

## Multi-State, Multimodal, Oversize/Overweight Transportation

### DETAILS

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### AUTHORS

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NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

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**NCHRP REPORT 830**

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**Multi-State, Multimodal,  
Oversize/Overweight  
Transportation**

**CPCS**  
Washington, DC

IN ASSOCIATION WITH

**Perkins Motor Transport, Inc.**  
Northfield, MN

AND

**Portscape, Inc.**  
Lexington, MA

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## **CRP STAFF FOR NCHRP REPORT 830**

**Christopher W. Jenks**, *Director, Cooperative Research Programs*  
**Christopher Hedges**, *Manager, National Cooperative Highway Research Program*  
**Lawrence D. Goldstein**, *Senior Program Officer*  
**Anthony P. Avery**, *Senior Program Assistant*  
**Eileen P. Delaney**, *Director of Publications*  
**Sreyashi Roy**, *Editor*

## **NCHRP PROJECT 08-97 PANEL** **Field of Transportation Planning—Area of Forecasting**

**Eric O. Glick**, *Nevada DOT, Carson City, NV* (Chair)  
**Cheryl Ball**, *Missouri DOT, Jefferson City, MO*  
**Brian A. Blanchard**, *Florida DOT, Tallahassee, FL*  
**John F. Frittelli**, *Congressional Research Service, Washington, DC*  
**John W. Fuller**, *University of Iowa, Iowa City, IA*  
**Brenda Lantz**, *North Dakota State University, Lakewood, CO*  
**Paul E. Nowicki**, *BNSF Railway, Chicago, IL*  
**Vahid Nowshiravan**, *California DOT, Sacramento, CA*  
**Paul S. Truban**, *New Jersey DOT, Trenton, NJ*  
**Jin Wang**, *Atkins, San Francisco, CA*  
**John Berg**, *FHWA Liaison*  
**Darrin Roth**, *American Trucking Associations Liaison*  
**Scott Babcock**, *TRB Liaison*

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FOREWORD

By Lawrence D. Goldstein

Staff Officer

Transportation Research Board

*NCHRP Report 830: Multi-State, Multimodal, Oversize/Overweight Transportation* presents a comprehensive compilation and review of existing permitting requirements for the transportation of oversize/overweight (OSOW) freight throughout the United States. It identifies and presents information necessary to understand state-by-state differences in OSOW road transportation regulations and permitting practices, and the challenges these differences pose for carriers. It discusses factors affecting modal competitiveness in OSOW transportation as well as opportunities for improved modal access. The report also discusses ongoing and potential opportunities to improve information and procedural applications, covering the permitting process as well as the need for improved communication and coordination. It will serve as a valuable resource for those responsible for transportation of OSOW freight.

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CPCS, in association with Perkins Motor Transport, Inc., and Portscape, Inc., has put together a practical procedural guide for identifying and accommodating the diverse permitting requirements for transporting oversize/overweight (OSOW) freight from one jurisdiction to another across the United States. The complexities experienced from one state to another are significant, the different requirements extensive, and the randomness from one jurisdiction to another problematic.

This guide clearly presents extensive information and resources necessary to navigate the inherent difficulties in the most efficient manner possible. Building on these resources, it presents a process that encompasses normal planning steps in response to routine issues involving OSOW freight as well as additional complexities associated with shipping superloads and megaloads. This process addresses four primary components: contracting, application for permits, scheduling, and mobilization. The guide takes the user through all of these steps with information and recommendations on how to maximize efficiency and minimize cost.

The guide also provides access to an interactive website with maps illustrating the variety and range of OSOW regulations across the United States. These maps cover a wide range of regulations and permitting practices, from maximum permitted axle weights, to hours of allowable travel, to permit processing time, to escort requirements, and numerous additional factors affecting travel at every key juncture. It accomplishes this task through case studies and specific examples, illustrating the difficulties any shipper might experience. The guide concludes with a discussion of options available to improve OSOW planning and implementation along with appendices that inventory the diverse permitting requirements for OSOW transportation by state.



# CONTENTS

1	<b>Summary</b>
10	<b>Chapter 1 Introduction</b>
10	1.1 Need for Research Project
11	1.2 Project Objectives
11	1.3 Research Questions
12	<b>Chapter 2 Oversize/Overweight Transportation</b>
12	2.1 Overview of OSOW Transportation
13	2.2 OSOW Load Permitting
16	2.3 Routine OSOW Loads
18	2.4 Superloads
18	2.5 Megaloads
20	2.6 Trends in OSOW Transportation
22	<b>Chapter 3 Multi-State Oversize/Overweight Transportation</b>
22	3.1 Anatomy of Multi-State OSOW Moves
27	3.2 Examples of Multi-State OSOW Moves
35	<b>Chapter 4 Multimodal Options and Modal Competitiveness in Oversize/Overweight Transportation</b>
35	4.1 Assessing Multimodal Options
42	4.2 Roadway Competitiveness
45	4.3 Rail Competitiveness
48	4.4 Marine Competitiveness
52	<b>Chapter 5 Common Challenges of Multi-State Oversize/Overweight Transportation</b>
52	5.1 Identifying Challenges
54	5.2 Permitting Processes
58	5.3 Communication and Coordination
59	5.4 Operational Restrictions
65	<b>Chapter 6 Inefficient Oversize/Overweight Transportation</b>
65	6.1 Private and Public Costs of Inefficient OSOW Transportation
67	6.2 Monetizing the Social Costs of Inefficient OSOW Routings
69	6.3 Case Studies of Social Costs
73	6.4 Social Costs of Inefficient OSOW Transportation
74	<b>Chapter 7 Opportunities to Improve Multi-State, Multimodal, OSOW Transportation</b>
74	7.1 Opportunities to Address OSOW Transportation Challenges
74	7.2 Options to Improve Information
77	7.3 Options to Improve the Permitting Process
78	7.4 Options to Improve Communication

81	7.5 Options to Improve Multi-Jurisdictional Coordination
89	7.6 Options to Improve OSOW Planning
92	7.7 Recognizing Barriers to Implementing Identified Opportunities
<b>95</b>	<b>Chapter 8</b> Conclusions and Next Steps
<b>96</b>	<b>Acronyms and Abbreviations</b>
<b>98</b>	<b>Appendix A</b> Inventory of OSOW Truck Permitting Differences
<b>155</b>	<b>Appendix B</b> Global Scan of Best Practices and Lessons for the United States
<b>162</b>	<b>Appendix C</b> Methodology for Ranking Border Friction





## SUMMARY

# Multi-State, Multimodal, Oversize/ Overweight Transportation

## Introduction

Oversize/overweight (OSOW) cargo is among the fastest growing segments of freight, with some states reporting 50% growth in OSOW cargo movements over the last 10 to 15 years.

Moving OSOW freight is complicated for a number of reasons, including infrastructure constraints, regulatory restrictions, and permitting processes. OSOW transportation can be significantly more complicated when moving OSOW cargo across state lines because regulations, permitting processes, and available information about routes often differ by state.

This patchwork of regulations, permitting processes, and available information can result in inefficiencies in multi-state OSOW transportation, which can lead to increased costs for carriers and shippers, as well as for the society more broadly.

The intent of this research project is to provide an information resource—a guidebook—to describe the current OSOW transportation regulatory and permitting landscape in the United States, to identify and define the challenges associated with multi-state OSOW transportation, and to suggest options to address these challenges.

Why should multi-state OSOW transportation inefficiencies be discussed? For carriers and shippers, it is about efficiency of process and routing, minimizing time and cost, and promoting safe and reliable transportation. For the public sector, it is about minimizing impacts on bridges and roads, avoiding disruptions, and reducing negative externalities and social costs, while promoting safety and commerce.

## Challenges in Multi-State OSOW Transportation

OSOW carriers and shippers are unanimous in citing inconsistent road transportation regulations and permitting processes across state lines as the dominant and overarching challenge to efficient multi-state OSOW transportation in the United States. Carriers must plan for and adapt to differences in state regulations, such as the maximum permitted axle weight limits, civilian and police escort requirements, and truck configuration restrictions when moving OSOW cargo across multiple states.

The conceptual map (Figure S-1) highlights the extent of the inconsistencies in OSOW road transportation regulations and permitting processes across the United States based on an index representing a combination of OSOW regulations, operational restrictions, and permitting requirements. The thicker the line along a state border, the greater the inconsistency or regulatory and permitting “friction” between the neighboring states. During consultations with the research team, one carrier noted that the barrier for multi-state OSOW transportation was sometimes so great that it felt like there were 48 countries under one flag.

## 2 Multi-State, Multimodal, Oversize/Overweight Transportation

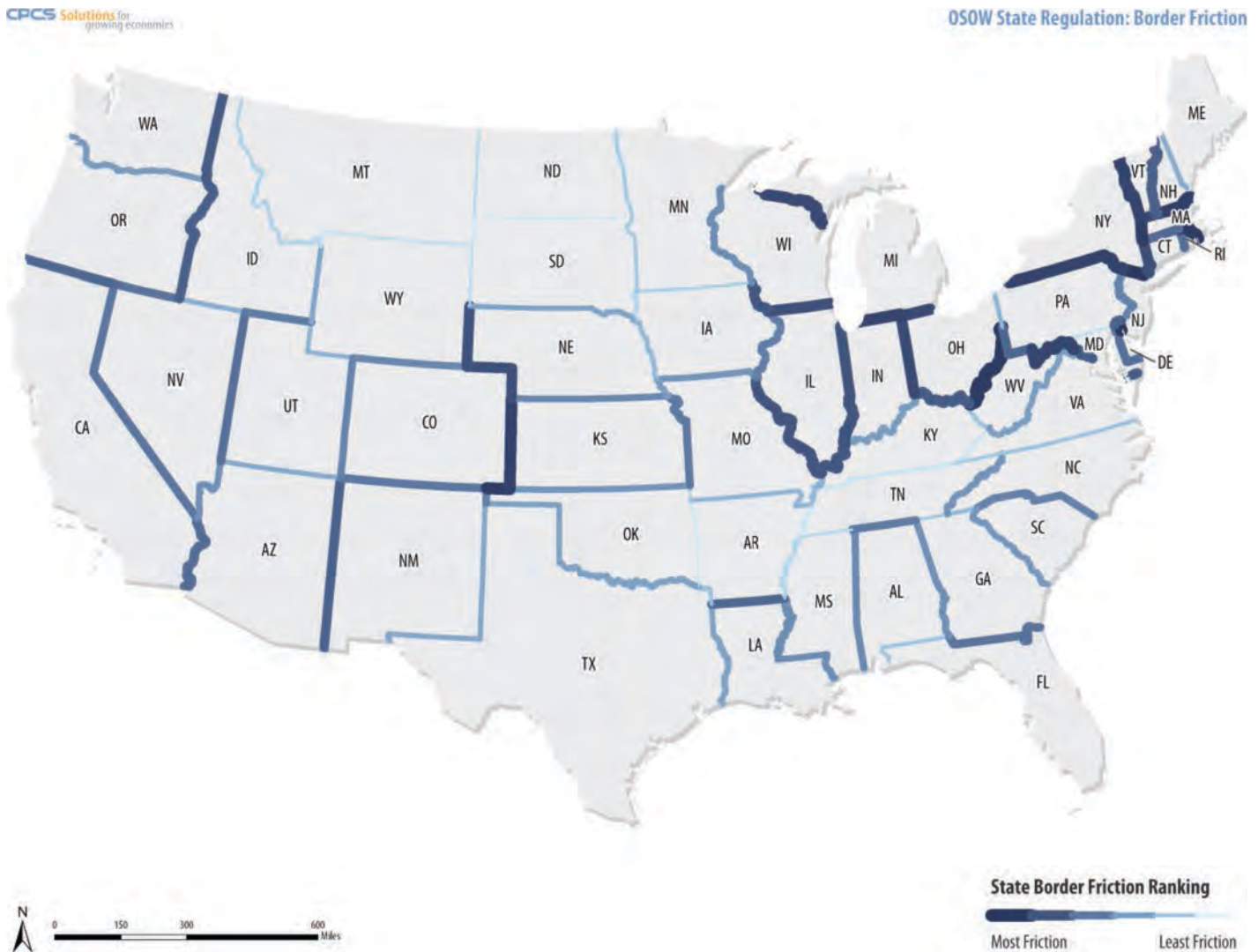


Figure S-1. Barriers to multi-state OSOW road transportation.

Notwithstanding state differences in OSOW road transportation regulations and permitting practices, OSOW carriers and shippers identified the following as the most significant multi-state OSOW transportation challenges:

### Challenges in the Permitting Process

- **Long or varying processing time.** The processing time for OSOW permits can vary greatly by state. Some states issue OSOW permits quickly, using automated permitting systems, but some states issue permits manually, taking more time. For larger loads, or when local permits are required, turnaround times can be several weeks. There is also a great deal of inconsistency in the number of days in advance of a move that carriers can apply for a permit and the total number of days a permit is valid.
- **Limitations in state permitting budgets.** States are increasingly encountering constrained budgets, which limit staffing, purchase of new permitting software, and the overall ability to analyze OSOW permits in an effective and efficient manner. OSOW routes become increasingly circuitous as the infrastructure condition worsens and the number of restricted bridges or roadways increases.

- **Inconsistent permit amendment rule.** Some states grant amendments or extensions to permits to accommodate a delay, a breakdown in equipment, or a necessary route change, but some states do not issue amendments under any circumstance. In these cases, carriers must reapply for a new permit subject to the same process, information requirements, and timelines as the original permit, which can further delay the move.
- **Differences in permit applications and permit system interfaces.** The advent and broad adoption of online application systems have improved the efficiency of obtaining OSOW permits in certain states, though different permit application systems and processes in different states can make applying for multi-state permits cumbersome.
- **Local permit requirements and utility notifications.** It can be a challenge to obtain information about local infrastructure and utility restrictions and clearances, when required. This information, along with associated contact information, is typically not available from State Departments of Transportation (DOTs) and must be researched by carriers. The local permitting process may also take longer to issue a permit, thereby delaying the move.

### Challenges in Communication and Coordination

- **Unanticipated construction along a planned OSOW route.** Construction projects can vary on a weekly basis and are not easily factored into OSOW routing plans, especially for those planned far in advance. Construction projects are also a problem when OSOW loads move across state lines as permitting agencies in one state may be unaware of construction along the same route in a neighboring state.
- **Local infrastructure investment decisions and OSOW transportation.** Local road investment decisions may not adequately reflect the needs of OSOW transportation on OSOW corridors. Local construction of roundabouts with fixed signage or tight turning radii, or the presence of unmovable structures in the center island on a port access road, an interstate, or the on and off ramps of highways are classic examples. This challenge may stem from local control over design and build specifications, though it is also likely a failure of road planning coordination.

### Challenges in Operational Restrictions

- **Hours and days of operation.** States and local jurisdictions specify the hours, time, and days of the week that an OSOW load is allowed to move. Often allowed hours and days of operation are different across state lines. For example, one state may require daytime travel while the neighboring state may require nighttime travel. Some states also restrict OSOW transportation on weekends, in varying degrees. Generally OSOW carriers can plan for this but unforeseen delays or rerouting could result in loads having to wait at state borders until allowed to travel in the state.
- **Requirements for police escorts.** Police escorts are often required to accompany larger OSOW loads, but related requirements often differ across states. From an operational perspective, carriers have to work around the hours police will work, plan with district offices, and plan for exchanges at jurisdictional boundaries, all of which contribute to delays and increased costs.
- **Frost and thaw restrictions.** Frost/thaw restrictions, which place seasonal limits on the axle weights allowed for OSOW loads, notably in northern United States, can differ by states. Carriers may need to add axles for a move, route around a state, or wait until the restriction is no longer in effect.

These challenges can lead to delays in moving OSOW loads and increased costs for carriers. For example, if an OSOW load is required to wait at a state border due to allowable hours of

operation regulations, the carrier will incur additional labor costs and may also incur additional costs associated with civilian or police escorts. When a move must be rerouted around a state due to regulatory restrictions in that state, the carrier incurs higher fuel, labor, and other operating costs. In some cases, carriers must also invest in additional trailers or related equipment to meet the specific truck configuration requirements of the state. These increased costs are ultimately largely passed on to the shippers, in one form or another.

### **Public Costs of Inefficient Multi-State OSOW Transportation**

On top of the additional costs incurred by carriers and their shippers, there can be very real costs imposed on society when OSOW loads are routed sub-optimally because of regulation- or restriction-induced circuitous routings. These external costs, which include increased wear and tear on roads, emissions from fuel consumption, or disruptions on roadways, are passed on to society as a whole.

A number of case studies—based on actual moves—were used to demonstrate the social costs of inefficient, multi-state OSOW transportation resulting from OSOW regulations and permitting. In one case study involving a 250,000 lbs move from Pennsylvania to Texas, the carrier submitted permits on a route through Pennsylvania, West Virginia, Ohio, Kentucky, Tennessee, Arkansas, and finally Texas (Figure S-2). The carrier was approved for weights in all states but Tennessee, which resulted in the load being routed around Tennessee. It was estimated that this sub-optimal route led to a 27% increase in social costs (e.g., emissions, pavement impacts), among other external costs that can't be quantified (e.g., traffic disruptions, bridge impacts), compared to the more direct route.

Other case studies—also based on actual moves—revealed an increase in social costs associated with routing OSOW loads around states because of regulatory and permitting inconsistencies across states.

These findings point to a commercial, economic, and social impetus to address the challenges of OSOW transportation outlined in this research.

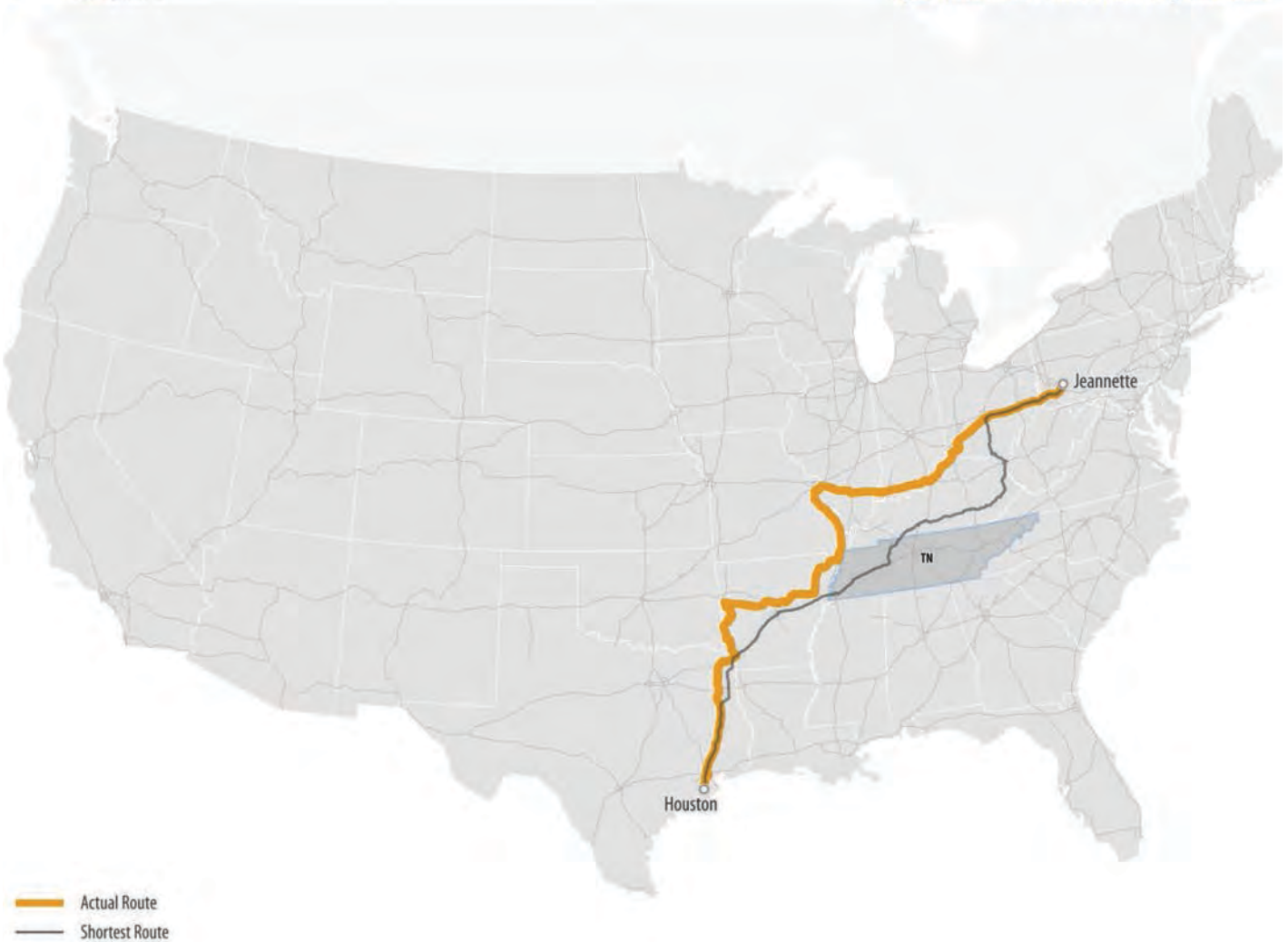
### **Opportunities to Improve Multi-State OSOW Transportation**

Initiatives are being taken to improve multi-state OSOW transportation. FHWA and AASHTO have taken an active role in advancing the harmonization of OSOW regulations through research and meetings of AASHTO Standing Committee on Highway Transportation (SCOHT). Certain states have also sought to better coordinate OSOW transportation, such as Minnesota and Wisconsin, which have collaborated to designate regional OSOW corridors.

Opportunities to improve OSOW transportation identified as part of this research project complement and in many cases support these efforts. These opportunities are outlined below, organized by thematic heading.

#### **Opportunities to Improve Information**

- **Build an inventory of OSOW regulations and permitting requirements.** This report and the associated interactive website, [www.osowfreight.com](http://www.osowfreight.com), provide a consolidated inventory of OSOW regulations and permitting requirements. The Specialized Carriers



**Figure S-2. Case study of OSOW route from Pennsylvania to Texas.**

& Rigging Association has agreed to continue to update and maintain the interactive website after the completion of this research project. State DOTs should leverage this facility as a clearinghouse for information and provide updates directly to the Specialized Carriers & Rigging Association as and when changes in regulations and permitting processes justify.

- **Develop state-level fact sheets on OSOW regulations and permitting requirements.** Notwithstanding the interactive website, states can improve and simplify OSOW regulations and permitting requirements by developing and making available simplified and consistent fact sheets on OSOW regulations and permitting requirements. This could be aligned with the content and structure of the interactive website. AASHTO may be best placed to facilitate a consistent fact sheet structure.
- **Improve the availability of information on city and county OSOW regulations and permitting requirements.** State DOTs may require carriers to seek permission to use roadways that are maintained by non-state institutions, including toll authorities, cities, and counties (local jurisdictions), but DOTs often do not provide the related details. A relatively simple solution would be for state DOTs to compile and make available

information on the roadway segments that require carriers to contact the local jurisdictions, along with the contact information of these jurisdictions. In time, this information could be included in the interactive website, [www.osowfreight.com](http://www.osowfreight.com).

- **Improve the availability of information on physical constraints and restrictions.** Carriers take necessary steps to ensure that they can clear all physical constraints along their route. But there would be value in DOTs making available route-specific bridge clearance and maximum load information, which is not currently always available. The State of Washington’s “State Route Bridge Vertical Clearance Trip Planner” is a useful model for making such information available.
- **Improve the availability of information on utilities.** Utility notification and involvement was repeatedly cited as costly and time-consuming for OSOW carriers. State DOTs could facilitate access to information on the owners of relevant utilities through city- or county-level government representatives. The Georgia National Joint Utility Notification System provides an example of a potential utility focused model. The availability of utility maps and contact information will decrease the cost of complying with utility notification requirements.

### Opportunities to Improve the Permitting Process

- **Streamline permitting processes and provide greater information on expectations.** The number of steps and complexity of the permitting process typically increase with the size of the OSOW load. In certain states, there is a lack of clarity with respect to expectations and timelines for obtaining permits. State DOTs should seek to simplify the process and provide more information and notifications about permitting requirements and the associated timelines.
- **Set clear expectations for turnaround time.** OSOW permit turnaround times are key to scheduling an OSOW load and deploying equipment. States should specify and commit to the turnaround times for permits. States such as Illinois update carriers by email and on their website if they expect delays, which is a good practice. It would also be a good practice to measure and track performance with respect to permit turnaround times.
- **Make use of technology to facilitate permitting and route planning.** Technology is increasingly being used by DOTs to automate routine permitting and to identify suitable routes. The adoption of automated permitting platforms or other electronic permitting technologies is not yet widespread across all state DOTs. There are costs associated with the adoption of these technologies, but the benefits can be significant, both for the DOTs and the industry.
- **State permitting fees to reflect the full cost of the move.** States should ensure that the permitting fees charged for OSOW loads reflect both the administrative cost of issuing the permit and the differential damage done by heavier overweight loads. This may result in higher permitting fees, but consultations with carriers suggest that this would be welcome if it also led to commensurate improvements in the permitting process.

### Opportunities to Improve Communication

- **Build greater DOT capacity and understanding of industry needs.** State DOTs would benefit from having greater knowledge of carrier operations, carrier issues, and carrier routing decision factors and this report will help to increase awareness in these areas. Beyond this and to identify important state-specific issues, it would be a good practice for DOTs to hold regular working group meetings with OSOW carriers, as is done at the Arizona Overdimensional Permit Council and Illinois’ bi-annual industry outreach meetings, to review OSOW permitting issues and updates. Another example may be the participation of OSOW carriers on state freight advisory committees.

- **Establish direct communication with carriers and provide regular notifications.** State DOTs should have regular communications with carriers on permitting updates, changes in regulations, or route issues. Illinois DOT communicates regularly by email with carriers and carrier associations, which is seen as a useful and simple model. Illinois DOT also uses its automated permitting program to convey messages to the industry.

### **Opportunities to Improve Multi-Jurisdictional Coordination**

- **Harmonize OSOW regulations and permitting processes.** Harmonization efforts are taking a variety of different forms throughout the United States. AASHTO is in phase two of its harmonization initiative, which involves research and recommendations for specific OSOW issues. Harmonization requires buy-in, adoption by individual DOTs, and in some cases legislative changes.
- **Improve jurisdictional coordination.** When states route OSOW loads within their territory, they often ignore constraints that may occur across the state line in a neighboring state, such as construction or a weak (load posted) bridge. More formalized communications with neighboring states are a relatively simple way to improve coordination of OSOW permitting and route planning with those states. The Canadian New West Partnership (NWP) model is an example of best practices. When one NWP member province proposes a change to a regulation, all members look at the regulation. NWP members also jointly look at opportunities to remove multi-jurisdictional barriers. In the United States, the various AASHTO subcommittees and subregions serve a similar function, but the relationship is not necessarily institutionalized. Institutionalized communication ensures that a base level of communication occurs regardless of changes in staffing or priorities.
- **Integrate local permitting.** A number of states as well as other international jurisdictions have pursued the integration of local OSOW permits into their state permitting processes, whereby local permits are obtained through the state DOT. For example, local permits in Maryland are obtained from the Maryland DOT. This system is also in place in Alberta, Canada.
- **Improve the implementation of multi-state permits.** Some states have pursued multi-state permitting for routine OSOW loads. Examples include the Western Regional Permit and the WINNDOT Cross-Border Permit. The adoption and use of multi-state permits has for the most part been limited because regulations and operational differences across state borders continue to exist. Some carriers have also noted that it is faster to obtain individual permits along a route than a multi-state permit, particularly where individual state permits are issued by an automated process. This research study suggests that the industry prefers uniformity in the requirements for permits to multi-state permitting.

### **Opportunities to Improve OSOW Planning**

- **Better leveraging of OSOW data obtained by state permitting offices.** Some states reported that OSOW data are not used for any other purpose outside of permitting. Data obtained as part of the permitting process, including information about the origin, destination, routing, size, and dimension of a load, can be a rich source of data for a variety of purposes and should be better leveraged within DOTs for policy, planning, and programming functions.
- **Using OSOW data to identify and plan for OSOW corridors.** By leveraging OSOW routing data, state DOTs can identify the roadways that have the highest use, the first and last mile connectors to other modes, and OSOW generators. This data can be used to define OSOW corridors as well as help with the related planning needs and the associated engineering specifications for these corridors.

### Opportunities to Better Leverage Multimodal Options

Some have suggested that rail and marine transportation offer potential alternatives or complementary means of moving OSOW freight long distance.

Multimodal options are already being considered by shippers, forwarders, and brokers and there are no notable gaps in their understanding of rail and marine transportation options. In fact, consultations with carriers of all modes, shippers, and brokers revealed significant knowledge about competing modes, including rules of thumb for when each mode is competitive and the advantages and disadvantages of each mode.

Road		Rail		Waterway	
Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages
Access	Weight	Weight	Width	Weight	Speed
Speed	Height	Height	Speed	Height	Access
Ease of Use	Price	Price	Access	Width	Ease of Use
Width	Permitting	Multi-Piece Move	Ease of Use	Multi-Piece Move	Price

Source: CPCS analysis of modal consultations

#### ***Relative advantages and disadvantages of modes in OSOW freight transportation.***

Multiple consultations suggested that while there is competition between the modes, it is limited to specific subsets of the market due to the unique access, cost structures, and infrastructure restrictions for each mode.

OSOW-appropriate roadway connections to rail and marine facilities should be improved and included in the broader freight corridor planning efforts.

- **Regional integration of OSOW corridors.** According to a survey of the states undertaken by the research team, most of the communication and data sharing on OSOW issues among neighboring states is informal and depends on working relationships. Many of these relationships have been established through activity in multi-state organizations, including AASHTO's Regional Associations. Joint identification, coordination, and planning of OSOW corridors could help in the planning of multi-state OSOW corridors.

### Conclusions

This report identifies challenges associated with multi-state OSOW transportation and puts forward several options to address these challenges.

Many, particularly within industry, believe that harmonization of state OSOW regulations and permitting practices is the obvious answer to most of the challenges. Greater harmonization would no doubt improve the efficiency of multi-state OSOW transportation, but harmonization is by no means easy to achieve. The level of state coordination, negotiation, compromise, and research and analysis required to advance harmonization, along with the significant associated time and cost, make this solution difficult, if not impractical as a singular focus in the short to medium term. It is also unlikely that OSOW transportation issues garner sufficient attention at state DOTs to energize a serious institutional push toward harmonization. And those on the front lines in state permitting offices have little incentive or resources to



push for change, particularly when such change could be perceived—correctly or incorrectly—as potentially compromising safety or infrastructure preservation.

