods	989	6.4%
Military Freight	530	23.5%
Containers	4	2.0%
All other commodities on K-10	11,883	9.6%
Total	15,942	7.1%

Source: CPCS Analysis of K-TRIPS OS/OW Data
Note: The OS/OW permit volumes include permits issued to trucks traveling on the entire K-10.

The total volume of OS/OW using K-10 is 1,500 – 5,000, as illustrated in Figure H-141. The permitted loads originated from/terminated in cities along I-70 east of US 81, including Salina, Junction City, Manhattan, Topeka, Lawrence, and Kansas City, except for Garden City. Among those locations, Topeka generated and received the most OS/OW loads that traveled through K-10. The 23.5 percent of OS/OW military freight permits allow truck movements from/to the Fort Riley area (north of Junction City and west of Manhattan) and Kansas City (Figure H-142).

Fort Riley

Fort Riley is one of the two military installations in Kansas. Located between Junction City and Manhattan, Fort Riley provides training facilities for the 1st Infantry Division as well as National Guard and Reserve units from several states. It is also home to 15,000 active-duty service members, 18,000 family members, 29,000 veterans and retirees, and 5,600 civilian employees.

Source: US Army Fort Riley https://home.army.mil/riley/index.php

Figure H-141: Origins and Destinations for OS/OW Permits Traveling on K-10 (2019-2021)

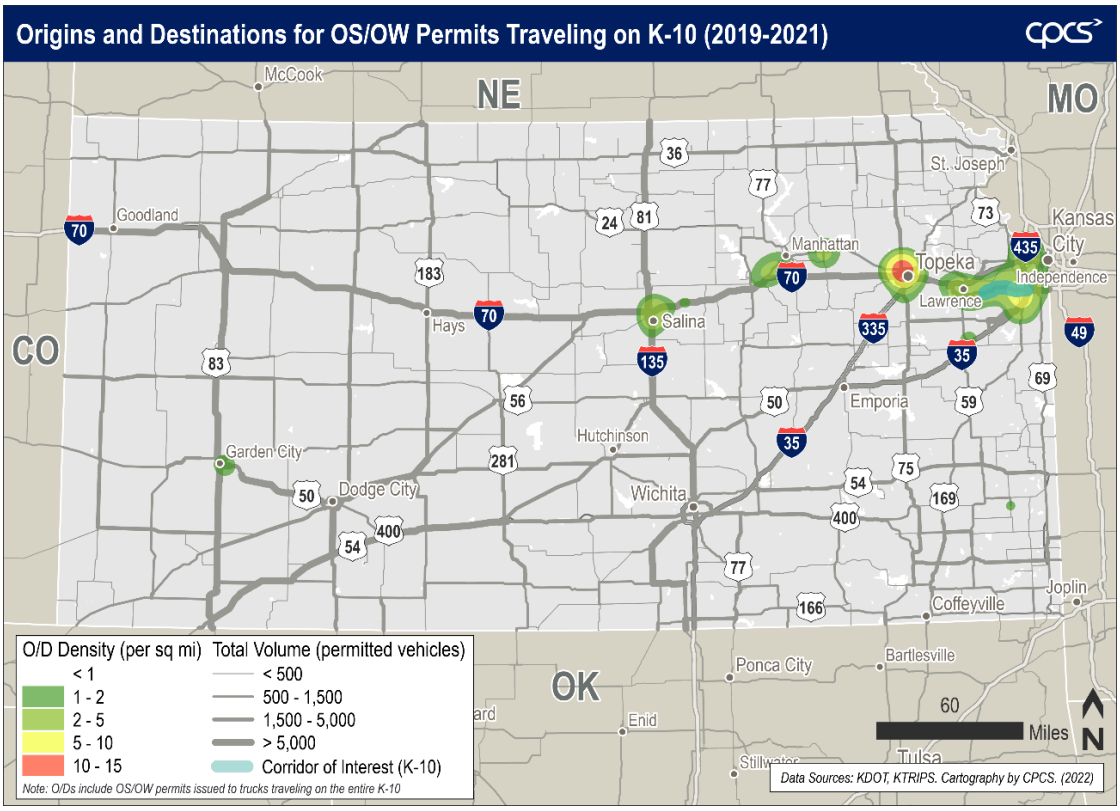
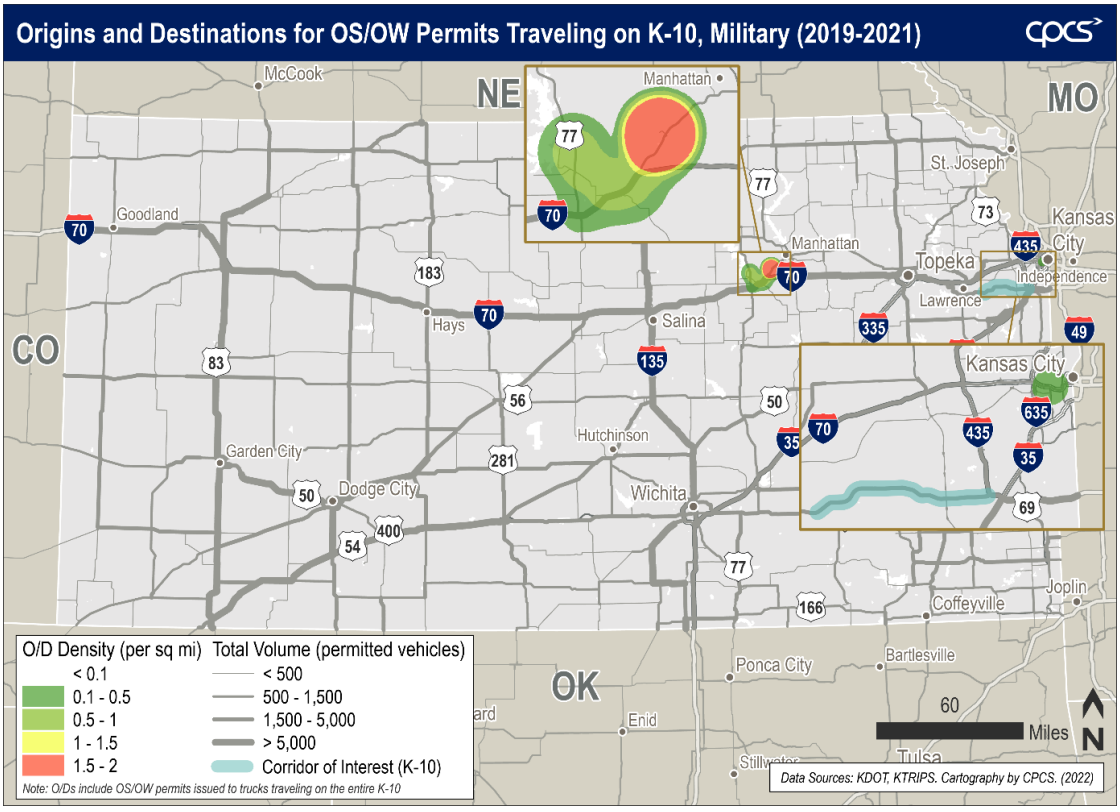


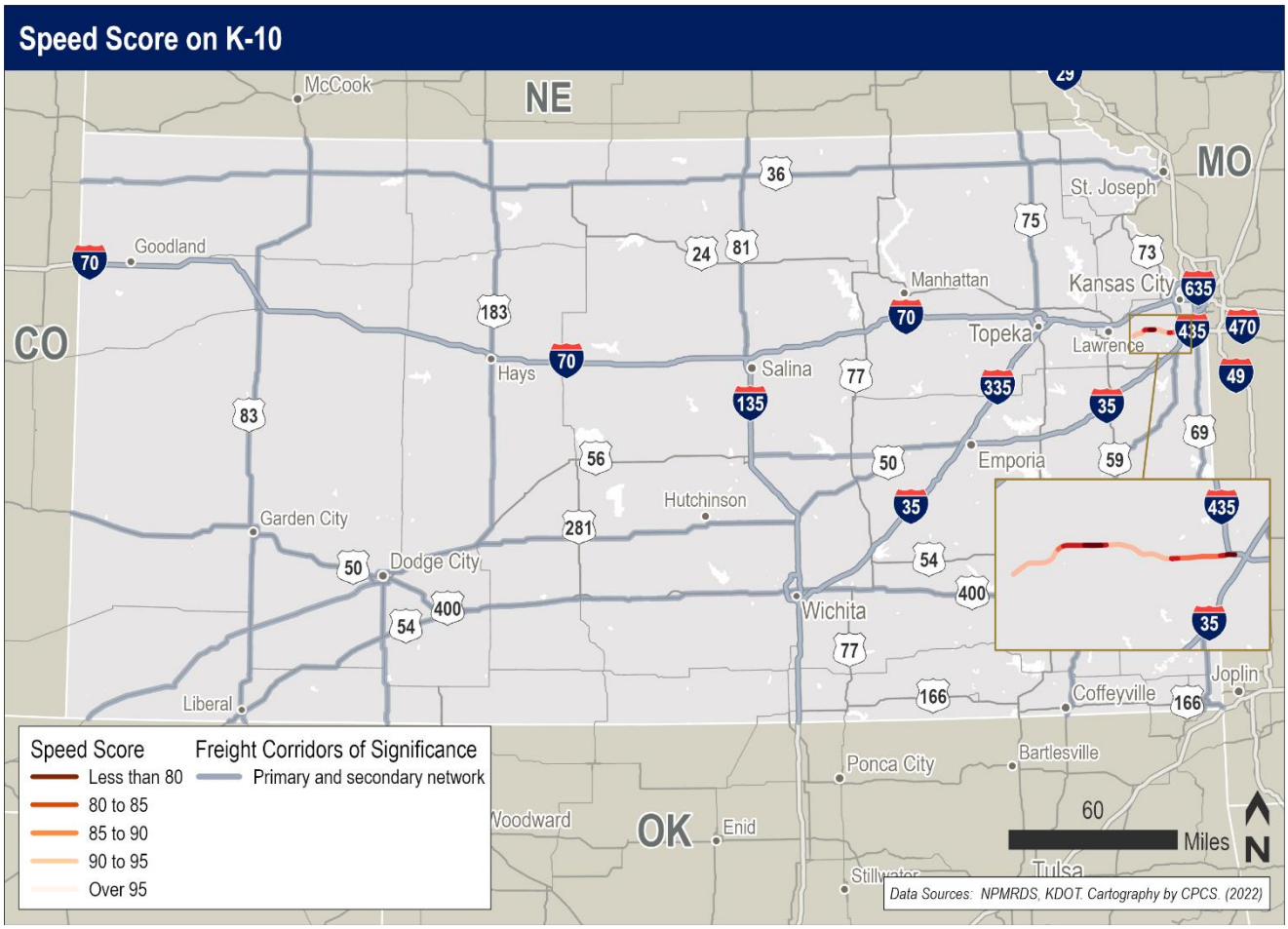
Figure H-142: Origins and Destinations for OS/OW Permits Traveling on K-10, Military (2019-2021)



Speed Score

Speed Score is an effective indicator of roadway efficiency by comparing actual speed to the free-flow speed of each segment. The higher the Speed Score, the closer the actual speed is to the free-flow speed. The truck speeds on the majority of the K-10 corridor reached at least 80 percent of the free-flow speed in 2019, except for the portion near the interchange with Interstate 435 and the portion between Lexington Avenue and Kill Creek Road, shown in dark red in Figure H-143.

Figure H-143: Speed Score – K-10 (2019)



Truck Parking Utilization

There are no truck parking locations along the K-10 corridor.

Asset Preservation

Pavement and Bridge Conditions

The pavement on the K-10 corridor is all in good (80%) or fair condition (20%) by length. This stretch of K-10 doesn't have poor pavement condition issues. The 31 bridges on the US 400 corridor are all well-maintained, with more than 39.1 percent in good condition and 60.9 percent in fair condition by deck area. The average age of those bridges is 45 years old.

Freight and Economic Vitality

Commodity Flow

A total of 36.8 million tons of Kansas-based freight moved on the KS 10 corridor in 2017. In addition, the KS 10 corridor supported 0.05 million tons of goods passing through Kansas (Figure H-144).

For all commodity movements using the corridor, Figure H-145 shows the top five commodities transported on the KS 10 corridor by volume in 2017 and their forecast volumes in 2045. Those commodities include non-metallic mineral products (5.5 million tons), natural sands (3.2 million tons), cereal grains (2.7 million tons), waste/scrap (2.5 million tons), and mix freight (2.1 million tons). All five top commodities are expected to grow in volume in 2045.

Figure H-144: Tonnage Transported on KS 10 (2017)

	Tonnage (Million)
Originate/End in Kansas	36.8
Pass-Through	0.05

Source: FAF 5 Disaggregation by CPCS.

Figure H-145: Tonnage Transported on KS 10 by Top Commodity (2017 v. 2045)

Top Commodity	2017 Tonnage (Million)	2045 Forecast Tonnage (Million)
Non-Metallic Mineral Products	5.5	7.4
Natural Sands	3.2	5.5
Cereal Grains	2.7	2.9
Waste/Scrap	2.5	3.1
Mixed Freight	2.1	3.4

Source: FAF 5 Disaggregation by CPCS and FAF 5.3 Forecast.

Freight-Reliant Establishments and Employment

Freight-reliant industries include agriculture, construction, manufacturing, mining, retail trade, transportation, utility, and wholesale. Figure H-146 highlights the freight-reliant establishment clusters along the K-10 corridor, showing the most predominant cluster near Kansas City. K-10 provides convenient access for these businesses to access Interstate 435 and Interstate 35.

Figure H-147 shows that 1,690 freight-reliant establishments employed 19,194 people within a 5-mile radius of the K-10 corridor in 2021[38], accounting for three percent of the total freight-reliant businesses and employment in Kansas. The construction sector had the highest number of establishments (614) along the corridor, followed by retail trade (552). When analyzed by employment, the manufacturing businesses hire the most people (6,998) along the corridor, followed by construction (4,304) and wholesale (3,776).

[38] Not including businesses more directly served by Interstate 435 and Interstate 35.

Figure H-146: Freight-Reliant Establishments near K-10 (2021)

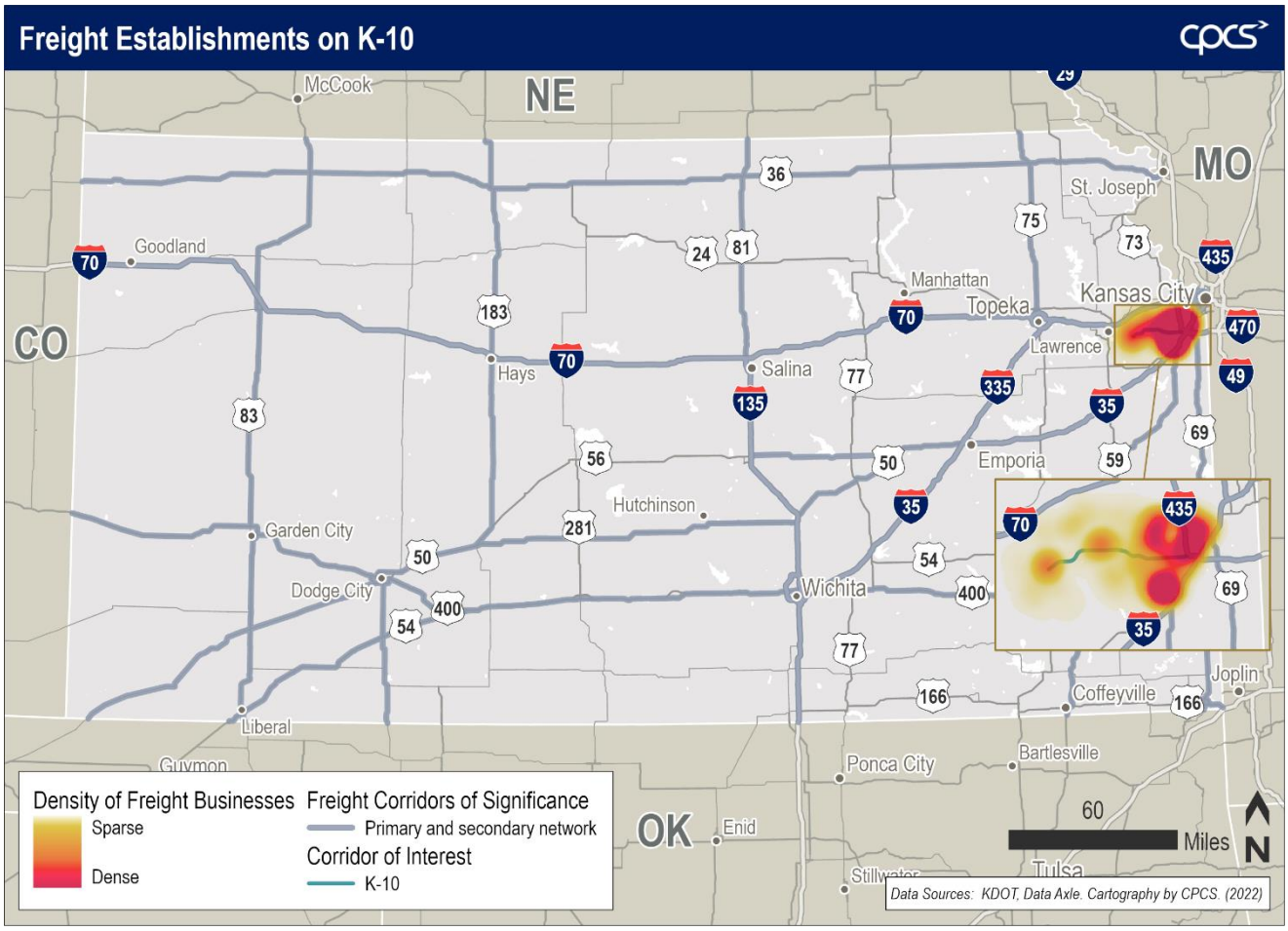


Figure H-147: Freight-Reliant Establishment and Employment Count near K-10 (2021)

Freight-Reliant Industry	Establishment Count	% of Total Freight-Reliant Establishments in KS by Industry	Employment Count	% of Total Freight-Reliant Employment in KS by Industry
Agriculture	48	1%	243	2%
Construction	614	5%	4,304	5%
Manufacturing	143	3%	2,715	2%
Mining	10	2%	101	2%
Retail Trade	552	3%	6,998	4%
Transportation	140	3%	800	2%
Utility	3	1%	257	4%
Wholesale	180	4%	3,776	5%
TOTAL	1,690	3%	19,194	3%

Source: CPCS Analysis of Data Axle (2021)

Appendix I. Freight Trends in Kansas

I.1 STEEP Factors and Trends

"STEEP" is a commonly used analytic framework for evaluating different external factors that may affect an organization including Social, Technological, Environmental, Economic, and Political considerations. In the context of this State Freight Plan, these five factors are considered in terms of their influence on freight origins, destinations, routing, and commodity loads and therefore in determining future freight system needs, issues, and opportunities.

Figure I-148: STEEP Trends Impacting Kansas' Freight System

STEEP trends shape freight both directly and indirectly via four pressure points: freight origins, freight destinations, freight routing, and freight volume/value.