This is not to suggest that harmonization of state OSOW regulations and permitting requirements should not be a vision, nor that efforts to advance harmonization are not worthwhile. On the contrary, these represent positive steps forward and are well received by the OSOW transportation industry. But these efforts—as challenging as they are—should not detract from other, more easily achievable, and incremental opportunities to improve OSOW transportation.

Improving the availability and consistency of information on physical infrastructure constraints and restrictions, setting clearer expectations on permit turnaround times, involving OSOW stakeholders on state freight advisory committees, and including a review of OSOW needs, issues, and corridors within the scope of statewide freight plans are all relatively easy to achieve and relatively low-cost incremental steps that individual states can take to improve OSOW transportation in the short term.

As an information resource, this report and the associated interactive website, [www.osowfreight.com](http://www.osowfreight.com), will inform the efforts to achieve incremental improvements to OSOW transportation as well as encourage bigger, bolder, and longer-term discussions to advance harmonization.

An immediate next step could be a joint summit of state DOTs and OSOW industry stakeholders to discuss the findings in this report and the opportunities to effect incremental improvements.



## CHAPTER 1

# Introduction

### 1.1 Need for Research Project

Moving oversize/overweight (OSOW) cargo is complicated because of infrastructure constraints, regulatory restrictions, and permitting processes. OSOW carriers must traverse constrained routes, which include bridges or roads with limited weight capacities, bridge and tunnel clearances, overhead wires, and road dimensions. OSOW carriers also face a long list of regulations and restrictions—each with its own constraints, data requirements, timelines, and costs.

OSOW routing and the permitting process can become significantly more complicated when OSOW cargo moves across multiple states and national borders as jurisdictions often have different regulations, permitting processes, information requirements, and different levels of details about the routes within their own borders. Complicating matters even further are challenges in identifying the right contacts within individual cities, counties, and utility companies to obtain permission for OSOW shipments on local streets and under overhead wires, where required.

Different OSOW regulations, restrictions, permitting standards, information requirements, and permitting processes can result in the sub-optimal use of the transportation system. These factors not only affect the efficiency of OSOW moves, but can also lead to negative externalities and social costs.<sup>1</sup>

There is need for greater uniformity in OSOW regulations and permitting processes to promote the most optimal OSOW cargo routings—as much for OSOW carriers and shippers as for the public who are affected by OSOW shipments.

For shippers and carriers, efficiency of process and routing ultimately minimize time and cost and help to promote safe and reliable transportation. For the public, efficiency in OSOW transportation minimizes disruptions and impacts on bridges and roads, reduces negative externalities and social costs, and promotes safety and commerce.

The intent of this research project is to provide a resource that will benefit both groups—the industry and the public—and help optimize the movement of OSOW cargo shipments across multi-state corridors.

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<sup>1</sup>Negative externalities include emissions, wear and tear, noise, traffic disruptions, and other impacts and costs that are not “internalized” or paid for by the party creating these impacts.

## 1.2 Project Objectives

As outlined in the Requests for Proposal, the objective of this research is

*To develop guidelines for use by states and other practitioners to improve the permitting process and to evaluate potential OSOW freight movement solutions involving multi-state, multimodal transportation corridors.*

Ultimately, this research project is about identifying procedures, methodologies, and information that will improve OSOW permitting processes, while promoting optimal decision making with respect to multi-jurisdictional, multimodal, OSOW routing decisions.

## 1.3 Research Questions

We have organized our approach around the following research questions:

- What is the OSOW regulation and permitting landscape in the United States and what are the notable differences across jurisdictions (OSOW regulation and permitting agency perspective)?
- What information do OSOW cargo shippers and their freight carriers or brokers require to make optimal multi-state, multimodal routing decisions (OSOW shipper/carrier/broker perspective)?
- What opportunities exist to improve multi-state, multimodal OSOW cargo routing decisions and to streamline the related route planning and permitting processes?



## CHAPTER 2

# Oversize/Overweight Transportation

### 2.1 Overview of OSOW Transportation

OSOW loads come in all shapes and sizes. The loads may be oversize, overweight, or both, and use truck, rail, or marine, or a combination of modes, to reach their destination. In the context of trucking, OSOW loads are defined as those that are beyond the legal truck size and weight limits. OSOW movements trigger permitting and operational restrictions on travel.

#### Truck Size and Weight Limits<sup>1</sup>

Truck size and weight limits vary by state. Generally, for a semi-trailer configuration, trailers are 48 ft to 65 ft long, 8 ft 6 in. wide, and 13 ft 6 in. to 15 ft high.<sup>2</sup> Colorado and Iowa have set the legal height of trucks at 14 ft 6 in. and 13 ft 6 in., respectively. Weight limits are typically around 80,000 lbs.

Federal truck size and weight regulations are applicable to specifically designated roadway networks. Federal length and width limits apply to the national network which is about 200,000 miles (which constitutes about 5% of all mileage). Weight regulations only apply to the interstate system, which consists of about 47,000 miles (which constitutes about 1% of all mileage).<sup>3</sup> State exemptions based on grandfathering or state-specific legislation affect truck size and weight regulations.

State departments of transportation (DOTs)<sup>4</sup> and local governments are responsible for regulating the movement of OSOW loads on roads to ensure safe operations and to minimize infrastructure wear and tear, among other aims.

Once a truckload surpasses legal weights and dimensions, it typically needs approval in the form of a permit from the state DOT to travel on state-maintained roadways and a permit from the city or county to travel on city- or county-maintained roadways.

<sup>1</sup> Unless explicitly stated, the dimensions used in this report are for a loaded trailer, meaning that the reported height includes the height of the load and the height of the trailer.

<sup>2</sup> *Federal Highway Administration Should Conduct Research to Determine Best Practices in Permitting Oversize Vehicles*. Government Accountability Office. <http://www.gao.gov/assets/670/668711.pdf>. Accessed November 3, 2015.

<sup>3</sup> *Federal Highway Administration Should Conduct Research to Determine Best Practices in Permitting Oversize Vehicles*. Government Accountability Office.

<sup>4</sup> OSOW permits are generally issued by state DOTs, but in some states other agencies such as the Department of Motor Vehicles, Department of Revenue, or state law enforcement issue permits. DOT information on bridge and roadway characteristics are key in these states in forming permitting policies and assessing whether to permit an OSOW load.

There are no comparable governmental permitting requirements for the movement of OSOW loads by rail or water, though there may be technical, operational, or commercial barriers to using these modes.

Multi-state OSOW transportation—which is the focus of this report—can be particularly challenging for road transportation. OSOW truck carriers and their customers are frequently subject to inconsistent treatment of the same load as it crosses jurisdictional boundaries. One carrier concluded, “Each U.S. state has their own oversize load restrictions. From a heavy-haul point of view, it is like there are 48 countries under one flag.” Appendix A provides an inventory of state OSOW permitting requirements for the transportation of OSOW loads by road. State DOTs have oversight of OSOW loads moving by road as compared to loads moving by rail or water, which generally do not fall under state DOT jurisdictions. Therefore, the process of moving OSOW loads by truck is first explored, and then the movement of OSOW loads by rail and water is assessed.

## 2.2 OSOW Load Permitting

There is no standard definition for the types of OSOW loads and often the thresholds are different by jurisdiction. A study conducted by the New Jersey DOT in 2011 found that states have between one and 23 different types of permits with an average of six per state.<sup>5</sup> The following OSOW typology was developed for this research project, which generally categorizes three different types of permits:

- Routine OSOW load permits
- Superload permits
- Megaload permits

Each category is progressively more restrictive by either triggering additional regulations or by increasing the depth of oversight, analysis, or planning required before and during the move.

Each state defines the weight and dimensions of routine OSOW loads, superloads, and megaloads differently, as exemplified in Figures 2-1 and 2-2. Generally, states west of the Mississippi require permits once loads reach larger dimensions and higher weights compared to states east of the Mississippi. Similarly, routine OSOW loads and superloads start at higher thresholds in the west. Megaloads are defined on a case-by-case basis encompassing the largest OSOW moves, often taking months if not years to organize.

Each permit type begins at the maximum weight and dimensions in the previous category, triggering permits and restrictions on movement. The threshold between superloads and megaloads is ambiguous, with very few states defining separate permits or restrictions for megaloads.

OSOW regulations differ by state and the overall size of OSOW loads. The following discussion is provided as a general overview of some of the major OSOW regulations encountered during the permitting process and the movement of OSOW loads, referred to as operations going forward.

- **Load configuration** regulates the maximum allowable axle weights, trailer configurations, including the positions of lift axles or special restrictions on lift axles, and the use of special dual lane trailers.
- **Frost/spring/thaw restrictions** limit the maximum allowable weight for axles depending on the time of year.
- **Escorts** require one or more vehicles to accompany the load through the route. Escorts may be civilian or police and may require state certification for operation or additional equipment such as a height pole for identifying overhead obstacles.

<sup>5</sup>Titze, C. *Oversize/Overweight Permitting Practices Review*. New Jersey Department of Transportation, 2011. <http://www.nj.gov/transportation/refdata/research/reports/NJ-2011-002.pdf>. Accessed November 16, 2015.

### Divisible Load versus Non-Divisible Load

While OSOW freight is largely thought of as large, non-divisible loads, many states issue OSOW load permits for divisible loads. Non-divisible loads are defined by FHWA as loads that if separated would:

- Compromise the intended use of the vehicle,
- Destroy the value of the load or vehicle, or
- Require more than 8 hours to dismantle.<sup>6</sup>



Source: Lehr Logistics

#### ***Divisible OSOW load.***

Divisible load permits are often available for specific commodities, such as forestry products, milk, containerized cargo, and cotton, and are often implemented as a weight exemption. For example, the figure above displays multiple steel products on one trailer. One or more of the steel products could be removed in a reasonable amount of time without compromising the vehicle or the load. Therefore, the load would be classified as divisible, but allowed to travel in states with a divisible load permit on steel products. Divisible load permits allow the carrier to operate under specific dimensional limits, such as over the legal weight, but under the legal length, width, height, and overhang dimensions.

According to FHWA's 2013 Annual Freight Data, from 2008 to 2012, non-divisible trip permits accounted for 75% of the loads measured.<sup>7</sup>

- **Permitting** identifies the length of time it takes to process a permit application to the total number of days a permit is valid. Other issues in permitting relate to whether a state allows for extensions or revisions to the filed permit and the total fees for issuing the permit.
- **Minimum clearance** is the minimum distance from the top of the load to the bottom of an overhead obstruction.
- **Hours of travel** restrict travel during specific times in a city, county, or state. These restrictions typically involve restricted travel at night or on holidays. They may also restrict travel on weekends partially or completely.

<sup>6</sup> *Oversize/Overweight Load Permits*. Federal Highway Administration, 2014. [http://www.ops.fhwa.dot.gov/Freight/sw/permit\\_report/index.htm](http://www.ops.fhwa.dot.gov/Freight/sw/permit_report/index.htm). Accessed November 3, 2014.

<sup>7</sup> *Freight Facts and Figures 2013*. Federal Highway Administration, 2014. [http://www.ops.fhwa.dot.gov/freight/freight\\_analysis/nat\\_freight\\_stats/docs/13factsfigures/pdfs/fff2013\\_highres.pdf](http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/13factsfigures/pdfs/fff2013_highres.pdf). Accessed October 27, 2014.

Permit Type	Length	Width	Height	Weight
Legal	65 ft	8 ft 6 in.	13 ft 6 in.	80,000 lbs
Routine OSOW load	100 ft	14 ft 6 in.	15 ft 6 in.	120,000 lbs
Superload	Over 100 ft	Over 14 ft 6 in.	Over 15 ft 6 in.	Over 120,000 lbs
Megaload	Case-by-case	Case-by-case	Case-by-case	Case-by-case

Source: Perkins Motor Transport

**Figure 2-1. Permit weights and dimensions east of the Mississippi (typical).**

Permit Type	Length	Width	Height	Weight
Legal	75 ft	8 ft 6 in.	14 ft	80,000 lbs
Routine load	150 ft	16 ft	17 ft	250,000 lbs
Superload	Over 150 ft	Over 16 ft	Over 17 ft	Over 250,000 lbs
Megaload	Case-by-case	Case-by-case	Case-by-case	Case-by-case

Source: Perkins Motor Transport

**Figure 2-2. Permit weights and dimensions west of the Mississippi (typical).**

Routine OSOW Load	Superload/Megaload
Civilian Escorts	Civilian Escorts
Hours of Travel	Police Escorts
Axle Weights	Hours of Travel
Bridge Postings	Axle Weights
City and County Permits	Bridge Postings
Construction	City and County Permits
Frost/Thaw Restrictions	Construction
	Frost/Thaw Restrictions
	Utilities
	Configurations

Source: CPCS research

**Figure 2-3. Regulatory and permitting differences between states.**

- **Utility notification** requires OSOW carriers to notify utilities along the route to identify overhead lines that will need to be lifted during the move.

Figure 2-3 displays the regulatory and permitting differences between states for each permit type. Many of these regulations differ across state lines. Appendix A explains each permit, provides examples of how each permit is implemented, includes a national map of regulations and permitting requirements by state, and explains how each regulation may contribute to delaying an OSOW load at state borders.<sup>8</sup>

<sup>8</sup>To develop descriptions and maps, the research team scanned existing literature and regulations. As a starting point, the team used SC & RA's permit manual, data collected for a study of OSOW harmonization funded by FHWA for AASHTO SCOHT, and state DOT permit manuals. The data was then validated through a survey of state permitting offices conducted in September 2014. The permits are ordered based on priorities identified by SC & RA through member feedback and the consensus of its permit policy committee.

Additionally, because each state issues permits for its state alone (with the exception of regional permits), carriers must interface with each state separately, taking construction, infrastructure restrictions, and regulatory differences into account when planning their route. Asymmetry between neighboring states increases the chances of higher operating costs or delays in following compliances.

## 2.3 Routine OSOW Loads

Routine OSOW load permits include single-trip permits and multi-trip permits for common loads. Routine OSOW permits face less restrictions on their movement and the need for escort vehicles, and require less coordination and planning to facilitate movement between jurisdictions.

### 2.3.1 Single-Trip Permits

Routine single-trip permits are used by carriers to move a load one time from origin to destination. Routine single-trip permits can be issued for loads that are larger than the loads that require multi-trip permits, but the loads must be smaller than superloads.<sup>9</sup> These permits are generally applied for individually within each state of travel and are valid for a set number of days along a specific route. The size of routine single-trip permits coincides with the thresholds for one or two escorts, a height pole on the lead escorts, and restrictions on the hours of travel in many states.

State DOTs begin to place a greater level of scrutiny and additional operational requirements when OSOW loads begin to exceed state-specific thresholds. Depending on the state, route, and dimensions of the load, a routine single-trip permit can be issued instantaneously or take a couple of weeks, if a route or bridge analysis is required.

In general, as the dimensions of the load increase, difficulty in obtaining a permit also increases. This is directly related to concerns over safety, impact on infrastructure, and the possibility that the load could disrupt the flow of traffic. Figure 2-4 displays the relative number of permits issued for both single trips and multi trips in the United States during 2012. Single-trip permits (encompassing routine load, superload, and megaload permits) make up the vast majority of permits issued, identified through FHWA's commercial vehicle enforcement activities. Multi-trip permits allow for more than one trip per permit, which could result in more than one OSOW trip traveling under the same permit compared to single-trip permits.

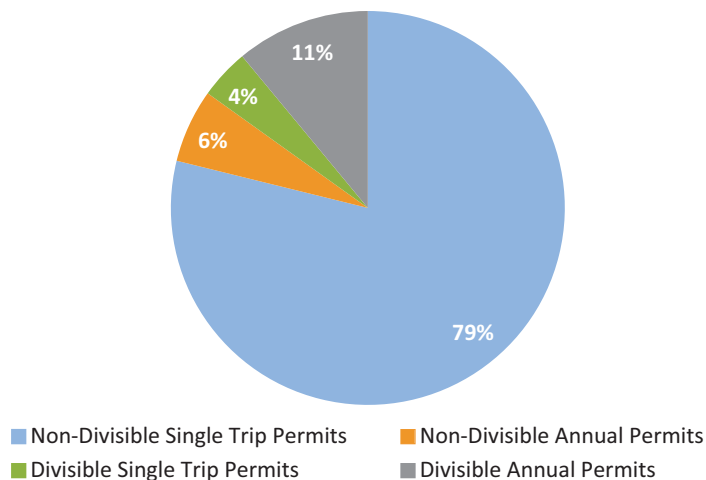
### 2.3.2 Multi-Trip Permits

Multi-trip permits, also known as annual or seasonal permits, are typically issued for specific commodities or industries, or for repetitive loads that are only slightly over the legal weight or dimensions. In many cases, multi-trip permits have minimal oversight from permitting offices and have minimal restrictions on their movements. For example, one of North Carolina's multi-trip, non-divisible permits allows for unlimited travel on all North Carolina highways if the load is less than 12 ft wide, 105 ft long, and 13 ft 6 in. high and subject to the maximum axle weights. The load doesn't require escorts and may travel at all times if it is within legal dimensions and less than 112,000 lbs; otherwise it is restricted from sunrise to sunset Monday through Saturday. North Carolina's multi-trip permit is similar to multi-trip permits issued by other states, making it easy for these loads to travel throughout the state.<sup>10</sup>

<sup>9</sup> Superload permits generally begin at 100 ft to 150 ft length, 14 ft 6 in. to 16 ft width, 15 ft 6 in. to 17 ft height, and 120,000 lbs to 250,000 lbs weight.

<sup>10</sup> *Oversize/Overweight Permit Handbook*. North Carolina Department of Transportation. <https://connect.ncdot.gov/business/trucking/Documents/Oversize%20Overweight%20Permit%20Handbook.pdf>. Accessed November 17, 2015.





Source: *Freight Facts and Figures 2013*

Note: Multi-trip permits are also known as annual permits.

**Figure 2-4. Distribution of routine OSOW load permits in 2012.**

Therefore, while multi-trip permits are important to the industries that use the permit, the carriers are likely not experiencing significant inefficiencies in multi-jurisdictional movements, especially within the state. In many jurisdictions, the primary intention of multi-trip permits is to facilitate movements of economically important goods.

Many states use multi-trip permits to increase the efficiency of important state industries. These permits allow industries such as agriculture, forestry, steel, construction, or energy to apply for permits for heavier weights or loads that are only slightly larger than the legal limits.

Additionally, some multi-trip permits allow for divisible loads, often acting as a weight exemption for the shipper (Figure 2-5). States may require a minimum number of axles for an overweight load in order to meet the axle weight specifications. For instance, North Carolina



Source: Tony Fischer Photography

**Figure 2-5. Divisible OSOW load.**

allows 90,000 to 132,000 lbs depending on the number of axles in a multi-trip sealed-container permit.<sup>11</sup>

Many states allow for the permitting of international cargo containers shipping international commerce above the legal gross vehicle weight under an OSOW permit.

## 2.4 Superloads

When a load extends beyond the maximum dimensions or weight of a routine single-trip permit, it is subject to additional permitting requirements and possibly to a superload specific permit.

Superload permits often trigger additional requirements, including route surveys, bridge reviews, additional civilian escorts, police escorts, longer permit processing times, limited hours of travel, and utility notification and involvement.

Some states have a special permit for superloads and other states use the same permit for routine OSOW loads but add restrictions on loads that are above state-specific weights and dimensions. Superload permits are often more expensive than routine OSOW permits because of the incremental cost structures by weight, distance traveled, or dimensions. Additionally, carriers often use more expensive equipment to carry superloads, which increases the cost.

OSOW shippers and carriers may move superloads using rail, but often the dimensions, primarily the width, do not fit the envelope for rail. According to the Railway Industrial Clearance Association, most railroad infrastructure is constrained between 13 ft and 13 ft 6 in. width. Additionally, OSOW loads more than 12 ft 6 in. wide are often difficult to move by rail. Water transportation is often limited by the lack of water access near the origin and destination of OSOW loads, as well as the adequate landside infrastructure to move loads in and out of the port.

Superloads require significantly more preparation from both a permitting and an organizational standpoint. Depending on the size of the load and the route, a superload can take anywhere from a few days to several months to be permitted. Superload permits may require a route survey, which involves a personal verification of vertical and horizontal distances to ensure clearance and turning radius. As the weight of a load increases, bridge analysis is often required, which increases permitting time and cost.

Superloads also require additional support vehicles such as police escorts, bridge monitors, and lift trucks needed to move overhead wires (Figure 2-6), as well as extra civilian escorts. Superloads often have additional restrictions on their hours of travel, which limit their daily progress.

Each additional restriction adds to the time and cost needed for planning and executing the move. These restrictions are in effect to ensure that the increased size of superloads do not substantially increase the risk of an accident. From a carrier perspective, as the number of people needed for each move increases, the overall cost of equipment used increases, as does the cost of delay.

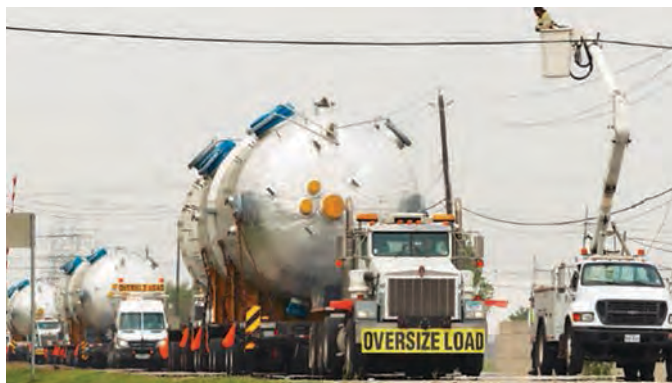
## 2.5 Megaloads

Megaloads encompass all loads above the superload category and often take months or years of planning and coordination. Megaloads can be well over 800,000 lbs and require five trucks doing a combination of pushing and pulling to move down a roadway.

By virtue of their size and weight, megaloads often use the entire roadway to spread out the weight of the load over hundreds of tires. In addition to being heavy, megaloads are often long due to the space needed to accommodate the number of axles and tires. Carriers and permitting

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<sup>11</sup> *Sealed Ship Containers*. North Carolina Department of Transportation, 2014. <https://connect.ncdot.gov/business/trucking/Documents/Sealed%20Ship%20Container%20Permits%20C-11.pdf>. Accessed October 27, 2014.



Source: Perkins Motor Transport

**Figure 2-6.** Lift truck clearing overhead wires for a superload.

offices must map and analyze all portions of the move to ensure that the equipment and megaload can safely traverse intersections, wires, and the roadway. Megaload planning and execution is truly customized, requiring special provisions for traffic management, routing, and restrictions on speed. Similar to superloads, megaloads are limited in their multimodal options due to their size, availability, and the constraints of rail and navigable waterways, sometimes leaving roadways as the only option for moving these critical loads.

### 1.8 Million-Pound Transformer Move

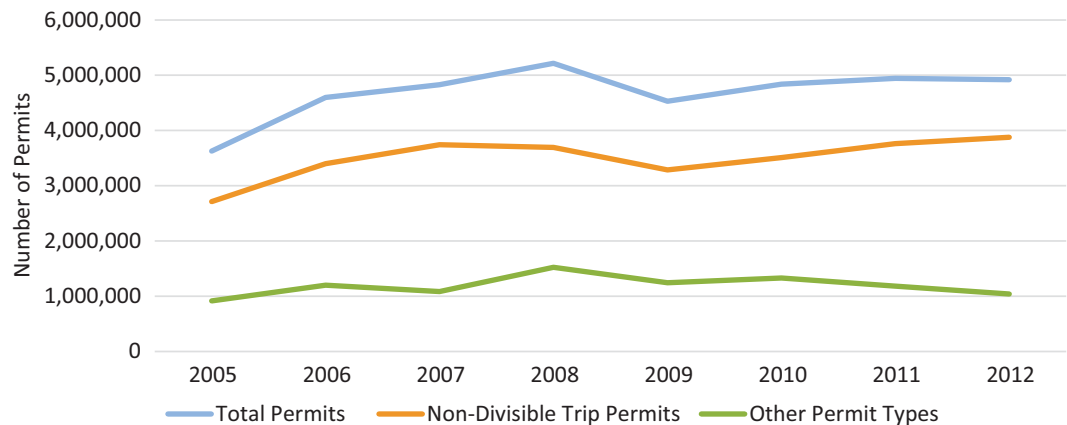
A transformer for a wind farm in Utah was constructed in China. It weighed 1.8 million lbs and was 415 ft long and 25 ft wide. The load was transported by boat to Houston, Texas, where it was loaded onto a train and traveled to New Mexico. The transformer was then trucked from New Mexico through Arizona to finally arrive in Monticello, Utah. The transformer took six trucks and a crew of 17 to move from New Mexico to Utah. The load traveled through Arizona at 12 miles per hour, according to the Arizona DOT. Extensive planning and organization were needed to ensure that the large configuration could navigate each turn and hill and safely pass over each segment of the roadway.<sup>12</sup>



Source: Rocky Mountain Power

**Megaload using dual lane loading, trunnion axles, and push trucks.**

<sup>12</sup> 1.8 million-pound oversize load set to move through Arizona. Arizona Department of Transportation, 2015. <http://www.azdot.gov/media/blog/posts/2015/10/28/1.8-million-pound-oversize-load-set-to-move-through-arizona>. Accessed November 17, 2015.



Source: *Freight Facts and Figures 2013*

**Figure 2-7. Number of permits counted annually.**

## 2.6 Trends in OSOW Transportation

OSOW freight is among the fastest growing segments of freight. Some states have reported a 30% to 50% growth in the number of permits issued for OSOW loads between 2000 and 2010.<sup>13</sup> FHWA data shows a 26% increase in the total permits issued from 2005 to 2012 (Figure 2-7), despite the dip experienced during the Great Recession.<sup>14,15</sup>

Comparable OSOW statistics are not available for rail and marine transportation, though consultations with carriers almost uniformly suggested that the number of OSOW loads was increasing along with the overall size and weight of the loads. Sectors such as wind energy, road and bridge construction, heavy machinery, oil and gas production, specialty services, and project cargo<sup>16</sup> have contributed to the growth in OSOW loads in recent years.<sup>17</sup>

<sup>13</sup> Adams, T., E. Perry, A. Schwartz, B. Gollnik, M. Kang, J. Bittner, and S. Wagner. *Aligning Oversize/Overweight Permit Fees with Agency Costs: Critical Issues*, 2013. <http://wisdotresearch.wi.gov/wp-content/uploads/WisDOT-CFIRE-project-0092-10-21-final-report.pdf>. Accessed October 27, 2014.

<sup>14</sup> *Freight Facts and Figures 2013*. Federal Highway Administration, 2014.

<sup>15</sup> *Freight Facts and Figures 2008*. Federal Highway Administration, 2008. [http://www.ops.fhwa.dot.gov/freight/freight\\_analysis/nat\\_freight\\_stats/docs/08factsfigures/pdfs/fff2008\\_book.pdf](http://www.ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/docs/08factsfigures/pdfs/fff2008_book.pdf). Accessed October 27, 2014.

<sup>16</sup> In this project, cargo is broadly defined as the transportation of large, heavy, and valuable pieces of inputs or equipment for use in construction projects. Examples include pieces of mining equipment, generators, boilers, pipe modules, etc.

<sup>17</sup> Adams, T., E. Perry, A. Schwartz, B. Gollnik, M. Kang, J. Bittner, and S. Wagner. *Aligning Oversize/Overweight Permit Fees with Agency Costs: Critical Issues*, 2013.

### OSOW Movement of Wind Towers

Global supply chains that deliver wind turbine components from the factory to the construction site are complex and multimodal—crossing state and jurisdictional boundaries en route from the port or the manufacturing plant to the installation site. This complexity is exacerbated by the variety and size of the components. For example, shipping an entire 150-megawatt turbine can require up to 689 truckloads, 140 rail cars, and eight vessels, including aggregate transportation needs for the foundation.<sup>18</sup>



Source: Perkins Motor Transport

#### ***Transportation of a wind turbine blade.***

Wind tower components often require OSOW permits to move to the job site. The challenge of installing a wind tower is navigating OSOW permitting requirements and on-the-ground execution of the move, especially as the carrier crosses state and jurisdictional boundaries. Any piece of the wind tower could be delayed by weather, a permitting mistake, or missing the hours a permitted load is allowed to move, thus delaying the project. These challenges will only increase as the industry designs and builds larger wind towers to increase efficiency. OSOW carriers encounter similar challenges when they transport other large loads, such as bridge girders, power plant boilers, and oil rigging equipment.

<sup>18</sup> Neff, M., and Y. Bai. Developing a Multi-Modal Freight Movement Plan for the Sustainable Growth of Wind Energy Related Industries. Mid-America Transportation Center, 2012. [http://matc.unl.edu/assets/documents/matcfinal/Bai\\_DevelopingaMulti-modalFreightMovementPlanfortheSustainableGrowthofWindEnergyRelatedIndustries.pdf](http://matc.unl.edu/assets/documents/matcfinal/Bai_DevelopingaMulti-modalFreightMovementPlanfortheSustainableGrowthofWindEnergyRelatedIndustries.pdf). Accessed May 25, 2016.



## CHAPTER 3

# Multi-State Oversize/ Overweight Transportation

### 3.1 Anatomy of Multi-State OSOW Moves

Multi-state OSOW permitting and operations involve numerous interrelated steps that share a similar structure but differ in implementation throughout the United States. Whether a load is subject to an OSOW regulation and to what degree the regulations impact cost and fluidity depends on the route, weight, and dimensions of the load. To illustrate the differences between states, an overview of the planning and operational process of moving OSOW loads is provided.

Consultations with industry veterans suggest that OSOW carriers rely heavily on individuals who have worked in OSOW shipping for many years on how to plan routes and navigate the permitting landscape. Similarly, companies create their own databases and rely on permit manuals for a consolidated store of information. One respondent noted that it was difficult to stay informed because the rules changed often and the permit manuals, such as the one maintained by the Specialized Carriers and Rigging Association (SC & RA), did not always include the most recent changes.