- **Freight Origins:** Types of raw materials and other commodities and where they originate.
- **Freight Destinations:** Types of raw materials and other commodities and where they are destined, for consumption or other uses.
- **Freight Routing:** How (mode choice, connections) and where (pathway) goods are routed.
- **Freight Volume and Value:** The volume and value of commodities moved on the freight system.

The impacts of the STEEP trends are summarized in Figure I-149 and are used to inform planning scenarios. The remainder of this Appendix provides an overview of the STEEP trends impacting Kansas.

Figure I-149: Summary of STEEP Impacts

Social	Technological	Environmental	Economic	Political
Impact on Freight Origins				
• Land-use patterns that develop to accommodate the population can change the economics of where materials are stored or accessed. • A growing population will require more goods and in turn, broader markets supplying goods. • An increase in income may result in a demand for higher-value goods.	• As new technology is adopted, the demand for raw materials may change. Battery-electric vehicles, for example, require lithium components for batteries. • If automated or electric freight vehicles are adopted, transportation costs may decrease along CAV and EV corridors. Manufacturers and consumers may choose raw materials and goods from locations connected via CAV or EV corridors.	• As resiliency threats grow, locations for material storage or production may be relocated to avoid risks such as flooding. • If certain routes are less resilient and as a result less reliable, costs to move freight along those routes may increase resulting in higher costs to ship.	• More efficient additive manufacturing (3D printing) will have impacts on the manufacturing supply chain including a higher demand for raw materials. • The health of the agriculture industry and food processing industries impacts the supply of farms and food goods. • The introduction of new advanced manufacturing facilities potentially with automation and/or 3D printing in new locations on larger footprints may require raw materials from new locations.	• Sourcing patterns for manufacturers may change with fluctuations in international trade relations (i.e., if tariffs are added or removed relevant to raw materials). • A continued focus on growing industries like advanced manufacturing, energy, food production, and agriculture will increase demand for the raw materials needed for these industries potentially to new locations.
Impact on Freight Destinations				
• Following population growth, final miles destinations will migrate towards where end consumers are located. • Rural connections will still be important for key industries like agriculture and energy as well as those aging in rural areas or the institutions that serve an aging population.	• If technological trends, such as CAVs and remote work, influence people to live in areas served by broadband, technology can impact destinations. • If technology allows for more efficient manufacturing and transportation, more raw materials may be moved to existing manufacturing facilities than today, and freight may move further distances for less cost.	• Businesses and final consumers may adjust their locations to avoid resiliency risks such as flooding impacting the destinations of freight. • A lack of resiliency or redundancy in the transportation system may result in businesses or residents migrating to other cities, towns, or states.	• Changes to consumer preferences and demand can introduce new trading partners. • As other states deal with extreme weather events, Kansas industries may serve more locations/have greater reach. • Continued growth in key industries such as agriculture, advanced manufacturing, and energy may result in Kansas industries serving more diverse locations.	• The number and scale of destinations can grow, shrink or shift based on trade agreements and tariffs. • Focus on the growth of key industries may broaden the diversity of destinations served by Kansas industries. • Expansion to other industries or types of goods manufactured may impact the destinations served.

Social	Technological	Environmental	Economic	Political
Impact on Freight Routing				
• Warehouse facilities may locate further from urban centers as urban areas sprawl to accommodate growing populations. • Truck routing may adjust to avoid increasing congestion in urban areas. • There may be increased demand (potentially from new locations) for goods serving institutions (such as healthcare) for an aging population in rural areas.	• Smart technology helps ensure efficient routing through smart corridors and other transportation technology. • Last-mile delivery trips can be fulfilled by drones. • Growth in e-commerce moves goods from stores to warehouses before reaching the consumer. • Shippers using EVs or CAVs will choose routes along enabling corridors.	• The number of routing options expands to build redundancy and resiliency into shipping networks. • Shippers may choose to avoid transportation segments vulnerable to weather impacts.	• Changes to consumer demand and preferences or businesses attracted to Kansas can open or alter markets for existing industries.	• Routing changes due to political trends are uncertain.
Impact on Freight Commodity Volume and Value				
• More consumers from a growing population will increase commodity volume. • Increasing consumer incomes will also result in additional spending potentially on higher-valued goods.	• Autonomous and electric trucking makes truck freight more cost-competitive with rail freight and brings more goods to the roadway.	• Responding to and preparing for transportation system resiliency to threats creates costs that will be passed onto producers, shippers, and consumers.	• Continued aerospace and potentially other manufacturing (through automation and 3D printing) success increase overall commodity value. • Manufacturing and agriculture growth increase overall commodity volume.	• The volume of goods increases as more goods are produced for both international trade and domestic trade through new trade partnerships and a focus on economic growth.

Social Factors & Trends

Demographics

Kansas' demographic trends could alter future supply and demand patterns for goods, particularly in terms of the type and quantity of goods coming to, from, or moving within the state. This in turn could affect where freight transportation improvements are needed, the type of improvements that will best serve state needs, and the sustainability of revenues to pay for maintaining and improving freight transportation.

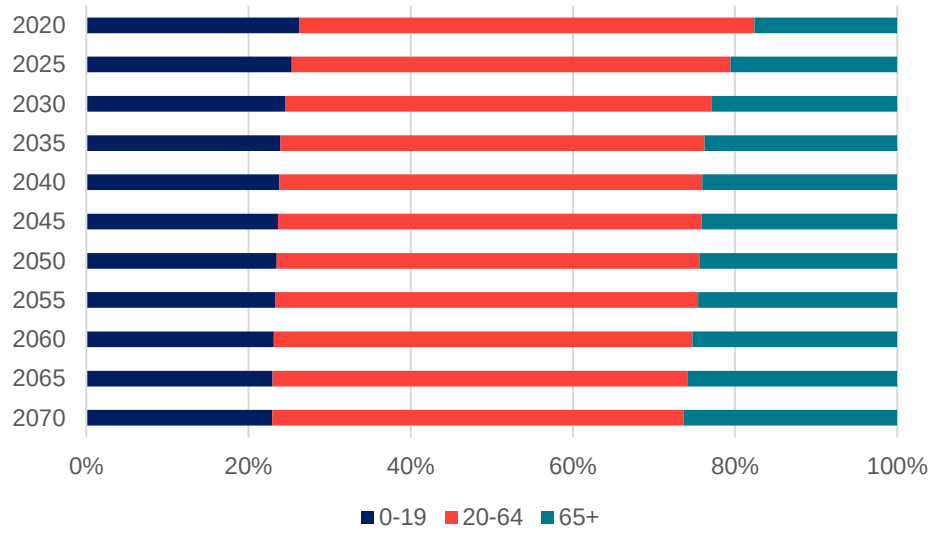
Population

- **Population Growth –** According to state population estimates, Kansas has a population of 2.9 million people, which reflects a growth rate of 0.39 percent annually since 2010. According to population projections from the Kansas Population Forecast by Wichita State University's Center for Economic Development and Business Research (CEDBR)[39], the state's population is projected to continue growing at an annual rate of 0.43 percent between 2020 and 2070. Kansas' total 2044 population is projected to be 3.46 million. This expected growth rate is slower than the expected growth for the United States as a whole.
- **Population Distribution –** In the last decade, Kansas population growth has been strongest in the northeast corner of the state; Pottawatomi County, Geary County, Douglas County, and Johnson County experienced over one percent growth annually.[40] By 2045 over 43 percent of Kansans are expected to live in either Sedgwick County (~614,000) or Johnson County (~887,000). Population is expected to be clustered around Kansas City, Topeka, Wichita, Manhattan, and Lawrence. Rural areas are experiencing and will continue to experience population decline.
- **Population Age –** While the overall population of Kansas will grow slowly, the number of older Kansans – in line with national trends – is expected to jump upward as people live longer and population growth slows. According to the CEDBR population projections, Kansas' population will also continue to age. Today 15 percent of the population is over the age of 65; by 2045, CEDBR predicts that those 65 and older will make up 24 percent of the state's population, and this percentage will grow to 26 percent by 2070. Figure I-150 illustrates this trend. Population aging will be more pronounced in rural areas where all age groups except for those 65 and older will decrease. An aging population creates unique mobility and service challenges. Medical, health, and human services and the goods that keep those services running must be available throughout areas with an aging population. As older Kansans retire from the workforce, the number of workers will decrease, particularly in rural areas of the state where the working-age population is declining.

[39] Wichita State University, Center for Economic Development and Business Research, (2016). Forecast: Kansas Population. Retrieved 07 25, 2021, from Kansas Economy: https://kansaseconomy.org/local-forecasts/kansas-population-forecast

[40] US Census, Estimates of the Components of Resident Population Change for Counties, April 1, 2010 to July 1, 2019;

Figure I-150: Population Projections by Age Group



Source: Wichita State University, Center for Economic Development and Business Research, Population Forecasts, 2015-2070

Education and Income

A more educated workforce correlates with higher earnings and lower unemployment rates.[41]

- **Educational Attainment Levels –** The proportion of Kansans with a higher education qualification is steadily increasing. Nationally, this trend is expected to continue over the next decade; for example, three percent more bachelor's degree awards are projected by 2028/29 compared to 2016/17, while the number of master's degree awards is projected to increase by four percent over the same period.[42] If Kansas follows national projections for educational attainment levels, the state may see more residents with higher incomes and a corresponding increase in consumer spending. Experts are concerned, however, that a more educated workforce could cause a shortfall in skilled technical workers. According to the National Academies of Sciences, Engineering, and Medicine, a shortfall of 3.4 million skilled technical workers is expected nationally by 2022.[43] Several higher education institutions in Kansas, including Kansas State University, Wichita State University, and the University of Kansas are investing in specialized training and research programs to support needs in the manufacturing sector. These programs will help preserve a mix of educated and skilled workers.
- **Household Income Growth –** Median household income in Kansas was $59,597 in 2019. Growth in household income was 2.8 percent between 2010 and 2019.[44] Among the highest-paying occupations statewide are those in the medical field, including anesthesiologists, psychiatrists, and surgeons, earning around $300,000 annually or more in 2018. Workers in the hospitality and food and beverage industries are among the workers with the lowest wages statewide at around $18,000 per year. [45]

[41] US Bureau of Labor Statistics, (June 2021). Education Pays, 2020. https://www.bls.gov/careeroutlook/2021/data-on-display/education-pays.htm
[42] Institute of Education Sciences (2020), Projections of Education Statistics to 2028, (2020), https://nces.ed.gov/pubs2020/2020024.pdf.
[43] National Science Board, The Skilled Technical Workforce: Crafting America's Science & Engineering Enterprise, (2019) https://www.nsf.gov/nsb/publications/2019/nsb201923.pdf.
[44] US Census, QuickFacts, Kansas, https://www.census.gov/quickfacts/KS.
[45] Kansas Department of Labor, Kansas Labor Information Center, Labor Market Data, Income & Wages 2021, https://klic.dol.ks.gov/vosnet/Default.aspx.

Employment

A shortage of workers or a mismatch between available workers and needed skills can slow economic growth and/or hinder economic performance. Additionally, higher unemployment decreases consumer spending. Freight demand is greatest when economies are thriving and consumers are spending.

- **Labor Force Changes:** Kansas' employed population[46] has increased over the past decade, growing from 1.40 million in 2010 to 1.45 million in 2021, while the labor force has remained steady at 1.50 million.[47] Meanwhile, the state's unemployment rate has also declined, from 7.0 in 2010 to 3.2 in 2021, despite an increase to 5.9 in 2020 due to COVID-19. Kansas' unemployment rate has remained below the US's unemployment rate, which stood at 5.3 in 2021.48 However, Kansas' population is expected to age, with seniors projected to make up more than 25 percent of the state's population by 2070. This will reduce the state's labor force – the Kansas Department of Labor's 2020 annual Economic Report notes the size of the state's labor force may erode as the population under 25 shrinks as a result of a declining birth rate and the out-migration of 20 to 24-year-olds.[49] Additionally, workforce challenges during the COVID-19 pandemic caused industries that traditionally required dense proximity or contact (e.g., food services, manufacturing) to turn to automation (e.g., robotic manufacturing technology, self-serve customer kiosks) to safely provide goods and services during the COVID-19 pandemic.[50] This impact on labor dynamics has accelerated automation in some industries – not just in Kansas, but nationwide and globally. It is anticipated that automation will not completely replace human labor but may require a more technically trained workforce.
- **Trucking Industry Labor Shortage:** Since the 1980s, the trucking industry has faced a labor shortage, especially for long-haul services. As with the larger labor market, an aging population will cause large changes to the trucking industries. With many operators nearing retirement, it is estimated that the trucking industry will need to hire 1.1 million new drivers (110,000 per year) through 2030.[51]
- **Job Growth:** The Kansas Department of Labor projects that total jobs in all industries will increase by 2.6 percent from 2018 to 2028 with the greatest percentage growth in the professional, scientific, and technical services industry and the highest absolute growth in health care and social assistance. Transportation and warehousing job numbers are projected to grow by 9.8 percent from 2018-2028. Jobs in goods-producing industries are projected to decline at a rate of 0.1 percent per year over the same period.[52]

Technological Factors & Trends

Mass adoption of new technology can profoundly alter how the world works. For instance, twenty years ago, no one owned a smartphone and fewer than half of adults across the US had access to the Internet. Just like changes in demographics, the diffusion of new transportation technology in Kansas

[46] People are considered employed if they did any work at all for pay or profit during the survey reference week. This includes all part-time and temporary work, as well as regular full-time, year-round employment (as defined by BLS).
[47] Source: Bureau of Labor Statistics (BLS) Local Area Unemployment Statistics (LAUS), Labor force data by county. Analysis by CPCS, 2022.
[48] Source: Bureau of Labor Statistics (BLS) Local Area Unemployment Statistics (LAUS), Labor force data by county. Analysis by CPCS, 2022.
[49] US Census, American Community Survey and Wichita State University, Center for Economic Development and Business Research, Population Forecasts, 2015-2070, (2019), https://www.cedbr.org/forecast-blog/kansas-population; Kansas Department of Commerce, "2020 Annual Report", (Topeka, KS: 2021), Retrieved July 25, 2021, from https://issuu.com/kdcmarketing/docs/commerce_annual_report-pageview?fr=sZWNiODI5NDgzODM
[50] McKinsey Global Institute, "The Postpandemic economy: The Future of work after COVID-19", (February 2021), https://www.mckinsey.com/~/media/mckinsey/featured%20insights/future%20of%20organizations/the%20future%20of%20work%20after%20covid%2019/mgi_the%20future%20of%20work%20after%20covid-19_report-f.pdf
[51] Costello, Bob and Karickhoff, Alan, "Truck driver shortage analysis 2015", American Trucking Associations, July 2019, https://www.trucking.org/sites/default/files/2020-01/ATAs%20Driver%20Shortage%20Report%202019%20with%20cover.pdf
[52] Kansas Department of Labor, Kansas Labor Information Center, 20280 Employment Projections, https://klic.dol.ks.gov/gsipub/index.asp?docid=800

could affect where transportation improvements will be needed, the type of improvements that will best serve community needs, and the financial sustainability of revenues to pay for transportation.

Nationwide and in Kansas, the highway freight trucking industry is experiencing many changes caused by technological advances that include fast broadband internet, zero-emissions vehicles, semi or fully connected and autonomous vehicles, unmanned aerial systems, smart technology, the Internet of Things, and changes in cybersecurity.

US 83 Great Plains Rural Freight Technology Corridor Project

Kansas is successfully stewarding a project that will demonstrate the implementation of many technologies discussed in this section, including broadband, smart technologies, and connected devices.

Location: 100-mile stretch of US-83

- Anchors five counties (Thomas, Logan, Gove, Scott, Finney) key to Kansas' agriculture industry

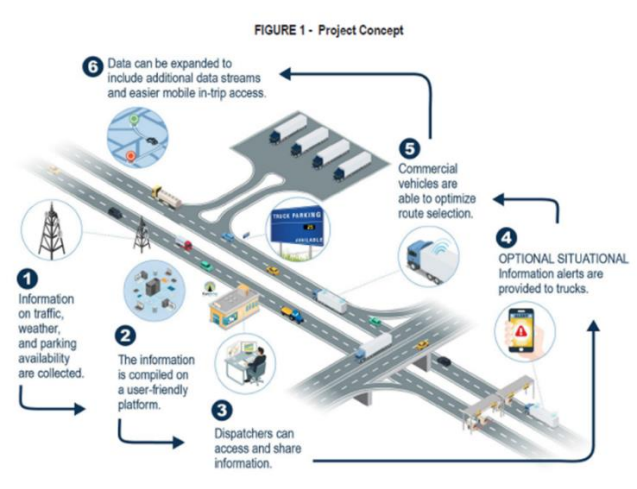
Project Size: $14.6 million, supported by $6.7 million ATCMTD grant (awarded August 2022)

Description:

- Install fiber-optic cable
- Acquire real-time data (weather, traffic, truck parking)
- Expand the KanDrive system and develop other means to report conditions to drivers
- Install other connected technologies (DMS, signal phase and timing)

Benefits: Improve safety and economic productivity

Figure I-151: Project Concept



Broadband

Broadband is an enabling technology for fully connected transportation, supporting robust economic opportunities. Broadband provides a high-speed connection to the Internet of the kind needed for connected transportation technologies, such as intersection signalization hardware that learns and responds to traffic patterns, Mobility as a Service (MaaS), and a variety of infrastructure sensors. It also provides better rural access to technology-driven innovations such as telemedicine, precision agriculture, and remote working that create economic and public health advances. A US Department of Agriculture (USDA) report estimates that expanded rural broadband could generate an additional $47 to $65 billion annually in the US economy through improved efficiencies in precision agriculture.[53]

- **Broadband Access:** In 2018, the Kansas legislature established a Statewide Broadband Expansion Task Force through House Bill 2071 to identify and close broadband coverage gaps in Kansas. In its 2020 report to the state Legislature, the task force modified the definition of broadband and set a goal for the state to ensure every Kansan has access to broadband services at a speed of, at a minimum, 25 Megabits per second (Mbps) (download)/3 Mbps (upload), with scalability.[54] Figure I-152 illustrates the US census blocks

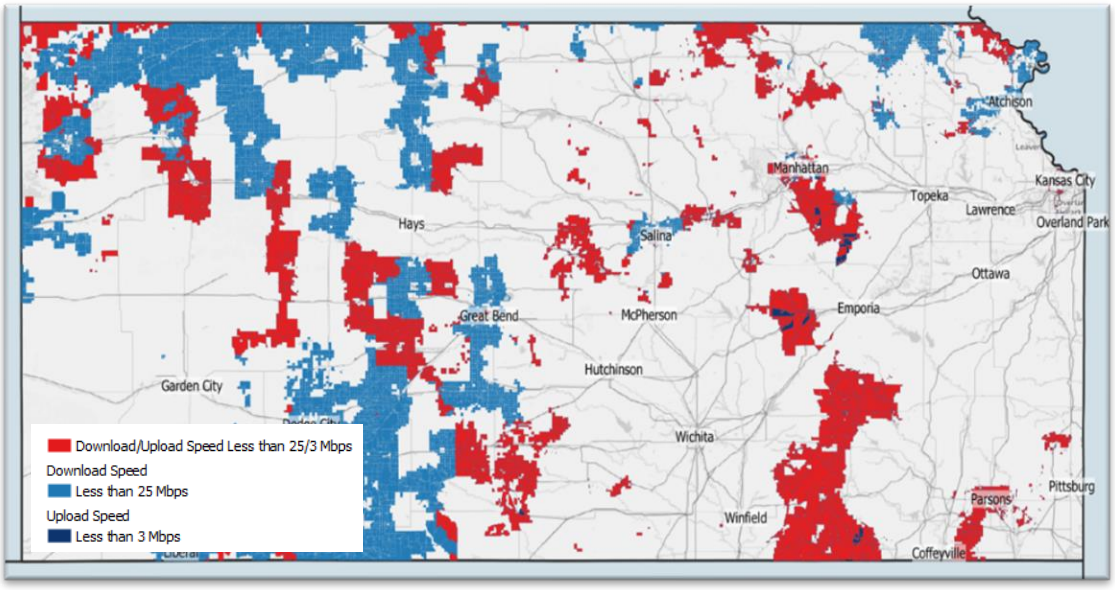
[53] USDA, A Case for Rural Broadband: Insights on Rural Broadband Infrastructure and Next Generation Precision Agriculture Technologies, (Washington, DC.: April 2019), https://www.usda.gov/sites/default/files/documents/case-for-rural-broadband.pdf.