#### 3.1.1 Permitting Process

Generally speaking, the permitting process goes through the same steps in every state. The permitting process can be divided into four phases: contracting, application, scheduling, and mobilization.

##### *Contracting*

The permitting process begins with contracting, which covers the shipper's request for a quote, the bid, and the final contract signed with the carrier. During the contracting phase, the carrier analyzes the load and the origin and destination of the load to decide on a trailer configuration. The carrier also assesses different route options as well as the potential for a multimodal move.

Route selection is contingent on a couple of factors, the primary one being the dimensions and weight of an OSOW load. As the dimensions and weight of an OSOW load increase, the ability for a carrier to choose a route decreases because of infrastructure restrictions such as bridges and overhead structures along a route. When multiple routes are available, the key drivers of route selection highlighted in consultations were primarily cost-focused, such as the maximum axle weights which impact the trailer configuration, cost of permits, and escorts needed balanced against the difference in total route mileage. Safety assessments based on experience were also suggested as a key driver. The choice between two roadway routes is more than a comparison of miles, but depends on the restrictions and the associated cost of compliance, potential delay, and safety.

Once the configuration and best route are identified, the carrier estimates the permitting fees, civilian or police escorts, utilities, and the amount of time it will take to get through each state,

accounting for hours of travel restrictions. Estimates of all OSOW requirements are compiled and sent to the shipper for consideration. Once the bid is accepted and the contract signed, the carrier begins the application process.

### *Application*

Once the contract is signed, the carrier finalizes the configuration and determines how to place the load to minimize height and weight. The final configuration is checked against the route identified in the contracting phase to ensure that the load can navigate infrastructure restrictions along the route; if not, the configuration is redesigned or the route is remapped. Carriers may route around states that will not permit their configuration. The route is also checked for construction near the origin and destination, which would substantially affect the route. Once the route is planned, a route survey is done, if required. The route survey identifies infrastructure impediments that may require a change in the route. At this point, the carrier uses the route to estimate the schedule for the load, which is needed to apply for the permit. The schedule must account for the various sources of delay in OSOW operations, including police escorts, utility involvement, weather delays, hours of travel restrictions, and driver hours of service restrictions to inform the start and end dates of the OSOW movement.

The carrier can now apply for all OSOW permits. Once carriers have applied and received state permits, carriers notify and apply for the city and county permits along the route. Filling out the permit application can be one of the shorter steps in the application process compared to the time spent compiling the information needed for the application and the actual processing time. While permits are being processed, the carrier moves to the scheduling phase of the permitting process.

### *Scheduling*

If the carrier is confident that the route it has proposed will be approved by states and local jurisdictions along the route, it may need to contact utilities to arrange for their escort under low wires as needed. Carriers provide utilities with the route, and the date and estimated time they will need assistance. During this phase, carriers also contact cities, counties, railroads, or local organizations to schedule the movement, which may require the removal of wires and signs along the route. During the scheduling process, all permits are received and the carrier contacts any police and civilian escorts that will be hired for the route. The scheduling process relies on the ability of the carrier to accurately estimate the progress of the load, to make sure that wires and signs are removed before the load arrives, to negotiate railroad crossings effectively, and to ensure that escorts are ready to depart when the load arrives.

### *Mobilization*

During the mobilization phase, the carrier plans its route to the load or hires an independent carrier to bring the equipment to the origin of the load. Trailers may be in one piece, requiring an OSOW permit, or taken apart and shipped in pieces. Once mobilization and permitting are completed, the carrier moves the equipment to the origin of the load, loads the trailer, and is ready to depart.

### *Timeline*

As the size of an OSOW load increases, the number of steps and the amount of time spent on each step also increase. Figure 3-1 displays the permitting process along with the estimated time it takes for each step for routine OSOW loads, superloads, and megaloads.

### Key Steps in Planning OSOW Moves

**Sign a contract.** Request and accept a bid for an OSOW shipment. Carriers assess multimodal options and define the best route after considering state restrictions, permitting fees, travel time, and escort provisions to estimate a cost.

**Finalize configuration and load drawings.** Receive finalized load drawings and assess trailer options to meet state weight maximums and allow the load to travel the outlined route.

**Apply for state permits.** Identify and route around construction along the route, undertake route survey if required, develop load schedule accounting for all hours of travel restrictions, and apply for permits.

**Apply for city, county, and toll road permits.** When necessary, notify and apply for permits in cities and counties along the route.

**Contact utilities, sign and signal organizations, and railroads.** Contact and schedule utilities, cities, counties, and railroads to remove utilities, signs, signals, and railroad crossings.

**Set up civilian and police escorts.** If civilian or police escorts are required to accompany the load, organize their availability for each jurisdiction.

**Mobilize trucks and trailers to the origin of the load.** Move personnel and equipment to the job site. Also route and order permits if equipment is larger than the legal dimensions.

**Load truck.** Place and secure load onto the trailer.

Routine OSOW load permits have the fewest steps and requirements for permitting relative to superloads and megaloads because they are below the thresholds for many regulations. For example, in most states routine OSOW loads do not need to complete a route survey, undergo bridge analysis, require district review; and, due to their size, they are more likely to stay on state-maintained highways, limiting the number of permits to local and county jurisdictions.

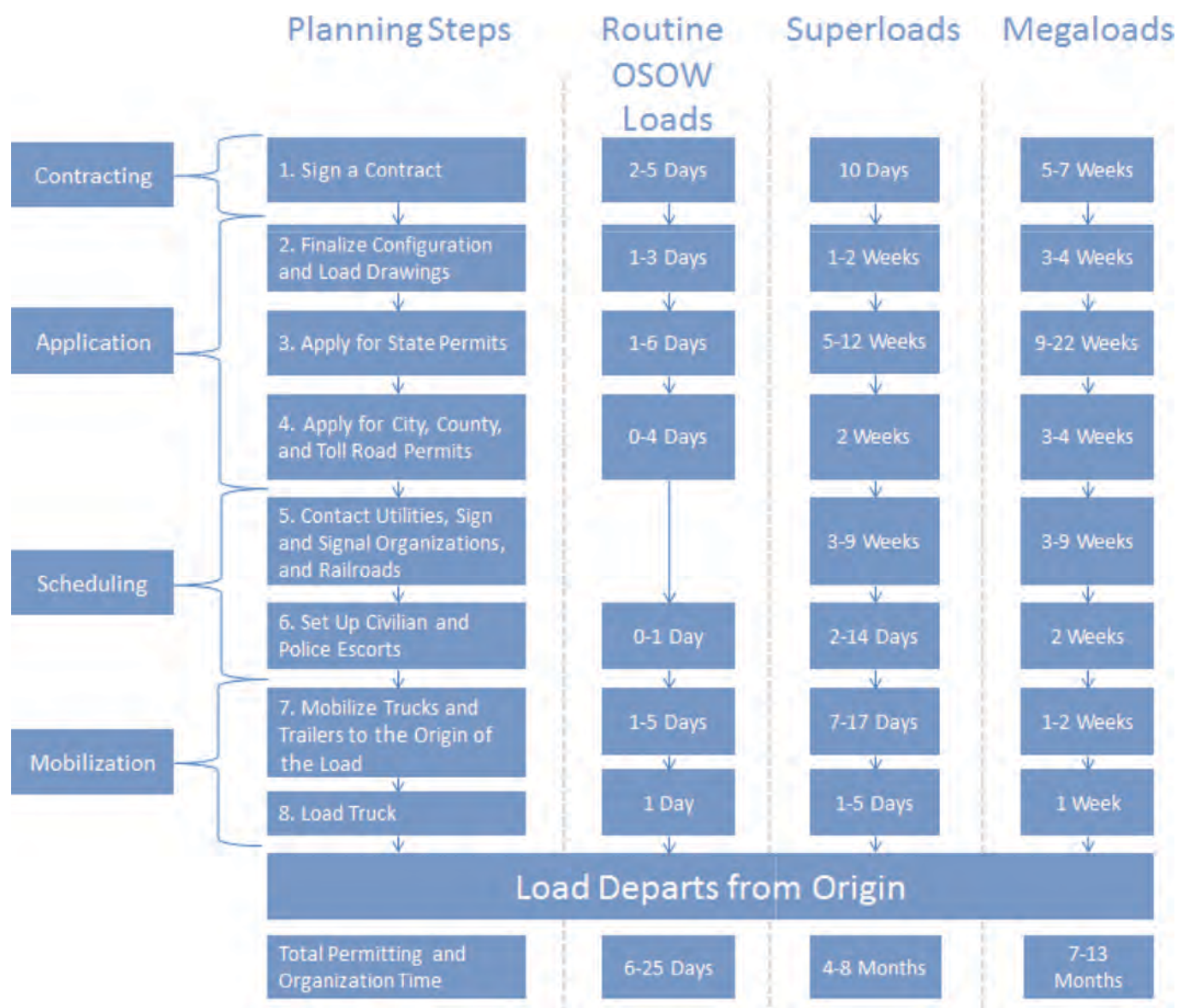
A superload can take much longer to complete the permitting process relative to a routine OSOW load.

Though the steps are roughly the same as a superload, a megaload's extreme size requires more in-depth analysis in nearly every step. Additionally, a megaload will require more civilian and police escorts and will likely be routed off state-maintained highways, which requires more utility, city, and county coordination.

### 3.1.2 Operational Process

OSOW operations include normal travel and compliance with permitting regulations along the route. The ease of travel for a routine load is directly related to the size, route, and regulations governing its movement. OSOW carriers must stay in contact with third-party support entities such as utilities, local jurisdictions, railroads, and police and civilian escorts to ensure that the load is in compliance with the relevant regulations and can safely traverse the route. As a load progresses, the carrier notifies the third-party of the support that it requires in the next jurisdiction. In the case of a delay, the carrier must also watch the effective dates of the permit





Source: Perkins Motor Transport

**Figure 3-1. Approximate timeline of the permitting process.**

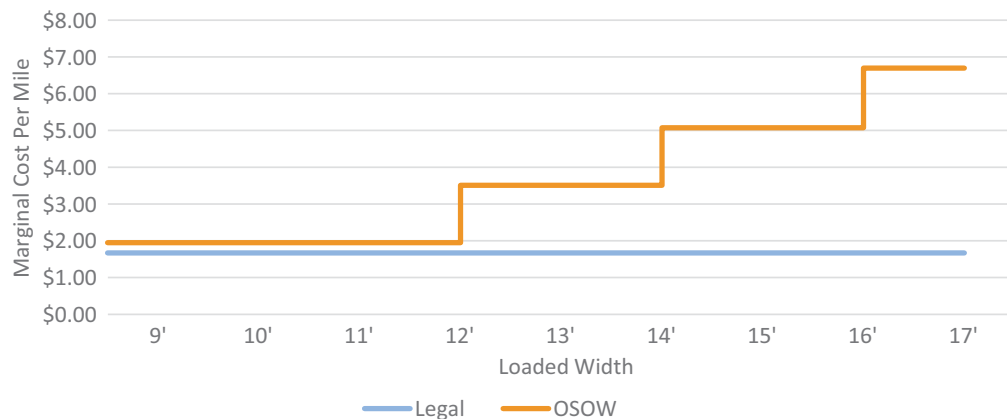
to ensure it is traveling on a valid permit. If a permit expires, the carrier needs to refile or extend the permit in order to keep moving.<sup>1</sup>

### 3.1.3 Cost Structure

OSOW trucking companies have standard costs, including the cost of the truck, trailers, drivers, repair and maintenance, tires, insurance, and fuel.<sup>2</sup> In addition to the standard costs,

<sup>1</sup>States have various approaches to permitting extensions, ranging from allowing extensions for weather or mechanical issues during movement to not allowing extensions, which results in carriers having to refile their permits and wait until permission is granted.

<sup>2</sup>The research team used the American Transportation Research Institute's (ATRI) "An Analysis of the Operational Costs of Trucking: A 2014 Update" as the basis for the cost of operating a legal truck. ATRI uses a survey of trucking companies to estimate the cost per mile of operating a truck.



Source: CPCS analysis of data provided by ATRI and Perkins Motor Transport

**Figure 3-2. Cost of OSOW operations based on width.**

OSOW trucking companies have costs that are a result of their size, including civilian and police escorts, permitting fees, utility involvement, and jurisdictional delay.

Figure 3-2 displays the approximate per mile cost of legal trucking operations in 2013<sup>3</sup> and the cost of operating OSOW trucks as the loaded width increases. The research team focused on width in this example, but the overall stepped-cost function of operating an OSOW truck is comparable for length, height, and weight.

#### Incremental Permit Cost

States charge variable prices and employ various calculations to determine the cost of OSOW permits. Generally speaking, the majority of states charge incrementally once a load exceeds a specified threshold. The threshold may be based on weight or the dimensions of the load. For instance, Missouri charges \$20 for every 10,000 lbs above the legal weight and adds an incremental bridge analysis fee of \$425, \$625, or \$925 for loads over 160,000 lbs. The bridge analysis fee is calculated based on the number of miles traveled in the state. Oregon charges a per mile cost based on the number of axles and the weight. Ohio uses a per ton-mile cost (\$0.04 cents) over a specified weight (120,000 lbs).

The cost per mile is stepped for OSOW carriers because costs increase as a load crosses regulatory thresholds. The first step shown in Figure 3-2 is at 8 ft 6 in. wide, where a load needs a permit to operate. The cost function steps again at 12 ft and 14 ft wide as civilian escorts are required. The last step in OSOW operating cost is at 16 ft wide, where states often require a police escort.

The total cost per mile of operating an OSOW truck is at least 4.5 times more than the cost of operating a truck carrying a legal load. OSOW trucks cost more because of higher driver salaries

<sup>3</sup>Torrey, W. F., and D. Murray. *An Analysis of the Operational Costs of Trucking: A 2014 Update*. American Transportation Research Institute, 2014. <http://atri-online.org/wp-content/uploads/2014/09/ATRI-Operational-Costs-of-Trucking-2014-FINAL.pdf>. Accessed May 10, 2015.

and benefits, increased fuel cost as weight increases, higher cost of specialized OSOW equipment, increased maintenance costs, and other regulations.

## 3.2 Examples of Multi-State OSOW Moves

In order to demonstrate the impact of weight and the loaded dimensions of OSOW trucks on their operations, the research team identified a routine load, a routine load/superload, and a superload. As each load increased in size and/or weight, it triggered different OSOW regulations throughout the country, which significantly affected the flow of the load. The three multi-state moves are outlined in this section as examples of the challenges encountered when OSOW freight travels across multiple jurisdictions.

### 3.2.1 Move 1

Move 1 was a routine OSOW load traveling from Azusa, California, to Savannah, Georgia, carrying a large air purifier. Figure 3-3 displays the weight and dimensions of the cargo and the overall weight and dimensions when loaded. The fully loaded dimensions for Move 1 were within the legal length, weight, and height but outside the legal width. Therefore, the load needed an OSOW permit. Move 1 used a five-axle configuration (three truck axles and a tandem trailer). Move 1 was within the legal height, which eliminates the potential for overhead structures to interfere and allows the load to travel mainly on the interstate.

Figure 3-4 displays the route from California to Georgia. The load is routed primarily on interstates, moving through California, Arizona, New Mexico, Texas, Oklahoma, Arkansas, Tennessee, Mississippi, Alabama and finally into Georgia. The dimensions of the move allowed for an unimpeded routing from origin to destination because the load did not need to route around overhead structures or weak bridges.

Figure 3-4 also displays how the escort requirements changed as Move 1 traveled from California to Georgia. Of the 10 states covered, six states (Arizona, New Mexico, Texas, Arkansas, Tennessee, and Mississippi) did not require a civilian escort, three (California, Oklahoma, and Georgia) required one escort, and one (Alabama) required two escorts.

Figure 3-5 displays the operational timeline for Move 1. The load took nine days to transit the entire route. Other than the Federal Motor Carrier Safety Administration's hours of service regulations, the load was able to move unimpeded on days 1 through 5. On day 6, the load was limited to traveling by daylight until noon in Alabama because of Saturday hours of travel restrictions. Alabama did not allow any OSOW travel on Sundays, resulting in no travel on day seven. Following the hours of travel restriction in Alabama, the load traveled two days and arrived in Savannah on day 9.

Figure 3-6 displays the miles permitted, permit cost, and civilian escorts required in each state. The permitting fees ranged from \$10 to \$60, and only Alabama required more than one escort.

Characteristics	Cargo	Loaded
Length	45 ft	65 ft
Width	12 ft 1 in.	12 ft 1 in.
Height	8 ft	13 ft 6 in.
Weight	45,000 lbs	80,000 lbs

**Figure 3-3. Weight and dimensions of Move 1.**



Figure 3-4. Route of Move 1 from Azusa, California, to Savannah, Georgia.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday
Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Travel	Travel	Travel	Travel	Travel	Travel	No Travel	Travel	Travel
Azusa, CA	Gallup, NM		Henryetta, OK		Jasper, AL		Metter, GA	
Needles, CA		Amarillo, TX		Memphis, TN		Jasper, AL		Savannah, GA

Figure 3-5. Operational timeline of Move 1.

State	Permit Miles	State Permit Cost	Civilian Escorts
California	234	\$20	1
Arizona	368	\$15	0
New Mexico	372	\$25	0
Texas	173	\$60	0
Oklahoma	354	\$44	1
Arkansas	286	\$22	0
Tennessee	20	\$15	0
Mississippi	118	\$10	0
Alabama	218	\$10	2
Georgia	303	\$38	1
<b>Total</b>	<b>2,446</b>	<b>\$259</b>	<b>5</b>

Figure 3-6. Permitting and operational requirements of Move 1.

Characteristics	Cargo	Loaded
Length	47 ft 6 in.	142 ft 8 in.
Width	15 ft 3 in.	15 ft 3 in.
Height	16 ft	17 ft 4 in.
Weight	105,000 lbs	218,000 lbs

**Figure 3-7. Weight and dimensions of Move 2.**

The number of escorts is a function of both size and type of roadway. The move traveled largely on interstates, which require fewer escorts than two-lane roadways. Overall, the move faced very few impediments from California to Georgia.

### 3.2.2 Move 2

Move 2 highlights an international move from Houston, Texas, to Fort McMurray, Alberta. Figure 3-7 displays the weight and dimensions of the cargo and the fully loaded trailer. The loaded weight and length increase by a factor of two and three respectively, compared to the unloaded cargo.

Move 2 used a 13-axle configuration (nine axles on the trailer and four on the truck). The trailer used rear steering that steers independent of the truck to maneuver around corners on two-lane roadways (shown in Figure 3-8). The 13-axle configuration was used to ensure that the load remained under the 20,000 lbs maximum axle weight allowed in Oklahoma.

Figure 3-9 displays the route that the move took from Houston to the Alberta oil fields in Fort McMurray. Additionally, the figure also displays the shortest route from Houston to Fort McMurray to show route detours around infrastructure constraints.

Figure 3-9 also displays a selection of the requirements that the move encounters while traveling through each state. Some of the differences in regulations were because of the route taken. If the move was able to stay on state highways, U.S. highways, and interstates the carrier would face fewer city permits, country permits, and utility notifications and assistance. Some of the escort requirements were required by cities. The police escort was required in Kansas while routing through the city of Liberal.



Source: Perkins Motor Transport

**Figure 3-8. Cornering with a rear steer in Move 2.**



Figure 3-9. Route of Move 2 from Houston, Texas, to Fort McMurray, Alberta.



**Figure 3-10. Operational timeline of Move 2.**

Move 2 traveled through Texas, Oklahoma, Kansas, Colorado, Wyoming, Nebraska, and Montana before entering Alberta. Low and weak bridges in Oklahoma, specifically around Oklahoma City and Tulsa, affected the routing, pushing the load west through the Oklahoma panhandle. Wires had to be lifted in Liberal, Kansas, which required coordination and management of the load's timing through the town. The load then traveled through Kansas into Colorado. After crossing the Colorado–Wyoming border, the load immediately went into Nebraska for one mile and returned to Wyoming to avoid a low overpass. Finally, the load traveled through Wyoming and Montana, crossed the U.S.–Canadian border into Alberta, and eventually arrived at Fort McMurray.

The total mileage for the trip from Houston to the U.S.–Canadian border was almost 2,370 miles compared to an unrestricted routing of approximately 1,920 miles. In addition to the added mileage, the OSOW route included city and county roads, which required additional permitting, hours of travel restrictions, and utility coordination.

Figure 3-10 shows the operational timeline for the move. The load took 13 days to travel from Houston to the U.S.–Canadian border. Travel was stopped on day 7 and 8 because of a mechanical breakdown. The load stopped in Gillette, Wyoming, because Montana did not allow travel on weekends. Even without the breakdown, the load would have had 2 days without travel because of Montana's weekend restriction on large loads.

Figure 3-11 displays a selection of the permitting and operations requirements for Move 2, including the number of miles traveled in each state, state permit costs, the number of city and county permits required, civilian and police escorts required, utility notification and assistance, and whether a route survey was required. The move was classified as a superload in Kansas, Colorado, and Montana, which increased the restrictions it encountered during permitting and operations.

State	Permit Miles	State Permit Cost	City Permits	County Permits	Utilities and Jurisdictions Notified	Utility Assistance	Civilian Escorts	Police Escorts	Route Survey
Texas	791	\$471	1	0	5	0	2	2	Yes
Oklahoma	75	\$1,362	0	0	0	0	2	0	No
Kansas	185	\$50	0	0	13	5	2	1	No
Colorado	304	\$410	0	3	5	1	2	0	Yes
Wyoming	436	\$1,484	0	1	16	1	2	0	No
Nebraska	1	\$25	0	0	0	0	0	2	No
Montana	575	\$574	0	1	10	5	4	0	No
Total	2,367	\$4,376	1	5	49	12	14	5	2

**Figure 3-11. Permitting and operational requirements of Move 2.**

Characteristics	Cargo	Loaded
Length	47 ft 6 in.	142 ft 8 in.
Width	15 ft 3 in.	15 ft 3 in.
Height	16 ft	17 ft 4 in.
Weight	105,000 lbs	218,000 lbs

**Figure 3-12. Weight and dimensions of Move 3.**

The cost of permitting Move 2 varied significantly from state to state. The variation in the cost of permitting is related to differences in the state permitting structure. Oklahoma uses a base permitting fee of \$80 for an OSOW truck and an additional \$10 per 1,000 lbs if a load is more than the legal limit, whereas Kansas charges a flat \$50 permitting fee for all superloads. OSOW carriers also experience variation in the permitting of city and county roadways. Not all cities or counties require a permit to use their roadways, but travel on city and county roadways may trigger other OSOW requirements. Liberal, Kansas, did not require a permit but required a police escort, and the carrier needed assistance from two utilities to move through the city. City, county, and utility coordination is substantially affected by the number of towns on the permitted route. In the case of Kansas, the carrier needed assistance from five different utilities and notified many more to ensure there were no low-hanging utility lines along the route. In the case of Texas, each district along the route had to be notified.

Most states along the route required the move to include two civilian escorts while traveling. In addition to civilian escorts, the carrier was required to hire police escorts in three states (Texas, Kansas, and Nebraska). Lastly, only two states required a route survey. Move 2 experienced the greatest variation in permitting costs and the number of utilities and jurisdictions along the route.

### 3.2.3 Move 3

Move 3 was a heavy compressor skid for a chemical plant, which originated in Pittsburgh, Pennsylvania, and was destined for Rosharon, Texas. Figure 3-12 displays the weight and dimensions of the cargo and the fully loaded trailer. The move had a legal loaded height that allowed the load to move unimpeded by overhead structures.

Figure 3-13 shows the move being loaded onto a 13-axle configuration (nine axles on the trailer and four on the truck). The trailer had a rear steer to increase maneuverability around



Source: Perkins Motor Transport

**Figure 3-13. 13-axle configuration of Move 3.**



corners on two-lane roadways. The 13-axle configuration distributed the weight of the load so that no axle was above 20,000 lbs.

Figure 3-14 displays the route from Pittsburgh to Rosharon, moving through nine states. The load was classified as a superload in all states except Texas because of its weight. The load's dimensions, especially its legal height, allowed for a route on state-maintained roadways, reducing the number of city and county permits and eliminating utility involvement. The load traveled from Pennsylvania through West Virginia, Ohio, Kentucky, Indiana, Illinois, Missouri, and Arkansas to Texas. Move 3 traveled more than 1,570 miles on the OSOW route compared to 1,370 miles on an unrestricted route.

The load detoured around Tennessee as the permit request was denied because of axle weight restrictions, and traveled through Indiana, Illinois, and Missouri to bypass Tennessee. The load also detoured around construction in Arkansas, which caused a deviation from the unrestricted route. In addition to showing the detours from the unrestricted route, Figure 3-14 displays state-to-state variation in civilian and police escorts, city and turnpike permits in Pennsylvania, as well as required bridge monitors in Ohio and West Virginia.

Figure 3-15 displays the operational timeline for the move. The load took a total of 14 days to travel from Pennsylvania to Texas. The load left on a Friday and was restricted from traveling

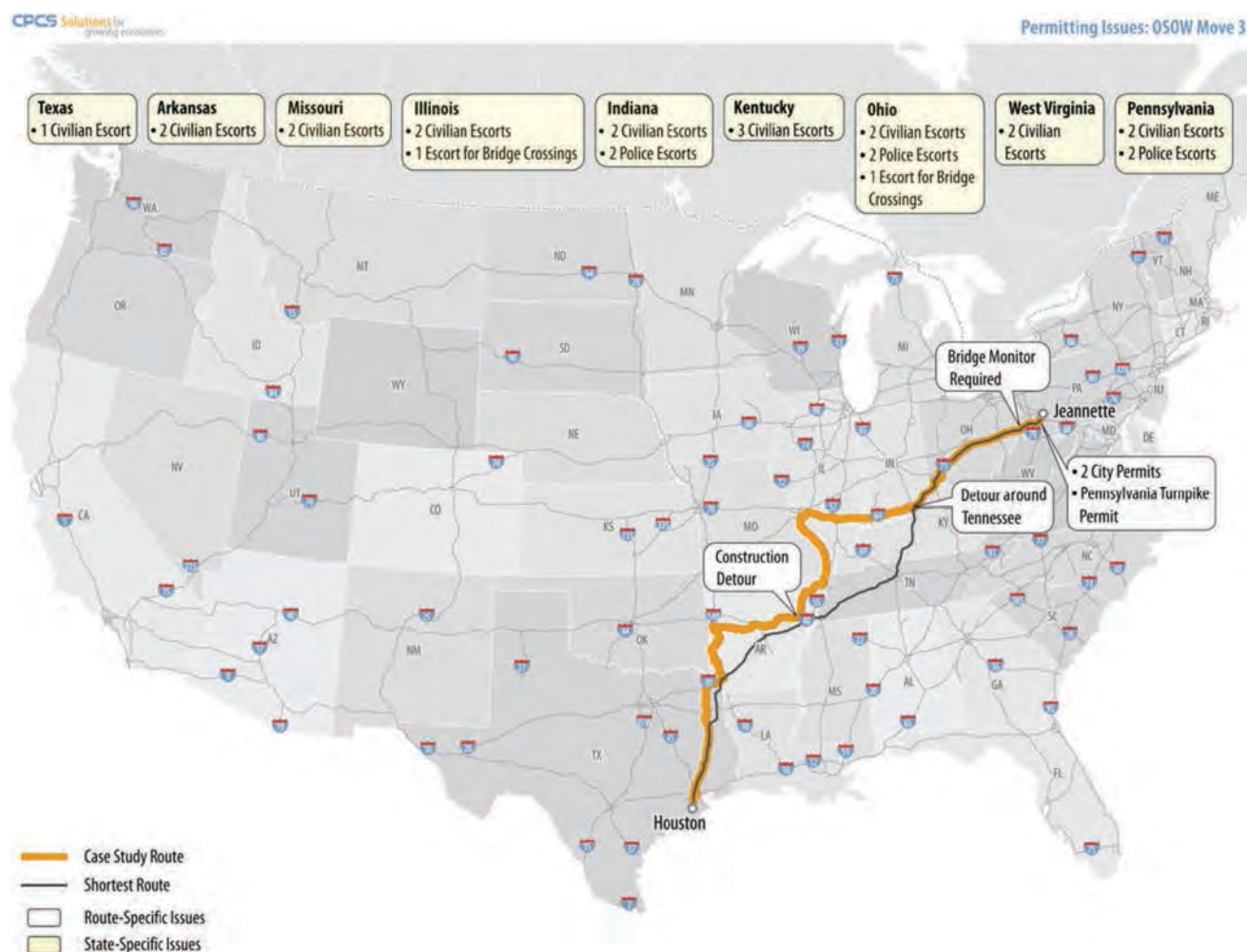


Figure 3-14. Route of Move 3 from Pittsburgh, Pennsylvania, to Rosharon, Texas.

## 34 Multi-State, Multimodal, Oversize/Overweight Transportation



Figure 3-15. Operational timeline of Move 3.

State	Permit Miles	State Permit Cost	City Permits	Civilian Escorts	Police Escorts	Route Survey
Pennsylvania	70	\$235	3	2	2	Yes
West Virginia	14	\$216	0	2	0	No
Ohio	135	\$270	0	2	2	No
Kentucky	33	\$60	0	3	0	No
Indiana	141	\$846	0	2	2	Yes
Illinois	143	\$563	0	2	0	No
Missouri	220	\$1,330	0	2	0	No
Arkansas	470	\$1,660	0	2	0	No
Texas	347	\$470	0	1	0	No
Total	1,573	\$5,650	3	18	6	2

Figure 3-16. Permitting and operational requirements of Move 3.

on Saturday and Sunday in West Virginia. Travel did not continue until Tuesday because the load could not get an Ohio police escort on Monday. Travel stopped again on Thursday because the load needed a police escort in Indiana. The move traveled to Belleville, Illinois, on Friday, where it sat until Monday morning. The load did not travel on Saturday because of the weather, was restricted from moving on Sunday because of its width and weight, and could not move on Monday because of the weather. From Tuesday to Thursday, the move traveled from Belleville, Illinois, to its destination in Rosharon, Texas.

Figure 3-16 displays a selection of the permitting and operations requirements for the move including the number of miles traveled in each state, state permit costs, the number of city permits required, civilian and police escorts required, and whether a route survey was required. In addition to the requirements shown in Figure 3-16, a truck inspection and a construction notification were required in Pennsylvania, as well as a bridge monitor in Ohio and Illinois.

As with Move 2, the cost of permits for Move 3 varied substantially between states due to incremental charges for the weight of the vehicle. City permitting was concentrated in Pennsylvania, where two cities and one toll road required their own permits. Overall, the major impediments to Move 3 progressing from origin to destination were the weather, police escort coordination, and restrictions on weekend travel.

# Multimodal Options and Modal Competitiveness in Oversize/Overweight Transportation

## 4.1 Assessing Multimodal Options

The routing of an OSOW load is based on a variety of factors including origin and destination, weight and dimensions, state regulations, construction, modal access, cost, trip length, load time sensitivity, and infrastructure constraints.

The research team consulted with shippers, carriers, and forwarders or brokers to identify when routing decisions are made, the decision makers involved, and the key considerations for mode and route choice.

Figure 4-1 displays the typical planning process for an OSOW shipper or buyer. Depending on the company or contract, either the shipper or the buyer of a load organizes the load. The organization making the contracting decisions in the planning process is referred to as the organizer. In the planning process, the organizer makes decisions based on the cost, timelines, and weight and dimensions of a load, which in turn inform routing and mode of transportation. Figure 4-1 displays three paths involving carriers, brokers, and possibly a private fleet.

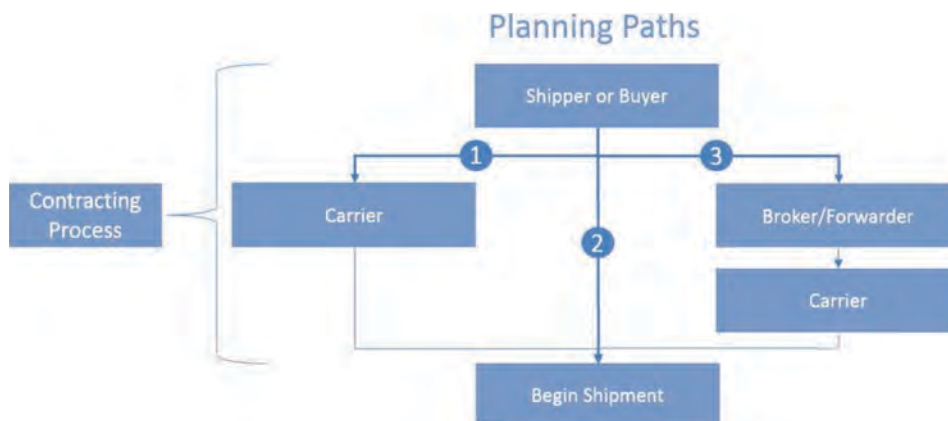
**Path 1.** The organizer contacts carriers directly to explore pricing, delivery timeframes, and availability. In this case the organizer is responsible for choosing the mode of transport.

**Path 2.** The organizer uses its own transportation assets to ship the OSOW load. In this arrangement, the organizer may carry the load for the whole or a portion of the trip.

**Path 3.** The organizer contracts a forwarder or broker to organize the load. The forwarder or broker then contacts carriers to price out different routes and modes of transportation.

Figure 4-1 presents the various paths in an OSOW planning process as mutually exclusive, but the organizer of an OSOW load often prices out multiple carriers, forwarders, or brokers to obtain the best price for its shipping needs. Additionally, an organizer may solicit quotes from multiple modes to determine the route and mode that best fit its needs. By obtaining quotes from multiple carriers and forwarders or brokers, the organizer is able to assess its options while leveraging the expertise of these firms. Organizers are able to take advantage of competitive market pressures to incentivize a transportation plan with the lowest cost.

In addition to comparing multiple carriers, forwarders, or brokers, the research team found that the OSOW market functioned efficiently through competition. An example provided to the research team was when an organizer asked for a trucking quote on a load that was going to be more competitive traveling by rail because it fit within the dimensional restrictions of rail and was moving long distance. The carrier suggested that the organizer use a mode other than road because it would not be as competitive. While slightly counterintuitive, the cost of providing a quote and knowledge of the market suggested to the carrier that transportation by road would



**Figure 4-1. Overview of the OSOW planning process.**

not be competitive, therefore it provided its expertise to build a relationship with the organizer and save the cost of the quote. Consultations with carriers of all modes, shippers, and brokers revealed significant knowledge about competing modes, including rules of thumb for when each mode is competitive and the advantages and disadvantages of each mode.

### 4.1.1 Modal Options and Competitiveness

Although most OSOW movements are carried by truck, rail and marine transportation are also used.

Each mode brings cost advantages and infrastructure constraints, which translates into three relatively exclusive market segments. Figure 4-2 displays a compilation of the advantages and disadvantages of each mode for the movement of OSOW freight.

Multiple consultations suggested that while there is competition between the modes, OSOW modes are limited to specific subsets of the market because of their unique access, cost structures, and infrastructure restrictions.

### 4.1.2 Factors Affecting Modal Competitiveness

There are four key factors that drive the relative competitiveness of road, rail, and marine transportation:

- Modal characteristics,
- Modal access at origin and destination,

Road		Rail		Waterway	
Advantages	Disadvantages	Advantages	Disadvantages	Advantages	Disadvantages
Access	Weight	Weight	Width	Weight	Speed
Speed	Height	Price	Height	Height	Access
Ease of Use	Price	Fewer Jurisdictional Issues	Access	Width	Ease of use
Width	Permitting	Multi-Piece Move	Ease of Use	Multi-Piece Move	Price

Source: CPCS analysis of modal consultations

**Figure 4-2. Advantages and disadvantages of OSOW modes of transportation.**



Source: Ceres Barge

**Figure 4-3. Wind tower blades moving with covered hopper barges.**

- Loaded dimensions, and
- Regulations encountered along the route (and the impact of these regulations on cost).

### *Modal Characteristics*

Road, rail, and marine transportation have comparative advantages in the movement of freight, and their pricing and business models reflect these advantages. Trucking is generally the fastest mode from origin to destination but is less cost-efficient at transporting heavy and large goods. Therefore, the competitiveness of rail and waterway largely hinge on the load not being time sensitive.

Beyond time sensitivity, rail and marine transportation are the most competitive in moving dense and heavy goods over long distances. Trains and barges can be configured to transport massive quantities of freight using unit trains and multi-barge tows. Depending on the size, number of pieces, and the requirements of the shipper and receiver, OSOW freight may get placed in the general pool to be transported from origin to destination as part of a multi-barge tow or merchandise train. Conversely, OSOW freight may use a dedicated rail or water service to increase the speed of the trip. The use of a dedicated rail service allows for OSOW loads that might face obstacles in road transportation to transit the rail network at an additional \$100 to \$120 per mile cost and in less time. For example, Union Pacific charges \$120 per rail mile with a minimum of a \$24,000 charge in addition to other freight charges.<sup>1</sup> Similarly, CSX charges \$105 per mile with a minimum charge of \$11,550.<sup>2</sup> A dedicated barge service could cost an additional \$120,000, but a dedicated service is limited to very large loads or multiple loads in a barge when the added cost is still competitive relative to trucking.

Another modal characteristic that increases the competitiveness of rail and marine transportation is the ability to combine multiple OSOW truck shipments onto a single barge, tow, railcar, or unit train. Figure 4-3 displays a group of nine wind tower blades in each of the open hopper barges. Alongside the blades are covered hopper barges, likely carrying other bulk commodities, which suggest that this move did not opt for a dedicated service. Each hopper barge replaces nine OSOW truck shipments. One consultation suggested that the cost of moving a non-dedicated barge from New Orleans to St. Louis was about \$35,000; but, in the case of Figure 4-3, the cost would be split between nine pieces, making it cost-effective.

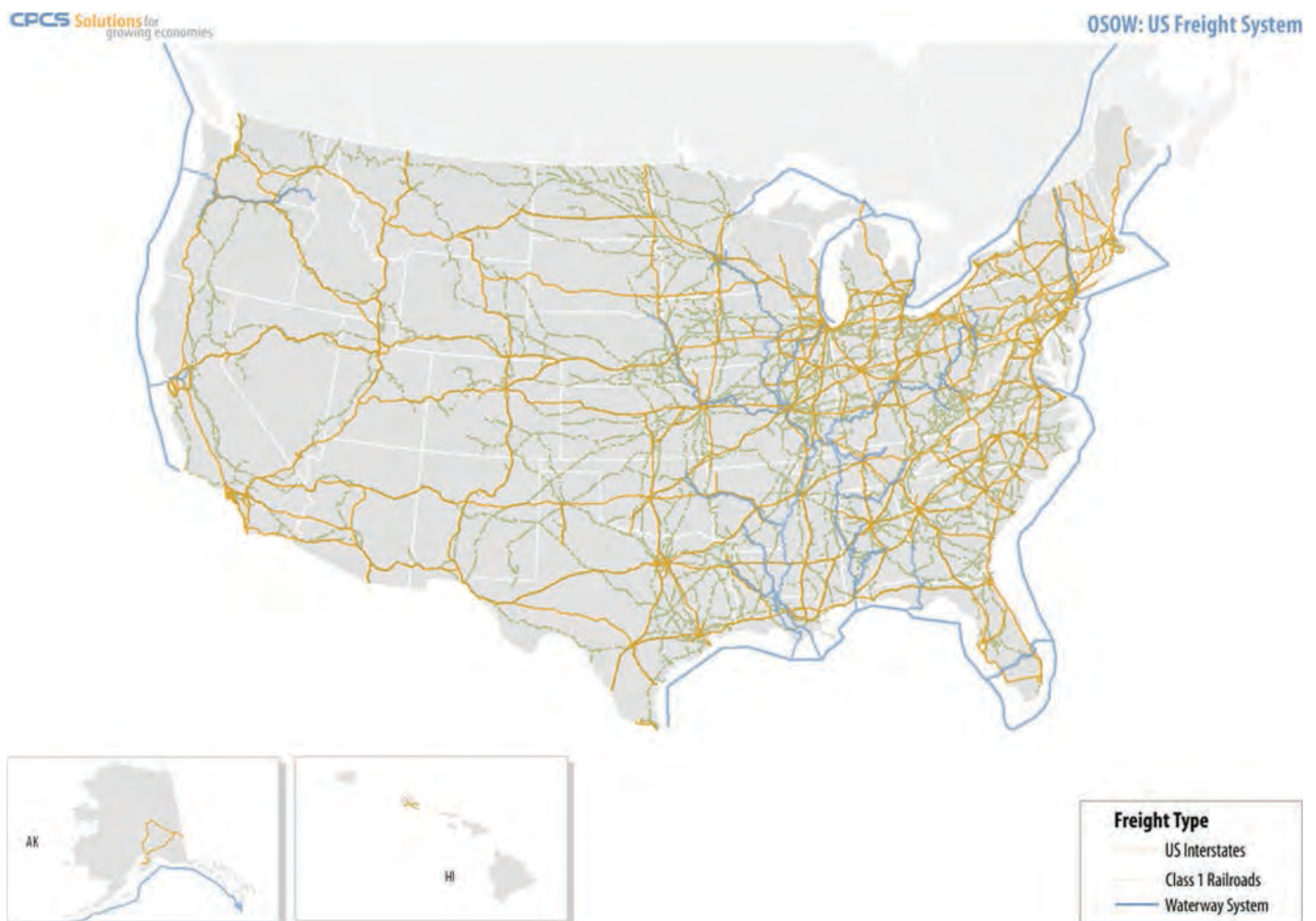
<sup>1</sup>*Frequently Asked Questions About Shipping Dimensional Loads.* Union Pacific. <https://www.up.com/customers/ind-prod/consumer/machdimen/faq/index.htm>. Accessed May 11, 2015.

<sup>2</sup>*Publication CSXT 8100: Terms and Conditions of Service and Prices for Accessorial Services.* CSX. [http://www.csx.com/share/wwwcsx\\_mura/assets/File/Customers/Price\\_Lists\\_Tariffs\\_Fuel\\_Surcharge/8100/cxm176094\\_csxt8100\\_8\\_5x11\\_rSgW.pdf](http://www.csx.com/share/wwwcsx_mura/assets/File/Customers/Price_Lists_Tariffs_Fuel_Surcharge/8100/cxm176094_csxt8100_8_5x11_rSgW.pdf). Accessed May 14, 2015.

### Modal Access

Rail and marine transportation require an access point such as a rail spur, siding, dock, or waterway access point at the origin, destination, or along the route. Modal access changes modal competitiveness due to the cost of transloading and the cost of using another mode to make up for limited access to a load's origin and/or destination. The cost varies by the weight and the radius of the crane needed to lift the load. Crane services cost between \$400 and \$1,400 per hour depending on the weight of the load alone. Transloading not only increases cost, but it also increases the risk of damaging an OSOW load. The risk of damage is at least partially contingent on the number of times the load must be moved to a different mode. In the case of a truck-only move, a maximum of two lifts is required in most cases, one at the origin and one at destination. The same load could require two to four lifts (six lifts if a product is moved through a laydown area) to move by rail or water depending whether the origin or destination has rail or waterway access. Therefore, limited access reduces the competitive advantage of rail and marine transportation on a cost per ton-mile basis.

Figure 4-4 displays the interstates, Class 1 railroads, and marine highway network in the United States. While the interstates are the most capable of carrying OSOW freight, they represent



Sources: Bureau of Transportation Statistics, U.S. Army Corps of Engineers, U.S. Maritime Administration, Federal Highways Administration, and Association of American Railroads

**Figure 4-4.** *Interstates, Class 1 railroads, and marine highway network in the United States.*

only 1.2% of the total roadway network.<sup>3</sup> Similarly, Figure 4-4 displays Class 1 railroads, which represent 69% of the U.S. rail network.<sup>4</sup> The marine highway and inland waterway system in Figure 4-4 covers most of the water routes, which leaves much of the United States far from waterway access.<sup>5</sup> The density of the road, rail, and waterway networks shown in Figure 4-4, representing 1.2%, 69%, and 100% respectively, displays the differences in modal access.

### *Loaded Dimensions*

The loaded dimensions of OSOW freight significantly affect the competitiveness of each mode. This is primarily the case with road and rail transportation, both of which face greater infrastructure constraints relative to waterway. In the case of road, the loaded height and weight are the limiting factors. Not only do high loads (15 ft and above) have a limited use of interstates throughout the United States, but also these loads start to need utility involvement, which requires significant coordination and can be the single largest component of the cost. Similarly, as the weight of an OSOW load increases, the number of bridge reviews needed increases along with cost and the time it takes to permit the load. Additionally, as shown in Move 3, the weight of a load may require a circuitous routing to avoid a weak bridge. Circuitous routings result in additional miles and an increased likelihood of traveling on local roads or roads with more stringent regulations. For the heaviest loads, a state may restrict roadway travel by providing a connection from rail or waterway to the origin or destination of the load. Therefore, height and weight provide a competitive advantage for rail and marine transportation relative to truck, though rail may be limited on height depending on the route.

The competitiveness of rail is largely a function of width and to a lesser extent height. Generally speaking, any piece over 13 ft wide has difficulty moving on rail. Some corridors can accommodate wider loads, but width is the largest constraint to the shipment of OSOW loads by rail. Therefore, railways cater to dense loads and high loads, especially on rail corridors used for double-stacked containers.

Marine has very few size and weight restrictions and is the mode most able to transport the largest OSOW loads. Air draft or overhead obstacles that could damage the load are examples of infrastructure restrictions in water. One consultation suggested that air draft restrictions were an issue at 30 ft high and become problematic at 40 ft high. Given those dimensions, air draft is not a substantial issue relative to other modes. Both rail and truck face more frequent overhead restrictions before a load reaches 30 ft or 40 ft, resulting in a competitive advantage for waterway for the movement of very high loads. The general lack of restrictions on dimensions and weight in water enables it to be very competitive on the movement of megaloads. Water is also competitive for very heavy loads that are outside the envelope of rail.

### *Regulations Encountered Along the Route*

States are responsible for the permitting of OSOW loads on state-maintained roadways. OSOW carriers often have to obtain permits from local jurisdictions (cities and counties) for the use of their roadways. Once a load is on the network, rail and marine transporters are not subject to state or local permits to use the transportation network. Not only does the lack of permit requirements create a cost advantage, but also trucking companies must apply for and

<sup>3</sup> *Transportation Statistics Annual Report 2013*. Bureau of Transportation Statistics, U.S. Department of Transportation, 2014. [http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/TSAR\\_2013.pdf](http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/TSAR_2013.pdf). Accessed April 24, 2015.

<sup>4</sup> *Overview of America's Freight Railroads*. Association of American Railroads. <https://www.aar.org/BackgroundPapers/Overview%20of%20Americas%20Freight%20Railroads.pdf>. Accessed April 24, 2015.

<sup>5</sup> *America's Marine Highways*. Maritime Administration, United States Department of Transportation. [http://www.maradot.gov/documents/AMH\\_Fact\\_Sheet\\_V11.pdf](http://www.maradot.gov/documents/AMH_Fact_Sheet_V11.pdf). Accessed April 24, 2015.

### Waterway Connection

During consultations for this study, ports, shippers, and carriers raised concerns about the connection of the waterways to OSOW generating and receiving facilities. For ports, many of which are surrounded by cities, the key challenge is identifying and protecting corridors that provide access for OSOW carriers. The protection of corridors is increasingly difficult when multiple jurisdictions exist along the corridors that serve a port. Port managers often work with shippers for years in advance to ensure their loads can transit to or from the port, without knowing how local roadways may change. The biggest issue is the construction of permanent structures or infrastructure that limit the dimensions that have access to the port.

For shippers, the focus is also on access. One shipper explored investing \$1 million in improving infrastructure and creating a corridor from its facility to the Mississippi River. Such a corridor would facilitate the landside movement of OSOW loads and allow for lower transportation costs. Ultimately, the efficiency by which OSOW loads are transported directly affects the competitiveness of the shippers and economy as a whole. It is critically important that shippers and receivers of OSOW freight are connected to the waterway to facilitate the safe and efficient movement of these goods.

wait for permits to be granted, which become increasingly difficult as the dimensions and weight of a load increase.

State and local regulations govern the operation of OSOW freight on the road network through the permitting process, which defines the operating parameters of a load, such as maximum weights allowed on a single axle or a group of axles. The competitive advantage of rail and water is that shippers and buyers can avoid the restrictions of the permitting process when shipping multi-state loads. Therefore, the competitiveness of each mode varies depending on the loaded dimensions and weight, origin, destination, the number of states a load transits, and the operating and cost characteristics of each mode.

Additionally, because each state issues permits for its state alone (with the exception of regional permits), carriers must interface with each state separately, taking construction, infrastructure restrictions, and regulatory differences into account on a state-by-state basis. While some states have an easier and less expensive permitting process than others, as the number of miles increases, so does the likelihood that a load has to obtain multiple permits as it crosses state lines.

### 4.1.3 Knowledge of Modal Options

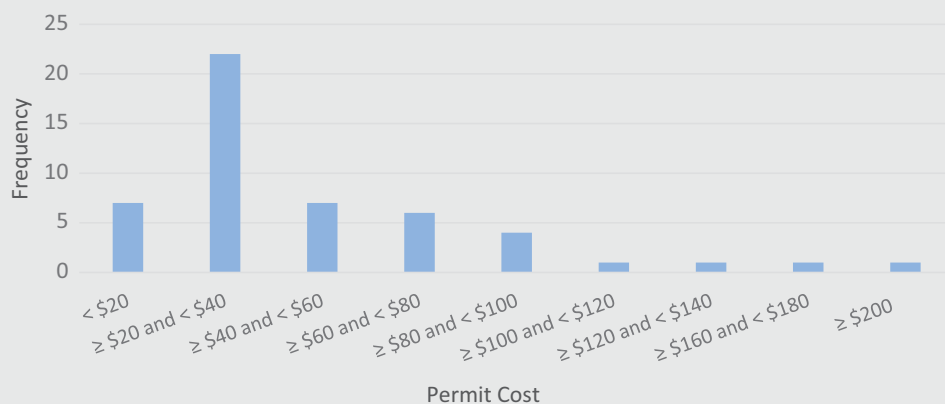
Carriers of all modes demonstrated knowledge and information of the relative competitiveness of each mode. Carriers work with other modes to move a load from origin to destination, which contributes to their exposure to the relative competitiveness of each mode as well as the constraints. The general consensus of carriers of OSOW freight is that they had the appropriate information needed to make efficient routing decisions. In addition to shipper and carrier knowledge of multimodal options, brokers and forwarders provide the expertise needed to navigate contracting a multimodal OSOW move. These firms have the experience and industry



### Variations in Permitting Costs

States have different OSOW permitting fee structures, varying from a flat fee per permit to an incremental fee based on the loaded dimensions, number of miles traveled within the state, axles, total weight, or a combination of these variables.

Permitting costs for a load measuring 80 ft long, 12 ft wide, 14 ft high, weighing 92,000 lbs, using a 5-axle configuration, and traveling 50 miles range from \$5 in Hawaii to \$210 in Texas, with most of the states charging \$20 to \$40. The states with the highest permitting costs were those with incremental fee structures. The difference between the permitting costs increases as the size of a load and the total number of miles increase. Therefore, the relative modal competitiveness of rail and water increases in states that have incremental fee structures as the weight and distance traveled increase.



Source: CPCS analysis of OSOW permit fees

### ***Distribution of permitting fees.***

connections to weigh the multimodal options and organize the movement of these loads on behalf of the shipper or buyer.

### Road

Road transportation is different from rail and waterway because of the number of different jurisdictions that can regulate the movement of OSOW loads (as distinct from rail and marine that are largely federally regulated). OSOW carriers have to request permission and follow the regulations of states, cities, counties, and toll roads depending on the route and jurisdiction that maintains those roadways. Essentially, there are three different types of information needed to permit and operate OSOW loads on roadway.

- **Permitting Requirements** include information on who requires a permit and how to obtain that permit, such as city or county permits, route surveys, or utility notification, as may be necessary.
- **Operational Requirements** include information on what will be required when moving the OSOW load, such as civilian or police escorts, or hours of travel restrictions.
- **Infrastructure Restrictions** include up-to-date information on the status of the infrastructure on which an OSOW load is traveling. Infrastructure changes such as construction, bridge

postings, and road closures are a variable and must be verified before using the route listed on a permit.

Consultations with carriers identified various gaps for each type of information, but were generally focused on easy access to information and communication when requirements or restrictions have changed.

### *Rail*

Through the course of this research, shippers, carriers, forwarders, and brokers demonstrated substantial knowledge about the constraints and opportunities to move OSOW freight by rail. That said, OSOW stakeholders did note that there is limited availability of information on the location of sidings for transloading to and from trucks. As a quick fix, carriers noted that they could use satellite-based maps, such as Google Earth, to locate the closest siding when defining a route. Similarly, the organization of rail services is a perceived information gap. Non-rail stakeholders cited issues with getting to the right person to organize an OSOW load and suggested that this knowledge was a barrier for first-time users of rail transportation.

From the rail side, one rail veteran noted that information on transload and rail sidings was available, but that organizers needed to ask for it from the railroads. The key difference in these perspectives was about what was publicly available to the organizers and what had to be solicited. Ultimately as private organizations, railroads have the choice about what to make public to facilitate these moves.

### *Marine*

Marine transportation is similar to rail in that experience and comfort with shipping by water is a key determinant of waterways being considered as a modal option. At least one shipper consulted used a broker when using more than one mode. The broker facilitated the movement, obtaining quotes and organizing the transload between modes. OSOW shippers were generally able to describe the circumstances when shipping by waterway was effective, suggesting that shippers understand the modal advantages of shipping by waterway.

## **4.2 Roadway Competitiveness**

Trucking is the most expensive mode of transportation on a per mile basis, but on the whole provides the most comprehensive level of service to shippers when assessed from a speed and access perspective.<sup>6</sup> Additionally, the access that roads provide makes the organization of road transportation simple, relative to the other modes that may require trucking to connect the origin and the destination.

### **4.2.1 Competitive Advantages**

Trucking is particularly competitive for OSOW loads less than 12 ft to 14 ft wide and up to 14 ft high because the load is largely able to select an interstate route for most of the journey. The access to infrastructure relative to rail and waterway is the biggest advantage of OSOW truck moves. Related to the access, trucking companies can move a load on a single mode of transportation from origin to destination. This ease of use is a key advantage for roadway transportation, because of the cost and risks associated with transloads when origins and destinations are

<sup>6</sup> Bureau of Transportation Statistics. [http://www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/national\\_transportation\\_statistics/html/table\\_03\\_21.html](http://www.rita.dot.gov/bts/sites/rita.dot.gov/bts/files/publications/national_transportation_statistics/html/table_03_21.html). Accessed May 25, 2016.

not connected to rail or waterway. Shippers noted that the ease of moving freight by truck had a distinct advantage and that they are willing to pay a premium for road transportation rather than use an alternative mode.

Trucking is also competitive for overwidth loads because rail faces a very constrained load envelope. Also, rail and water often require trucking and transloading at the origin and the destination, reducing their cost advantage.

OSOW movement by truck is typically faster than other modes, especially for routine OSOW freight. Trucking companies are better able to respond to single loads compared to rail and waterway transportation, especially when the configuration is classified as a routine load, thereby not requiring highly specialized trailers, bridge reviews, route surveys, utility notification, and lengthy permit processes.

#### 4.2.2 Competitive Disadvantages

Height and weight are two of the primary competitive disadvantages for moving OSOW freight by road. As the loaded height and weight increase, the probability that trucking will be the primary form of transportation decreases. The major constraint when height increases is that it limits the routes an OSOW load is able to take due to bridges and overpasses. The presence of overhead structures shifts OSOW loads off interstates and onto city and county roads, which are more likely to have utilities over the roadway.

Figure 4-5 displays a lift truck raising a traffic signal so that an OSOW load can travel safely through the intersection. The cost of utilities reconciliation is one of the major drivers of mode choice. For example, a load from Wisconsin to Alberta encountered 64 different utilities, which resulted in a total additional cost of \$230,000. A different load traveling less than 100 miles within Wisconsin paid over \$200,000 in utility costs. In some cases, the identification, notification, and cost of lifting lines is equal to the total operational cost of moving the load. Utilities can add substantial cost to the movement of OSOW freight when a load is significantly overheight.

Weight also affects the overall competitiveness of trucking. As the weight of a piece of OSOW freight increases, so does the weight of the equipment needed to carry the load. For example, a 150,000 lb load results in a total loaded weight of approximately 250,000 lbs. This issue is not



*Figure 4-5. Lift truck used to raise a traffic signal.*

unique to OSOW trucking; a loaded 80,000 lb truck is able to carry approximately 40,000 lbs to 45,000 lbs.

Weight impacts OSOW transportation in two ways. First, the cost of permitting can be substantially higher due to incremental permit costs assessed based on weight and the additional cost of bridge analysis in some states. Second, as weight increases it is more likely that the load will have to be routed around bridges that are not structurally able to handle the weight, increasing the chance that the route includes county and city roads.

Finally, state-to-state differences in regulation can cause delay in permitting or operations at state borders. A state border delay or rejection of a permit has a cascading impact on permits within other states. Depending on the associated delay, this could cause a carrier to reapply for permits for each state along the route to reflect a new timeline. This presents a significant risk to the timeline for shipping OSOW loads, but this risk is far greater for superloads compared to routine OSOW loads. Not all states allow permit amendments generally and some only allow amendments in specific cases such as a mechanical breakdown or weather restrictions. Carriers must file a completely new permit in states that do not allow permit amendments, which can result in significant delay depending on the permit turnaround time.

From an operations standpoint, differences in state regulations take different forms. Delays can be very minimal, such as changing the flags or signs on OSOW loads, or lengthy delays, such as those resulting from loads stopping at a state border to wait for police or civilian escorts, or from differences in hours of travel from one state to another. Each day of delay costs a carrier thousands of dollars in labor costs and lost utilization of trucks and trailers. Carriers must build these costs into the rate they charge, further detracting from the competitiveness of trucking, relative to rail and marine transportation, when these are viable alternatives.

### 4.2.3 Overall Market Segment

Trucking maintains a cost advantage for those loads with trip ends without nearby access to a rail spur. The other key advantage is the timeliness of the shipment. Trucking is able to quickly respond when the load falls within the routine OSOW load category and faces limited regulatory and infrastructure constraints. Additionally, trucking becomes more competitive as the width of a load increases to 12 ft 6 in. to 14 ft wide and is faced with very limited competition with rail when loads exceed 14 ft wide. There is minimal overlap in the market segments for truck and marine transportation due to access and the time needed to ship by waterway. Overall, trucking serves a largely complementary market to rail and waterway, serving time-sensitive and smaller loads for single trips that are not located on or near a rail line.

### 4.2.4 Example of a Multi-Jurisdictional Road Move

An OSOW load traveling from South Carolina to Maryland on a 5-axle configuration travels through four states and is subject to their respective maximum permitted axle weights on both single and tandem axles. The configuration must comply with the lowest maximum weights, in this case South Carolina's. Figure 4-6 shows the maximum permitted axle weight for single/steer and tandem axles.

As shown in the total maximum combination weight, the maximum weights for each axle group directly affect the maximum total weight of the configuration. If the configuration totaled more than 100,000 lbs, it would need to add an axle to comply with South Carolina's regulation and would have an "extra" axle when traveling through North Carolina, Virginia, and Maryland. Adding axles increases the cost to the carrier, because the equipment becomes more expensive, creates more wear and tear on tires, and reduces fuel economy. It is also possible that the

Axle Type	South Carolina (lbs)	North Carolina (lbs)	Virginia (lbs)	Maryland (lbs)
Single/Steer	20,000	20,000	24,000	20,000
Tandem	40,000	50,000	44,000	52,000
Maximum Total Weight	100,000	120,000	112,000	124,000

Source: Uship.com

**Figure 4-6. Maximum permitted axle weights.**

increased weight or trailer length could trigger other regulations, such as extra escorts or hours of travel regulations. Additional regulations depend on the weight and dimensions of the load as well as the states where the load is operating.

### 4.3 Rail Competitiveness

According to consultations with trucking, rail, and waterway carriers, rail is the least costly mode of transportation for OSOW freight on a cost-per-mile basis. The definition of OSOW loads, or dimensional loads as they are referred to by railroads, for rail transportation is different from the definition of OSOW loads for road transportation because the infrastructure, design, and constraints of rail are different. States define loads as OSOW when they are 8 ft 6 in. wide, but for rail overwide loads begin at 10 ft 6 in. to 11 ft (Figure 4-7). Similarly, states define legal height anywhere from 13 ft 6 in. to 15 ft. Figure 4-7 displays a selection of the dimensional limits of some Class 1 railroads. For the three railroads included, dimensional loads begin from between 15 ft 6 in. to 17 ft above top of rail. Therefore, OSOW loads in road transportation are not defined as dimensional loads when traveling on rail. Loads that are not defined as dimensional are not required to undergo a clearance process, which reduces the time and cost of transportation.