[54] Report of the Statewide Broadband Expansion Planning Task Force to the 2020 Kansas Legislature, (January 2020), http://www.kslegresearch.org/KLRD-web/Publications/CommitteeReports/2019CommitteeReports/statewide_brdbnd_exp_planning_tf-cr.pdf

in Kansas unserved by 25 Mbps download speeds and/or 3 Mbps upload speeds based on data from the January to June 2020 Federal Communications Commission (FCC) Form 477 data collection from US Internet service providers (ISPs).

- **Upgraded Broadband Networks:** In 2020, the Broadband Acceleration Grant program was created to bring critical broadband access to underserved Kansas communities. Funded through the KDOT's Eisenhower Legacy Transportation Program (ELTP), the Kansas Office of Broadband Development administers the program to make more last-mile broadband connections possible across the state. KDOT awarded $5 million in grants resulting in over $10 million in total investment to 11 recipients under this program in 2022, to support investments in high-speed broadband access across 10 rural Kansas counties.[55]

Figure I-152: Kansas Census Blocks without Broadband[56]



Source: Map created using data from the United States Department of Commerce, National Telecommunications, and Information Administration (NTIA).[57]

Smart Technology

The proliferation of smart technology – including smartphones and wearable devices, as well as the rise of the "Internet of Things" – physical objects that are linked through wired and wireless networks – will continue, providing increased information connectivity.

- **Connected Infrastructure:** In the transportation sector, emerging smart technologies include intersection controls that learn from and respond to traffic patterns, MaaS options, smart corridors, infrastructure sensors, and new safety solutions that rely heavily on steady, reliable, and deep streams of data. These transportation technologies are generating a wealth of data for both private and public stakeholders. Additionally, their real-time nature is helping to improve operations, including timely incident response and management, truck availability communications, and plowing operations.

[55] Kansas, Governor Laura Kelly Announces Recipients of $10 Million Investment Expanding Broadband Access Across Rural Kansas, May 2022.

[56] Map shows where ISPs reported consumer fixed broadband Internet services at speeds which do meet the FCC's 25/3 Mbps benchmark for fixed broadband. ISPs report services available from fixed technologies only (available satellite services are not shown).

[57] United States Department of Commerce, National Telecommunications, and Information Administration, "Indicators of Broadband Need", (June 17, 2021), https://broadbandusa.maps.arcgis.com/apps/webappviewer/index.html?id=ba2dcd585f5e43cba41b7c1ebf2a43d0 "Indicators - Census Blocks CSV" retrieved on August 31, 2021 from https://broadbandusa.maps.arcgis.com/home/item.html?id=83fb9c8db7f041ad8e32a7eb5c6f4d40

- **Smart Corridors:** Technologists predict that a growing and connected set of smarter vehicles will pair with smart highway infrastructure (known as Vehicle-to-Infrastructure, or V2I) to bring about new operations and safety solutions. Connected vehicles will increasingly share real-time data about road conditions and their surroundings, becoming sensors that feed smart corridors with valuable data and enabling better incident response, traffic optimization, and traffic re-routing. They will also receive information from systems like smart traffic lights, streetlights, lane markers, street signs, and smart parking sensors. Advanced traffic management systems will combine information from infrastructure, like toll facilities, traffic lights, or parking facilities as well as vehicles, to optimize traffic movement in real time.

Connected and Autonomous Vehicles (CAVs)

Auto manufacturers are prototyping connected and autonomous vehicles (CAVs), with some observers predicting the emergence of mass production of partial or full CAVs in the next decade. The trucking industry is preparing for a connected and autonomous fleet with the potential to transport more goods at lower costs on the Kansas highway system.[58] Since the 1980s, the trucking industry has faced a labor shortage, especially for long-haul services. With many drivers nearing retirement, the trucking industry will need to hire 1.1 million new drivers (110,000 per year) through 2030.[59] CAVs in freight can eliminate some labor demand while operating beyond the scope of a human's waking hours. While some autonomous technologies are available in vehicles today, full automation is still being developed and faces significant hurdles regarding testing, infrastructure reliability, and regulatory requirements. The rail industry remains concerned about on-road CAV interactions with trains at rail crossings, which will require multimodal consideration and collaboration moving forward.

- **CAV Market Uncertainty:** A market research report from Frost & Sullivan estimates autonomous trucks will enter the market in the next decade and contribute to 6.4 percent of total US freight tonnage movement per year in 2040.[60]
- **Kansas Statewide Connected and Autonomous Vehicle Vision Plan:** This plan identifies a framework to maximize CAV deployments and realize benefits for Kansas. The plan projects that CAVs would improve freight safety and efficiency and spur economic development, but notes the need to expand and develop a CAV-relevant workforce.[61] Applicable state agencies in Kansas responsible for sectors such as agriculture, commerce, and information security have also developed their own agency blueprints that set strategies and goals for incorporating CAVs into business plans.[62] Kansas also has an initiative underway to develop a statewide CAV pilot project program to expand the type and number of CAV safety pilots.
- **Policy Developments:** The American Trucking Association (ATA) is developing policy positions on the regulation of automated truck and platooning technologies at state and local government levels. In October 2017, ATA unanimously approved a policy that recognizes the potential impacts and benefits automated technologies bring to the trucking industry and addresses the following areas: Safety, Interstate freight flows, Federal preemption and

[58] Frost and Sullivan, Description of "Opportunities and Use Cases for Autonomous Trucking, Forecast to 2040", (July 2020), https://www.researchandmarkets.com/reports/5134325/opportunities-and-use-cases-for-autonomous
[59] Costello, Bob and Karickhoff, Alan, "Truck driver shortage analysis 2015", American Trucking Associations, July 2019, https://www.trucking.org/sites/default/files/2020-01/ATAs%20Driver%20Shortage%20Report%202019%20with%20cover.pdf
[60] Frost and Sullivan, Description of "Opportunities and Use Cases for Autonomous Trucking, Forecast to 2040", (July 2020), https://www.researchandmarkets.com/reports/5134325/opportunities-and-use-cases-for-autonomous
[61] Kansas Department of Transportation. "Kansas Statewide Connected and Autonomous Vehicle Vision Plan", (2019), https://www.ksdot.org/Assets/wwwksdotorg/bureaus/divInnovTech/KS_CAV_Vision_Plan.pdf
[62] Kansas Department of Transportation, "Kansas Statewide Connected and Autonomous Vehicle Vision Plan: Appendix A: Kansas State Agency Blueprints", (2020), https://www.ksdot.org/Assets/wwwksdotorg/bureaus/divInnovTech/KS_CAV_Vision_Appendix_A_Blueprints.pdf

state's rights, Uniform state laws, Freedom of choice vs. mandates, Infrastructure and connectivity, Public education, and Maintainability.[63]

Drone Technology

The potential drones offer for efficient and affordable imagery gathering and payload delivery has implications for the transportation sector and beyond. In transportation, drones are being deployed to enhance infrastructure inspections, and logistics providers are testing drone delivery services that could change freight patterns. As of July 2021, numerous companies operating in Kansas, including Amazon and UPS, have received Federal Aviation Administration approval for use of drone delivery beyond operators' line of sight.[64]

- **Kansas Statewide Unmanned Traffic Management (UTM) Initiative:** KDOT was the first state DOT to deploy a statewide Unmanned Traffic Management (UTM) initiative. Through a partnership with AirMap, KDOT has developed a UTM system that facilitates data exchange and air traffic control for drones.[65] Today, the Kansas Unmanned Aerial System (UAS) Integration Pilot Program (IPP) is led by KDOT and is one of ten pilot efforts nationwide conducting advanced UAS operations aimed at gathering sufficient data to support federal rule-making in this field. KDOT has led successful, historic beyond-visual-line-of-sight drone flights and has used drones to demonstrate disaster response and lead airport inspections.

Zero-Emissions Vehicles (ZEVs)

Zero-emissions vehicles that rely on battery power have the potential to reduce transportation-related emissions. The proportion of zero-emissions vehicles (ZEVs), which include plug-in hybrid vehicles, battery electric vehicles, or hydrogen fuel cell vehicles, is growing in both the US and Kansas. A recent Executive Order signed by President Biden in August 2021 sets a national 50 percent target for the electric vehicle share of total vehicle sales by 2030.[66] The Biden Administration's Build Back Better Investment Agenda identifies strategies to help achieve this target by investing in a national network of electric vehicle charging stations and expanding the domestic manufacturing supply chain for ZEVs. This domestic manufacturing supply chain also opens opportunities for Kansas' manufacturing industry. Automobile companies are already making investments to build ZEVs in Kansas; in 2020 Ford invested $100 million in its plant in Kansas City to build a zero-emissions transit van.[67]

- **Fast-Evolving ZEV Technology:** The variety of zero-emissions freight vehicles is expected to continue increasing, with battery-electric vehicles leading the ZEV market given quickly falling battery pack prices. At least 85 models of electric vehicles are available from over 30 companies in 2021. As vehicle battery costs, sizes, and weights decline, some battery-electric trucks are expected to reach cost parity with diesel trucks by 2030 or sooner, and ranges of up to 620 miles per charge may be feasible as soon as 2024.[68] The combination of heavy loads and long hauls required for freight movement means large freight vehicles will likely be one of the last vehicle types for which electric engines reach performance parity

[63] American Trucking Associations. Automated Truck Policy, (October 24, 2017) https://www.trucking.org/sites/default/files/2020-01/Proposed%20Automated%20Truck%20Policy_24OCT2017_final.pdf

[64] Palmer, Annie, "Amazon wins FAA approval for Prime Air drone delivery fleet", (August 31, 2020), Retrieved from CNBC at https://www.cnbc.com/2020/08/31/amazon-prime-now-drone-delivery-fleet-gets-faa-approval.html

[65] Kansas Department of Transportation. "KDOT deploys first statewide drone traffic management", (Topeka, KS: August 08, 2017), https://www.ksdot.org/Assets/wwwksdotorg/Headquarters/PDF_Files/pressrelease2017/KDOTAviationAirMap.pdf

[66] The White House Briefing Room. FACT SHEET: President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks, (August 5, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/05/fact-sheet-president-biden-announces-steps-to-drive-american-leadership-forward-on-clean-cars-and-trucks/

[67] Automotive Fleed, "Ford Assembling E-Transit in Kansas City & Builds Out $3.2B in North America EV Manufacturing", (November 10, 2020), https://www.automotive-fleet.com/10129944/ford-assembling-e-transit-in-kansas-builds-out-3-2b-in-north-american-ev-manufac

[68] MacDonnel, O., & Facanha, C. "How Zero-Emission Heavy-Duty Trucks Can Be Part of the Climate Solution. Drive to Zero", (2021), https://globaldrivetozero.org/site/wp-content/uploads/2021/05/How-Zero-Emission-Heavy-Duty-Trucks-Can-Be-Part-of-the-Climate-Solution.pdf; Phadke, A., Khandekar, A., Abhyankar, B., Wooley, D., & Rajagopal, D. Why Regional and Long-Haul Trucks are Primed for Electrification Now, (2021), International Energy Analysis Department, Lawrence Berkeley National Laboratory, https://eta-publications.lbl.gov/sites/default/files/updated_5_final_ehdv_report_033121.pdf

with conventional internal combustion engines. Pilot tests by companies such as Frito-Lay and Anheuser-Busch, however, have demonstrated successful heavy-duty vehicle deployment with no emissions, lower fuel costs, and improved work conditions.[69]

- **ZEV Fleet Growth:** BloombergNEF estimates ZEVs will make up 31 percent of the medium- and heavy-duty vehicle sales in 2040 with no new policy measures introduced to support their growth. [70] If a shift to battery-powered freight vehicles continues, demand for charging stations on key freight routes and facilities is likely to increase. The adoption of ZEVs will also reduce revenue collected from taxes on fuel sales.

Auxiliary Power Units (APUs)

Idling reduction technologies, such as APUs, can reduce emissions from rail locomotives. APUs are diesel-powered engines installed on a locomotive to provide electrical power for heating/air conditioning, lighting, and appliances, allowing for the use of these features when the train engine is shut down.[71] APUs installed on locomotives reduce idling hours and thereby improve fuel efficiency and reduce related pollution. This technology can save money and improve air quality.

- **Kansas Railroads Deploy APUs**: Both WATCO (Kansas and Oklahoma Railroad and South Kansas and Oklahoma Railroad) and Cimarron Valley Railroad (CVR) are deploying auxiliary power units (APUs). KDOT is currently partnering with CVR to install APUs on seven locomotives through an EPA Diesel Reduction Fuel Act (DERA) grant award.[72] WATCO deploys APUs in northern locations where cold weather is an issue. WATCO is also a recipient of DERA grants and will deploy APUs across two railroads using the grant funding.

[69] MacDonnel, O., & Facanha, C. "How Zero-Emission Heavy-Duty Trucks Can Be Part of the Climate Solution. Drive to Zero", (2021), https://globaldrivetozero.org/site/wp-content/uploads/2021/05/How-Zero-Emission-Heavy-Duty-Trucks-Can-Be-Part-of-the-Climate-Solution.pdf

[70] BloombergNEF, "Electric Vehicle Outlook 2021", (2021) https://about.bnef.com/electric-vehicle-outlook/

[71] United States Environmental Protection Agency (EPA), Verified Technologies for SmartWay and Clean Diesel, (2021), https://www.epa.gov/verified-diesel-tech/learn-about-idling-reduction-locomotives

[72] KDOT, KDOT receives EPA diesel reduction grant to help short line railroad lower emissions, (2021), http://ksdot.org/Assets/wwwksdotorg/Headquarters/PDF_Files/pressrelease2021/Aug/CVR_grant_release.pdf

Cybersecurity

Over the last 20 years, the integration of digital elements within transportation systems has increased the risk of cyber-attacks that compromise infrastructure and the vehicles using it. Investment in cybersecurity is critical for protecting the advanced computer systems on which transportation increasingly relies.

- **Cyber Attacks:** According to the National Highway Traffic Safety Administration at the US Department of Transportation (USDOT), in 2015, 1.4 million vehicles were impacted by the first and only cybersecurity-related recall to date.[73] Cyber-attacks, however, are increasingly common among private and public sector organizations. In May 2021, USDOT issued emergency measures to restore fuel supply after a ransomware attack on the country's largest fuel pipeline stopped operations along 5,500 miles of pipeline.[74] In exploring the potential of connected vehicles and other advanced technologies, USDOT recognizes that cybersecurity has an even more important role. State DOTs and the freight industry must protect their systems, devices, components, and communications from cyber threats, unauthorized access, damage, or other threats that can interfere with safety functions.
- **Blockchain**: A secure record attached to data used for tracking the progression of the data or an item – is expected to greatly improve the traceability of product movements through the supply chain. A blockchain network can track orders, payments, accounts, and production. Blockchain is decentralized, allowing data to be accessed, stored, and monitored on multiple systems. This greatly improves data security. Blockchain data records are linked to other records in the network so that there is a shared history, making it very difficult to alter a single record. This decentralized data also adds transparency; data can be accessed, monitored, stored, and updated on multiple systems and remains traceable throughout its lifetime. In the shipping industry, blockchain can minimize delays in real-time transactions, improve the transparency of transactions from remote areas and keep track of containers. Samsung estimated it reduced shipping costs by one-fifth by implementing blockchain across its supply chain.[75]

Environmental/Resiliency Factors & Trends

Environmental events – both extreme weather events and changes in long-term environmental conditions – have the potential to damage infrastructure and disrupt freight and passenger movements. The need to prepare and respond to these events has become increasingly important, with agencies planning and preparing to avoid, adapt to, and recover from – in other words, remain resilient to – these environmental disruptions.

Catastrophic Events

Kansas is especially prone to severe weather events – notably six EF5 (Enhanced Fujita Scale) tornadoes have occurred in Kansas since 1950. Only two other states have experienced a greater number of severe tornadoes.[76] Figure I-154 maps the locations and the frequency of tornados in Kansas. As shown, central and southwest Kansas experience the highest average tornado occurrences. The state also experiences strong winds (Figure I-155), riverine flooding (Figure I-156),

[73] USDOT National Highway Traffic Safety Administration, Vehicle Cybersecurity, https://www.nhtsa.gov/technology-innovation/vehicle-cybersecurity

[74] Dean, Grace, "The US issued emergency transport measures after its largest fuel pipeline was hit by a ransomware cyberattack…" (May 10, 2021), retrieved from Business Insider at https://www.businessinsider.com/colonial-pipeline-us-issues-emergency-measures-after-fuel-cyberattack-2021-5

[75] Dutta, Pankaj et al. "Blockchain technology in supply chain operations: Applications, challenges and research opportunities." Transportation research. Part E, Logistics and transportation review vol. 142 (2020): 102067. doi:10.1016/j.tre.2020.102067

[76] Frankson, R., K. Kunkel, L. Stevens, D. Easterling, X. Lin, and M. Shulski, Kansas State Climate Summary, (2017). NOAA Technical Report NESDIS 149-KS, 4 pp.

heat waves (Figure I-157), droughts (Figure I-158), winter weather (Figure I-159), cold waves (Figure I-160), hail, (Figure I-161) and ice storms (Figure I-162).

Extreme weather events are also occurring more frequently in Kansas. As shown in Figure I-153, five billion-dollar-disaster events occurred in the state in 2020 with an average of 3.7 events per year occurring during the last decade.