Dimensional loads require a clearance review of the infrastructure the load will transit, at a cost of \$500 to \$1,000. Burlington Northern Santa Fe (BNSF) railway notes that the cost of a clearance review is refundable on loads that use the railroad within one year of the clearance being conducted.

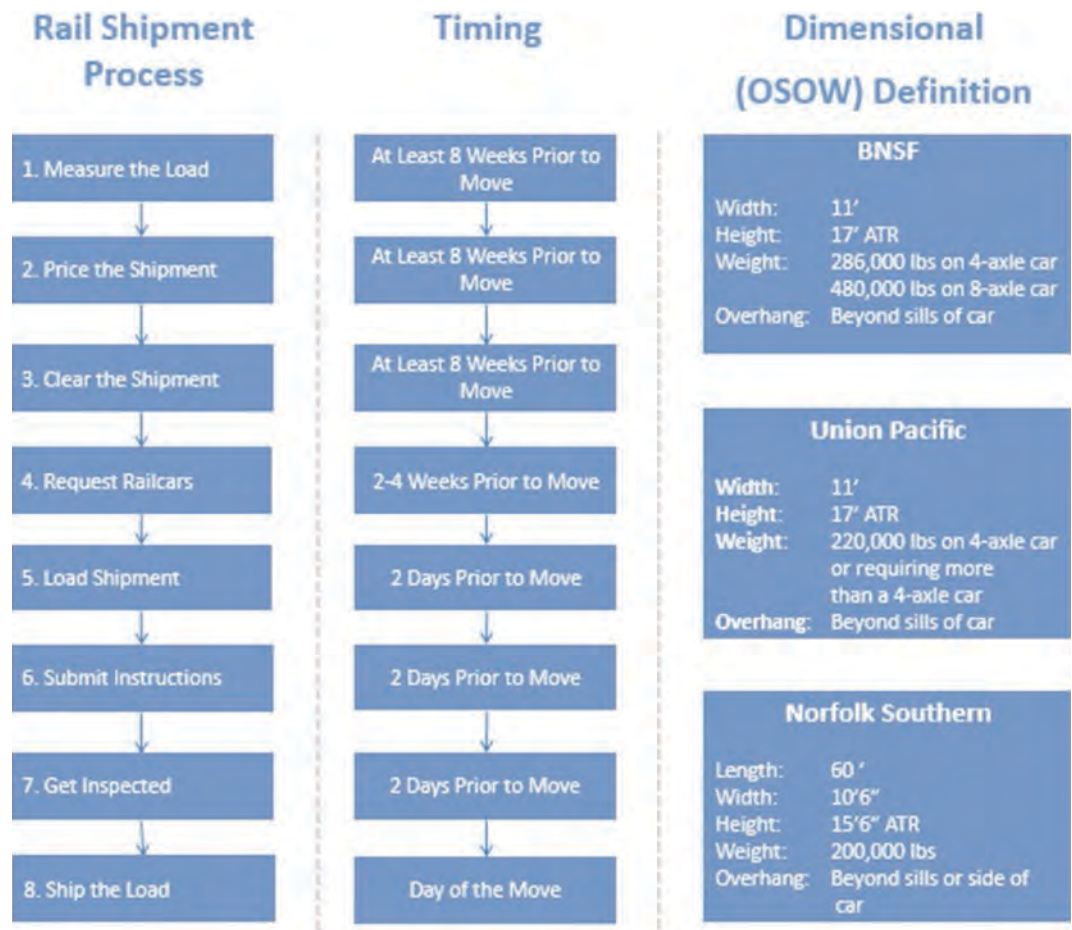
BNSF	Union Pacific	Norfolk Southern
Width: 11'	Width: 11'	Length: 60'
Height: 17' ATR	Height: 17' ATR	Width: 10'6"
Weight: 286,000 lbs on 4-axle car 480,000 lbs on 8-axle car	Weight: 220,000 lbs on 4-axle car or requiring more than a 4-axle car	Height: 15'6" ATR
Overhang: Beyond sills of car	Overhang: Beyond sills of car	Weight: 200,000 lbs
		Overhang: Beyond sills or side of car

Trucking			
Length: Federal Minimum 48'-59'6"	Height: 13'6"-15'	Width: 8'6"	Weight: 80,000 lbs

Source: BNSF, Union Pacific, and Norfolk Southern websites

**Figure 4-7. Class 1 definitions of OSOW.**



Source: CPCS research

**Figure 4-8. Railroad shipment process and timeline.**

Figure 4-8 displays the steps and the recommended timeline for those steps according to BNSF. Other railroads have similar steps and timelines for the shipment of dimensional loads. The timeline for the contracting process depends on the dimensions and the number of railroads involved along the route. One factor in the overall time needed to contract rail transportation is the type of car needed to transport the load.

As size and weight increase, the specialization of the railcar increases and so does the lead time needed to ensure that the car is available.

### 4.3.1 Competitive Advantages

The competitiveness of rail from a dimensional perspective is evident from looking at the definition of a dimensional load when compared to an OSOW load transported by road. The definitions of both height and weight start significantly higher than the legal definitions for trucking. Consultations with shippers, carriers, and forwarders/brokers suggested that the ability to carry heavier weights and taller heights are key advantages for rail. This competitive advantage relates to the cost and time needed to go through the bridge review process and the resulting route that the load may need to take to go around a weak bridge. Some states allow carriers to hire outside consultants to conduct bridge reviews, and most states require an additional fee for applications requiring a bridge review. The advantage for height stems from the need to involve utilities to

### Key Steps in the Rail Shipment Process

**Measure the Load.** Determine if the load is dimensional based on the criteria used by the railroad.

**Price the Shipment.** Contact the railroad to obtain a price quote to move the shipment.

**Clear the Shipment.** Request the railroad to undertake a clearance study to ensure that the infrastructure can handle the load. The railroad that originates the load will coordinate with the other railroads, including short lines along the route, to evaluate restrictions such as bridges, tunnels, and potential weights.<sup>7</sup> An alternate route may be suggested if the load can go around an obstruction.

**Load the Shipment.** The load must be loaded onto the railcar according to the rules specified by the Association of American Railroads (AAR).

**Submit Instructions.** Provide the railroad with instructions for shipment, which initiates the actual shipment of the load through the submission of a bill of lading.

**Get Inspected.** The shipment must be inspected and approved before it receives clearance to move on the railroad.

lift lines over roadways, usually when a load exceeds a loaded height of 15 ft. Utility involvement increases significantly as the load reaches a height of 16 ft because of the lines that the load encounters. The load will likely be routed off the interstate system, which again increases the overall number of utility lines encountered.

Lastly, railroad marketing departments highlight their ability to haul large quantities of OSOW freight by a unit train. In this instance, the shipper has all its freight concentrated in a single shipment, allowing for easy tracking. Additionally, the marketing departments assign an account manager that handles scheduling of service to ensure that assets are available far in advance. The unit train segment of OSOW shipments by rail is very time sensitive as the railroads often service manufacturer-to-port hauls, for which they must make ship departure schedules.

### 4.3.2 Competitive Disadvantages

The most significant limitation on the use of rail for OSOW shipments is width. Both road and waterway encounter fewer restrictions as width increases. Though the envelope for transporting OSOW freight varies depending on the origin and destination of the load, the research team found that rail encountered problems when a load was more than 12 ft 6 in. wide and had great difficulty when a load was more than 13 ft 6 in. wide. The difficulty in routing because of restrictions led one industry expert to suggest that loads which were more than 14 ft wide would not move by rail. From an infrastructure perspective, rail and road are similar in that the Eastern states are much more constrained than the Western states from both a height and width perspective, with width being the most limiting factor as railroads upgrade clearances to accommodate double-stacked containers.

<sup>7</sup>Some short-line railroads may not be able to handle the weight of very heavy OSOW load on their tracks. The clearance process identifies these constraints, as well as alternative routings.

Operationally, single OSOW shipments encounter greater travel time variability with rail rather than trucks. This is because railroads prioritize fluidity within their network over dimensional moves. Operationally, an OSOW car will be set out on a passing track to allow other trains to pass in order to maintain the fluidity of the network. Therefore, the transit times for OSOW loads can be very long. For example, one industry expert noted that a trip from Peoria, Illinois, to the Port of Savannah, Georgia, commonly takes two to four weeks. The exception to this is when OSOW loads use a specialized train, which comes at a significant cost (\$100 to \$120 per mile) or have the volume to book a unit train, which provides a superior level of service. As such, unless the load is very large, making trucking difficult due to bridge reviews and overhead obstacles, most of the OSOW loads traveling on rail are not single shipments. In fact, most of the rail business comes from equipment manufacturers moving freight from plants to ports for international export.

According to an industry expert, 65% to 75% of OSOW loads shipped by rail originated at the manufacturers' production facilities and were destined for the ports.

Generally speaking, single moves are less competitive on rail, especially when time is a factor. Exceptions to the competitiveness of single loads are superloads and megaloads that may be restricted from using roadways other than as a connection point to rail and water.

### 4.3.3 Overall Market Segment

The overall market segment for transportation by rail is primarily volume routes from factory to port. The remainder of the market segment consists of loads less than 12 ft 6 in. to 14 ft wide where time is not a factor and that have access to rail transportation at the origin and destination. According to an industry expert, OSOW shipments provide the best margins for railroads but make up only 0.4% of the total revenue. The business model of prioritizing fluidity on the rail network and giving secondary priority to loads that decrease fluidity such as OSOW is likely to continue.

### 4.3.4 Example of a Multi-Jurisdictional Rail Move

The John Deere facility in East Moline, Illinois, uses unit trains to transport combines from its factory to the Port of Baltimore, Maryland. Both the John Deere plant and the Port of Baltimore have rail access, removing the need to use trucking and the need to pay additional transloading costs. The combines are then loaded onto a ship to travel to international destinations. Two combines are often able to travel per car, allowing for the transportation of two equivalent truckloads. Additionally, a single combine may be combined with other related freight on the railcar. This same load would have to be split if it traveled by truck because the tires and other boxes would likely be classified as a divisible load.

From a service perspective, the total transit time from the factory to the port is usually less than four days because the railroad gives priority to unit trains. Trucking and marine transportation have difficulty competing with the level of service provided to John Deere.

## 4.4 Marine Competitiveness

Inland and coastal waterways represent the most limited network for the movement of OSOW freight from an access perspective, but are the most open in terms of infrastructure restrictions. As such, competition between water, rail, and truck for domestic routine load movements is limited to specific circumstances where access is provided at the origin and destination and where multiple pieces can be placed in one barge or vessel. Generally, waterway specializes in the



movement of superloads and megaloads, specifically those that are restricted from rail and road transportation or would be very costly due to restrictions and the involvement of third parties such as utilities.

#### 4.4.1 Competitive Advantages

The primary competitive advantage for the waterway shipments of OSOW freight is the unrestricted infrastructure it provides to move the largest OSOW loads. One consultation described water's market segment as those loads that cannot move by rail or truck. Real competition between the modes is lacking because water is the only option for these loads due to cost and regulations. Consultations suggested that pieces with unloaded weights of more than 250,000 to 300,000 lbs, 15 ft high, and 20 ft wide provide an opportunity for waterway to be competitive. Additionally, there are examples of multiple pieces of OSOW freight using a single barge or vessel to increase cost competitiveness.

#### 4.4.2 Competitive Disadvantages

Limited access to origins and destinations is the largest disadvantage to shipping OSOW freight by water. The majority of OSOW freight shipping by water will require another mode of transportation to complete the move. Additionally, not all waterways and ports are open year-round, further limiting the ability of OSOW shipments to move by water. Another constraint cited was the grain season, which according to one consultation increases the cost of barge travel by four times.

Additionally, depending on the channel and the loaded draft of the vessel, there may be restrictions due to the depth of the channel, particularly for inland waterways. There are a variety of other considerations such as the impact of extended droughts that reduce water levels or floods causing major infrastructure damage that lead to closures of waterway sections. While inland waterways may be seasonal, closing for certain periods annually because of ice, severe winters can extend the season or halt cargo shipments, as was the case on the Great Lakes during the winter of 2014 and 2015. Finally, depending on the load, the overall timeliness of the waterway was also cited as a disadvantage.

Marine transportation does encounter some infrastructure restrictions, especially as it relates to piloting requirements. For example, it takes 12 to 15 hours for an OSOW load to travel from the New York Harbor to the Port of Albany, New York. During the trip the load crosses three segments, requiring a different pilot for each segment. The route has potential additional delays in the Lower Hudson River segment for vessels with a draft over 28 ft, which need to wait for a rising tide. At least through 2010, if this mid-Lower Hudson River segment was reached near sunset, the journey was further delayed as pilots lacked the training for night travel through the Upper Hudson River segment to Albany.<sup>8</sup> Pilotage is compulsory on the Hudson River for foreign vessels and U.S. vessels under register; there are also pilotage fees.<sup>9,10</sup>

#### 4.4.3 Overall Market Segment

The research team's consultations with barge and U.S. flagged vessel owners, brokers, forwarders, and trucking companies suggested that waterway filled a very small niche market where trucking and rail could not compete because of their infrastructure restrictions. These

<sup>8</sup> 2010 Port of Albany NY Master Plan.

<sup>9</sup> General Transit Information. Hudson River Pilots Association. <http://www.hudsonriverpilots.com/ship-transit-information.html>. Accessed May 18, 2015.

<sup>10</sup> Hudson River. Hudson River Pilots Association. [http://www.hudsonriverpilots.com/uploads/3/1/1/3/3113206/cpb2\\_e41\\_c12\\_20120826\\_0006\\_web.pdf](http://www.hudsonriverpilots.com/uploads/3/1/1/3/3113206/cpb2_e41_c12_20120826_0006_web.pdf). Accessed May 18, 2015.



Source: Inbound Logistics

**Figure 4-9. Barge transportation of wind tower bases.**

loads are trucked to the closest waterway, loaded onto a barge or U.S. flagged vessel, then transited to the final destination or the closest offload point to the destination and trucked again. An exception to waterway's niche market is when multiple shipments of freight have the option of using the same barge or vessel, are located close to a waterway, and have flexibility on the delivery of their goods.

#### 4.4.4 Example of a Multi-Jurisdictional Marine Move

A 2010 series of moves from the Port of Vancouver, Washington, to Solano County, California, displays the strengths and weaknesses of moving OSOW freight by waterway. The developer, enXco, had 46 full wind turbine towers (tower sections, blades, and nacelles) to move along the West Coast. The company commissioned a feasibility study to determine how to move the load from origin to destination. The tower sections encountered significant challenges moving, which prompted the use of an ocean-going barge.

To bypass the regulatory and infrastructure constraints, enXco opted to transport 30 pieces of OSOW cargo per barge and use trucking to travel to the final destination (Figure 4-9). The company used four barges to transport the tower sections and then trucked the remaining 18 sections because it was not economical to move less than a full load by barge. The tower sections shipped by barge arrived faster than those moved by truck because of the delay that would have been needed to schedule highway patrol, permits, and drivers. The solution to move the tower sections by barge saved time and money for enXco and displays the economies of scale available when an entire barge is able to be filled. The project also demonstrated that in the absence of a full load, trucking can be more economical.<sup>11</sup>

<sup>11</sup> Brown, J. Transporting Wind Turbines: An Oversized Challenge. *Inbound Logistics*. January 2012. <http://www.inboundlogistics.com/cms/article/transporting-wind-turbines-an-oversized-challenge/>. Accessed May 27, 2015.

## Nebraska to Virginia by the Port of Houston

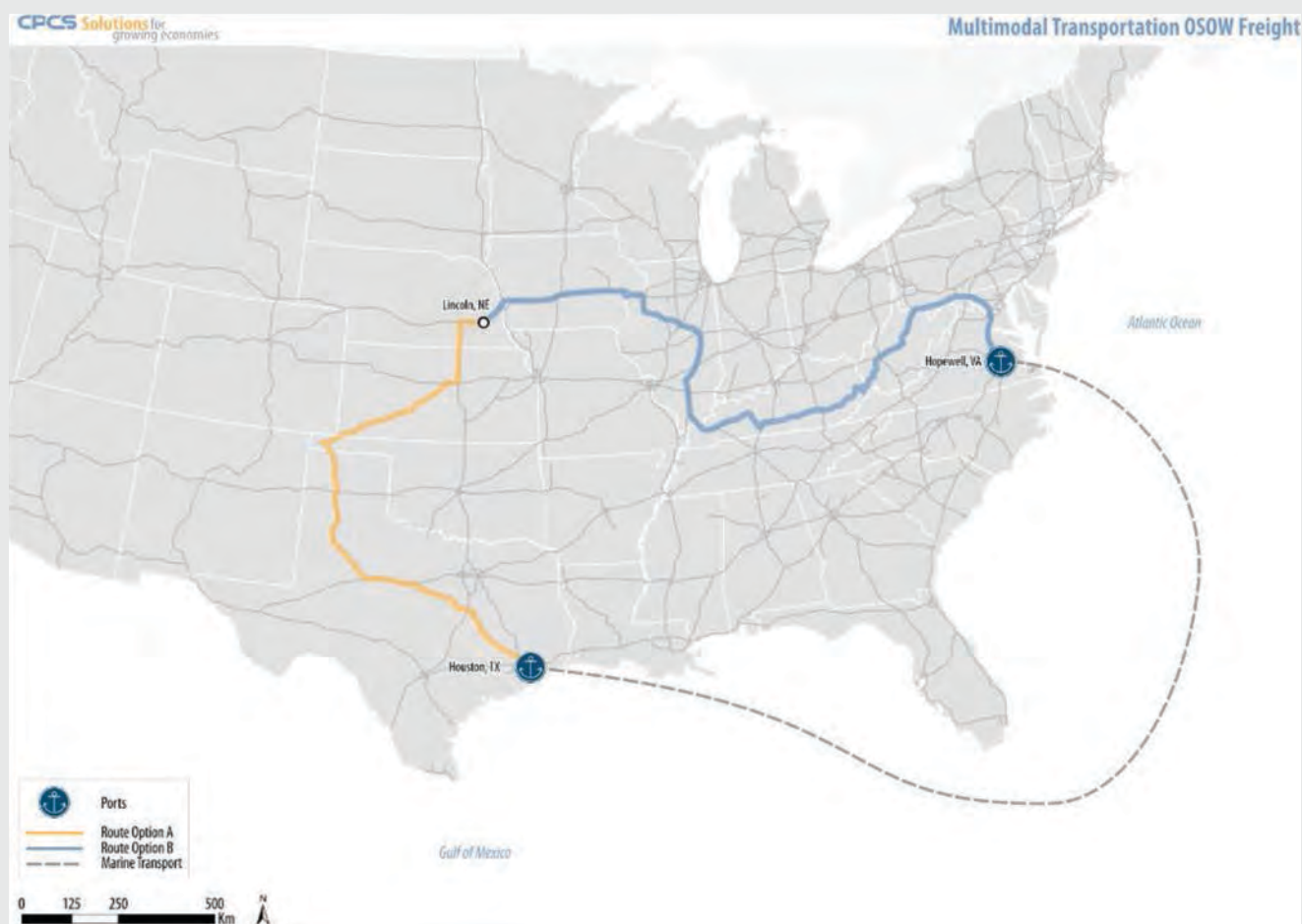
Waterways are the most competitive in the transportation of very large loads that are too wide for rail and too high or heavy for roadway. This case study provides an example of a shipper exploring its modal options for a very large load.

	Length	Width	Height	Weight
Piece Size	43 ft	15 ft	19 ft	225,000 lbs
Fully Loaded	214 ft	19 ft*	15 ft*	489,000 lbs

\*The load was placed on its side to minimize the height.

### ***Load and loaded dimensions.***

The shipper first explored moving the load by rail, but the dimensions were too large for rail. As an alternative a truck-only route was explored (Route Option B), but could not be permitted through Ohio and Maryland due to the loaded height and weight. Therefore, the load traveled by truck from Nebraska to the Port of Houston in Texas, where it was transloaded onto a U.S.-flagged vessel and traveled to Hopewell, Virginia. Finally the piece was transloaded onto a truck and shipped to its destination. The roadway-only option (Route Option B) would have cost \$295,000 and taken approximately 12 days. The truck and marine option (Route Option A) totaled \$755,000 and took 17 days (7 days of trucking and 10 days for marine). More than half of the truck and marine cost was attributable to marine transport.





## CHAPTER 5

# Common Challenges of Multi-State Oversize/Overweight Transportation

### 5.1 Identifying Challenges

OSOW shippers and carriers face a number of common challenges when moving OSOW loads across multiple jurisdictions. Most of these challenges are related to truck permitting and other roadway transportation issues.

As part of the NCHRP 08-97 project, the research team reviewed the available literature and consulted state DOT officials and carriers to determine common issues in OSOW movement. The research team identified the following issues to frame the current state of OSOW regulations and permitting practices:

- **Permitting processes** are about obtaining OSOW permits, which include availability of information, infrastructure restrictions, and the state and local permits needed for the OSOW move.
- **Communication and coordination** address the issues OSOW carriers encounter as a result of a lack of communication and coordination between jurisdictions.
- **Operational restrictions** encompass the operational issues experienced by carriers that delay the movement of an OSOW load.
- **Role of state DOTs** recognizes that state DOTs are both regulators of OSOW movement and enablers of economic development by allowing the movement of these loads.

Based on a survey conducted by the research team, Figure 5-1 displays the challenges faced by OSOW carriers during multi-state OSOW moves and ranks the regulatory compliances by cost. Most of these regulations fall within the purview of state DOTs.

Figure 5-2 integrates the ranking of the most frequent and the greatest total delay to highlight the relative importance of each issue. Issues that are up and to the right are more frequent and cause more total delay than those down and to the left. Issues placed up and to the left create more total delay but are less frequent and those down and to the right are more frequent but create less total delay. The difference between the two figures is that while Figure 5-1 addresses the cost of regulatory compliance only Figure 5-2 focuses on the delays, which in turn affect cost. For example, civilian escorts were identified as a larger component of total cost compared to police escorts. From a delay perspective, OSOW carriers reported that police escorts cause delay both more frequently and in greater total amounts compared to civilian escorts.

OSOW carriers and shippers are unanimous in citing inconsistent road transportation regulations and permitting across state lines as the dominant and overarching challenge to efficient multi-state OSOW transportation. Differences in state regulations, including the maximum axle weight limits permitted, civilian and police escort requirements, and truck configuration restrictions are some of the challenges that carriers must plan for and adapt to when moving OSOW cargo across multiple states.

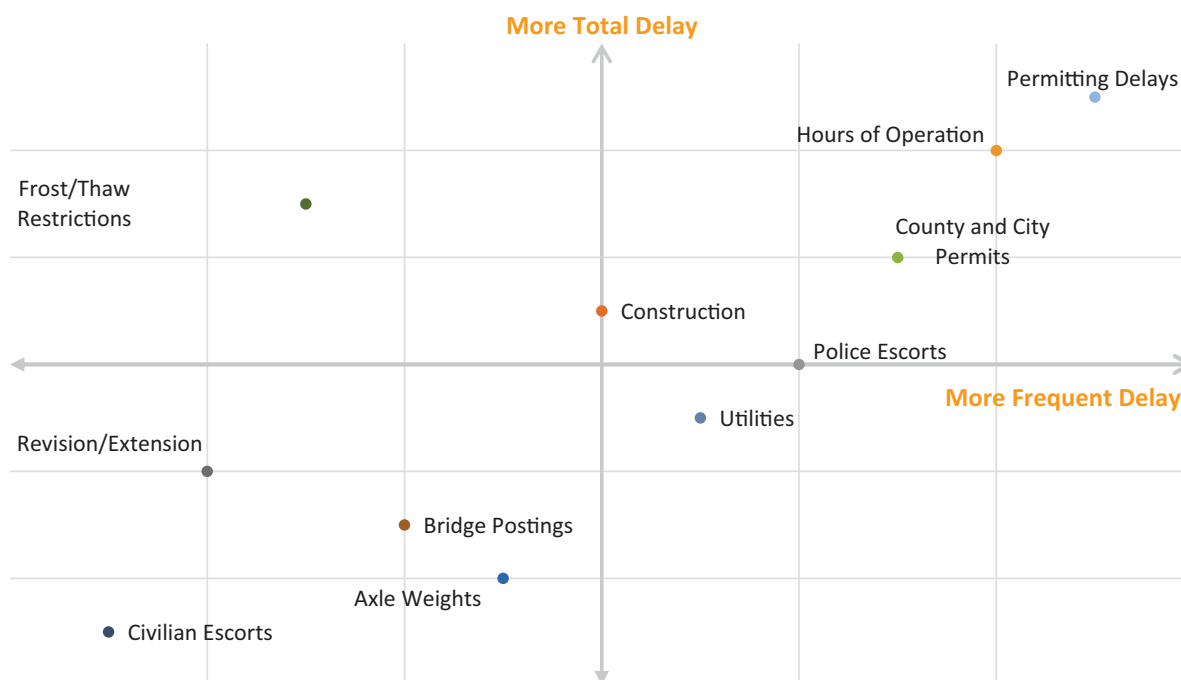
Rank	Issue
1	Civilian Escorts
2	Police Escorts
3	Permitting Fees
4	Utilities
5	Route Surveys
6	County and City Permits
7	Permit Extension/Revision

Source: CPCS analysis of responses by 19 carriers

**Figure 5-1. Ranking of regulatory compliance for multi-state OSOW moves by cost.**

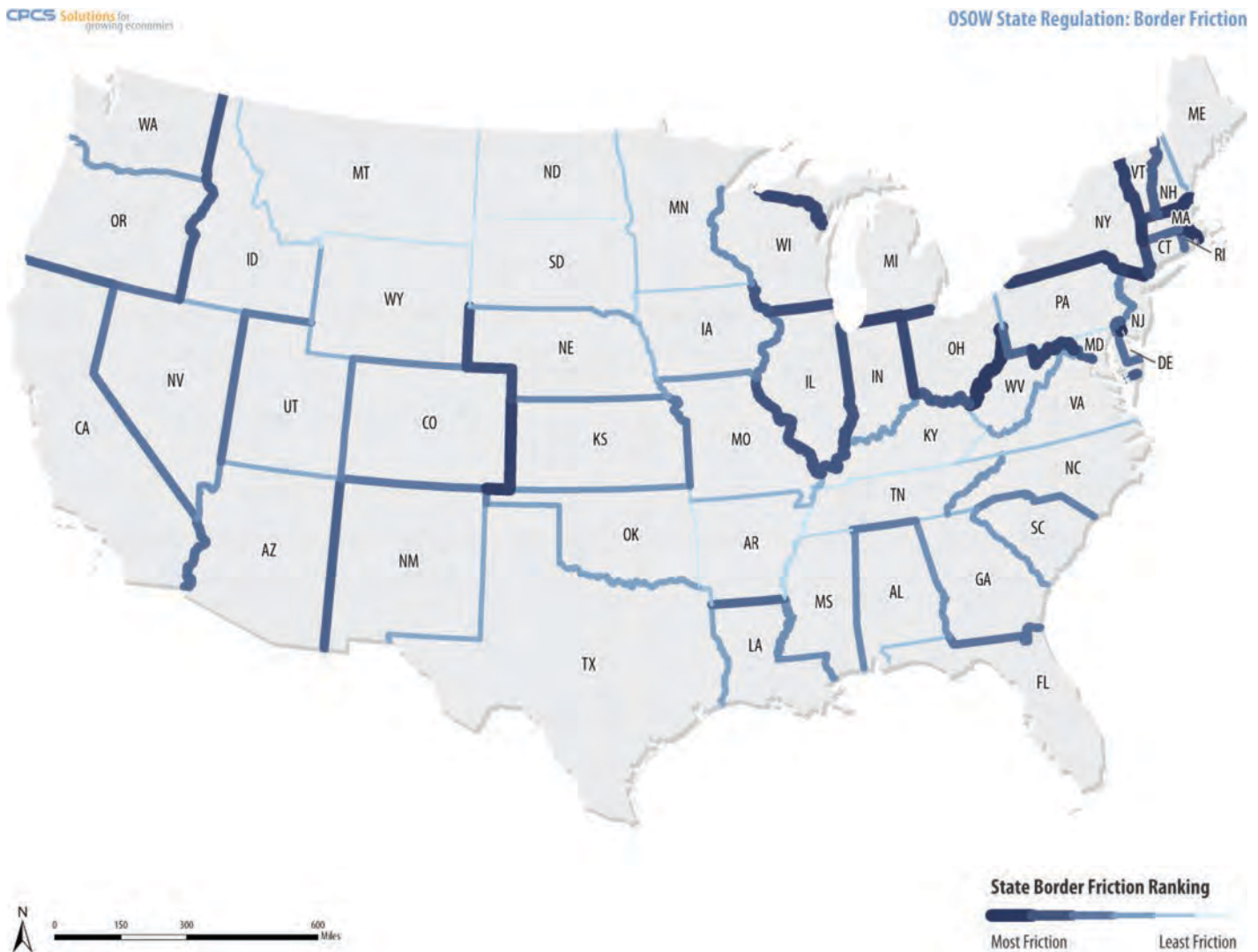
The conceptual map (Figure 5-3) highlights the extent of the inconsistencies in OSOW regulations and permitting requirements across the United States, based on an index representing a combination of OSOW regulations, operational restrictions, and permitting requirements. The thicker the line along a state border, the greater the inconsistency or regulatory and permitting “friction” between the neighboring states, which means the greater the barrier for multi-state OSOW transportation.

There are several factors driving the border friction rankings. The border friction ranking reflects the degree of impedance between two states on the basis of their regulations. It is intended to reflect the additional delay, risk, administrative burden, and ultimately cost that derives from differences in regulations. Border friction does not reflect the degree of regulatory restrictiveness itself. For example, two states that both have restrictive axle weights or strict civilian escort



Source: CPCS analysis of carrier surveys

**Figure 5-2. Relative ranking of issues that cause delay based on frequency and total delay.**



**Figure 5-3. Barriers to multi-state OSOW road transportation: inconsistent regulations, operational restrictions, and permitting requirements.**

requirements are shown as sharing a border with a low-friction ranking. Appendix C provides an overview of how the border friction rankings were established.

## 5.2 Permitting Processes

The introduction and broad adoption of permitting systems, especially those allowing online applications, have improved the efficiency by which OSOW permits are issued. While there still are state-by-state differences that can make the permitting process for multi-state moves cumbersome—such as different permit applications, permit interfaces, and different system requirements—completing the permit application is a small part of the permitting process. A bigger issue, according to industry representatives, is the turnaround time for permits, especially those requiring bridge analysis and district investigations.

As an OSOW load increases in size, the permitting process generally takes more time to complete. Some states have automated routine permitting and are able to issue permits

instantaneously, but the same state may require many weeks to issue a superload permit. Additional analyses are needed as the size and weight of OSOW loads increase. These include bridge analysis and/or district review to ensure that local circumstances will not impede the load. A bridge analysis is done to see if an OSOW load can safely pass over the bridges on its route. According to Perkins Motor Transport, bridge analyses can be very expensive (in the hundreds of thousands of dollars in some states) and can take months to complete. District reviews add another approval requirement to a permit, which can cause delay in issuing the permit.

Another permitting process challenge is utility notification. Utility notification requires OSOW carriers to contact electric, cable, or phone companies to ensure that the load will not encounter low-hanging lines. One carrier noted that it can take hours to determine who owns a low line and sometimes days to reach the right person to organize the lifting of a low-hanging line.

### 5.2.1 Permitting Requirements

The carriers consulted through the study believed that they had a good understanding of the permitting regulations, with the exception of local permitting. Many carriers noted that it is often difficult to identify whom to contact for local permits and the availability of clearances to facilitate a routing.

Local permits are required when an OSOW load is routed on roadways that are not state-maintained, such as those maintained by cities and counties. State permits require carriers to contact sub-state jurisdictions to obtain approval for roadway travel. The carriers consulted suggested that the trend is toward more local permitting but that there is a lack of information and limited capacity to permit at the local level. A prominent issue was that local and county permits were not being issued fast enough. Consultations and observations of participants in a Wisconsin DOT OSOW industry working group suggested that OSOW carriers were willing to pay a reasonable fee for local permits, but expected the permits to be issued in a timely manner and would like to know how and when to obtain these permits. One consultation shared that the City of New Orleans required OSOW permits to be picked up in person as opposed to faxed or emailed to the carrier. This resulted in the carrier halting operations before entering the city and personally retrieving the permit.

Carriers may also be subject to a different set of permitting regulations depending on the local jurisdiction. One carrier noted that differences between the state and the local jurisdictions, such as size and weight regulations, resulted either in the addition of axles to be in compliance with lower maximum axle weights or in the search for a new route, which often led to the filing of a new state permit.

### 5.2.2 Regulatory Information

The majority of carriers consulted believed that they either had or could find the information they needed to make efficient routing decisions. Consultations suggested that the OSOW industry relied on individuals who have worked in OSOW shipping for many years for their permit domain knowledge. OSOW companies create their own databases and/or rely on permit manuals for a consolidated store of regulatory information.

One comment from an industry outreach session was for states to produce a one-page document that consolidated the links and information needed to permit an OSOW load.<sup>1</sup> The

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<sup>1</sup>At the Specialized Transportation Symposium organized by SC & RA in 2015, the research team presented the general comments they had compiled during their industry outreach for validation and solicited comments on information gaps, best practices, and industry needs.

### Case Study on Maryland and Port of Baltimore Local Issuing of Permits

In response to increased local and county involvement in permitting, the Maryland DOT Motor Carrier Division has developed a permit-issuing program with the City of Baltimore. The program allows the state to issue OSOW permits for loads with an origin or destination at the Port of Baltimore, using specific roadways within the city.

The program became operational in about 2009 at the request of the Port. The Port was losing business and finding itself less competitive because of truck delays resulting from local permit processing delays. “City-issued permits give the route with one way in and out,” according to Tina Sanders of the Maryland State Highway Motor Carrier Division. According to Sanders, while the state DOT issues permits on behalf of the City of Baltimore, the City still has jurisdiction over all local permitting. The City has access to the Maryland DOT permit system and issues its own permits for anything not auto-issued.

The Maryland DOT confronted significant institutional challenges in implementing the program, including assembling city and county data for bridges, formatting the data, using the geographic information system (GIS) and, most importantly, ensuring there were data in place to provide for continuity of routes on all roadways, including those not within the DOT’s jurisdiction. Beyond the data and institutional challenges, Maryland DOT made relatively easy adjustments to its existing program and conducted customer outreach to implement the joint permitting system. The incorporation of city permitting into state permitting is viewed as a success by the Maryland DOT and its customers. Additionally, the DOT reported that it saw no increase in workload following implementation.

Key lessons learned from state permitting of OSOW loads on local roadways include:

- Start small and phase the rollout of the program.
- Accuracy of data is essential and needs to be aligned with GIS bridge data to facilitate automation.

recommendation from the outreach session focused on the organization, rather than the availability, of information. Similarly, another respondent at the outreach session noted that it was difficult to stay informed as rules changed and that the permit manuals did not always include the most recent changes. Trucking companies have explored technology-based solutions that find and consolidate data from permitting websites to stay up to date. Others simply update their manual as they permit through states and notice policy changes.

### 5.2.3 Infrastructure Restrictions

Infrastructure restrictions are critical to the routing of OSOW loads. Infrastructure restrictions take a variety of forms including restrictions on allowable height, width, or weight. Infrastructure restrictions are potentially more variable than regulations. For example, roadway construction often limits the maximum width allowed on a roadway, adjustments to pavements may decrease the maximum height allowed to travel under an overpass, or a bridge inspection could result in the posting of weight limits on the bridge. Additionally, weather events potentially can restrict OSOW



movements, delaying loads for multiple days. In each of these cases, there is the potential to alter the routes of an OSOW load, which could already be transiting the state. Carriers want advance or immediate notification when construction or a bridge posting affects their route. Many states issue these updates using the 511 transportation and traffic information hotline. One carrier wanted information on changes within the permitting office, such as scheduled maintenance, changes in staffing, or automation, namely changes that would affect the process or the speed of issuing permits.

## 5.2.4 State and Local Permits

Permitting delays and the application of city and county permits reveal inefficiencies in the permitting system and a lack of coordination, which some carriers believe is exacerbated by the trend toward more local involvement. The delay in permitting has both industry and state and local government origins. Maryland DOT conducted a survey of states and the industry on the top 10 challenges of the permitting process. The survey was administered by email to all types of OSOW companies and to state permit officials. In total, 280 industry representatives and 24 states responded.

### *State Issues in OSOW Permitting*

The Maryland DOT survey of state permitting offices identified common issues encountered when permitting OSOW loads. Survey responses fall in the following five categories:

- **Planning.** Permit applicants do not allow enough time for the state to permit their load.
- **Funding.** The state is unable to maintain the necessary funding, technical expertise, and software to react to the trend of increasing OSOW permits along with an increase in the size of OSOW loads.
- **Errors.** The mistakes that applicants make in applying for permits range from not following requirements to submitting false applications to avoid restrictions or analyses such as bridge review.
- **Internal state issues.** Problems with timely approvals from bridge engineers and district offices that are not managed by the central permit office.
- **Special cases.** Carriers may ask for variances on the established policies of the state, which takes time away from other permitting efforts. Along with this issue, states suggested they expend too much staff time explaining information that is readily available on the state's permitting website.

### *Industry Issues During OSOW Permitting*

The top issues and challenges identified by the industry in a survey conducted by the Maryland DOT fall in the following six categories:

- **Customer service.** States do not provide enough attention to customer service, an important complaint being that states do not answer the phone. Carriers feel permitting offices have an elitist attitude, especially toward the industry, due in part to the fact that carriers have to work with states regardless of how they are treated.
- **Amendments.** Carriers highlighted that some states do not allow amendments, even when there is a legitimate issue such as a breakdown in equipment.
- **Local jurisdictions.** Local jurisdictions present problems for the industry when information on when and whom to contact is not apparent.
- **System issues.** Permitting programs require different versions of computer software, such as Java, complicating multi-state application processes.
- **Communication.** There is a lack of status updates on permitting, including vague permit rejections such as "need better route." Carriers were also concerned about permit office retaliation if they expressed dissatisfaction. Last, carriers felt they did not have the privilege of dealing with the state directly, especially when states required carriers to use a permit service.

- **Harmonization.** This is generally cited as important and focuses on day versus night moves between bordering states. Other areas of contention highlighted included how many days in advance of a move a carrier is allowed to apply for their permit, the total number of days a permit is valid, and the overall processing time for permits. Carriers may have difficulties aligning these timelines, which has the potential to cause delay.

For even an intrastate move, special permits from the state, county, township, municipal, toll, or turnpike roadway may be required.

Lastly, carriers face a variety of different jurisdictions along an OSOW route. If an OSOW load is routed onto a county, township, municipal, toll, or turnpike roadway, a separate permit may be required. Carriers encounter varying levels of difficulty trying to contact the appropriate authorities for permission to travel on their roadways.

### 5.3 Communication and Coordination

When carriers schedule a multi-jurisdictional move, they must verify that the routing of each independent jurisdiction connects with the other. Jurisdictions often permit OSOW moves independent of the neighboring jurisdiction, creating issues when a roadway used to exit one jurisdiction is restricted in the next jurisdiction. Carriers may encounter low bridges, weight restrictions, or construction in the next jurisdiction, which could necessitate a new permit or a circuitous route around the restriction. From the state DOT's perspective, processing amended or new permits uses resources that could be used in another way.

#### 5.3.1 Construction

Delays due to construction are fairly frequent and in the top half of the most costly OSOW issues. Construction varies along roadways based on the time of year, geography, and the wear and tear cycle of roadways. Construction impacts OSOW permitting and operations in two general ways: route and hours of travel. Depending on the type of work, a construction zone may limit the dimensions of a load allowed to transit a roadway. This affects the routing of an OSOW load and can cause a load that would otherwise use multilane roadways to use two-lane roadways, triggering more stringent regulations. Additionally, roadways used to route around construction may be less able to handle OSOW loads, thereby reducing the overall speed and progress a load is able to make safely. Similarly, a carrier may have to be rerouted on permits that have already been issued, causing additional analysis and delay while waiting for a new route around construction.

Construction across state lines and on local roadways can also complicate the routing of OSOW loads, especially when the construction occurs right across a state line, necessitating the load to enter the state on a different road.

Construction presents a significant challenge for the OSOW industry relative to bridge or roadway restrictions. Construction is much more dynamic and cannot always be factored into the routing before the load moves.

Construction projects can vary on a weekly basis and are therefore not easily factored into OSOW moves, especially moves planned in advance.

The start and end date of construction projects can be different than anticipated or the permitting office may not know about local or out-of-state projects. These unknown elements result in significant delay and rerouting once a load begins to move. The variability of construction makes it difficult for carriers to address construction before operations begin, costing time and money.

### 5.3.2 Local Jurisdictions, Infrastructure, and OSOW

In addition to the difficulty that OSOW carriers reported in getting local OSOW permits, local infrastructure investment decisions can significantly affect the operation of OSOW loads. For example, the Port of Milwaukee in Wisconsin is surrounded by urban development, complicating the port's ability to serve as an OSOW access point to the Great Lakes. The port has direct interstate access, but is constrained by overhead heights at important interchanges.

Loads that are too high to pass through the interchange must be routed through up to eight suburbs, requiring additional permits, placing the load on crowded public streets, and increasing the number of jurisdictions carriers and the port must consider when scheduling a load. The Wisconsin DOT and the port are working to protect the routes connecting the port to facilitate the movement of OSOW loads coming into Wisconsin and those produced in the state and sold nationally or internationally. Specific issues cited by the Wisconsin DOT are the use of fixed overhead signage, roundabouts with limited turning radii, and median geometrics.

The port has identified five heavy manufacturers nearby that need access to the port to ship their goods. The difficulty stems from local control over design and build specifications, so the state cannot currently mandate design standards for projects on OSOW corridors to the port. Heavy manufacturers are important to the economic growth and development of the cities and suburbs in which they reside and transportation of these components can be a sizable portion of their cost. Therefore, there is an important complement between the local incentives of the community and the port and state.

Another example of local issues related to coordination with local jurisdictions occurred in Colorado during the movement of Vestas wind towers constructed within the state. This example demonstrates the importance of buy-in from local jurisdictions as they have the ability to limit the movement of OSOW loads traveling on roads that are locally maintained. The sole access point to a Vestas plant in Colorado is a county road connecting the plant to the interstate system. A problem arose when an overpass was measured, forcing OSOW loads to use city roadways. The use of city roadways evoked significant complaints from area residents, eventually causing the county to refuse OSOW permits on their roadways. The state worked with the county to place a speed limit on the wind tower loads to reduce the impact on residents. Eventually, the Colorado DOT re-measured the overpass, finding sufficient clearance for wind tower components.

An important takeaway, in addition to the need for precise measurement of overhead structures, is the importance of county and city cooperation for OSOW movement. In the case of the Vestas plant, the county has the ability to stop all roadway shipments out of the plant, causing a detrimental impact to the plant and its 500 to 800 employees. Coordination with local jurisdictions is essential when moving OSOW loads, especially when there is enough volume to cause recurring negative impacts on the community. Additionally, the economic component of the OSOW freight manufactured within a state—in the form of jobs and economic development—should be communicated to facilitate the coordination and movement of these loads.

## 5.4 Operational Restrictions

OSOW loads have special operational restrictions depending on the size and weight of the load. In many cases, jurisdictions have different thresholds where a restriction is enforced. Therefore, as a load crosses a jurisdictional boundary, it may be subject to a different set of operational rules.

Operational restrictions could nominally or significantly affect the costs of an OSOW cargo shipment. For example, neighboring states may have different requirements on the signs or flags a load must display when operating. Assuming the carrier has the correct signage and flags, the cost of changing them is fairly minimal. On the other hand, some states do not allow loads to travel on Sundays; or, if it is large enough, the load may be restricted from moving on weekends.

Differences in the allowable days of operation between states could cause a load to wait up to two days at the border.

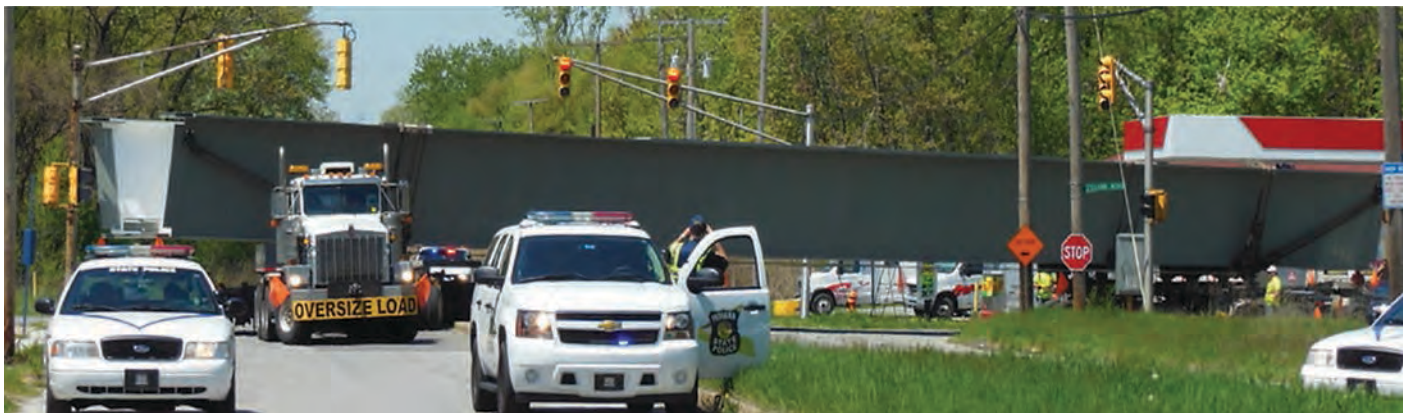
To avoid delays, OSOW shipments are carefully planned around these restrictions, but weather events, delays, or mechanical problems can cause unforeseen delays and rerouting that can result in unplanned border stoppages. The remainder of this section outlines the various operational restrictions that OSOW loads encounter while using roadways. Additionally, examples provide details of the impact operational restrictions have on the fluidity of an OSOW move.

### 5.4.1 Police Escorts

Police escorts are required when a state believes that a civilian escort is insufficient to ensure that the load moves safely through the jurisdiction. Consultations and the survey of OSOW carriers identified police escorts as a frequent cause of delay and a large source of cost for OSOW carriers. Ranking of police escorts as a substantial issue on all metrics demonstrates their importance to the efficient movement of OSOW freight.

Delay due to police escort is driven in part by the variability in regulations governing police hours of duty and jurisdictions. Some states will not allow civilian escorts to control traffic, requiring the state police to shut down intersections as shown in Figure 5-4. Police escorts manage traffic when an OSOW load is traveling or executing a maneuver such as a tight turn. The number of state police required for a particular move is frequently specified by the state permitting office, but can also be defined by the district offices. OSOW carriers often bid jobs as a cost plus police cost because they are unaware of how many police officers will be required when states leave the choice up to the district offices or require police on a case-by-case basis.

From a cost perspective, states often require a minimum number of hours police must be paid per OSOW move. In some cases, even if police escorts are only needed for a small portion



Source: Perkins Motor Transport

**Figure 5-4.** *Police-controlled intersection.*

of a move, regulations may require that the police accompany the load for the entirety of its trip within the jurisdiction. From an operational perspective, carriers have to work around the hours police work, plan with district offices, and plan for exchanges at jurisdictional boundaries. In some states the police are only available during the eight-hour standard business day, which includes traveling home from the load's location. Some states require carriers to hire police from the district the load is traveling through, which requires coordinating and potentially waiting for escorts at district boundaries.

### Cost of State Police Requirements on OSOW Movement

Police escort requirements cost anywhere from \$30 to \$100 per hour, but a potentially larger cost results from police scheduling and working hours and the resulting delay. Police escorts work different hours depending on the city and state. An example of a move from Gary, Indiana, to St. Paul, Minnesota, that required police escorts is provided to illustrate the potential for delay due to this requirement. The load required police escorts in Indiana, Illinois, Wisconsin, and Minnesota and traveled on numerous county roads due to construction and weak bridges on interstate routes. The move is outlined to show the operational impact of police requirements.

**Monday.** The load leaves Gary, Indiana, at 8:30 a.m. Indiana police escort loads from 8:30 a.m. to 3:30 p.m. and there are rush hour restrictions in the city. The load parks at 2:30 p.m., because Illinois police are not available to take the load forward. Illinois police escort loads from 9 a.m. to 3 p.m.

**Tuesday.** Indiana police pick the load up at 8:30 a.m. and hand off to Illinois police at 9 a.m. The load travels until 3 p.m. with Illinois police, ending the day one hour south of the Illinois–Wisconsin border.

**Wednesday.** Illinois police pick up the load at 9 a.m. and hand off to Wisconsin police at 10 a.m. The load makes it to Dane County, Wisconsin, by 12:30 p.m. and stops. Dane County requires OSOW loads to travel at night. The move resumes at 10:30 p.m. and moves through the night as Wisconsin police work 24/7.

**Thursday.** The load travels through the night and arrives at the Wisconsin–Minnesota border at 6 a.m. Thursday morning.

**Friday.** Minnesota police pick up the load at 3 a.m. Friday morning at Wisconsin–Minnesota border and travel to the destination, arriving on site at 6 a.m.

The total route measured 450 miles and took 5 days to complete. This particular load required a five-person crew including two trucks, which significantly increased the cost of delay. Indiana and Illinois have minimum charges for moving OSOW loads. Therefore, Perkins was billed a total of \$450 for the 30-minute move to the Indiana–Illinois border on Tuesday and the hour-long move on to the Illinois–Wisconsin border on Wednesday. The load would have arrived in St. Paul one day sooner if it were not required to stop at 2:30 p.m. on Monday and 3 p.m. on Tuesday because of the hours police escorts work in Indiana and Illinois. An extra day of travel cost anywhere from \$5,000 to \$7,500 when using a five-person crew.

## 5.4.2 Hours of Travel

States and local jurisdictions specify the hours of travel or the time of day that an OSOW load is allowed to move. Hours of travel vary between states and depend on the size of the load and the route. For example, many states allow OSOW loads that are overweight to travel during both day and night hours, but loads are often limited to daytime hours once length, width, height, or overhang extends beyond legal limits. When hours of travel differ between states, an OSOW load is required to stop at the state line and wait until it is allowed to move in the next state. The delay caused by differences in the hours of travel is particularly problematic when one state requires daytime travel only and the next state requires night travel. In this case, the carrier must wait at the state border until it is in compliance with both the hours of travel and the federal hours of service regulations that govern the number of hours truck drivers work. Federal hours of service are a constant consideration for trucks whether carrying OSOW or legal loads, but can result in an additional variable to account for when switching from day to night travel.

### Effect of Hours of Travel on OSOW Planning and Operations

Limits on hours of travel directly impact the productivity of an OSOW carrier by potentially delaying start time, ending a day early, or not allowing travel on weekends. In order to demonstrate the effect that hours of travel have on OSOW moves, the research team compared the progress of two loads with different dimensions traveling from Emmaus, Pennsylvania, to Briggsdale, Colorado. Load 1 is a 16 ft 6 in. wide OSOW load and Load 2 is a 12 ft wide OSOW load. The routes of the loads differ slightly, because of the differences in dimension. Overall, Load 1 travels 1,960 miles and Load 2 travels 1,780 miles. Along the routes, each load encounters hours of travel restrictions during rush hour and weekend restrictions.

The figures show the daily progress of each load along its route, noting the city where the load starts and stops. Load 1 is limited by rush hour restrictions in the morning and afternoon on days 1, 2, and 3, as well as in the morning of days 4 and 5. Load 1 starts on day 1 in Emmaus and travels to Pittsburgh, Pennsylvania, where it is not allowed to travel from 4 p.m. to 7 p.m. because of rush hour restrictions. On day 2, Load 1 is not allowed to move from 7 a.m. to 9 a.m. because of rush hour restrictions and therefore begins to travel at 9 a.m. As a result of hours lost to travel restrictions, Load 1 travels 685 miles by the end of day 3. Load 2, not encountering any rush hour restrictions other than in the morning of day 1, travels 1,150 miles.

Load 1 reaches Camdenton, Missouri, on Friday night of day 5. Load 1 does not move on day 6 and 7 because Missouri restricts weekend travel for loads more than 16 ft wide. Load 1 faces no rush hour restrictions on day 8 and 9, which allows two full days of travel. Day 10 marks the arrival of the load at its destination.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday
Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
9am-3pm	9am-3pm	9am-3pm	9am-5pm	9am-5pm	No Travel	No Travel	7am-5pm	7am-5pm	7am-4pm
Emmaus, PA	Columbus, OH		Vandalia, IL	Camdenton, MO	Camdenton, MO		Wichita, KS	Oakley, KS	Briggsdale, CO
Pittsburgh, PA		Indianapolis, IN	Camdenton, MO		Camdenton, MO		Oakley, KS		

### ***Load 1 hours of travel from Pennsylvania to Colorado.***

Monday	Tuesday	Wednesday	Thursday	Friday
Day 1	Day 2	Day 3	Day 4	Day 5
9am-5pm	7am-5pm	7am-5pm	9am-5pm	7am-3pm
Emmaus, PA	Cambridge, OH	Effingham, IL	Kansas City, KS	Colby, KS
				Briggsdale, CO

### ***Load 2 hours of travel from Pennsylvania to Colorado.***

Overall, Load 1 takes twice as much time as Load 2 to travel from the same origin to the same destination. Some of the additional time needed for Load 1 is due to a slightly longer route and lower average speed, but the hours of travel restrictions played a large role in slowing travel.

## **5.4.3 Frost/Thaw Restrictions**

Frost/thaw restrictions cause greater delay per incident, but are infrequent relative to the other OSOW restrictions. The infrequency of frost/thaw restrictions is a function of both their seasonality and the geography of the restriction. States in the north have these restrictions whereas the states in the south do not, due to differences in climate. Frost/thaw restrictions place seasonal limits on the axle weights allowed for OSOW loads. The reduction in axle weights requires carriers to add axles, route around a state with the restriction, or wait until the restriction is no longer in effect.

### **Effect of Frost/Thaw Restrictions on OSOW Planning and Permitting**

Frost/thaw restrictions vary by state, requiring OSOW carriers to carefully plan moves to account for state-by-state differences. For example, when frost restrictions are in force, Minnesota and Michigan limit the width and axle weights of OSOW loads traveling on state highways. During this period, a load more than 14 ft wide in Michigan and 16 ft wide in Minnesota would be unable to move in the state. Carriers will route around states with frost restrictions in order to complete their move. For example, a 16 ft load from Green Bay, Wisconsin, to Billings, Montana, would need to wait for the restriction to be lifted or route around Minnesota through Illinois, Iowa, South Dakota, and Wyoming, to finally reach Montana. The frost restriction route adds 30% more miles and costs anywhere from an additional \$2,500 to \$5,000 depending on the size of the load, according to industry sources.

For loads that are only overweight, carriers will use longer trailers with more axles to reduce the overall weight per axle. For instance, an overweight truck with a gross vehicle weight of 135,000 lbs would normally be hauled by a 7-axle combination, but under frost restrictions a carrier would use a 13-axle combination. As the size of the trailer increases, it crosses the threshold for one escort and requires two in some other states. Between the increased cost of using a larger trailer and the escort cost, moving from a 7-axle to a 13-axle combination can cost an additional \$2,000 per day.

#### 5.4.4 Utilities

Utilities cause delay in the planning and operation of OSOW loads. On the planning side, utilities have to be contracted far in advance of the load, requiring substantial lead time to determine who owns the low line, who to contact to get a lift truck to raise the line, and finally scheduling when the lift truck will be in place to assist the load. The relative ranking of utilities suggests that it is of less concern for OSOW carriers because it is not as large a contributor to total delay relative to the other issues on the survey, but overall it frequently causes delay.

#### 5.4.5 Other Causes of Delay

Carriers reported permit extensions and revisions, bridge postings, axle weights, and civilian escorts to be minor contributors to total delay. Overall, extensions and revisions were not an issue from a delay or cost perspective; this could be because some states allow permit extensions and revisions in both a timely manner and at a low cost. Both bridge postings and axle weights do not cause carriers delay, suggesting that states handle the notifications of bridge postings and the routing around these bridges effectively or that these issues are so infrequent that they are not a top-tier concern relative to other OSOW issues. Axle weights do not cause delays for OSOW carriers, most likely because the weights are well known within the OSOW industry, allowing them to choose the correct configuration. Civilian escorts do not cause delay, but were the number one ranked total cost item. Taking these two factors as a given suggests carriers are able to coordinate civilian escorts effectively, thereby minimizing delay. Additionally, some carriers have in-house escorts, which increases carrier control over the organization and coordination of escorts.

In order to account for the different roles and goals of OSOW stakeholders, the research team explored the roles and goals of state DOTs and OSOW carriers to identify areas that are complementary and those that are in conflict.



# Inefficient Oversize/ Overweight Transportation

## 6.1 Private and Public Costs of Inefficient OSOW Transportation

Carriers seek to deliver their load in the most efficient way possible, factoring in the need to maximize asset utilization and minimize cost. Carriers prefer to take the shortest path from origin to destination (referred to as the optimal route). In some instances, however, carriers will bypass a state to avoid having to comply with a particularly challenging or costly state requirement, making their journey longer as a result (referred to as the actual route). Carriers elect to take the actual route to avoid a state requirement, thereby increasing the number of miles traveled. This can increase both operating and societal costs. This section seeks to quantify these additional costs.

### 6.1.1 Additional Cost for Carriers

Additional cost for the carrier consists of direct expenses incurred by providers of freight transportation, including direct operating costs as well as investments in capital equipment such as rolling stock. The research team used an actual cost per mile obtained from the industry to represent the cost of operating an escort, a tractor used for routine OSOW, and a tractor used for a superload. The research team used a multiplier on the cost of a routine load and superload to account for the cost of the trailer. Trailers can increase the per mile cost by three to 10 times depending on the trailer.<sup>1</sup>

A carrier may select an actual route that is hundreds of miles longer than the optimal route to avoid a state with a low maximum axle weight relative to the other states along the actual route. Therefore, the cost of the additional miles is compared to the cost of using a more expensive, heavier, and longer trailer with more axles to comply with the axle weight regulations in one state. The use of the trailer with more axles may trigger additional regulations in states along the route, further adding to cost. This example illustrates the seemingly counterintuitive reality that carriers will sometimes elect to use a longer route to decrease the total cost of a move.

#### *Total per Mile Cost*

Figure 6-1 displays the incremental costs for escorts and the tractors for routine loads and superloads. In addition to the values presented in Figure 6-1, costs for the trailer and equivalent single axle loads (ESALs) are added depending on the configuration. The values presented in Figure 6-1 include the cost of fuel, equipment, driver, and emissions but do not include safety,

<sup>1</sup>The trailers used to move superloads can cost \$1 million and may have 80 tires or more.

Vehicle	Low (2013\$)	High (2013\$)
Escorts	\$1.89	\$3.23
Routine OSOW loads	\$4.23	\$4.26
Superloads	\$6.45	\$6.48

**Figure 6-1. Escort and tractor cost per mile for OSOW loads.**

Cost Type	Description of Cost
Emissions from Fuel Consumption	<ul style="list-style-type: none"> <li>Air pollutants including carbon dioxide (CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), particulate matter (PM) and sulfur oxides (SO<sub>x</sub>) contribute to serious health problems including asthma, lung and heart disease, as well as being a cause of acid rain</li> <li>CO<sub>2</sub> is the most significant component of greenhouse gas emissions that contribute to climate change</li> </ul>
Public Facility Costs	<ul style="list-style-type: none"> <li>Unrecovered costs associated with the provision, operation, and maintenance of public facilities, including roads and bridges</li> <li>Congestion associated with slow-moving OSOW loads</li> </ul>
Accidents	<ul style="list-style-type: none"> <li>The cost of fatalities, injuries, and property damage</li> </ul>
Noise	<ul style="list-style-type: none"> <li>Inconvenience and impacts from trucking noise</li> </ul>
Permitting Resources	<ul style="list-style-type: none"> <li>Unrecovered cost to issue a permit for OSOW load</li> </ul>

Source: Forkenbrock, D. 1999.