Figure I-153: Kansas Billion-Dollar Disaster Statistics (CPI-Adjusted), 1980-2020[77]

Period	Billion-Dollar Disasters	Events/Year	Cost	Percent of Total Cost
1980s (1980-1989)	8	0.8	$2.0B – $5.0B	13.0%
1990s (1990-1999)	8	0.8	$2.0B – $5.0B	14.3%
2000s (2000-2009)	19	1.9	$5.0B – $10.0B	20.7%
2010s (2010-2019)	37	3.7	$10.0B – $20.0B	48.1%
Last 5 Years (2016-2020)	17	3.4	$2.0B – $5.0B	12.2%
Last 3 Years (2018-2020)	13	4.3	$2.0B – $5.0B	10.4%
Last Year (2020)	5	5.0	$1.0B – $2.0B	3.7%
All Years (1980-2021)	78	1.9	$20.0B – $50.0B	100.0%

Source: National Oceanic and Atmospheric Administration (NOAA), Centers for Environmental Information

[77] NOAA National Centers for Environmental Information (NCEI), US Billion-Dollar Weather and Climate Disasters", (2021), https://www.ncdc.noaa.gov/billions/, DOI: 10.25921/stkw-7w73

Figure I-154: Tornado Frequency in Kansas

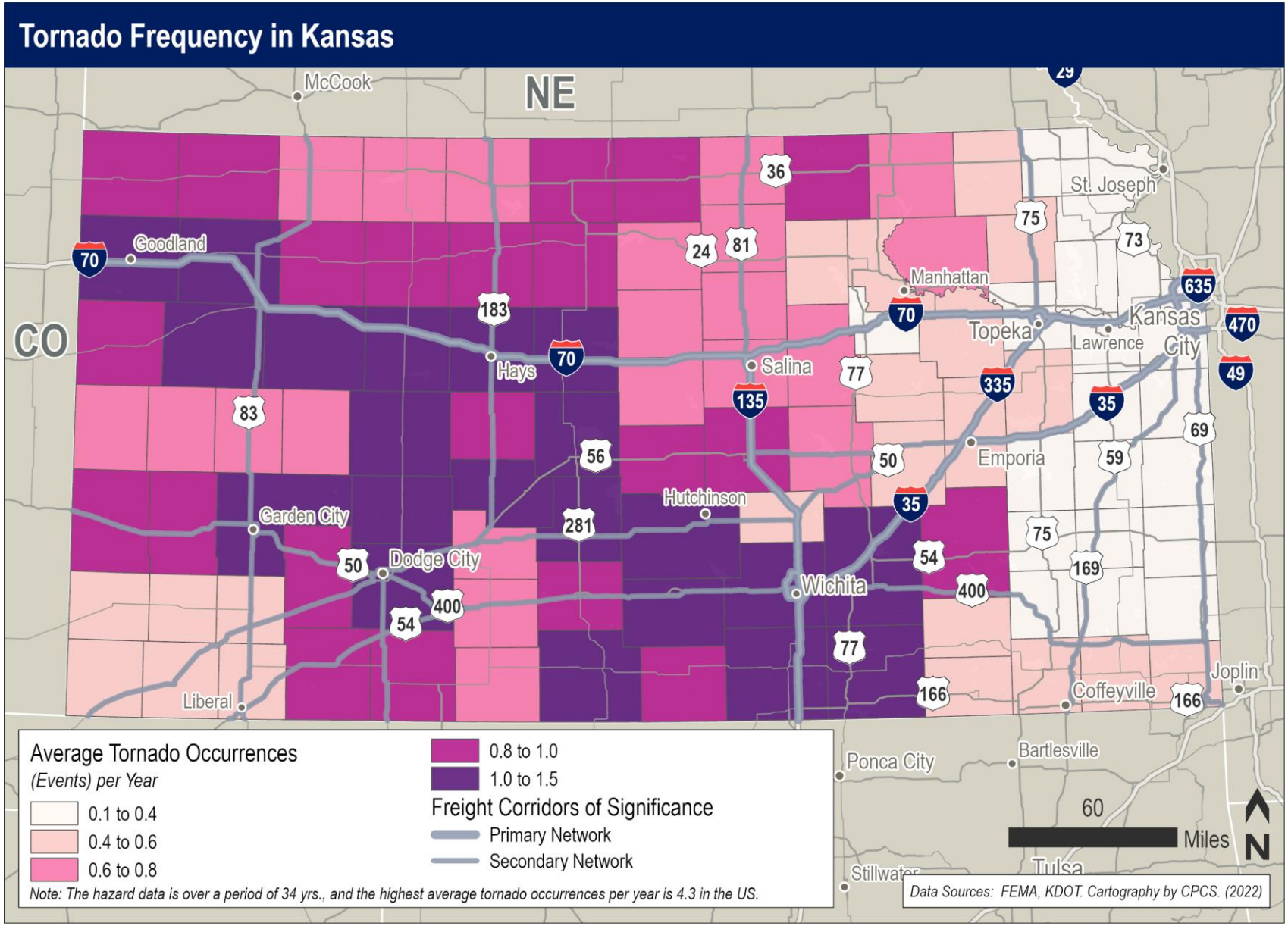


Figure I-155: Strong Wind Frequency in Kansas

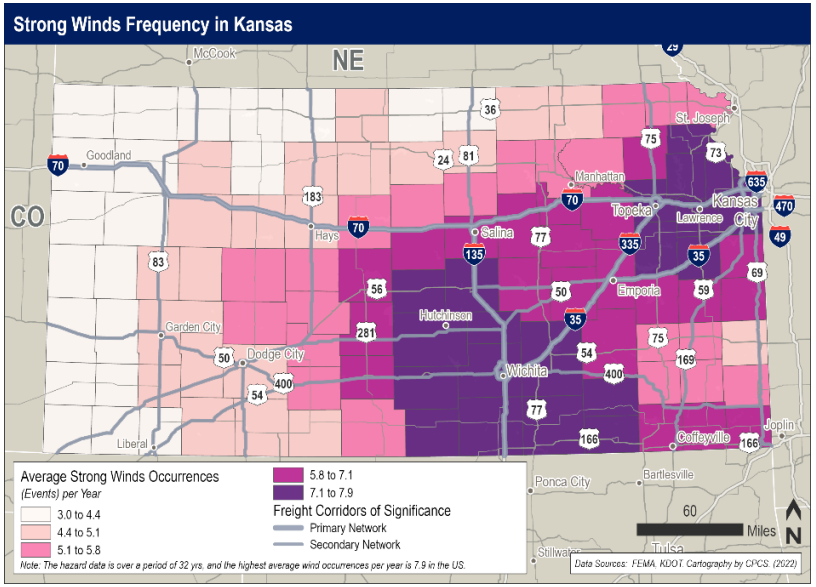


Figure I-156: Riverine Flooding Frequency in Kansas

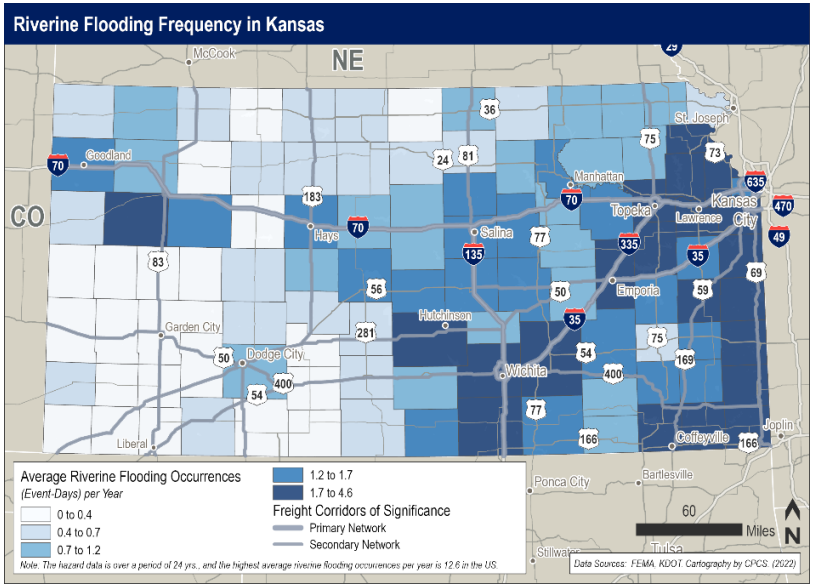


Figure I-157: Heat Wave Frequency in Kansas

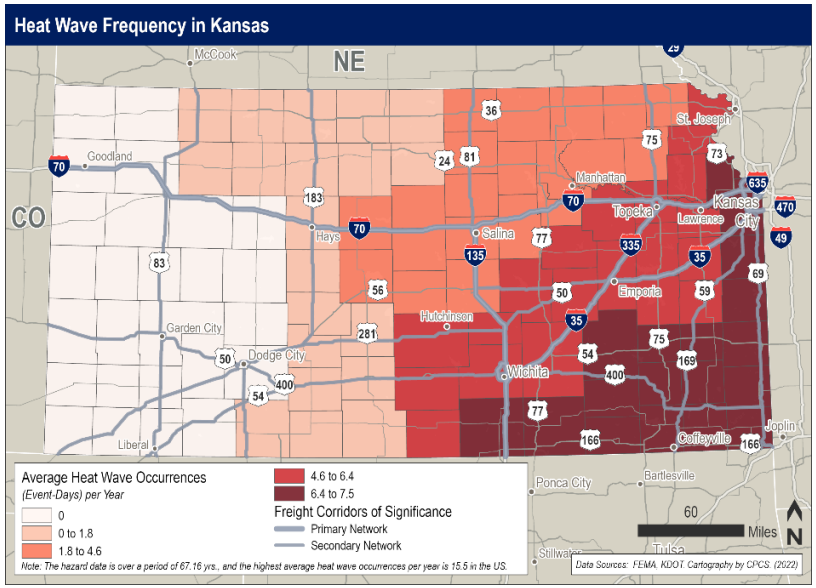


Figure I-158: Drought Frequency in Kansas

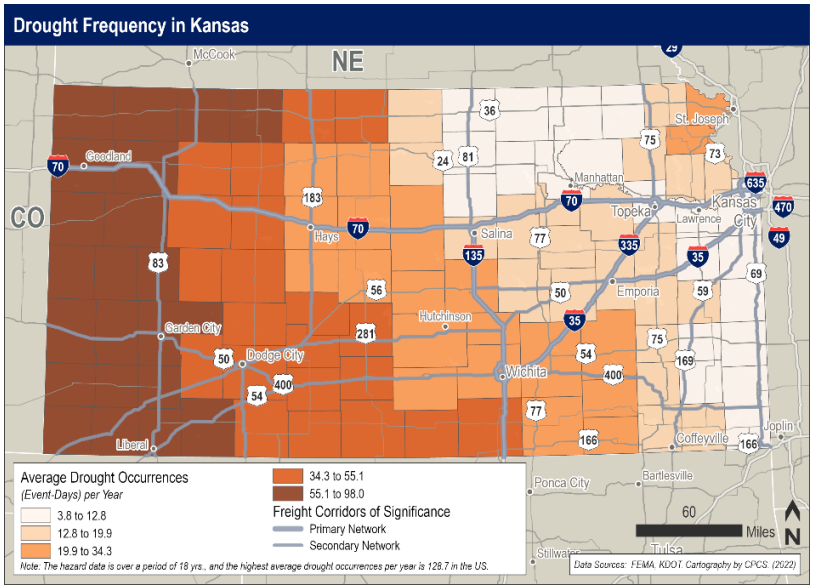


Figure I-159: Winter Weather Frequency in Kansas

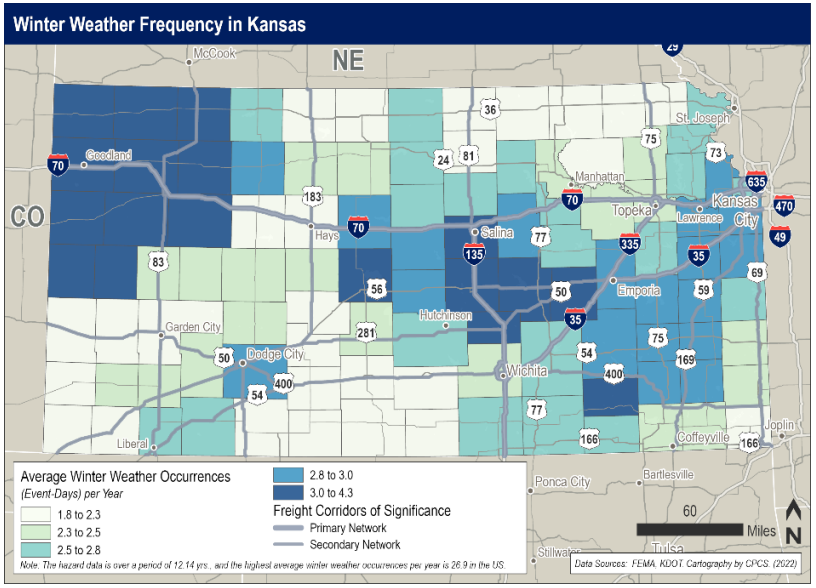


Figure I-160: Cold Wave Frequency in Kansas

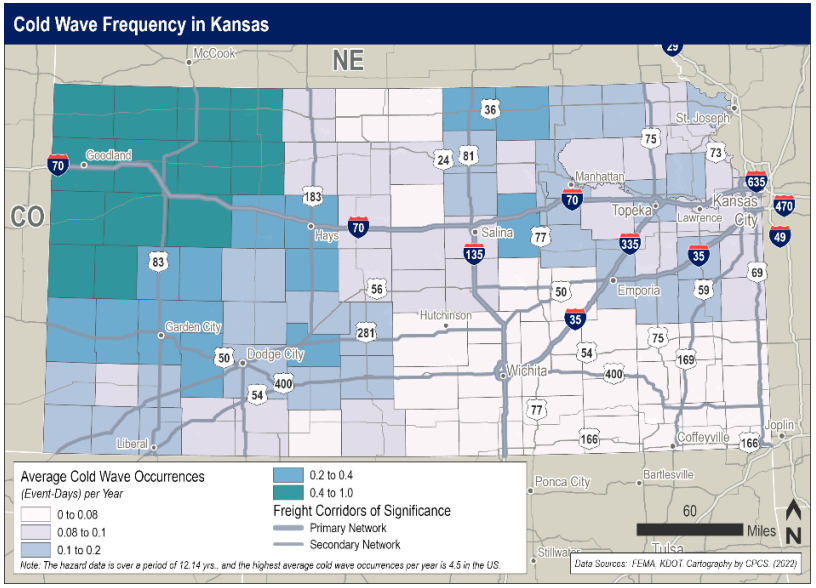


Figure I-161: Hail Frequency in Kansas

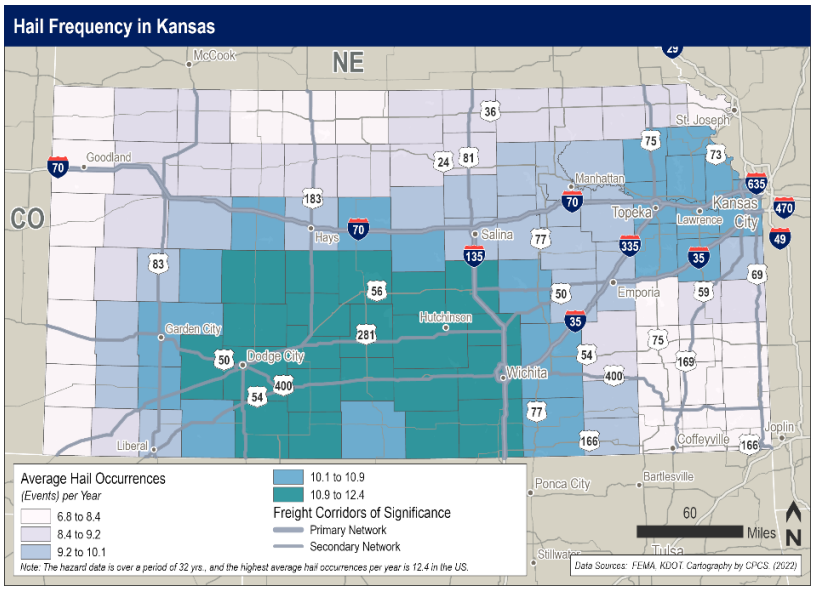
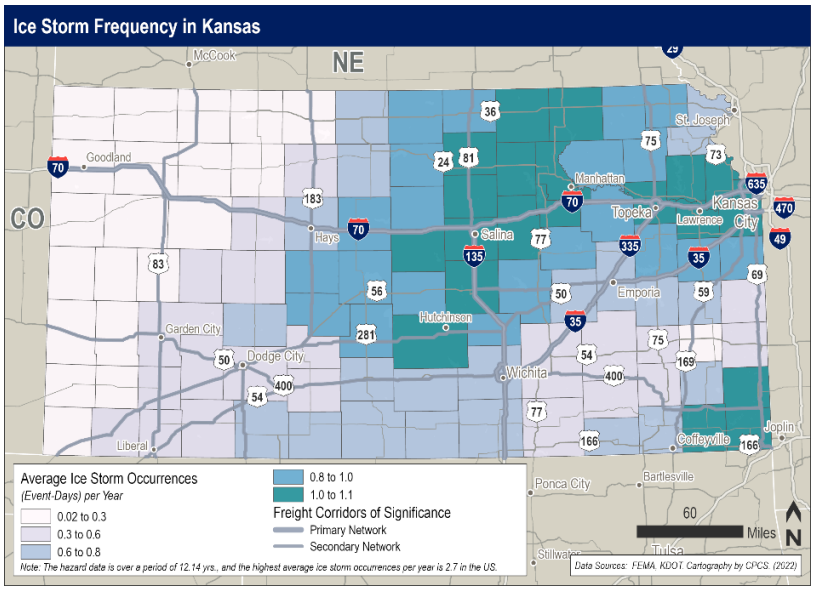


Figure I-162: Ice Storm Frequency in Kansas



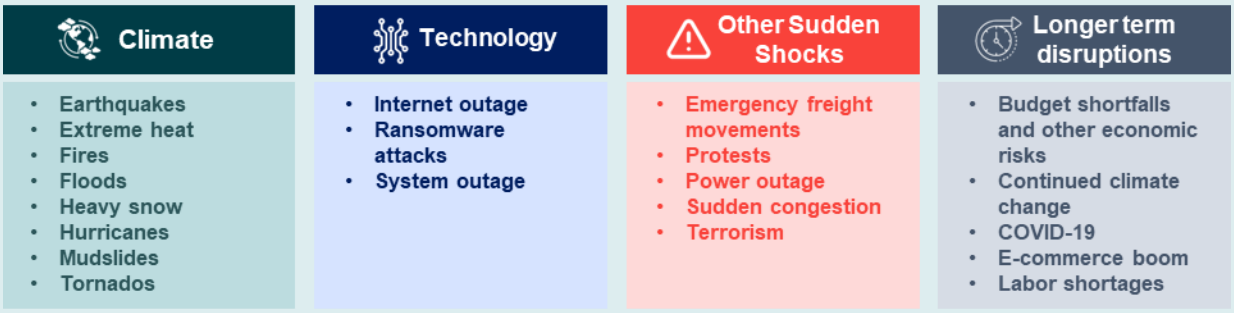
Long-term Environmental Changes

Changes in long-term environmental conditions can impact the economy, quality of life, and infrastructure. The High Plains/Ogallala Aquifer, for example, serves as a major source of water for Western Kansas with approximately 22 percent of state farmland irrigated from this aquifer. Once considered a limitless "underground ocean," some areas within the aquifer are showing less than 25 years of water availability.[78] Over the long term, KDOT must learn how to design and maintain infrastructure to handle persistently extreme weather such as extreme heat and drier or wetter climates. One academic paper estimates the US may face $19 billion in extra paving costs by 2040 if engineering standards of practice for asphalt are not updated to reflect warmer average temperatures.[79] Extreme heat also presents safety hazards for both those working outdoors and vulnerable populations. Spring temperatures in Kansas have been increasing in recent decades[80] which has implications for agriculture, construction, and other industries.

Resiliency

Resiliency refers to the ability to recover from or adjust easily to misfortune or change. In the case of the freight system, this misfortune or change may be caused by a variety of factors (Figure H-148), including but not limited to environmental and climate factors. A resilient transportation network can avoid, adapt to, and recover from the stressors on physical infrastructure and operations (both users and organizations) caused by this misfortunate or change.

Figure I-163: Freight System Disruptions



Source: CPCS

Infrastructure and operations that are not prepared for sudden shocks or long-term changes may result in serious impacts on safety and security, transportation system management, asset preservation, and freight and economic vitality. Strategic investments in tactical improvements to infrastructure (e.g., incorporate more hard-wearing design and construction practices where needed, and develop strategic system redundancies) will help improve freight system resiliency. Investing in mitigating strategies yields significant savings in terms of safety, preventing property loss, and minimizing disruption of day-to-day life. Resiliency has become an increasingly important topic for freight planning and operations. The Bipartisan Infrastructure Law (BIL) has outlined new requirements and opportunities focused on improved resiliency nationwide, including adding resiliency to State Freight Plan requirements, using resiliency as a key criterion to award federal funding under existing programs, and establishing new funding programs focused on resiliency.

[78] Buchanan, R. C., Wilson, B. B., Buddemeier, R. R., & Butler, J. J., The High Plains Aquifer. Kansas Geological Survey Public Information Circular 18 (January 2015). http://www.kgs.ku.edu/Publications/pic18/PIC18R2.pdf

[79] Underwood, B.S, Guido, Z., Gudipudi, P., and Feinberg, Y., "Increased costs to US pavement infrastructure from future temperature rise", (2017), Nature Climate Change 704-707. https://doi.org/10.1038/nclimate3390.

[80] Frankson, R., K. Kunkel, L. Stevens, D. Easterling, X. Lin, and M. Shulski, Kansas State Climate Summary, (2017). NOAA Technical Report NESDIS 149-KS, 4 pp.

Impacts on Supply Chain

Severe weather events in Kansas have led to damage to infrastructure and pose challenges to continued goods movement through the state.

- **Heat Waves:** Because heat causes materials to expand, extremely warm weather can cause pavement and other materials to buckle. This can create ripples or cracks in the roadway. Other times, the pressure from the heat can even cause concrete to explode out of the roadway.[81] As recently as June 2022, deteriorating steel combined with extreme heat caused a highway barrier wall on I-70 in Topeka to collapse (Figure I-164).[82] This heat event also led to the death of thousands of cattle.[83] The effects of heat on pavement performance can cause road closures, delays, or vehicle damage. Heat can also impact rail performance, as expanding materials can make derailments more likely. During extreme temperatures, rail operators are often faced with "slow orders" that require reductions in the speed of travel.[84]

- **Tornados:** Kansas is located in "Tornado Alley" and is thus at high risk for strong wind and tornado events. In 2016, an EF4 tornado near north-central Kansas bent railroad tracks in Chapman (Figure I-165), damaged portions of I-70, and destroyed vehicles.[85] Another tornado in 2015 derailed a 34-car freight train on BNSF tracks in Lyon County.[86] Strong winds are perilous too, capable of blowing over trucks, including a rolled-over truck that blocked traffic on I-70 in Salina in 2021.[87]

- **Winter Weather:** Winter weather events can wreak havoc on transportation infrastructure. Kansas will soon cross the 15-year anniversary of an ice storm disaster in late 2007. The storm caused hundreds of millions of dollars in damage, left thousands without power for weeks, prevented travel, and damaged countless infrastructure

Figure I-164: Heat Wave Impact on Highway Barrier Wall

Figure I-165: Tornado Impact to Railroad

Figure I-166: Winter Weather Impact to Roadway

[81] Stanglin, D., "Soaring heat across nation, reaching 100 degrees in some spots, takes its toll on events and roads." USA Today (July 2019). https://www.usatoday.com/story/news/nation/2019/07/20/heat-wave-temps-near-100-degrees-events-canceled-roads-buckle/1784877001/

[82] Hrenchir, T., "Officials didn't know steel connected to Topeka's I-70 viaduct was failing. Then a barrier wall fell." USA Today (June 2022). https://www.cjonline.com/story/news/2022/06/14/kansas-interstate-70-viaduct-collapse-official-explains-why-barrier-wall-plunged/7624233001/

[83] Cheng, A., "Extreme heat and humidity kill thousands of cattle in Kansas." The Washington Post (June 2022). https://www.washingtonpost.com/nation/2022/06/16/cattle-dead-kansas-heat-wave/

[84] Austin, N., "Excessive heat can impact rails as well as driver health." Freight Waves (July 2019). https://www.freightwaves.com/news/excessive-heat-can-impact-rails-as-well-as-driver-health

[85] Sincavage, H., "Visiting the Chapman, Kansas, EF-4 Tornado Damage." iWeatherNet.com (July 2016). https://www.iweathernet.com/thunderstorms/revisiting-the-chapman-kansas-ef-4-tornado

[86] Vaughn, J., "Kansas authorities say tornado derailed freight train, damaged homes and farms." Fox4KC (May 2015). https://fox4kc.com/news/kansas-authorities-say-tornado-derailed-freight-train-damaged-homes-and-farms/

[87] Schmidt, H., "High winds too much for some 18-wheelers on Missouri, Kansas highways." Fox4KC (December 2021). https://fox4kc.com/weather/wind-is-too-much-for-18-wheelers-on-missouri-and-kansas-highways/

assets.[88] A winter storm in late 2019 closed I-70 in Western Kansas (Figure I-166).[89] More recently, a winter storm left over two feet of snow in parts of western Kansas in early 2022. The storm closed parts of I-70 and K-27 due to treacherous travel and accidents blocking the road.[90] It is not just roads that see impacts from winter weather; in 2021, freight railroads, including Kansas City Southern, curtailed some operations as a result of inclement weather.[91]

- **Flooding:** Although Kansas is at quite a distance from the ocean and is not at risk for coastal flooding, the state is not immune to riverine flooding events. In 2019, floods overwhelmed roads, damaged well systems, caused billions of gallons of sewage to overflow into rivers and streams, and damaged 11 dams. Total damage costs were in the millions.[92]

The occurrence of severe natural events, such as wildfires, hurricanes, and floods, in locations outside of Kansas still impacts freight moving to, from, and through Kansas, as the impacts of these events travel down the supply chain.

- **Wildfires:** When wildfires force roadway and track closures, goods movement by highway and rail freight are impacted. For example, in August of 2016, wildfires halted both UP and BNSF railway services in California for two days which disrupted rail freight movement in Kansas.[93] Fires also cause longer-term rail freight disruptions by destroying critical infrastructure such as bridges.
- **Hurricanes:** Increasingly strong and frequent hurricanes also impact freight movement nationally and in Kansas. When transportation and energy hubs like Houston, TX, or New Orleans, LA experience strong winds, flooding, power loss, and other impacts, freight movement is impacted by both road and rail closures and sometimes increased fuel costs; for example, the average national price of fuel increased by 15 percent in the wake of Hurricane Harvey.[94] Railroad washouts caused by flooding in Iowa have also caused rail service disruptions to Kansas Class I railroads including UP and BNSF.[95]

Economic Factors & Trends

Making smart investments in the freight transportation system provides cost-competitive options for Kansas businesses to get their products to both domestic and global markets. An improved freight transportation system can lower transportation costs, provide economic development opportunities, and serve as a catalyst for job creation.

[88] "10 Year Anniversary of Worst Ice Storm in Kansas History." KSAL.com (December 2017). https://www.ksal.com/10-year-anniversary-of-worst-ice-storm-in-kansas-history/

[89] Small, K., "I-70 closed in western Kansas due to winter storm." Fox4KC (November 2019). https://fox4kc.com/news/i-70-closed-in-western-kansas-due-to-winter-storm/

[90] "Winter storm slams W. Kansas, some snowfall totals top 25 inches." KWCH12 (January 2022). https://www.kwch.com/2022/01/25/westbound-i-70-closed-goodland/#:~:text=The%20snow%20led%20to%20multiple%20road%20closures%20in,asked%20to%20delay%20travel%20or%20find%20alternative%20routes.

[91] March, J., "Freight railroads curtail operations as extreme winter weather blasts through." Freight Waves (February 2021). https://www.freightwaves.com/news/freight-railroads-curtail-operations-as-extreme-winter-weather-blasts-through#:~:text=Kansas%20City%20Southern%20%28NYSE%3A%20KSU%29%20is%20stopping%20all,the%20railroad%20said%20in%20a%20service%20update%20Wednesday.

[92] Shorman, J., "'Land of extremes': In Kansas, a year of damaging floods and forecast of more to come." The Wichita Eagle (November 2019). https://www.kansas.com/news/politics-government/article237295564.html

[93] Uranga, R., "The Blue Cut fire could cost Southern California's shipping industry $1 million a day." The Sun (August 2016). https://www.sbsun.com/2016/08/17/the-blue-cut-fire-could-cost-southern-californias-shipping-industry-1-million-a-day/

[94] U, April, "The Impacts of Hurricanes on the Logistics & Transportation Industry", (2018), https://www.pennlease.com/blog/impact-hurricanes-logistics-transportation-industry/

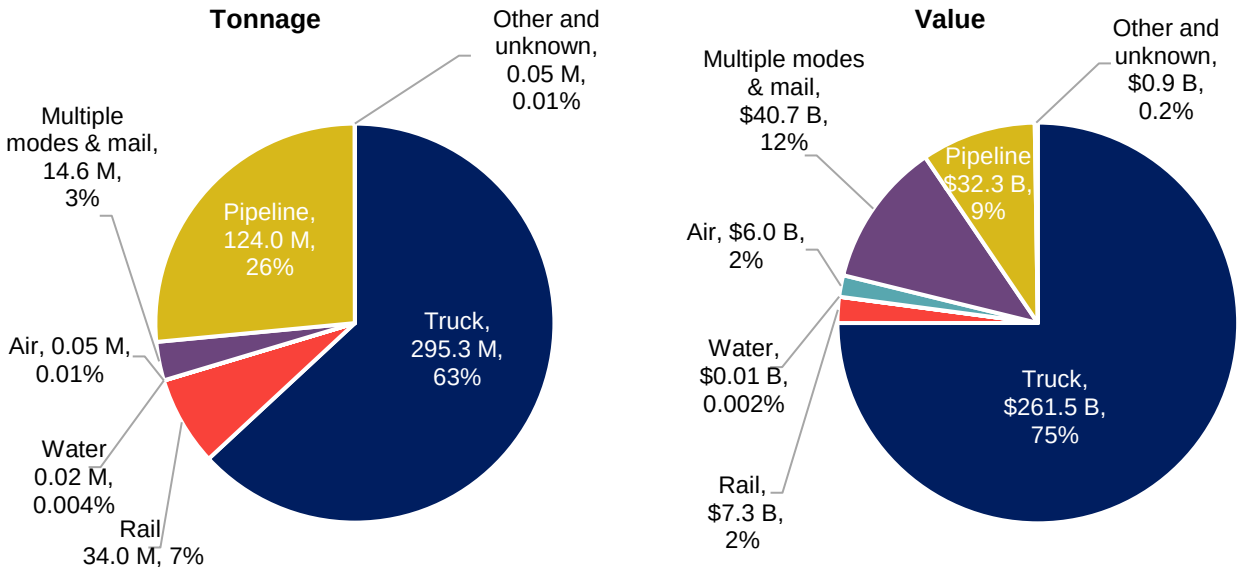
[95] Railway Age, "Contractors, Railroads Battle Catastrophic Flood Damage", (March 2019). https://www.railwayage.com/news/contractors-railroads-battle-catastrophic-flood-damage/

Freight System Use

Figure I-167 demonstrates the modal splits of Kansas' goods movements. Figure I-168 displays the modal share of goods movement to, from, and within Kansas in 2017, compared to the 2045 forecast.

- **Share of Freight Handled by Truck**: Trucks make up the largest share of the goods movement by both volume and value, accounting for 63 percent and 75 percent, respectively. The share of freight volume by truck is forecast to increase by 1.4 percent in 2045.
- **Share of Freight Handled by Rail:** Kansas' rail system handles 9 percent of the state's total freight movements by tonnage and 2.3 percent by value. Although the share of total goods moved by rail is projected to decrease between 2017 and 2045, the absolute volume of rail movements is projected to increase by 1.6 percent during this time, while the value of rail movements will increase by 49 percent.
- **Share of Freight Handled by Air and Multiple Modes & Mail**: Air and multiple modes & mail both carry high-value goods, moving a large share of goods by value (2 percent and 12 percent respectively), but a smaller share by tonnage (0.01 percent and 3 percent respectively).

Figure I-167: Total Tonnage and Value by Mode (2017)



Source: CPCS Analysis of FHWA FAF 5. Note: Air includes truck-air. Note: Modal shares represent modes used for the domestic movement of goods. Therefore, for international goods movement (i.e., imports and exports) within the total flows, "mode" refers to the domestic movement of import and export goods within the US.

Figure I-168: Kansas Modal Share of Total Flows – 2017 and 2045

Mode	Share of Total Flows (Tonnage)			Share of Total Flows (Value)		
	2017	2045	Trend	2017	2045	Trend
Truck	59.9%	61.3%	▲	74.5%	74.2%	▼
Rail	9.0%	7.1%	▼	2.3%	2.1%	▼
Water	0.003%	0.003%	–	0.001%	0.001%	–
Air	0.01%	0.02%	▲	1.6%	1.8%	▲
Multiple modes & mail	4.0%	4.5%	▲	12.7%	15.3%	▲
Pipeline	27.0%	27.1%	▲	8.4%	6.3%	▼
Other and unknown	0.03%	0.03%	–	0.4%	0.4%	–

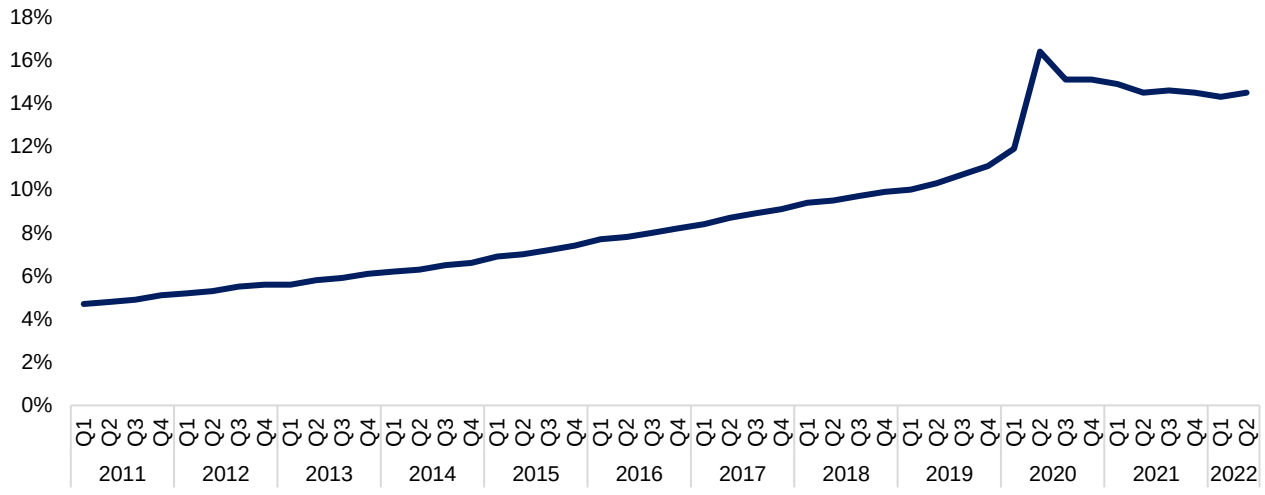
Source: FHWA FAF5. Analysis by CPCS, 2021. Note: Modal shares represent modes used for the domestic movement of goods. Therefore, for international goods movement (i.e., imports and exports) within the total flows, "mode" refers to the domestic movement of import and export goods within the US.

E-commerce

US E-Commerce Trends

E-Commerce Sales: E-commerce is increasingly replacing a growing fraction of traditional 'brick and mortar' sales, with e-commerce retail sales accounting for over 14 percent of total retail sales in the second quarter of 2022 (Figure I-169). Although this is below the spike experienced during the second quarter of 2020 at the onset of COVID-19, the share in the second quarter of 2022 still represents nearly a 22 percent increase compared to the first quarter of 2020.

Figure I-169: US Quarterly E-Commerce Sales as a Percent of Total Retail Sales



Source: CPCS analysis of Federal Reserve Bank of St. Louis data, 2022.

Warehousing and Distribution: The growth of e-commerce leads to a denser network of warehousing and distribution centers near urban areas. According to JLL, the second quarter of 2022 saw record-high asking rents for warehouse and distribution real estate in the US, surpassed 21% percent year-over-year. Moreover, the industrial vacancy rate in the US fell to 3.4%, which is the lowest ever. In response to the persistent demand, the warehouse and distribution real estate market

hit another record high with over 184 million square feet of facilities delivered and more than 567 million square feet under construction in the first half of 2022. [96]

The continued increase in e-commerce demand and the need to increase stocks to counter potential supply chain disruptions will continue to cause strain on prices. Asking rents are expected to continue rising while vacancy rates remain at record lows, despite new development.[97] Access to existing industrial space as well as access to potential new development is critical in attracting and accommodating e-commerce retail businesses.

Consumer Shopping Habit and Demand: Consumers are increasingly turning to e-commerce to fulfill their purchasing needs, from groceries, electronics, and hardware/home improvement products, to furniture. Consumers are also increasingly demanding shorter delivery times, such as one-day and same-day delivery from online retailers which also contribute to a further increase in delivery traffic.

Kansas E-Commerce Trends

Zooming into Kansas (Figure I-170), e-commerce growth is accompanied by growth in employment and businesses in the transportation and warehousing sectors. Kansas saw an increase in non-store retailer employment between 2010 and 2019 while the state also experienced a decreasing number of employees who work in department stores, in line with national trends.