**Figure 6-2. Social costs of trucking.**

noise, and the institutional cost to issue extra permits. The research is limited in its ability to measure and monetize the difference between routes for safety and noise. Both safety and noise are expressed in per mile charges, making the longer route more costly to society because of the increased noise generated and the greater exposure to risk. Additionally, the research team does not have information on the institutional cost for each state to issue a permit. Therefore, instead of monetizing this factor, the total number of permits issued for each route is compared to display the difference.

### 6.1.2 Additional Cost for Society

In addition to the price paid by the carriers, freight transportation services generate external costs that are paid by society as a whole. These costs are not fully reflected in the prices paid by carriers, which is an inefficient outcome for society. A description of the major external costs is presented in Figure 6-2.<sup>2,3</sup> It is important to note that carriers pay for some of the social costs when they operate. Registration, fuel tax, and permitting costs cover some of the damage done to the roadway. The research team recognizes that carriers pay a permitting fee, which covers all, or a portion of the total cost of administering the permitting process.

<sup>2</sup>Middleton, D., Y. Li, J. Le, and N. Koncz. *Accommodating Oversize and Overweight Loads: Technical Report*. Texas Transportation Institute, 2012.

<sup>3</sup>Forkenbrock, D. External Costs of Intercity Truck Freight Transportation. *Transportation Research Part A*, Vol. 33, 1999, pp. 505–526.

Emission Type	Societal Cost per Mile (2013\$)	
	OSOW Truck/Trailer (diesel)	Escort Vehicle (gasoline)
Nitrogen Oxides (NO <sub>x</sub> )	\$0.007—\$0.028	\$0.002
Particulate Matter (PM <sub>2.5</sub> )	\$0.004—\$0.016	\$0.001—\$0.002
Carbon dioxide (CO <sub>2</sub> )	Regular OSOW—\$0.10 Superload— \$0.17	\$0.04
<b>Total Cost Per Mile</b>	<b>\$0.11—\$0.214</b>	<b>\$0.043—\$0.044</b>

## Notes:

- NO<sub>x</sub> and PM<sub>2.5</sub> calculations are based on two sources: 1) emissions/mile from EPA, Truck Carrier Partner 2.0.14 Tool (<http://www.epa.gov/otaq/smartway/forpartners/documents/trucks/tool-guide/420b15002.pdf>), using data for vehicle class 8b, combination long-haul trucks, and vehicle class 2b, passenger trucks, and 2) monetized value of tonne of emissions from U.S.DOT, "TIGER Benefit-Cost Analysis (BCA) Resource Guide," updated 4/18/14 (<http://www.dot.gov/sites/dot.gov/files/docs/TIGER%20BCA%20Resource%20Guide%202014.pdf>).
- CO<sub>2</sub> calculations are based on two sources: 1) U.S. Energy Information Administration, Voluntary Reporting of Greenhouse Gases Program Fuel Emission Coefficients, Table 2: Carbon Dioxide Emission Factors for Transportation Fuels (<http://www.eia.gov/oiaf/1605/coefficients.html#tbl2>, accessed April 15, 2015), and 2) monetized value of tonne of emissions from U.S.DOT, "TIGER Benefit-Cost Analysis (BCA) Resource Guide," updated 4/18/14 (<http://www.dot.gov/sites/dot.gov/files/docs/TIGER%20BCA%20Resource%20Guide%202014.pdf>).

**Figure 6-3. Social cost of emissions: costs for OSOW and escort vehicles.**

## 6.2 Monetizing the Social Costs of Inefficient OSOW Routings

It is challenging to assign dollar amounts to many of the societal costs noted above and even harder to allocate such costs accurately to truck transportation. Where possible, the research team has attempted to quantify the amount and the value of societal costs from OSOW shipping. In some cases, a range of estimated impacts is used to reflect the uncertainty in available estimates.

### 6.2.1 Emissions Cost

The emissions of a vehicle, especially nitrogen oxides (NO<sub>x</sub>) and particulate matter (PM), are dependent on a variety of factors including vehicle class, year, speed, and driving patterns. In contrast, CO<sub>2</sub> emissions are largely independent of vehicle type, class, and operating attributes.<sup>4</sup> As a result, making some assumptions to define emissions is required. The research team used emission factors used by the EPA's SmartWay Truck Tool as a simplified approach.<sup>5</sup> In order to account for the age of vehicles, values for trucks produced in 2010 and 2015 were used. The monetized value of important pollutants from the burning of fuel is presented in Figure 6-3, for diesel-consuming OSOW vehicles as well as for gasoline-consuming escort vehicles.

### 6.2.2 Pavement Cost

All vehicles cause damage to the roadways they travel but, by virtue of their weight, trucks cause exponentially more damage than cars. Figure 6-4 illustrates a range of costs per ESAL mile based on a 2012 study for the Indiana DOT on the pavement costs associated with OSOW

<sup>4</sup>Technical Documentation 2014 Data Year. Smartway Transportation Partnership, U.S. Environmental Protection Agency, 2014. <http://www.epa.gov/otaq/smartway/forpartners/documents/trucks/tool-guide/420b15002.pdf>. Accessed April 29, 2015.

<sup>5</sup>Technical Documentation 2014 Data Year. Smartway Transportation Partnership, U.S. Environmental Protection Agency, 2014.

ESAL Estimate	Cost per ESAL Mile	Cost per Mile (80,000 lb 5-Axle Truck)	Cost per Mile (100,000 lb 5-Axle Truck)
ESAL Cost (2013\$)—Interstate	\$0.0064	\$0.015	\$0.037
ESAL Cost (2013\$)—Non-Interstate on NHS	\$0.0588	\$0.140	\$0.344
ESAL Cost (2013\$)—Non-NHS	\$0.2329	\$0.558	\$1.36

Source: Ahmed, A., B. R. D. K. Agbelie, S. Lavrenz, M. Keefer, S. Labi, and K. C. Sinha. 2013.

**Figure 6-4. Cost per ESAL mile estimates.**

vehicles.<sup>6,7</sup> The Indiana study develops three cost per ESAL mile estimates based on simplified roadway categories and weights per axle group. Figure 6-4 displays the total cost per mile of a legal 5-axle 80,000 lb truck and a permitted 5-axle 100,000 lb configuration on interstates, non-interstates on the National Highway System (NHS), and non-NHS roadways.

Carriers pay for their impact on pavements through OSOW permitting fees, various trucking fees, fuel taxes, and registrations required to operate a commercial vehicle. In fact, the Indiana DOT credits loads traveling under their “Overweight Commodity Permit” 2.4 ESALs to remove the ESAL fee for the first 80,000 lbs (weight of a legal 5-axle truck).

The analysis in this research project compares the actual route to an optimal route to determine the inefficiencies resulting from carriers routing around states. Therefore, this analysis uses the full cost per ESAL mile because all costs paid by the carrier in fees, taxes, and permits above those paid under the optimal route represent an inefficient use of resources. The additional miles of inefficient use of resources are labeled because this damage would not occur under a harmonized approach to OSOW permitting and operations. Therefore when comparing the optimal to the actual route we count the total cost per ESAL mile.

### 6.2.3 Other External Costs

Other external costs associated with the operation of heavy vehicles are noise, congestion, and safety. We were not able to identify information on these costs that are generalizable to OSOW loads because of the restrictions on the operation of OSOW loads. Given that these other external costs are typically expressed on a cost per mile basis (for regular trucks and vehicles), this analysis assumes that these costs increase with the length of the route.

Additionally, the research team recognizes that bridge impacts are a critical cost category of OSOW shipping that are not monetized in our analysis. *Advances in State DOT Superload Permit Processes and Practices*<sup>8</sup> highlights the difficulty of assessing the impact of heavier trucks on bridges and points out the importance of collecting better data, specifically on management practices to better estimate these costs.

<sup>6</sup> Ahmed, A., B. R. D. K. Agbelie, S. Lavrenz, M. Keefer, S. Labi, and K. C. Sinha. *Costs and Revenues Associated With Overweight Trucks in Indiana*. Publication FHWA/IN/JTRP-2013/01. Joint Transportation Research Program, Indiana Department of Transportation and Purdue University, West Lafayette, Indiana, 2013. doi:10.5703/128828431498.

<sup>7</sup> The research team used the generalized fourth power rule to calculate the number of ESALs per truck. This simplified approach was used to approximate the impact of trucks on the pavement because of the lack of data on the properties of the pavement along the optimal and actual route.

<sup>8</sup> Scan Team Report. *Advances in State DOT Superload Permit Processes and Practices*, 2004. [http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-68A\\_12-01.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-68A_12-01.pdf). Accessed May 25, 2016.

### Cost of Issuing an OSOW Permit

The cost of issuing an OSOW permit varies between states and also depends on the size of the load. A 2013 study of the Mid America Association of State Transportation Officials (MAASTO) states found that the cost of issuing a permit varied significantly from a low of \$7 to a high of \$480. The study measured the direct and marginal agency costs for six loads (combine, generator, steel bridge girder, mobile home, wind turbine blade, and a wind tower component). When comparing the cost of issuing a permit to the fee, some state permitting fees covered costs well and above the direct and marginal costs of issuing, whereas others had a significant shortage.

Beyond just the cost of permitting, a 2012 study suggests that Texas DOT spends about \$11 to issue a permit based on the permitting division's operations budget and annual permits issued. This corresponded to a \$70 million shortfall in revenues relative to the operating cost of OSOW loads including enforcement, infrastructure damage, hit and run damage to Texas DOT property, and unreimbursed court fees.

The studies of permitting fees in MAASTO and Texas display the variation in the marginal cost of permitting OSOW loads, as well as other costs that may not be captured by the permitting fee.

## 6.3 Case Studies of Social Costs

### 6.3.1 Impact of Maximum Permitted Axle Weights on Route Selection

OSOW carriers consider the regulatory burden and ease of travel when selecting a route and configuration. A carrier interviewed for this study was moving a load from Pennsylvania to Texas with a total loaded weight of 254,000 lbs. The load was transported on a 9-axle trailer, towed by a truck with three drive axles and a steer axle. The configuration placed 20,000 lbs per axle and 14,000 lbs on the steer axle for a total of 254,000 lbs. The carrier submitted permits on a route through Pennsylvania, West Virginia, Ohio, Kentucky, Tennessee, Arkansas, and finally Texas. The carrier was approved for weights in all states except Tennessee. The permit was denied in Tennessee because the axle spacings were too small, resulting in a lower maximum axle weight. The carrier faced two options: increase the number of axles or find a route around Tennessee (Figure 6-5).

Adding axles would have put the load into the superload category in Texas, which requires substantial bridge analysis as well as refile permits for the newly reconfigured load. Routing around Tennessee kept the load out of the time-intensive and costly Texas bridge review, but required permit reordering in Ohio and Arkansas, as well as applying for permits in Indiana, Illinois, and Missouri.

By choosing to go around Tennessee, the carrier avoided the additional time and cost of the Texas bridge review. In this case, the axle spacings and weights allowed in Tennessee and the bridge analysis threshold in Texas resulted in a route around Tennessee that added miles, time, and cost to the operations of the load.

Figure 6-6 displays a comparison of the routes from a private and social perspective. The carrier costs aggregate the cost of the truck, trailer, fuel, drivers, civilian escorts, and police escorts. The social costs, including pavement damage and emissions, did not differ significantly between



**Figure 6-5. Impact of maximum permitted axle weights on route.**

the routes because of the small difference in the total miles traveled. Therefore, the low estimates for social costs are displayed in Figure 6-6.

In total, carrier costs increased by 9% and social costs increased by 26% when comparing the most direct route to the actual route taken. While the difference in the cost between the shortest and actual route was highest for the carrier in absolute terms, society had the largest percentage increase in cost. This was largely because of the differences in the number of miles traveled on non-NHS roadways, which resulted in substantially more damage per mile relative to interstate roadways and other non-interstates on the NHS. Other increases in social costs stemmed from increased emissions from the longer route.

	Shortest	Actual	% Change
Carrier Costs	\$48,010	\$52,154	9%
Social Costs	\$1,174	\$1,478	26%
Total Costs	\$49,319	\$53,815	9%

**Figure 6-6. Private and social costs.**

In addition to the carrier costs presented in Figure 6-6, a significant extra cost to the carrier and society was the time needed to reapply for and review permits in Ohio and apply for new permits in Indiana, Illinois, Missouri, Arkansas, and Texas after the initial route was denied by Tennessee. The permits used public sector resources above what would have been needed for the original route. Additionally, the equipment needed for this move was on site while the carrier was reapplying for permits, thus reducing the potential revenue generated.

### 6.3.2 Impact of Regulatory and Infrastructure Constraints on OSOW Routing

OSOW routing is a combination of factors relating to infrastructure restrictions and the time and cost needed to move a load from origin to destination. This case study overviews the various routes considered for a move from Lincoln, Nebraska, to Madison, Wisconsin.

Figure 6-7 presents the three routes that were considered to move the load. Route A would have been the most direct route from origin to destination, but the height of the load would have triggered utility notification, meaning that the carrier is required to contact all utilities along the route, which is very costly and time-consuming. Additionally, the carrier would have added costs if a line needed to be lifted or if the utility required involvement in the move. Lastly, there



Figure 6-7. Impact of regulations and infrastructure constraints on OSOW routing.

	Route A (Optimal)	Route B (Actual)	% Change
Carrier Costs	\$61,831	\$88,725	43%
Social Costs	\$2,435	\$3,619	49%
Total Costs	\$64,266	\$92,344	44%

**Figure 6-8. Comparison of private and social costs of Route A and Route B.**

is the potential for delay in the movement of the load due to utility involvement and the added cost of coordination with those utilities.

Therefore the carrier chose to route through South Dakota and Minnesota to travel from Nebraska to Wisconsin. Route B and Route C were both considered as options to transit Minnesota. The total mileage for Route B and Route C are roughly the same, but Route C transits a number of small towns along the route, which causes the load to take an additional two days of travel. Conversely, Route B was not able to meet the minimum clearance needed, so the carrier used hydraulics on the trailer to lower the load and passed under a bridge slowly to minimize bouncing. This case required the load to move at night and the state police to escort the load. The additional cost to move under the bridge was \$12,500 because of the delay and the additional police escort cost.

The case study shown here is interesting because it displays the consideration of three routes: the optimal (Route A), the actual (Route B), and a northern route (Route C). Both the optimal and northern route were shorter distances than the actual route traveled, but due to the delay that would have been caused by utilities and by traveling on the northern route, the carrier opted to use Route B. Figure 6-8 displays the social and total cost for Route A and Route B as well as the difference between the two routes. The difference between the routes is substantial from both a carrier and social cost perspective. Route A is clearly more efficient compared to Route B, but the cost of utility notification and the associated delay made the carrier choose Route B.

After selecting to go around Iowa, the carrier had to choose between a northern (Route C) and a southern (Route B) route around Minneapolis and St. Paul, Minnesota. Figure 6-9 displays a comparison of Route B and Route C. The carrier traveled on Route B and realized a 3% decrease in the cost of travel. The social cost of Route B relative to Route C is 37% higher. The savings stem from the delay the carrier would have experienced traveling on Route C, due in part to the route. The difference in social cost is due to Route B having a greater total mileage compared to Route C and thus having greater emissions and pavement damage.

In total, the differences between the carrier and social costs of Routes A, B, and C are considerable. The decision to use Route B is based on the delay and the cost the carrier would have experienced in Iowa and in Minnesota. The values presented in Figure 6-8 and Figure 6-9

	Route B (Actual)	Route C (Northern Route)	% Change
Carrier Costs	\$88,725	\$91,685	-3%
Social Costs	\$3,619	\$2,639	37%
Total Costs	\$92,344	\$94,324	-2%

**Figure 6-9. Comparison of private and social costs of Route B and Route C.**



display the potential impact of an OSOW regulation on the carrier and the social cost of an OSOW load.

#### **6.4 Social Costs of Inefficient OSOW Transportation**

An important takeaway from the comparison of optimal versus actual OSOW routes is that there are real public and private costs associated with OSOW regulations. Additionally, the social costs from the move overviewed in the case studies are transferred from states on the optimal route to those on the actual route. The bearer and magnitude of these costs change because the mileage in each state changes, shifting the impacts on infrastructure, emissions, use of permitting resources, noise, and safety to states on the actual route. The multi-state nature of this move provides insight into the magnitude and bearer of the social costs of OSOW moves and how regulatory differences between states affect the distribution of these costs.



## CHAPTER 7

# Opportunities to Improve Multi-State, Multimodal, OSOW Transportation

### **7.1 Opportunities to Address OSOW Transportation Challenges**

There are already initiatives aimed at improving multi-state OSOW transportation. For example, FHWA and AASHTO have taken an active role in advancing harmonization of OSOW regulations through research and meetings of AASHTO Standing Committee on Highway Transportation (SCOHT). Certain states have also sought to better coordinate OSOW transportation issues, such as Minnesota and Wisconsin, which have collaborated in designating regional OSOW corridors.

The opportunities to improve OSOW transportation identified as part of this research project complement and in many cases support these other efforts. These opportunities are outlined below, organized by thematic headings.

### **7.2 Options to Improve Information**

There are a number of options state DOTs may pursue to improve the availability of information to both carriers and internally. These are summarized below.

#### **7.2.1 Create an Inventory of OSOW Regulations and Permitting Requirements**

As part of the project, the research team created an interactive website that would allow the user to select and display information on OSOW regulations and permitting requirements across the United States. The data compiled through this project can be found on the interactive website at [www.osowfreight.com](http://www.osowfreight.com). Additionally, the research team has partnered with SC & RA to host and update the maps after the completion of this research project, which will increase the longevity of this project and serve as a resource for state DOTs and carriers on a sustained basis.

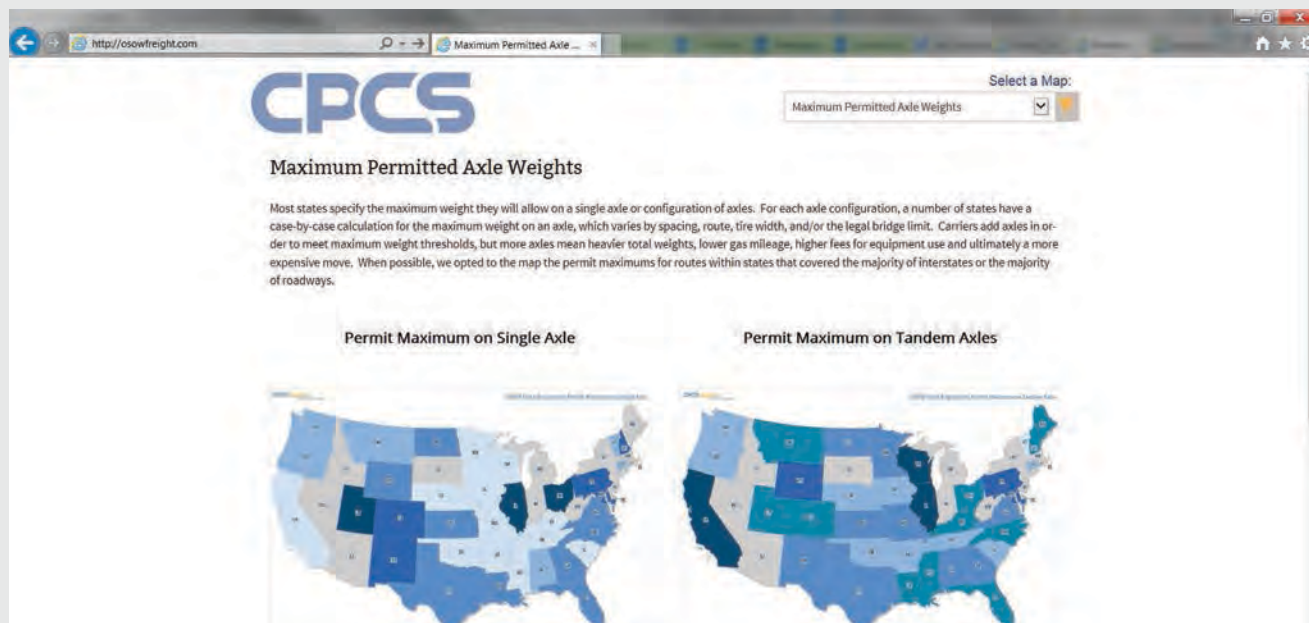
One solution proposed by SC & RA to increase the notification of changes in OSOW permitting is for the states to provide SC & RA with updates to their permitting policy and regulations, which it would consolidate and make available to carriers. State DOTs could effectively leverage SC & RA as a clearinghouse for information on OSOW regulations, permitting, and related updates.

#### **7.2.2 Develop State-Level Fact Sheets on OSOW Regulations and Permitting Requirements**

States provide information on their permitting requirements in a variety of formats. Some states develop a permit manual that outlines the permitting process and corresponding regulations, whereas other states link the permit seeker to their code of regulations.

### Inventory of OSOW Regulations and Permitting Requirements: Interactive Website

As part of the project, the research team created an interactive map that would allow the user to select and display information on OSOW regulations and permitting requirements across the United States.



*Interactive website screenshot.*

States can improve and simplify the communication of state OSOW regulations and permitting requirements by developing and making available simplified and consistent fact sheets on OSOW regulations and permitting. State-level fact sheets could include links to related information and forms.

In the interest of consistency, state DOTs could align the presentation and organization of these fact sheets with the content and structure of the interactive website, developed as part of this research project, and/or commercial permit manuals as made available by J. J. Keller & Associates, Inc., or SC & RA, among others.

### 7.2.3 Provide City and County OSOW Regulations and Permitting Requirements

Challenges in obtaining city and county permits can be a source of delay and additional cost for OSOW carriers. Many of these challenges stem from difficulties in obtaining information. In many cases, the solution is relatively simple.

#### *Provide City and County Contact Information*

Although states issue permits, they require the carrier to also seek permission from roadways that are maintained by non-state institutions, including toll authorities, cities, and counties (local jurisdictions). OSOW carriers are often required to contact jurisdictions about their route

but are not provided the contact information, and at times the roadways that need local permits are not identified. An option for state DOTs is to include the roadway segments that require the carrier to contact the local jurisdiction and the contact information for that jurisdiction on that permit.

### *Compile Local Regulations and Requirements*

In addition to the contact information, state DOTs could add a section to their permit manual that outlines the permit regulations and requirements of local jurisdictions. Relevant information includes outlining the permit process, permit regulations such as hours of travel or escorts, and permit cost. The inclusion of local jurisdiction contact information and permit regulations lowers the cost of compliance for carriers by collecting information that can be used by all OSOW loads traveling over non-state roadways.

Beyond making more information available, there is value in involving cities and counties in state permitting, where required, as they are able to provide local knowledge of a route.

## **7.2.4 Provide Information on Physical Constraints**

The most frequently cited gap in information for OSOW carriers is the height of overhead restrictions such as overpasses and bridges. Some states do not provide information on the allowable height on a highway corridor.

Information on the distance between the road and the bottom of the overhead obstacle may vary over time and may depend on the lane used for the measurement. If a roadway undergoes construction, such as adding or removing material to the roadway or rebuilding the overhead obstacle, the distance from the road to the bottom of the overhead obstacle will change. Similarly, the height of an overhead obstacle can vary depending on the lane or direction of traffic, as the I-5 Skagit River bridge collapse in Washington State proves.

NTSB recommended that the Washington State DOT develop a geospatial application with route-specific bridge clearances, including lane specific information. Two consultations mentioned Washington's "State Route Bridge Vertical Clearance Trip Planner" as a resource that is used during the routing process to identify the approximate height of overhead restrictions. It is important to note that the Trip Planner is a tool used by carriers to plan their route. The tool does not remove the liability from the carriers; they are still required to clear all obstacles along their route.<sup>1</sup>

State DOTs have different opinions on whether providing a bridge log with overhead heights will increase or decrease safety and infrastructure damage. Some states have been hesitant to provide this information because they believe that carriers will use the information and not check the actual heights of overhead obstacles. Nevertheless, the NTSB investigation of the I-5 Skagit bridge collapse suggests that this information is valuable, in addition to their other recommendations, one of which is a state review of overhead clearances. Carrier consultations suggested that this information is valuable during the route selection process and that it would increase their efficiency.

## **7.2.5 Provide Information on Utilities**

Utility notification and involvement was repeatedly cited as costly and time-consuming for OSOW carriers. Identifying the right contacts and then contracting with the utilities were noted

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<sup>1</sup> *Collapse of Interstate 5 Skagit River Bridge Following a Strike by an Oversize Combination Vehicle, Mount Vernon, Washington, May 23, 2013.* NTSB, 2014. <http://www.nts.gov/investigations/accidentreports/reports/HAR1401.pdf>. Accessed February 26, 2016.

as particularly time-consuming. State DOTs could facilitate access to information on the owners of relevant utilities, and related contacts, perhaps through city- or county-level government representatives.

The Georgia National Joint Utility Notification System (NJUNS) provides an example of a potential model. Essentially, NJUNS is the identification and communication medium between carriers and utilities to efficiently allow carriers to contact affected utilities and to provide utilities the opportunity to approve or specify an action when a line presents a problem. Carriers have suggested that NJUNS is an effective way to notify utilities along an OSOW load's path.

The availability of utility maps and contact information can decrease the cost of complying with utility notification requirements. While this information is helpful, carriers still must identify their contact at the utility to notify them of their movement or to coordinate a lift truck. The addition of contact information that OSOW carriers could use for notification or to schedule lift trucks would enhance the value of this tool.

### **7.3 Options to Improve the Permitting Process**

Moving beyond the form and the availability of permitting information, this section outlines the options state DOTs could pursue to improve the permitting process.

#### **7.3.1 Streamline the Permitting Process**

OSOW carriers suggested that the permitting process can be fairly complex and at times states did not provide sufficient detail on the steps in the permitting process. The steps and complexity of the permitting process increase as the size of the OSOW load increases. This is more an issue for superloads and megaloads than routine OSOW loads. The important information for OSOW carriers is the estimated time required for each step and the notifications they receive during the process.

#### **7.3.2 Set Clear Expectations for Turnaround Times**

Delay in issuing an OSOW permit was identified as a prominent issue by carriers. As part of their goal to maximize efficiency, OSOW carriers seek to maximize the use of their equipment. As such, reliability in the turnaround time of an OSOW permit is essential for scheduling an OSOW load and deploying the equipment. If a permitting office specifies an estimated turnaround time, it should be expected to be held to its estimate.

Specifying the OSOW permitting process and turnaround time are examples of setting expectations. States such as Illinois update the industry by email and their website if they are undergoing maintenance or if permits are taking longer than expected to process.

In order to inform the estimated turnaround time, state DOTs may wish to establish performance measures for their OSOW permitting processes. State OSOW performance measures include the number of permits issued (including the number issued through an automated process), the average turnaround time for each permit type, the revenue generated, OSOW accidents, ticketed OSOW loads, and the total administrative cost.

#### **7.3.3 Use Technology to Facilitate Permitting and Route Planning**

State DOTs have increasingly used electronic permitting to increase the efficiency of their permitting processes. Electronic permitting has multiple benefits: less labor is needed to process

the permits, permitting is accessible in an electronic format, and around-the-clock access to permitting is provided.

### *Automation*

State DOTs are increasingly using their electronic permitting systems to automate the permitting process. Automation allows state DOTs to specify the maximum size and weight under which the permitting software will check the size and route of the load to either approve or deny the permit. Automated permitting can involve little to no human interaction, issuing a permit anywhere from instantaneously to a couple hours after submission. Proponents of automation suggest that it requires fewer permitting staff and allows staff to focus on large OSOW loads that require more attention. Automation does involve states relinquishing direct human oversight on some OSOW loads in favor of focusing on other loads. Additionally, states must have infrastructure data such as bridge characteristics and heights accurately collected and in the correct format for use in the permitting software. There is, however, a cost to automating the permitting process associated with system design, software, implementation, maintenance, and training.

### *OSOW Routing Process*

Another advantage of an electronic permitting process is the ability of the software program to route an OSOW load based on its origin, destination, weight, dimensions, and known infrastructure constraints. In states without an electronic routing process, permit applicants rely on their knowledge of the infrastructure system to select the route, which the permitting official or computer program passes or fails. If their applications fail, applicants try another route based on any information the system provides or on the reason for failure. The reiterative process of guessing and checking by either the permitting program or a permit official could be more efficiently handled if the permitting software at least attempts the route before requiring applicants to specify their own route or work with a permitting official to define a route.

## **7.3.4 Include Permitting Fees in the Total Cost of the OSOW Move**

States should ensure that the permitting fees charged for OSOW loads reflect the administrative cost of issuing the permit and the differential damage done by heavier overweight loads. While the goal of OSOW permitting is not profit generation, states with OSOW fees below the true cost are subsidizing OSOW producers and carriers at the expense of the public. Additionally, this subsidy may go to firms that only pass through the state, generating very little economic activity.

## **7.4 Options to Improve Communication**

### **7.4.1 Build Greater Internal State DOT Capacity**

State DOTs would benefit from having greater appreciation of carrier operations, carrier issues, and carrier routing decision factors.

State DOTs throughout the United States hold working group meetings to discuss issues in OSOW permitting and potential changes to OSOW regulations. For example, Arizona has a standing Overdimensional Permit Council that includes members from the industry, law enforcement, public safety, and DOT. The council is statutorily created and required to meet annually to develop the rules on size, weight, and load regulations for permitting. Arizona's Overdimensional Permit Council involves the industry in developing changes to OSOW

### OSOW Funding and Permitting Fees

The cost of a single-trip OSOW permit varies throughout the United States. A 2013 study of the costs to permit OSOW loads in the Midwest found that the difference in the cost of permitting an OSOW load ranged from \$10 to \$1,779, depending on the load and the state.<sup>2</sup> The difference in the cost of permitting OSOW loads stems from different fee structures. Generally, states use the following permitting frameworks:

- **Flat fee.** All loads eligible for the permit are charged the same fee. For example, Iowa charges \$10<sup>3</sup> regardless of the size or weight of an OSOW load. Similarly, Kansas charges \$20 for a regular load permit and \$50 for a superload permit.
- **Incremental fee.** Permitting fees vary based on dimensions, weight, and/or miles. For example, Washington charges an increasing fee per mile as the weight of an OSOW load increases.
- **Flat fee and incremental fee.** Loads up to a size and/or weight threshold are charged a flat fee, after which begins the addition of incremental costs. For example, Maryland charges \$30 for an OSOW permit and \$5 for every 2,000 lbs for a load that is over 80,000 lbs.