In terms of industrial land use, the number of warehousing and distribution establishments in Kansas grew at a rate exceeding the national rate during the 2010s. The Kansas City area continues to break records for new industrial developments, becoming one of 16 industrial markets in the US with more than 300 million square feet of industrial space.[98] During the first half of 2022, the Kansas City area's industrial market showed steady growth with a lower year-to-year vacancy rate and high net absorption during the first half of 2022. The industrial market in the greater Wichita region also remains robust, with two Amazon warehouses coming to the area in 2021 and multiple speculative warehouses in the pipeline.[99]

Figure I-170: Kansas E-Commerce Trends

Indicators		Trends	Statistics
Employment	Transportation and warehousing employment	↑	**45%** Employment in the transportation and warehousing sectors in Kansas grew by 45 percent between 2010 and 2019, higher than the national growth rate of 39 percent.[100]
	Department store retail employment	↓	**-55%** Department store employment in Kansas dropped by 55 percent between 2010 and 2019, indicating a more drastic impact of e-commerce on Kansas's retail industry than the national rate of 28 percent.[101]

[96] United States Industrial Outlook – Q2 20222, Aug. 15, 2022. https://www.us.jll.com/en/trends-and-insights/research/industrial-market-statistics-trends
[97] CBRE, U.S. Industrial & Logistics Figures - Q2 2021, (2021), https://www.cbre.com/
[98] The Newmark Zimmer's Kansas City Industrial Market Report – 3Q21. https://nmrkzimmer.com/market-research/kansas-city-market-reports/
[99] Retail, Industrial Brokers in Wichita Market Remain Busy, Rebusiness Online. https://rebusinessonline.com/retail-industrial-brokers-in-wichita-market-remain-busy/
[100] Bureau of Economic Analysis, Employment by State, https://www.bea.gov/
[101] Ibid.

Indicators			Trends	Statistics
	Non-store retailer employment[102]			**17%** Non-store retailer employment in Kansas grew by 17 percent between 2010 and 2019, while the national increase rate was 39 percent during the same period.[103]
Land Use	Number of warehouses and distribution centers			**56%** The number of warehousing and distribution establishments in Kansas increased by 56 percent between 2010 and 2019, more than double the national rate of 24 percent.[104]
	Vacancy Rate	Kansas City		**4.5%** Kansas City's industrial market vacancy rate decreased by 0.8 percent between 2021 and 2022, slightly higher than the US year-to-year decrease of 0.4 percent.[105]
		Wichita		**5.0%** Wichita's industrial market vacancy rate in 2022 decreased by over 5 percent from 10.57 percent in 2021, exceeding the national decrease rate of 0.4 percent.[106][107]
	Net Absorption (Kansas City)			**5.3 million square feet** The year-to-date net absorption of the industrial market in the Kansas City region increased by 1.7 million square feet, keeping pace with the inflow of new space. [108][109]

Key Freight Impacts

Statewide Truck VMT	The increase in e-commerce and higher demand for next- or second-day deliveries can transform trips made by individual consumers to truck trips generated by freight services. Between 2014 and 2019, Kansas already saw a 13.7 percent increase in truck vehicle miles traveled, with the share of truck volume growing nearly 20 percent.
First/Last-Mile Delivery	E-commerce typically relies on smaller commercial vehicles that travel on local and residential roads to make first- and last-mile deliveries. This increased freight traffic can increase congestion, generate emissions, worsen pavement deterioration, and cause safety concerns for pedestrians on local streets. E-commerce delivery is also

[102] Industries in the Nonstore Retailers subsector establishments include mail-order houses, vending machine operators, home delivery sales, door-to-door sales, party plan sales, electronic shopping, and sales through portable stalls.
[103] Bureau of Economic Analysis, Employment by State, https://www.bea.gov/
[104] Ibid.
[105] Ibid.
[106] 2021 Commercial Market Trends Report, J.P. Weigand & Sons, Inc. https://www.weigandcommercial.com/shared/fs/0830/company/Commercial/pdfs/2021_16pg_FINAL_web_p.pdf
[107] 2022 Commercial Market Trends Report, J.P. Weigand & Sons, Inc. https://www.weigandcommercial.com/shared/fs/0830/company/Commercial/pdfs/2022_Forecast.pdf
[108] Kansas City MarketBeat Reports, Q2 2021. https://cw-gbl-gws-prod.azureedge.net/-/media/cw/marketbeat-pdfs/2021/q1/us-reports/industrial/kansascity_industrial_marketbeat_q12021.pdf?rev=a3ac34ffe61941e0bd1f539a366bd5d7
[109] Kansas City MarketBeat Reports, Q2 2022. https://cw-gbl-gws-prod.azureedge.net/-/media/cw/marketbeat-pdfs/2022/q2/us-reports/industrial/kansas-city_industrial_marketbeat_q2_2022.pdf?rev=335f4d7a8519471b84c2e0b0e039cdb4

	increasingly accomplished using the personal vehicles owned by gig workers. In urban areas, there has been recent interest in using cargo bikes to reduce the congestion and emissions produced by typical freight vehicles.
Air cargo activities	Eighteen percent of air cargo volumes in the US in 2019 can be attributed to e-commerce packages, and this share is expected to rise to 22 percent in 2022.[110] With Kansas's air-dependent commodity tonnage projected to increase by 82 percent from 2017 to 2045, the state is expected to see increased air cargo services. For example, Amazon launched daily cargo services at Wichita's Eisenhower National Airport, beginning in January 2022, to provide greater capacity for shipping packages throughout the Wichita area and central Kansas.[111]

Planning for Growing E-commerce Demands

KDOT can study e-commerce freight trip patterns and industrial land use demands, working with regional and local stakeholders to plan for growing freight demand driven by the growth of e-commerce. This may include identifying the most efficient set of roadways for handling first/last-mile delivery, improving road conditions near warehousing and distribution centers to handle expected freight demand, and investigating alternative freight modes (e.g., cargo bikes) to carry out first/last-mile deliveries.

Key Freight-Reliant Industries in Kansas

Kansas Framework for Growth

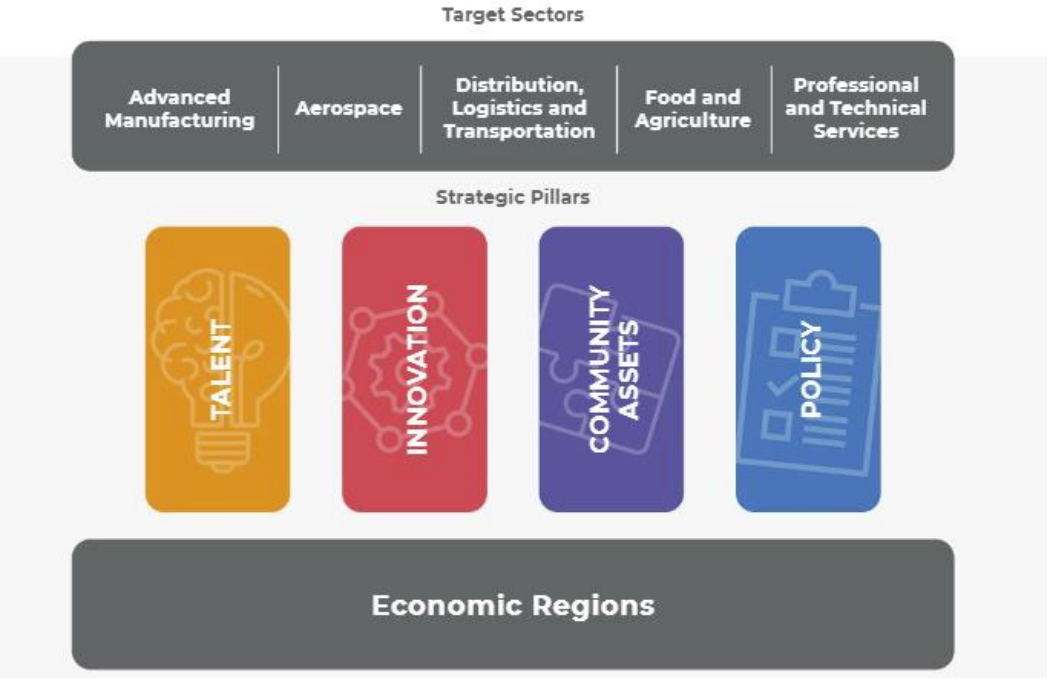
The Kansas Department of Commerce launched the *Kansas Framework for Growth* in February 2021, which identifies assets Kansas can leverage to stimulate future growth and overcome challenges to economic progress. It identifies three phases of economic development: (1) "Stabilize and reposition" (2021-2025), (2) "Punch above our weight" (2026-2030), and (3) "Realize a "future proof" economy" (2031-2035). Strategic opportunities are focused on five industries:

- Advanced Manufacturing;
- Aerospace;
- Distribution, Logistics, and Transportation;
- Food and Agriculture; and
- Professional and Technical Services.

For each sector, opportunities are arranged broadly into talent, innovation, community assets, and policy categories. Specific tasks include talent recruitment, technical and capital support for startups, broadband investments to attract data center investment, and strengthening relationships with export partners.[112] Figure I-171 illustrates the *Kansas Framework for Growth*.

[110] The STAT Trade Times, "Is E-commerce the air cargo industry's one bright spot?", (2022), https://www.stattimes.com/latestnews/is-e-commerce-the-air-cargo-industrys-one-bright-spot-1345029
[111] City of Wichita, "Amazon Air Takes Flight at Wichita Airport", (2022), https://www.wichita.gov/News/Pages/2022-01-20a.aspx
[112] Kansas Department of Commerce, "Kansas Framework for Growth," (2021), https://issuu.com/kdcmarketing/docs/framework_report-pageview?fr=sNjcyNDI5NDgzODM

Figure I-171: Kansas Framework for Growth



Source: Kansas Framework for Growth.

The Department of Commerce has also recently restored its International Division to boost state support for international trade relations and it has established a Community Development Division to support domestic-focused businesses.

Manufacturing

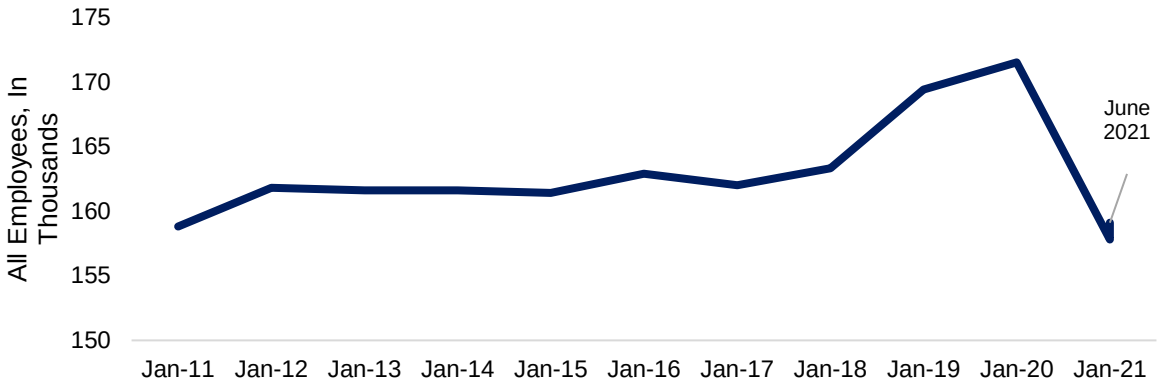
Manufacturing in Kansas includes industries ranging from food processing to aerospace. Kansas is particularly well-known for its aviation manufacturing; about one-third of all general aviation planes built in the US are built in Kansas[113] and nearly 70 percent of the world's embedded aviation fleet is built in the state.[114] Educational and research institutions such as the National Center for Aviation Training, Wichita State, Kansas State University, and the University of Kansas excel in areas like research, hands-on training, and aerospace engineering and combine to create a pipeline of talent for the industry. The supply of qualified aircraft technicians may not meet demand; the 2018-2028 Global Fleet & MRO Market Economic Assessment projects a nine percent gap between supply and demand for aircraft technicians by 2027.[115]

- **Importance to the Kansas Economy:** Manufacturing contributed 15.6 percent of the state's freight-generated GDP from 2000 to 2019. Manufacturing-related GDP in Kansas grew two to three percent annually between 2009 and 2019, which is faster than the nation as a whole.[116] Manufacturing jobs make up 11.2 percent of total employment in Kansas.[117] As

[113] Kansas Department of Commerce, "Aerospace & Defense", (2021) https://www.kansascommerce.gov/industry/aerospace/.
[114] Kansas Department of Transportation, "Kansas Aviation Economic Impact Study," (2017), https://www.ksdot.org/Assets/wwwksdotorg/bureaus/divAviation/pdf/2016EISFinalReport.pdf.
[115] Aeronautical Repair Station Association, "Global Fleet & MRO Market Economics Assessment, 2018-2029," http://arsa.org/wp-content/uploads/2018/03/CAVOK-MarketReport-ExecSum-20180305.pdf.
[116] National Institute of Standards and Technology, "Where Manufacturing is Growing (and Where It Is Not)," (Gaithersburg, MD: November 2020), https://www.nist.gov/blogs/manufacturing-innovation-blog/where-manufacturing-growing-and-where-it-not.
[117] Kansas Department of Commerce, "Build it in the Middle", (2021), https://issuu.com/kdcmarketing/docs/advanced_manufacturing_brochure_kdc3.26.2021?fr=sODEzYTI5NDgzODM.

shown in Figure I-172, Kansas manufacturing jobs have increased from 2011 until the coronavirus pandemic began in 2020.[118]

Figure I-172: Statewide Manufacturing Employment (January 2011-June 2021*)



Source: US Bureau of Labor Statistics

- **Manufacturing employment** has begun to recover from the coronavirus pandemic, but manufacturing jobs are still expected to decrease by 3.2 percent between 2018 and 2028, according to the Kansas Department of Labor. Manufacturing industries projected to experience the largest job losses are Apparel, Printing and Related Support Activities, and Textiles.[119] The pandemic may have contributed to a more rapid decline in employment as manufacturing plants deployed automation and artificial intelligence solutions to address increased demand and the need to reduce workplace density. Further, because the pandemic impacted low-wage jobs more significantly than middle- and high-wage jobs, McKinsey and Company estimate that almost all growth in labor demand will occur in high-wage jobs.[120]
- **Technology Advances:** The future of manufacturing in Kansas will be heavily influenced by technological advancements. Additive manufacturing (also referred to as 3D printing) is increasingly common in specialized applications or as an alternative to maintaining inventories of specialized product components. The aerospace and medical industries are using the technology to produce custom devices on demand for just-in-time delivery, significantly reducing inventory costs. New applications and types of 3D printing techniques are under development. Adoption of 3D printing techniques may result in changes to the volume and value of freight moved throughout the state. Another defining technology will be the use of robotics. Robotics have typically taken the roles of high-volume production, repetitive movement, or heavy object placement,[121] and can offer cost savings due to the increased speed of production and because of safety improvements compared to human labor.[122]

Deloitte Smart Factory

Deloitte's first Smart Factory in the US opened on the Wichita State University Innovation Campus in 2022. The factory integrates a host of novel technologies from a variety of partners, including artificial intelligence,

[118] US Bureau of Labor Statistics, Databases, Tables & Calculators by Subject https://data.bls.gov/timeseries/SMS20000003000000001?amp%253bdata_tool=XGtable&output_view=data&include_graphs=true
[119] Kansas Department of Labor, "Kansas 10 Year Job Outlook, 2018-2028," (Accessed July 29, 2021), https://klic.dol.ks.gov/gsipub/index.asp?docid=800.
[120] McKinsey & Company, "The future of work after COVID-19", (2021) https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19.
[121] McKinsey & Company, "Automation, robotics, and the factory of the future," (September 2017), https://www.mckinsey.com/business-functions/operations/our-insights/automation-robotics-and-the-factory-of-the-future.
[122] Manufacturing Tomorrow, "Robots in Manufacturing Applications," (August 2, 2016), https://www.manufacturingtomorrow.com/article/2016/07/robots-in-manufacturing-applications/8333.

the Internet of Things, advanced analytics, cybersecurity, and a renewable smart grid into a single manufacturing operation. The Smart Factory trailblazes the future of industry, where the human workforce is augmented by innovative technologies, efficiency brings down costs, safety is prioritized, cybersecurity is preserved, and sustainability is achieved. Some anticipated benefits include automated quality inspection, smart climate control, predicted equipment failure, effortless product customization, and more. Deloitte projects that the facility will draw at least 5,000 visitors annually, as industry partners come to explore the future of industry.

The Smart Factory not only draws from and fosters research and innovation at Wichita State University, it also manufactures products to inspire the next generation of thinkers. Deloitte has partnered with Elenco Electronics to manufacture STEM education products at the facility. These will be donated to schools around the country.[123]

- **COVID-19 Impacts:** The coronavirus pandemic disrupted numerous manufacturing processes and supply chains, highlighting potential resiliency concerns and improvement opportunities. Between May 2020 and May 2021, prices of commodities rose by 19 percent (as tracked within the Produce Price Index), the largest year-over-year cost increase since 1974.[124] Price increases paired with unpredictable demand swings caused inventory liquidation at the beginning of the pandemic and industries later found themselves unable to bring inventories back to pre-pandemic levels when the economy began to recover.[125] International manufacturing disruptions highlighted the importance of domestic production and the ability to move goods within the US However domestic production was not without delay. A US Census Small Business Pulse survey conducted in mid-July 2021 found over 64 percent of small manufacturing businesses experienced domestic supplier delays within the week. Nearly 40 percent of all manufacturing respondents indicated they need to identify new supply chain options within the next six months.[126]

Aerospace

Kansas has a storied history in the aerospace industry. Boeing's B-29 Superfortress and B-52 bombers were produced in the state in the 1940s and 50s.[127] Kansas continues to be a major international player in the aerospace sector, building some of the world's most sophisticated aircraft. The state is home to national and regional headquarters for many leading aerospace, aviation, and navigation equipment manufacturers, including Spirit AeroSystems, Textron Aviation, Garmin International, Bombardier Learjet, and TECT Aerospace.[128] The aerospace industry is relatively labor intensive, demanding a higher share of employment to sales volume than other industries.[129] As a result, the aerospace industry relies on the freight transportation system not only to transport goods but also to carry the workers who manufacture these goods.

- **Importance to Kansas' Economy:** Kansas is a national aerospace leader, delivering 35 percent of all general aviation airplanes built in the nation in 2019.[130] The aerospace industry directly contributes $7 billion annually to the Kansas GDP and accounts for almost 20

[123] The Smart Factory @ Wichita, accessed October 2022. https://www.thesmartfactory.io/home# | Deloitte Opens New US Smart Factory in Wichita, Kansas, Convenes Ecosystem of Innovators to Make Industry 4.0 a Reality, Deloitte, June 2022. https://www2.deloitte.com/us/en/pages/about-deloitte/articles/press-releases/deloitte-opens-new-us-smart-factory-in-wichita-kansas.html

[124] Helper, Susan and Evan Soltas, "Why the Pandemic Has Disrupted Supply Chains", (June 17, 2021), retrieved from the US White House at https://www.whitehouse.gov/cea/blog/2021/06/17/why-the-pandemic-has-disrupted-supply-chains/

[125] Ibid.

[126] Callen, Jane, "Census Bureau's Small Business Pulse Survey Reveals Delays from Domestic, Foreign Suppliers", (August 09, 2021), retrieved from United States Census Bureau at https://www.census.gov/library/stories/2021/08/united-states-small-businesses-suffer-supply-chain-disruptions.html

[127] Kansas Department of Commerce, "Aerospace & Defense." https://www.kansascommerce.gov/industry/aerospace/

[128] Ibid.

[129] CPCS analysis of Data Axle, Business Establishment Data, 2021.

[130] Air Capital of the World, "Fueling A Heritage of Innovation." https://www.aircapitaloftheworld.com/

percent of the state's total exports.[131] Supporting this industry is the third largest concentration of aviation workers in the country.

- **The Air Capital of the World:** Wichita, due to its numerous aerospace industries, is known internationally as the Air Capital of the World. Textron Aviation, Cessna Aircraft Company, Airbus, Bombardier, and Spirit AeroSystems all have operations in the region. Blue Origin signed contracts with several aerospace manufacturers in Wichita in 2021.[132] As a result, Wichita does not only have a workforce specialized in aerospace but is ranked as the most specialized region in the US for manufacturing overall, likely given the labor demands of producing aircraft.[133]
- **Aerospace Education, Training, and Research:** Kansas offers a wide variety of world-class education and research programs that align with the aerospace industry. These include the National Center for Aviation Training, the National Institute for Aviation Research, the Wichita State University Innovation Campus, Kansas State University Polytechnic, and the University of Kansas. Wichita State University is ranked as the #1 college for industry-funded aerospace research. These programs provide the necessary workforce pipeline to support Kansas' impressive aerospace industries.[134]

Agriculture

Agriculture is a major contributor to the Kansas economy. Kansas is the nation's largest wheat producer and third largest livestock producer.[135] The Kansas agricultural sector also includes renewable energy production, food processing, research and education, and agribusiness. The agricultural economy depends on an extensive network of local roads, state highways, rail lines, and transload and intermodal facilities that can bring products and commodities from rural areas to market, including large or oversized agricultural loads.

- **Importance to the Kansas Economy:** Direct agricultural products contribute $19.6 billion annually to the Kansas GDP – three percent of the total GDP contributed by private industry. The Kansas Department of Agriculture estimates agriculture is the largest single economic driver in Kansas, valued at $64 billion in 2018.[136] The agriculture sector in Kansas employs more than 238,000 people, almost 13 percent of the entire workforce in the state.[137]
- **Technology Advances:** New technologies are already beginning to change agriculture in Kansas. Examples of change include connected and autonomous equipment that will make planting and harvesting more efficient; and the use of drones for monitoring crops or livestock. As a result, by 2027 the U.S. market for agricultural drones is expected to increase at a compound annual growth rate of 34.2 percent, reaching over $5.06 billion.[138] Blockchain is expected to greatly improve the traceability of livestock and agricultural product movements through the supply chain, bringing transparency to enhance food safety.[139]
- **Environmental Impacts:** Climate impacts are causing an increase in temperatures and a decrease in available water as mentioned in previous sections. These changes will impact

[131] Kansas Department of Commerce, "Aerospace & Defense." https://www.kansascommerce.gov/industry/aerospace/
[132] Business Wire, "Blue Origin Signs Long-Term Agreements with Four Kansas Companies to Support New Glenn Heavy-Lift Launch Vehicles and Engine Programs" (October 2021). https://www.businesswire.com/news/home/20211029005478/en/
[133] Air Capital of the World, "Fueling A Heritage of Innovation." https://www.aircapitaloftheworld.com/
[134] Kansas Department of Commerce, "Aerospace & Defense." https://www.kansascommerce.gov/industry/aerospace
[135] Ibid.
[136] Kansas Department of Agriculture, "2019 Strategic Action Plans for Kansas Agricultural Growth", (2019), https://agriculture.ks.gov/docs/default-source/ag-growth-summit/january-2018-documents/2019-growth-book_final_web.pdf?sfvrsn=69298ac1_8.
[137] Ibid.
[138] Market Watch, " Agricultural Drones Market Share 2022 Industry Outlook, Global Size, Business Strategies, Product Demand, Forecast 2027," (December 8, 2022), https://www.marketwatch.com/press-release/agricultural-drones-market-share-2022-industry-outlook-global-size-business-strategies-product-demand-forecast-2027-2022-12-08.
[139] USDA, "A Case for Rural Broadband: Insights on Rural Broadband Infrastructure and Next Generation Precision Agriculture Technologies," (Washington, DC.: April 2019), https://www.usda.gov/sites/default/files/documents/case-for-rural-broadband.pdf.

Kansas' agricultural industry. Warmer temperatures will decrease agriculture yields by approximately 50 percent if fields cannot be irrigated. Higher temperatures create an inhospitable environment for corn, decreasing production even on irrigated fields. Warmer springs and shorter winters may allow for a longer growing season but may shorten dormancy for winter crops which can lead to crop loss during spring freezes.[140]

Energy and Natural Resources

The Energy and Natural Resources industry in Kansas includes mining, quarrying, oil/gas extraction, utilities, and manufacturing related to energy production and operation (including wind energy, solar energy, ethanol and biodiesel, natural gas, nuclear energy, coal, and oil). The energy and natural resources industry is both supportive of and driven by a healthy economy. According to the US Energy Information Administration (EIA), the 2020 economic downturn caused by the coronavirus pandemic decreased end-use demand for energy to 90 percent of 2019 levels.[141] While energy demand will grow, driven by a growing economy and population, energy efficiency will offset some future needs. The EIA's Annual Energy Outlook 2021 projects electricity demand will return to 2019 levels by 2022 and electricity demand will grow at an annual rate of less than or around one percent through 2050.[142]

- **Kansas is a Leader in Wind Energy:** In 2020, renewable energy sources generated 44 percent of Kansas' in-state electricity, nearly all of it coming from wind power. Kansas is among the top five states in the US for total wind energy generation; as of January 2021, Kansas had 6,900 megawatts of wind generating capacity already installed. Four new wind projects with a capacity of over 1,000 megawatts are planned to come online in 2021. In addition to generating energy, wind turbines require many manufactured products made in Kansas. Wind turbine components require permitted large loads to travel across Kansas highway and rail systems that must be specially routed to avoid geometric impediments.
- **Energy Diversity:** Kansas is among the top ten states in the production of biofuels, benefiting from access to agriculture from which biofuels are sourced and that serve as the stock for fuel and a market for biofuel by-products. As initiatives around the county focus on carbon reduction, Kansas biofuels are finding market opportunities by efficiently using outputs from agriculture services such as hog processing. Kansas is also among the top ten states in terms of the number of sunny days experienced, which provides great potential for solar energy production.[143] The petroleum industry has hundreds of oil and natural gas wells throughout the state with nearly 43,000 active wells in 2021.[144]
- **Future Energy Production:** Energy production will also be needed to keep Kansas running in a future age of technology. All major electric utility providers in Kansas are members of the Southwest Power Pool (SPP) which reports on projects related to energy capacity and use. Of the nine electric utility generators included in the SPP's 2021 Biennial Report, six are projecting a 2038 system capacity deficiency.[145] In its Annual Energy Outlook 2021, the EIA estimates the share of generated renewables in the US will increase from 21 percent in 2020 to 42 percent in 2050. Wind and solar generation are projected to account for most of that growth.[146] Home to numerous institutions offering training programs for the renewable energy

[140] US EPA, What Climate Change Means for Kansas EPA 430-F-16-018, (2016), https://www.kansasforests.org/resources/resources_docs/climate-change-ks%202016.pdf
[141] US Energy Information Administration, "Annual Energy Outlook 2021, Narrative", (February 2021), https://www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf
[142] Ibid.
[143] Kansas Department of Commerce, "Energy and Natural Resources", https://www.kansascommerce.gov/industry/energy-natural-resources/
[144] University of Kansas, Kansas Geological Survey, "State Production and Historical Info", (August 2, 2021), http://www.kgs.ku.edu/PRS/petro/state.html
[145] Kansas Department of Commerce. Electric Supply and Demand Biennial Report 2021, (Topeka, KS: 2021), https://kcc.ks.gov/images/PDFs/legislative-reports/2021_Electric_Supply__Demand_Report.pdf
[146] Dubin, K., "EIA projects renewables share of US electricity generation mix will double by 2050", (February 08, 2021), Retrieved from Today in Energy: https://www.eia.gov/todayinenergy/detail.php?id=46676

workforce, Kansas resources will come into play as renewable energy occupies a larger share of the nation's electricity generation.

Major New/Planned Freight Facilities

Several new and planned major freight-related projects in Kansas will grow the economic impact of freight in Kansas, while also increasing demand on the state's freight system, particularly on roads and railways. Figure I-173 to Figure I-177 provide overviews of the facilities and detail each facility's impacts on the freight system.

Figure I-173: Bartlett Soybean Crushing Facility

Bartlett Soybean Crushing Facility	Status: Expected to begin operations in 2024	Location: South of Cherryvale
 Source: KDOT	**Facility Overview** The facility will create 50 permanent jobs and will be capable of processing **up to 115,000 bushels of soybeans per day and 40 million annually**. The facility will also include enough **storage for about 4 million bushels of soybeans**. Products produced by the facility will include soybean meal, refined soybean oil, feedstocks used in producing food, renewable fuels, and animal feed. The facility has rail access to three Class I railroads (UP, BNSF, and KCS) and will be directly served by South Kansas and Oklahoma Railroad (SKOL – WATCO). **Impacts on the Freight System** The facility is in proximity to numerous US and State highways and will support significant local and regional truck traffic, amounting to **roughly 244 semi-truck trips per day** and **up to 600 a day during harvest season**. In addition to truck access, the site will receive $39 million in mainline track and bridge infrastructure upgrades to improve rail infrastructure to 286K capability at 25 mph, **supporting the movement of 12,000 to 15,000 rail carloads** of inbound soybeans and outbound products annually. Through additional investments, there will also be a capacity for over 300 rail cars on 4 miles of track within the facility.	

Figure I-174: Seaboard Energy Facility

Seaboard Energy Facility	Status: In operation	Location: Hugoton

Source: KDOT

Facility Overview

The facility creates **65 permanent jobs** and produces about **85 million gallons of renewable diesel and biodiesel annually**. The Seaboard Energy project also included $15 million in rail infrastructure improvements to **connect the facility to BNSF via the Cimarron Valley Railroad (CVR)**.

Impacts on the Freight System

These commodities will generate demand for **between 12,000 and 15,000 new annual truckloads of cargo**. This investment will offer a rail alternative to truck movements and is anticipated to generate **about 5,500 inbound and outbound rail carloads per year**.

Figure I-175: FedEx Distribution Center

FedEx Distribution Center	Status: Construction started in October 2021	Location: Crawford County

Source: KDOT

Facility Overview

FedEx is developing a **250,000-square-foot distribution center** that will generate about **150 new full- and part-time jobs**.

Impacts on the Freight System

In addition to the distribution center, there are also **proposals to incorporate highway layout improvements** in the area and conduct **a site drainage study**. The site is anticipated to generate **256 new daily truck trips and 320 new daily van trips**.

Figure I-176: Amazon Fulfillment Center

Amazon Fulfillment Center	Status: In operation as of August 2021	Location: Park City

Source: Google Map

Facility Overview

The **one-million-square-foot** fulfillment center started its operation in August 2021, providing between **700 and 1,000 jobs** throughout the year.

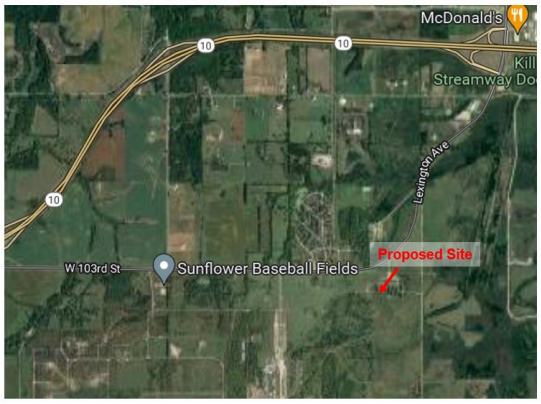
Impacts on the Freight System

Park City built **a roundabout at 77th and Broadway Street** to accommodate the facility's needs. Additionally, the city also invested $1.5 million to **construct a sewer line stretching one and a half miles from 77th Street to 61st Street**. Located next to the I-135, the fulfillment center will handle bulky or large-sized items such as patio furniture, outdoor equipment, or rugs.[147]

[147] Massive Amazon fulfillment center to start local work Sunday, The Wichita Eagle, Aug.14, 2021. https://www.kansas.com/news/business/article253481734.html.

Figure I-177: Panasonic EV Battery Plant

Panasonic EV Battery Plant	Status: Planned	Location: De Soto



Source: Google Map

Facility Overview

In July 2022, Panasonic announced its plans to build **a $4 billion EV battery plant – the world's largest – to manufacture and supply lithium-ion batteries** to EV makers. This project will be the largest economic development project in Kansas' state history. Planned for the Kansas City region, at the former Sunflower Army Ammunition plant south of KS 10, the new facility is expected to provide **up to 4,000 new jobs**, which would make Panasonic one of the state's largest non-governmental employers. These new jobs will provide an annual income of just over $50,000. Panasonic will be eligible for $829 million in tax credits, exemptions, and other incentives. De Soto is also expected to provide a local property tax incentive.[148]

Impacts on the Freight System

The impact on the freight system is still unclear, but the EV battery plant could potentially increase the truck traffic on the nearby KS 10.

Political Factors & Trends

Policies at the international, national, statewide, and local levels have the potential to impact freight movements and operations in Kansas – notably, when policies change, they may either bolster or hinder the ability for freight to move to and from different geographies. Policies include not only regulations and agreements, but also approval or lack of funding authorization by governmental bodies. By planning for and adapting to policy changes, KDOT can identify how to take advantage of freight-friendly policies and address policies that pose a challenge to safe and efficient freight movements across the nation and the world.

International Trade

International trade policies have an impact on trade in the US and Kansas. In 2020, Kansas exports totaled nearly $10.4 billion, with the top export countries being Mexico, Canada, Japan, and China.[149] Evolving US trade policies could have important implications for the future of trade between the US and its trading partners, including those closest to the US – Canada and Mexico – as well as fast-growing China.

- **Trade with Mexico and Canada:** The United States-Mexico-Canada Agreement (USMCA) took effect on July 1, 2020, and includes language that supports agriculture, including Kansas agriculture. The USMCA provides Kansas farmers, ranchers, and agribusinesses a degree of certainty and instills confidence in the state's top trade partners and neighbors that the US can be counted on as a reliable supplier of food and agricultural commodities.[150] Mexico and Canada have historically been stable trading partners with Kansas. Connectivity to those markets and the facilitation of trade service has been at the forefront of Kansas'

[148] Tech Crunch, "Panasonic to build $4B EV battery plant in Kansas," July 13, 2022, https://techcrunch.com/2022/07/13/panasonic-to-build-4-billion-ev-battery-plant-in-kansas/

[149] Kansas Department of Commerce. "2020 Kansas Exports by Country", (February 2021), Retrieved from Kansas International Trade Summary: https://www.kansascommerce.gov/wp-content/uploads/2021/02/2020-Kansas-Exports-by-Country-Updated.pdf

[150] Kansas Office of the Governor. "Governor applauds Congressional passage of USMCA," (January 16, 2020), https://governor.kansas.gov/governor-applauds-congressional-passage-of-usmca/

trade policy. Investments to improve access can return large benefits at a lower cost than addressing connectivity issues with more distant trading partners.

- **Trade with China:** As a growing trade partner, internal relations with China greatly impact Kansas. In 2018, the US and China entered a trade war of escalating tariffs which resulted in falling exports to China. National and Kansas exports to China reached a ten-year low in 2019. While tariffs still exist on US and Chinese goods, tariff exclusions began in March 2020 to support trade commitments and to help establish a more normal flow of goods between the two countries. The policy change created an approximate $1 billion increase in exports from Kansas to China between 2019 and 2020.[151] The fluctuations in trade with China have real on-the-ground implications for suppliers and buyers. For example, demand changes overseas alter the demand for grain (a large component of the Kansas-China trade) which must be facilitated through storage.

Regulations

Freight operations are regulated by state and federal policies. The following exemplifies how these regulations could impact truck and rail movements in Kansas.

- **Truck Restrictions:** Kansas weight limits for vehicles in regular operations are generally comparable to bordering states as shown in Figure I-178. However, Colorado allows heavier tandem axle vehicles, and Oklahoma, Missouri, and Nebraska have higher gross weight limits on non-Interstate highways.

Figure I-178: Kansas and Regional Weight Restrictions

	Kansas	Colorado	Oklahoma	Missouri	Nebraska
Single Axle	20,000 lbs.	20,000 lbs.	20,000 lbs.	20,000 lbs.	20,000 lbs.
Tandem Axle	34,000 lbs.	36,000 lbs. on Interstates 40,000 lbs. on non-Interstate highways	34,000 lbs.	34,000 lbs.	34,000 lbs.
Gross Weight	80,000 lbs. on Interstates	80,000 lbs. on Interstates	80,000 lbs. on Interstates	80,000 lbs. on Interstates and non-Interstates	80,000 lbs. on Interstates
	85,500 lbs. on non-Interstate highways	85,000 lbs. on non-Interstate highways	90,000 lbs. on non-Interstate highways	Up to 120,000 lbs. when entering from Kansas and 90,000 lbs. when entering from Oklahoma	95,000 lbs. on non-Interstate highways

Source: Compilation of Existing State Truck Size and Weight Limit Laws, USDOT FHWA. Note: Some exceptions apply on a state-by-state basis. See source for additional detail.

- **Rail Regulations**: In July 2020, KDOT proposed K.A.R. [36-43-1] Crew Requirements regulations requiring at least two crew members in the control department of trains operating within Kansas.[152] Similarly, the FRA proposed federal rulemaking regarding minimum crew staffing in March 2016. Short line railroads and agricultural industry groups tend to advocate against crew-size legislation, arguing that such legislation at the federal or state level would

[151] US-China Business Council,"2021 State Export Report", (May 2021), https://www.uschina.org/sites/default/files/state_export_report_2021_full_report.pdf

[152] Kansas Department of Transportation, "Kansas Department of Transportation Proposes Safety Rule Regulating Minimum Railroad Crew Size", (July 2020), https://governor.kansas.gov/kansas-department-of-transportation-proposes-safety-rule-regulating-minimum-railroad-crew-size/

decrease efficiency and increase labor costs with no impact on safety.[153] KDOT's proposed Crew Requirements regulation was denied by the Kansas Attorney General in September 2020 and the proposed federal rulemaking on train crew staffing requirements was withdrawn in 2019.[154] However, as of July 2022, a Notice of Proposed Rule Making was again issued by the FRA requiring a minimum of two train crewmembers for over-the-road railroad operations, with some exceptions for certain low-risk operations and other circumstances.[155]

[153] American Short Line and Regional Railroad Association, "Oppose Train Crew Size Legislation", (February 2019). http://files.aslrra.org/images/news_file/Crew_Size_2-15-19.pdf

[154] Schmidt, D., "Re: K.A.R. 36-43-1", (September 2020). https://d39l22i8npk6ka.cloudfront.net/app/uploads/20201007083302/20201007_Ms.-Gelene-Savage-Kansas-Department-of-Transportation-E_001.pdf; Federal Railroad Administration, "Withdrawal of Proposed Rulemaking: Train Crew Staffing", (May 2019), https://railroads.dot.gov/elibrary/withdrawal-notice-proposed-rulemaking-train-crew-staffing#p1_z10_gD_lLR_lLI_lLN_lLP_kcrew

[155] Federal Railroad Administration, "FRA Issues Proposed Rule to Enhance Train Safety, Codify Train Crew Size Requirements", (July 28, 2022), https://railroads.dot.gov/newsroom/press-releases/fra-issues-proposed-rule-enhance-train-safety-codify-train-crew-size-0#:~:text=WASHINGTON%20%E2%80%93%20To%20enhance%20safety%2C%20the,operations%20and%20circumstances%20where%20mitigating

Appendix J. Kansas Weigh Stations

This Appendix provides additional detail on Kansas' weigh stations, including issues and opportunities.

USDOT has two major roles related to commercial motor vehicle (CMV) regulations. It establishes certain CMV regulations, including hours-of-service (HOS) and Commercial Driver's License (CDL) certification. It also plays a role in the enforcement of CMV regulations through the FMCSA. Among other responsibilities, FMCSA maintains and improves federal safety information systems, many of which are crucial for state inspection processes.

States work within the confines of federal regulations and systems but have significant leeway in CMV regulation. States can establish their own regulations, install and maintain their own e-screening technologies, manage their own enforcement staff, and partner with bypass service providers of their own choosing. Moreover, the duty of inspecting CMVs to ensure compliance largely falls on the states. About 95 percent of CMV inspections are conducted by state inspectors

To verify compliance with federal and state safety regulations, CMVs are inspected at weigh stations or inspection sites. These stations are the nuts and bolts of a system to ensure that the more than 13 million large trucks registered in the US operate safely.[156] In Kansas, there are 8 weigh station facilities located in 6 locations.

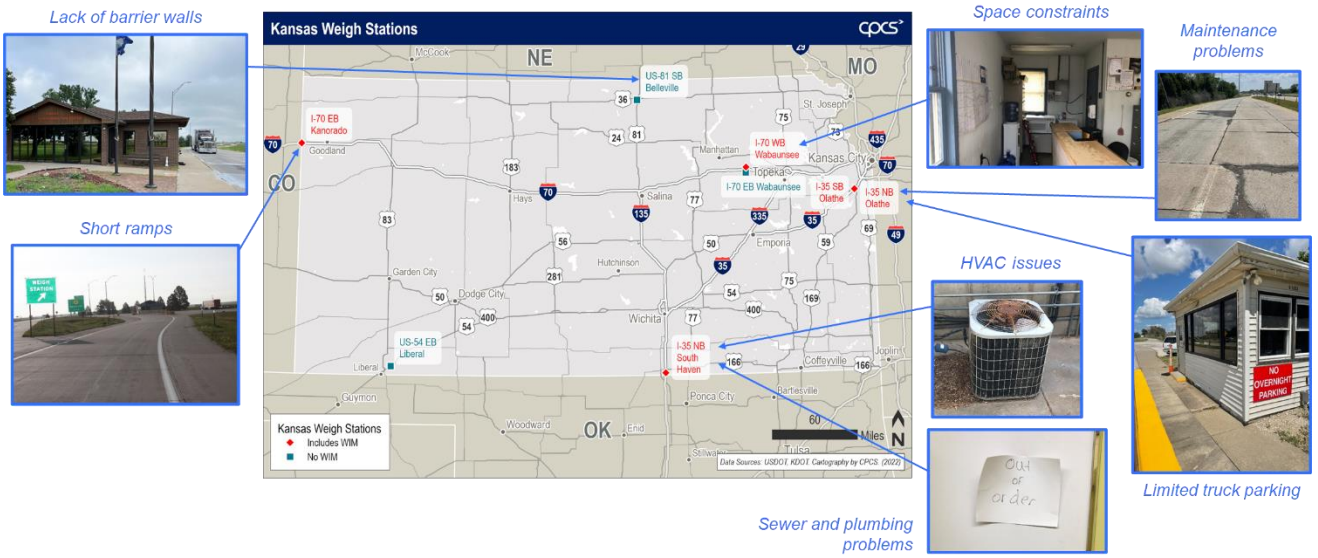
The weigh stations in Kansas suffer from chronic underinvestment. Figure J-179 identifies the eight weigh station facilities in Kansas, as well as their identified issues. The most common problems facing Kansas weigh stations are maintenance problems, like deteriorating structures, concrete, flooring, and technology, limited truck parking onsite, and HVAC issues.

Figure J-179: Kansas Weigh Station Facilities and Identified Issues

	Station 21W & 22W	Station 23W & 24W	Station 26A	Station 37A	Station 46	Station 58
Location	Wabaunsee	South of Olathe	South Haven	East of Liberal	Kanarado	South of Belleville
Route	EB & WB I-70	NB & SB I-35	I-35	US-54	EB I-70	US-81
Year Built	<1966	1950s	1986	1995	1967	1993
Pests	Yes	Yes	No	No	No	No
Maintenance problems	Yes	Yes	Yes	Yes	No	No
Space constraints	Yes	Yes	No	No	No	No
High volume traffic	No	Yes	Yes	No	Yes	No

[156] USDOT, FMCSA, Pocket Guide to Large Truck and Bus Statistics, 2021, https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/2022-01/FMCSA%20Pocket%20Guide%202021.pdf

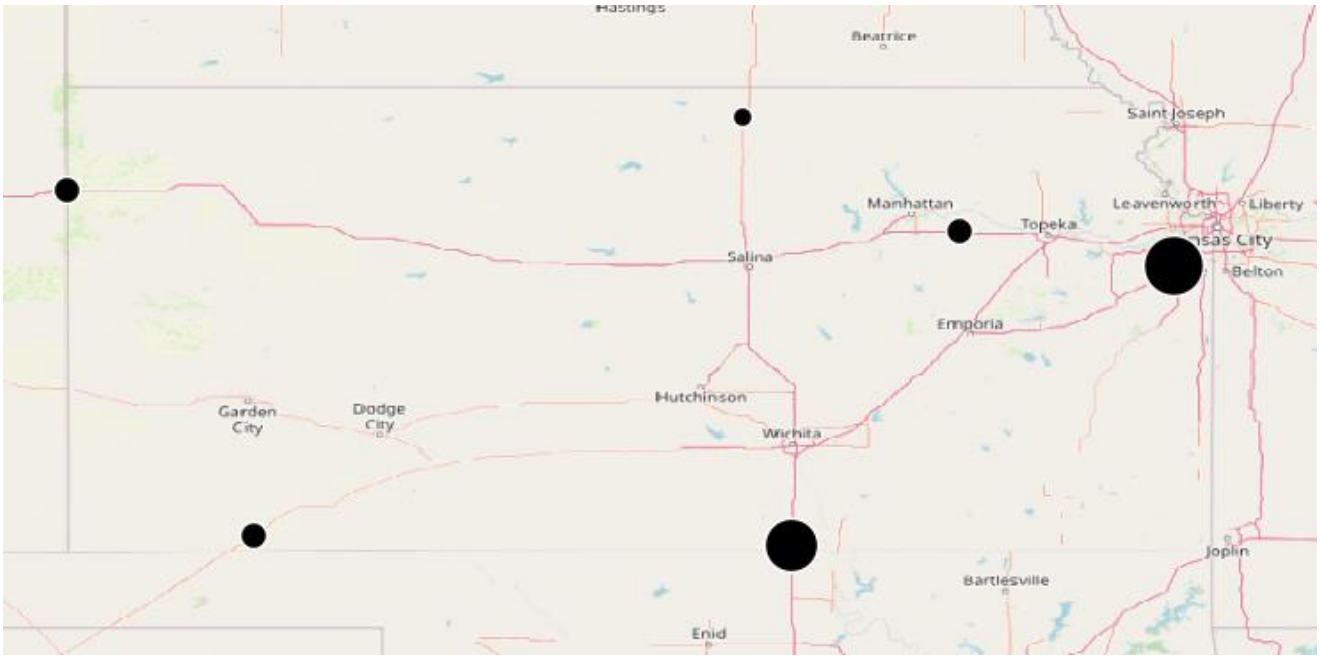
	Station 21W & 22W	Station 23W & 24W	Station 26A	Station 37A	Station 46	Station 58
Short ramps	No	Yes	Yes	No	Yes	No
Limited truck parking	Yes	Yes	Yes	Yes	No	No
Electrical/ plumbing problems	No	Yes	Yes	No	No	No
Sewer problems	No	Yes	No	No	No	No
HVAC issues	No	Yes	Yes	Yes	No	No
No on-site trash service	No	No	Yes	No	No	No
Limited camera views	No	No	Yes	Yes	Yes	Yes
Other	N/A	N/A	N/A	N/A	Bridge limits sight distance to exit ramp	No barrier walls, ineffective audio speaker



Source: CPCS analysis of Kansas Highway Patrol information, 2022.

Figure J-180 maps the six weigh station locations in Kansas and scales each by the number of issues identified in Figure J-179. The facilities in Olathe and South Haven present the most serious problems.

Figure J-180: Kansas Weigh Station Locations Scaled by the Number of Identified Issues



Source: CPCS analysis of Kansas Highway Patrol information, 2022.

In addition to addressing the noted issues, the Kansas High Patrol proposes a number of additional technological and engineering upgrades that will help to modernize the weigh stations. These include:

- Installing Weigh-in-Motion technologies
- Installing tire anomaly machines
- Installing registration readers

- Installing USDOT number readers
- Construction barrier walls to protect scale house facilities
- Adding truck parking capacity
- Building inspection pits
- Installing additional exterior and interior cameras

Appendix K. Potential Evaluation Criteria for Freight Project Selection

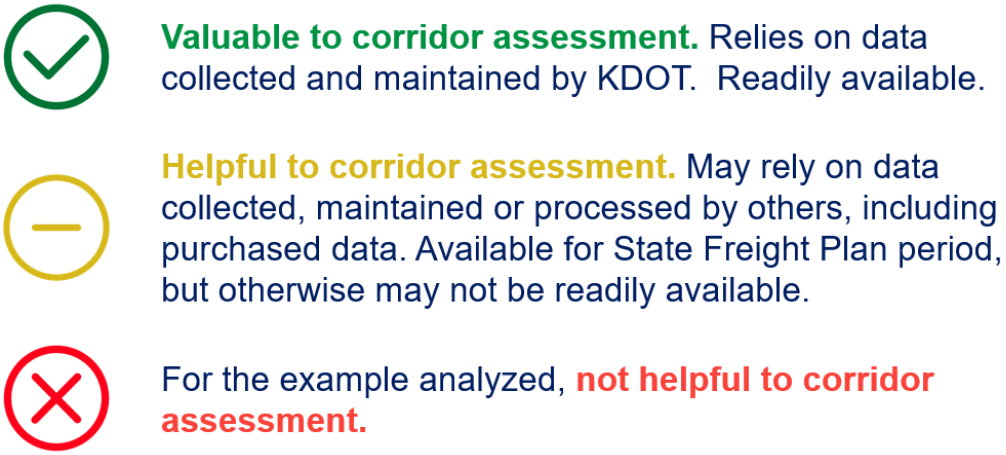
As part of developing the Kansas State Freight Plan, KDOT sought to assess and articulate how freight corridors and evaluation criteria could be incorporated into broad KDOT policies, project planning, decision-making, and investments. The process involved several discussions held among KDOT's Executive Team and policy experts, which included representatives from the Bureau of Transportation Planning, Bureau of Freight and Rail, Division of Multimodal Transportation and Innovation, and Division of Program and Project Management.

The KDOT Executive Team group discussed Kansas' freight network designation, evaluation criteria to identify freight uses and needs along the state's roadway network, and freight integration into program and funding guidance. In total, three meetings were held:

- **Meeting 1: Policy Options for Designating a Freight Network (June 2022).** The group discussed different purposes for designating a freight system and reviewed KDOT's process for updating the state's freight designation – the Kansas FCS – as part of the State Freight Plan process.
- **Meeting 2: Review Proposed Criteria to Incorporate Freight Into Project Selection (August 2022).** The group further discussed the Kansas FCS, including designation of Kansas' Critical Rural Freight Corridors (CRFCs). Information was also presented on the evaluation measures used to assess select key freight corridors in the state, and how certain criteria are more or less useful in assessing corridors.
- **Meeting 3: Refine Approach to Incorporate Freight into Project Selection (September 2022).** The group finalized discussions related to the Kansas FCS designation, KDOT use of NHFP funds for projects along the FCS, and what elements of the State Freight Plan and freight assessment could be used by KDOT for future decision making and funding allocation.

As part of Meeting 2, freight evaluation criteria were reviewed for future project funding selection consideration. Figure K-181 shows how the potential criteria was evaluated.

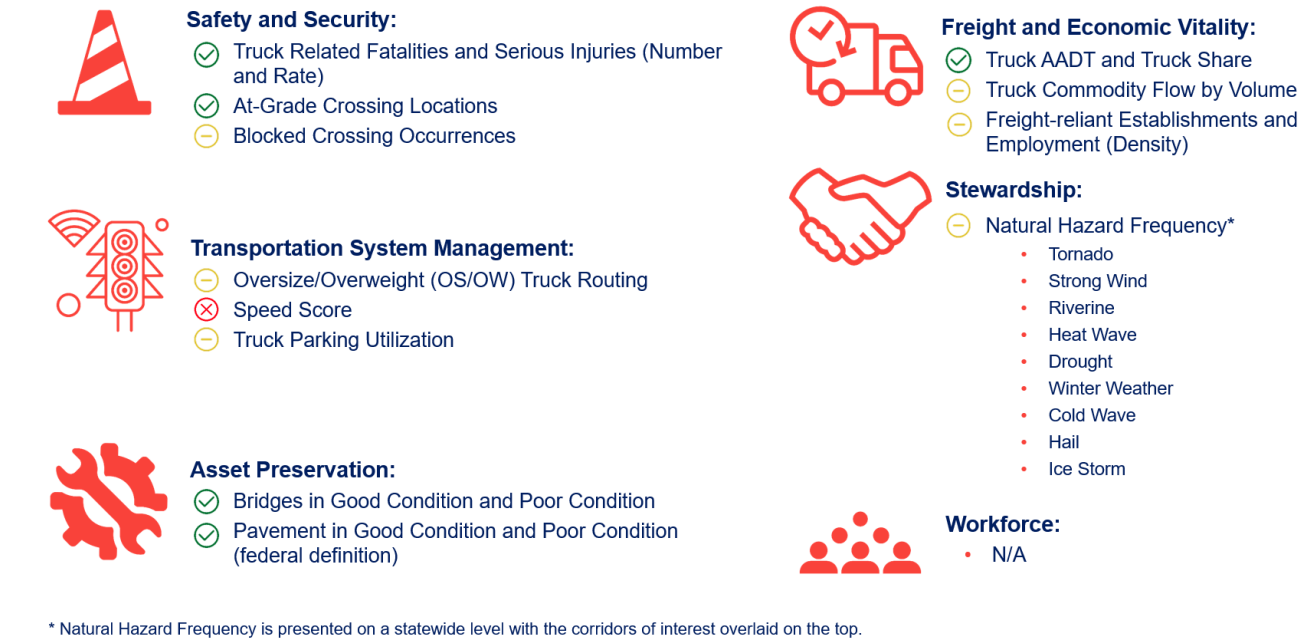
Figure K-181: Evaluation Criteria Assessment



Roadway system evaluation criteria, organized by State Freight Plan goals, were calculated as part of the corridor assessment (Appendix G) and then considered for applicability to future project funding selection. As shown in Figure K-182, five evaluation criteria were deemed to have merit for potential future project funding selection, including:

- Truck-related Fatalities and Serious Injuries
- At-grade Crossing Locations
- Bridges in Good Condition and Poor Condition
- Pavement in Good Condition and Poor Condition (federal definition)
- Truck AADT and Truck Share

Figure K-182: Evaluation Criteria Assessment Results



* Natural Hazard Frequency is presented on a statewide level with the corridors of interest overlaid on the top.

At the culmination of these discussions, the KDOT Executive Team expressed interest in using the FCS designation as an evaluation factor when determining where to invest funds, with the goal of prioritizing projects that are located on the state's FCS network. Other freight evaluation criteria were not advanced for inclusion, but are recorded in the State Freight Plan for future consideration.

Appendix L. Public Comments

KDOT released the Final Draft of the 2022 Kansas State Freight Plan for public comment on November 16, 2022. KDOT invited the public and interested parties to submit comments online via KDOT's public comment management portal by December 16, 2022. Figure K-167 details the comments received by KDOT during this public comment period.

Figure K-167: 2022 Kansas State Freight Plan Public Comments

Date Received	Comment
11/17/2022	I have reviewed the information pertaining to Manhattan Regional Airport. The chart on page 145 needs to be updated to reflect current MHK pavement conditions. Runway 13/31 is concrete only and in excellent condition. Runway 3/21 is in poor condition as of today; however, runway reconstruction will occur in the summer of 2023 and following that work the pavement will be in excellent condition.
11/30/2022	My name is Brad Haynes and I am commenting today on behalf of the Wichita Airport Authority. I have read through the Final Draft of the 2022 Kansas State Freight Plan and although I did see reference to the physical conditions and the length of runways necessary to accommodate large air cargo carriers, additional considerations must also be made. The KFAC must also consider the area, P.C.I. (Pavement Condition Index) and thickness of pavement for the Aprons/Ramps and Taxiways. With the recent addition of Amazon to our cargo Apron, we are currently at capacity. In order to adapt to the growing needs of our air cargo operations; we must always be looking towards expansion. This expansion could include larger Aprons with additional Taxiways and potentially larger hangars to support this aircraft design group. Per this final draft, ICT airport handles the most tonnage of air cargo freight in the state of Kansas. I please hope you will consider these comments and look into these subjects for our airport and other airports throughout the state.
12/1/2022	Is there any exhibit (list) that is available that would list proposed projects for FYE 2023 that currently has funding appropriated or is proposed? Name of railroad recipient + brief description + funding amount and co-share dollar match requirement of the railroad owner?
12/2/2022	I would like to make comment on the following passage on page 163 of the current draft: "As part of the State Rail Plan update, the Kansas Rail System Investment Plan identifies planned and potential railroad projects in the state, identified through a review of existing project lists, stakeholder input, and data analysis, including: • Ready rail projects, which address rail needs at a specific location, with developed project details. These include four projects totaling nearly $75 million in total project costs and three projects with project costs yet to be determined. • Rail projects in development, which address rail needs at a specific location but still remain under development to identify detailed project costs and benefits. These include 17 projects amounting to $212.4 in estimated project costs. • Other rail project opportunities, which address statewide rail needs, but remain in the concept phase, with project details yet to be determined. Project types include those that increase capacity and improve aging infrastructure." We simply want to ensure that the proposed Port Authority of Stafford County Transload Facility near St. John is included in that count. The facility is in Rail Ready phase, with 30% plans completed, land acquired, over $5 million in grant funding approved, and borrowing authority for an additional $2 million. A grant application to the Federal Railroad Administration is under review which would fully fund the construction of a 3.5 mile track interconnecting with the BNSF including a one mile loop track designed to accomodate 110 car unit trains. Final engineering will proceed in early 2023, and with construction that could proceed as soon as fall 2023. The Port Authority of Stafford County was authorized and created in 2014 by the Kansas Legislature and Stafford County Commission. Its purpose, by establishing infrastructure that enables access to more efficient, less expensive rail transportation, is to stimulate economic activity that otherwise wouldn't occur in this rural part of the state. That is consistent with goals articulated in the State Rail Plan.