Most states have a base permit fee and add an incremental cost that makes larger and heavier vehicles more costly to permit, with an incremental fee based on weight as the most frequent additional cost.

regulations.<sup>4</sup> Other states hold industry meetings to assess the issues that are impeding the efficient movement of OSOW freight within their state. For example, Illinois DOT conducts industry outreach twice a year in Chicago and Springfield where it overviews changes to the rules and regulations during a 3- to 4-hour meeting. These meetings, along with Illinois DOT attendance at OSOW conferences, are part of an effort to make the permitting office accessible to the industry and provide a venue for two-way communication. Illinois DOT has found that the industry appreciates this open communication.

Similarly, regional AASHTO groups hold subcommittee meetings for SCOHT. SCOHT meetings provide a venue for the transfer of ideas between state permitting offices and the industry. Permitting officials and carriers both noted that these meetings are valuable opportunities to discuss OSOW issues.

### 7.4.2 Communicate with the Carrier

Active carrier communication extends beyond conferences and meetings into day-to-day notification on specific permits or issues. The case study on Illinois DOT below provides examples of various forms of communication between the state permitting office and the industry.

<sup>2</sup> Adams, T., E. Perry, A. Schwartz, B. Gollnik, M. Kang, J. Bittner, and S. Wagner. 2013. *Aligning Oversize/Overweight Permit Fees with Agency Costs: Critical Issues*, 2013. <http://wisdotresearch.wi.gov/wp-content/uploads/WisDOT-CFIRE-project-0092-10-21-final-report.pdf>. Accessed October 27, 2014.

<sup>3</sup> Iowa is scheduled to increase its permit fee from \$10 to \$35 on January 1, 2016.

<sup>4</sup> Arizona Revised Statutes Title 28 1150(C)(3).

### Case Study on Illinois DOT Communication

Illinois DOT was identified by FHWA as a state example of best practices in communication. The research team consulted with the Illinois permit office to define how it communicated with the industry and in what ways its communication effectively conveyed information to the industry about changes affecting OSOW permitting or operations.

Illinois DOT's main form of communication comes from an email list of 3,500 trucking and permitting individuals. Additionally, the DOT emails a list of industry associations such as the Illinois Trucking Association, Midwest Trucking Association, and the Illinois Road Builders to leverage their email lists, reaching a combined 7,000 trucking firms. Illinois DOT highlights its email system as its most powerful tool to reach the industry with critical information.

Illinois DOT also uses its automated permitting program (ITAP) to convey information to the industry. The DOT places important information on the ITAP home page, highlighting changes affecting OSOW operations such as bridge postings, changes in regulations, ITAP downtime, and information on the permitting office itself, such as office hours and holiday information. In addition to the announcement section of ITAP, Illinois DOT uses the system to identify and notify permit holders of changes affecting their routes. For example, Illinois DOT used ITAP to identify and email or call permit holders with a route that included a bridge that was unexpectedly posted with a weight restriction. Illinois DOT also called the companies in the area that ship OSOW goods to notify them of the bridge closure.

ITAP also includes a communication box where the industry is able to ask questions about their permits and get information. This communication provides access to permitting officials before buying an OSOW permit. Illinois DOT also maintains an interactive map called "Getting Around Illinois," which includes roadway closures, limited clearances, weight restrictions, and construction affecting OSOW operations. The interactive map is used by the industry to see the limitations they might encounter along an OSOW route. Additionally, annual and semi-annual permits are required to use "Getting Around Illinois" before traveling.

Lastly, the Illinois DOT permitting office uses MAASTO to communicate with their counterparts within the region. For example, Illinois and Missouri worked together to coordinate OSOW permitting on a new bridge between the states. Initially the bridge was not going to be available for OSOW loads, but eventually it was opened up for use. The coordination on the use of the bridge for OSOW routing provided a viable route from one state to another.

An important takeaway from Illinois DOT's approach to communication is the various means the state uses to connect with the industry. Whether it is through a mass email, ITAP, Getting Around Illinois, or direct communication, Illinois DOT uses multiple avenues to ensure that the industry is aware of operational and permitting changes affecting OSOW loads.



## 7.5 Options to Improve Multi-Jurisdictional Coordination

Multi-jurisdictional coordination encompasses actions between jurisdictions that seek to improve the efficiency of OSOW moves through coordination. Coordination takes many forms, but presents a distinct opportunity to advance the routing of OSOW loads through multiple jurisdictions.

### 7.5.1 Harmonize Regulations and Permitting Requirements

Literature on OSOW issues often shows that the trucking industry is most concerned with the difficulty it encounters navigating the various regulatory differences between states that increase the cost of moving OSOW freight.<sup>5</sup> Many carriers note the importance of operational issues compared to the permitting process. This focus highlights the importance of harmonization. “Anything that can be done to make the process work better is welcomed, but the actual permit is probably the smaller issue. . . . The larger issues deal with uniformity in the requirements for the permits.”<sup>6</sup> A variety of organizations and individuals have been actively calling for the harmonization of OSOW regulations, including AASHTO, SC & RA, individual carriers, and state permitting offices. FHWA and AASHTO have taken an active role in advancing harmonization through research and meetings of AASHTO SCOHT. AASHTO is in phase two of its harmonization, which involves research and recommendations for specific OSOW issues. Additionally, the AASHTO subregions have considered proposals for harmonization within their region and a number of state-by-state initiatives have developed to harmonize regulations or to work together on specific loads.

AASHTO SCOHT has been working on OSOW harmonization since 2012. The goal of AASHTO’s recommendations is not to get every state to have the same OSOW regulations but to establish a minimum standard for all states. Figure 7-1 displays the phase one issues and recommendations for OSOW harmonization.

AASHTO’s OSOW recommendations have had mixed success at harmonization and have been expanded into phase two, collecting data on the OSOW regulations as shown in Figure 7-2.

AASHTO recommendations are not binding, which requires state DOT officials to champion the harmonization effort within their respective organizations and legislative bodies. The harmonization effort is ongoing as states individually and in some cases regionally assess their responses to the AASHTO recommendations. Regionally, Figure 7-3 displays the regional SCOHT subcommittees or permitting groups.

- **NASTO:** Northeastern Association of State Transportation Officials
- **SASHTO:** Southeastern Association of State Highway and Transportation Officials
- **MAASTO:** Mid America Association of State Transportation Officials
- **WASHTO:** Western Association of State Highway and Transportation Officials

On a smaller scale, Minnesota and Wisconsin jointly considered state differences by undertaking a 2010 comparison of OSOW regulations. Furthermore, Wisconsin and Minnesota have developed a cross-border permitting portal to get approval for both Minnesota and Wisconsin permits with one application.

<sup>5</sup> Wittwer, E., and R. Gollnik. *North/West Passage Corridor-Wide Commercial Vehicle Permitting*. National Center for Freight & Infrastructure Research and Education, 2010. [http://www.wistrans.org/cfire/documents/CFIRE\\_03-09\\_Final\\_Report.pdf](http://www.wistrans.org/cfire/documents/CFIRE_03-09_Final_Report.pdf). Accessed October 28, 2014.

<sup>6</sup> Wittwer, E., and R. Gollnik. *North/West Passage Corridor-Wide Commercial Vehicle Permitting*. National Center for Freight & Infrastructure Research and Education, 2010.

Harmonization Issue	Recommendations
Escort requirements—width—two-lane and multilane highways	12' to 14': 1 front escort > 14': 1 front escort & 1 rear escort
Escort requirements—height—two-lane and multilane highways	≥ 14'
Escort requirements—length—two-lane and multilane highways	> 90'
Flag size	18" x 18" minimum
Flag color	Fluorescent red or fluorescent orange pursuant to title 49 cfr 393.87 standard
Transport number and location	Minimum requirements pursuant to title 49 cfr 393.87
Escort number and location	No requirements
Days and hours of operations	Minimum: sunrise to sunset Monday through Saturday; Sunday: states make determination
Sign/banner message	Oversize load
Oversize load sign/banner color	Black letters on yellow background
Oversize sign/banner size	18" x 7'
Size of letters	10" x 1.4"—1.5"
Oversize load sign/banner location	Front and rear of transporting vehicle where license plate and lights are not blocked; front and rear of escort or above roofline of escort where it is visible from front and rear
Transport and escort warning lights	Minimum: flashing or strobe amber light; should be visible for 500', 360°

Source: AASHTO SCOHT proposal

**Figure 7-1. AASHTO SCOHT phase one issues and recommendations.**

Overall, harmonization efforts are taking a variety of different forms throughout the United States. OSOW harmonization will be an ongoing process, driven by state DOT champions, industry pressure, and regional and national organizations. Two important issues to consider when pursuing harmonization are to focus on OSOW regulations that have the greatest impact on OSOW movement across state lines and to account for the lack of data on the safety impacts of changing regulations.

### 7.5.2 Improve Jurisdictional Coordination

States generally route OSOW loads according to their beginning and end points within the state and the route constraints in the state. But this approach completely ignores the constraints that may occur across the state line in the neighboring state, such as an overhead restriction, construction, or a weak bridge. It is easy to imagine how permitting based solely on restrictions

AASHTO Phase Two Harmonization	
Number of valid days allowed on single-trip permits	Escort requirements for overheight loads and overheight loads with other dimensions
Permit amendments	Type and size of escort vehicles
Holiday restrictions	—

Source: AASHTO

**Figure 7-2. AASHTO phase two harmonization.**

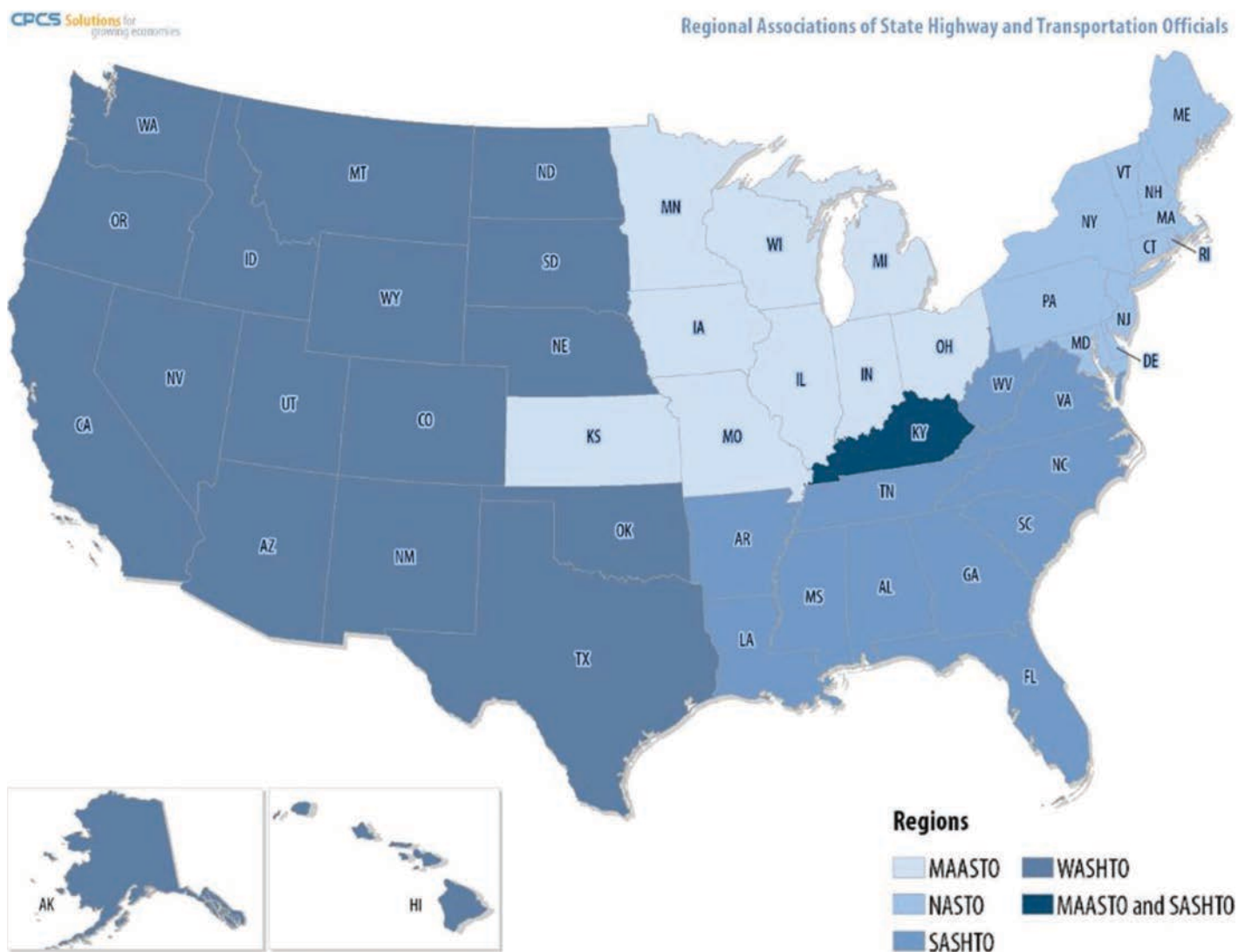


Figure 7-3. Regional AASHTO groups.

within one state could result in a circuitous route in the neighboring state as the load routes around infrastructure constraints. Conversely, jurisdictional coordination provides options for state DOTs to coordinate across jurisdictional boundaries to identify an optimal route.

### Coordinate Restrictions and Routing for OSOW Loads

Jurisdictions can increase the efficiency of their permitting processes as well as the efficiency of OSOW movements by better communicating and coordinating moves with neighboring jurisdictions. To ascertain the current state of OSOW data sharing across jurisdictions, the research team surveyed state DOTs on the subject.<sup>7</sup> Figure 7-4 summarizes the findings.

States make information available to their neighboring jurisdictions, but there is no mechanism for the consistent sharing of this information. Consultations with carriers suggest that

<sup>7</sup> 24 states responded to the survey questions. The questions were asked as follows:

- Beyond permitting, how is OSOW data used in the DOT (freight planning, asset management, infrastructure design, etc.)?
- What data sharing (on routing, construction, permit information, etc.) occurs between the state DOT and other jurisdictions (municipalities and neighboring states)?

OSOW Data Application	Example of Use	Frequency of Application	
		Common	Limited/ Emerging
Construction Alerts	States and sub-state jurisdictions share construction information with neighboring jurisdictions to assist with OSOW route planning. Much of the information is shared on state DOT websites and not necessarily through a formal “sharing mechanism.”	☑	
Road Closures	Similar to construction, state DOTs share road closures, which assists with OSOW efficiency and rerouting.	☑	
WIM Data	Maryland is one of a few states that share OSOW data captured through virtual weight stations (portable WIM).		☑
Permit Integration	New York State DOT and New York City DOT share OSOW data as part of an integrated permitting program and will expand this to the Port Authority of New York & New Jersey and New York Thruway in the future. Another example is the Western Regional permit, which provides a single-trip permit for 12 states.		☑
Load-Specific Information	Some state DOTs share information on specific loads that will require coordination. For example, Maine and New Hampshire share information on routing and dimensions.		☑

**Figure 7-4. Cross-jurisdictional OSOW data sharing and coordination.**

routing across state borders presents problems because of the lack of coordination. An agreed upon framework between states would allow neighboring jurisdictions to amend the information within their permitting program to factor in a constraint across the border.

#### *Develop Formal Regional Communication*

Regional communication between neighboring states is typically an informal process subject to OSOW permitting officials knowing their counterparts in another state. The western provinces of Canada have developed an alternative to this informal arrangement called the New West Partnership (NWP). NWP began by identifying rules that hinder the free movement of goods, services, and people across and between British Columbia and Alberta. Eventually Saskatchewan joined NWP. They assessed the common issues the industry encounters when transporting goods within NWP (Figure 7-5). Additionally, stakeholders identified the best practices and similarities between provinces to improve the permitting process.



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**Figure 7-5. Canadian OSOW load.**

NWP has had some successes in harmonizing OSOW regulations, including night move regulations, escort vehicle specifications, holiday restrictions, and escort vehicle warning signs. The partnership continues to move forward on OSOW issues, by identifying OSOW corridors in the region, when civilian escorts are required, and the weights allowed for OSOW transportation.

NWP is an example of removing barriers between jurisdictions and formalizing communication on regulatory issues. When one NWP member is proposing a change to a regulation, all members look at the regulation. This approach institutionalized working relationships between provincial regulators and serves as a forum for regulations to evolve within the region in response to industry input, trends, or new opportunities. Best practices from NWP include:

- Using carriers and shippers from major industries to identify the biggest issues for OSOW travel.
- Developing close working relationships between permitting counterparts within member jurisdictions.
- Forming and agreeing on a standardized notification and analysis process with other members to assess proposed measures and to keep officials up to date on what is occurring in the other jurisdiction.

In the United States, the various AASHTO subcommittees and subregions serve a similar function, but the relationship is not necessarily institutionalized. Institutionalized communication ensures that a base level of communication occurs regardless of changes in staffing or priorities. As an extension of the previous frameworks, officials in British Columbia, Alberta, and Saskatchewan have used NWP to begin to identify and remove multi-jurisdictional OSOW barriers.

### 7.5.3 Integrate Local Permitting

A number of states as well as other international jurisdictions have pursued the integration of local OSOW permits into their state permitting process.

Alberta, Canada, and Australia are two relevant examples of permit integration from an international scan of OSOW approaches. Important takeaways for the integration of local permitting is to ensure that the permitting office is able to handle the volume of requests through its system. For example, Alberta tested its permitting system in four local jurisdictions before full implementation. Additionally, carriers and state DOTs need to carefully consider changing local jurisdictions from passive to active participants in OSOW permitting. A central issue is whether local jurisdictions have the resources to review OSOW permits in a timely manner. Additionally, any system should implement an approach whereby localities specify dimensions where permits are automatically approved.

### 7.5.4 Issue Multi-State Permits

Some states have pursued multi-state permitting to make the move over multiple jurisdictions easier for OSOW loads. Multi-state permits allow a carrier to file one permit application and receive permits for multiple states. Four examples of multi-state permits available in the United States are the Western Regional permit, Southern Regional permit, New England Transportation Consortium (NETC) permit, and the WINNDOT Cross-Border permit.

Each multi-state permit functions slightly differently. For example, the Western Regional permit and NETC permit are issued by member states, whereas the WINNDOT permit is obtained through a portal where the user can submit one application and get two permits. In the case of the Western Regional permit, any state that is the entry/origin, exit/destination, or pass-through

### **Alberta, Canada**

Alberta developed the Transportation Routing and Vehicle Information System (TRAVIS) for OSOW permitting within the province. TRAVIS was a single point of contact for the OSOW industry to order permits for both provincial and local roadways.

TRAVIS established a route and then either automatically approved the route or sent the permit to the local jurisdiction to manually approve the route based on the rules defined by the local jurisdiction. Once the local jurisdictions signed off, a single fee was charged and the permit issued. On average, TRAVIS issued permits in three hours and an industry survey suggested that it saved the industry an estimated \$3 million CAD annually.

TRAVIS provides significant value to local jurisdictions, including free access to TRAVIS, automatic involvement in OSOW movement on their roadways, revenue from OSOW permitting, and access to OSOW reporting. Automatic involvement in the OSOW permitting process encouraged local involvement. In some cases, OSOW loads were traveling through local jurisdictions without permits, which reduced local revenue and increased the potential for accidents.

Consultations with the Alberta permitting officials and Canadian OSOW shippers revealed that TRAVIS was easy to use and, according to one carrier, one of the best systems available for permitting.

### **Australia**

Australia provides an example of a national method of OSOW permitting. Australia created the National Heavy Vehicle Regulator (NHVR) which, among other things, was tasked to administer an opt-in national permitting program. NHVR was set up to be a one-stop shop for OSOW loads traveling in participating states and territories.

The launch of the national permitting system resulted in significant delay in permitting OSOW loads, which resulted in the reversion to the original individual permitting system. Consultations with the Crane Industry Council of Australia (CICA) and NHVR identified two primary issues that hindered the success of the national permitting system:

- Localities, which had only a passive role in permitting, were suddenly put in an active role by the national permitting system. These localities did not have the capacity or capability to assess and approve permits, resulting in delays in permit approval. Although there was a 28-day permit review time limit, permits were taking far longer to be issued.
- The NHVR took on all permits that were currently being applied for and all future permits as of the launch. Local jurisdictions could not handle the amount of permits that needed to be issued in the time frame expected by the industry.

Multi-State Permit	Length	Width	Height	Weight
Western Regional Permit	110 ft	14 ft	14 ft	160,000 lbs
Southern Regional Permit	100 ft	14 ft	13 ft 6 in.	120,000 lbs
NETC Permit	90 ft	14 ft	13 ft 6 in.	120,000 lbs (6+ axles)

Source: Louisiana DOT, Washington DOT, New Hampshire DOT

**Figure 7-6. Maximum multi-state permitting dimensions.**

jurisdiction may issue a multi-state permit for the load as long as it does not exceed the size and weight envelope. In order to route the OSOW load, Idaho maintains a network map and is notified at least seven days before detours or restrictions are in effect. Permits may only be issued for routes on the regional permit network. If a road must use roadway outside the regional network, the permit applicant must contact the member jurisdiction.<sup>8</sup>

Multi-state permits are only applicable for loads that fit within a defined length, width, height, and weight envelope. Loads larger than the permit envelope must apply for a permit in each individual state. Figure 7-6 displays the maximum dimensions for the Western Regional permit, the Southern Regional permit, and the NETC permit. The WINNDOT Cross-Border permit is available for single trips.

Of the four permit agreements, the Western Regional permit, NETC permit, and WINNDOT Cross-Border Permit are still available. Figure 7-7 displays the states that were or are members of multi-state permits. The Southern Regional permit was created in the 1990s and the agreement that created the permit is still in place, but Wayne Davis of the Virginia Department of Motor Vehicles (DMV) noted, “Over the years the trucking industry has not requested [the permit] and [the agreement] simply remains dormant.”<sup>9</sup> Wayne Davis noted that enforcement officials sometimes would not recognize the regional permit, which decreased its use.<sup>10</sup>

Similarly, the number of states participating in the NETC permit has declined. The agreement formally covers Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont, but currently only New Hampshire and Maine issue and recognize the NETC permit.

Overall, multi-state permits make obtaining permits easier but do not affect the operations part of the move. Therefore, carriers will still encounter differences in jurisdictional escort requirements, hours of travel, overhang, and warning sign requirements. A 2010 survey of 14 states within multi-state permits found that most states issue a multi-state permit less than 10% of the time OSOW permit applications are submitted. One carrier noted that it is often quicker to apply individually to each member state than use the multi-state permit. Depending on the state and the level of automation, states may issue a permit instantaneously, making applications to individual states a quick process.

Furthermore, the study suggests that the industry prefers uniformity in the requirements for permits to regional permitting.<sup>11</sup> The findings of the study suggest that the industry would prefer DOTs to provide one permit for multiple states as well as simplify operational requirements. For

<sup>8</sup> *Western Regional Permit Desk Guide*. Washington Department of Transportation, 2010. <http://www.itd.idaho.gov/dmv/poe/WesternRegionalPermitInfo.htm>. Accessed November 13, 2014.

<sup>9</sup> Email with Wayne Davis by Laurel Rafferty, Portscape, November 21, 2014.

<sup>10</sup> Phone discussion with Wayne Davis by Laurel Rafferty, Portscape, October 16, 2014.

<sup>11</sup> Wittwer, E., and R. Gollnik. *North/West Passage Corridor-Wide Commercial Vehicle Permitting*. National Center for Freight & Infrastructure Research and Education, 2010.

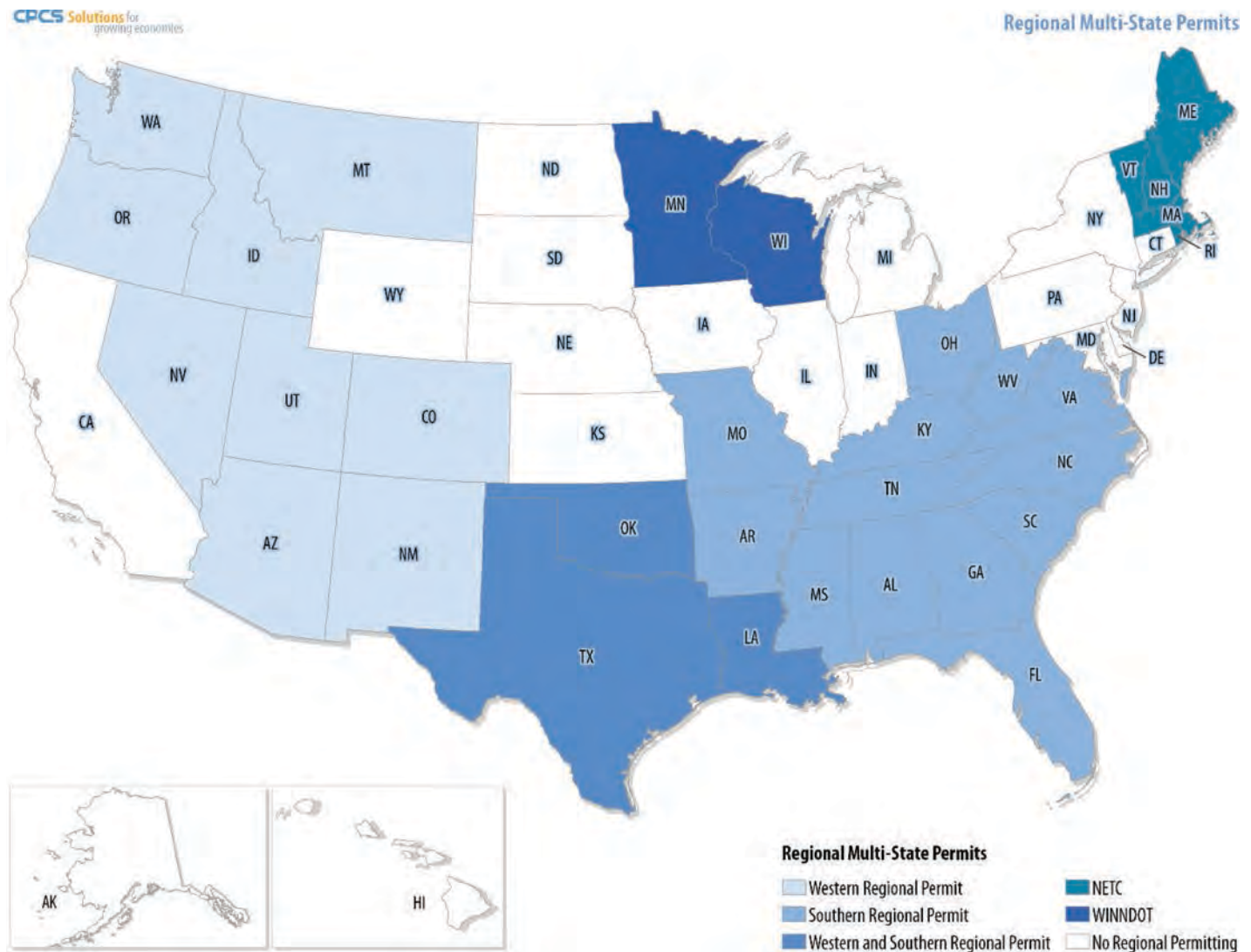


Figure 7-7. Regional multi-state permits.

example, the NETC permit has standard hours of travel, warning signs, lights, and civilian escort requirements, while also being a single permit for Maine and New Hampshire.

### 7.5.5 Provide Escort Certification

A growing number of states are requiring that civilian escorts be certified in order to escort an OSOW load. In response to a 2001 OSOW accident, NTSB recommended the development and state adoption of an escort training program and a model OSOW vehicle movement guidelines. This recommendation prompted the development of a report on best practices for escort vehicles. NTSB made a similar recommendation in 2013 following the I-5 Skagit River bridge collapse. NTSB identifies reciprocity as a key component of the escort certification as well as an updating of the 2004 “Pilot Car Escort Best Practices Guidelines.”

Escorts are a critical component of an OSOW move. As such, OSOW carriers, their drivers, and other roadway users should be able to assume escorts know their responsibilities. Therefore, states should implement an escort certification program in line with the updated pilot car best practices guidelines and training materials.



## 7.6 Options to Improve OSOW Planning

A survey of state DOTs found that very few use OSOW permitting data outside of the permitting office, which suggests that state DOTs are missing an opportunity to leverage this data for policy and planning. The opportunities are listed below:

- State permitting offices collect origin, destination, route, weight, dimensions, and commodity data that state DOTs rarely have access to outside of private data sets or expensive data collection; and
- Future construction at local and state levels will impact the size and weight of OSOW loads that are allowed to travel the roadway.

Therefore, state DOTs and local jurisdictions have a distinct opportunity to enable the movement of OSOW freight in the future by incorporating OSOW data and information in state and local policy and planning decisions. Furthermore, the identification of key OSOW generators, corridors, and modal connections will enable the state DOT to better understand internal OSOW flows, needs, and connections and enable future planning to expand or protect infrastructure assets that at a minimum support the efficient movement of OSOW freight as well as jobs and economic development in the state.

### 7.6.1 Leverage OSOW Data Obtained by State Permitting Offices

State permitting offices have access to a rich source of OSOW transportation data, including information about load origins, destinations, routes, weights, dimensions, and cargo types. However, data obtained as part of the permitting process is rarely leveraged by other divisions within state DOTs. More can and should be done with this data within state DOTs, such as incorporating the data in policy, planning, and programming functions and use of the data by bridge offices for load rating and bridge postings.

Figure 7-8 summarizes the potential applications of OSOW permitting data outside state permitting offices and the prevalence of this application.<sup>12</sup>

### 7.6.2 Use OSOW Routing Data to Identify and Plan for OSOW Corridors

In addition to the automation of the permitting process, the electronic permitting software can support the use of OSOW data to define state OSOW corridors. Leveraging routing of an OSOW load, state DOTs can identify the highest use roadways, the first and last mile connections to modal connections, OSOW generators and receivers, and if loads passing through the state use different roadways than those beginning or ending within the state.

Once OSOW corridors have been identified, states can define the main constraints facing OSOW shipping along those corridors and identify projects that will address those issues. A state may identify the need for the corridors to maintain a minimum height to enable roadway travel or to connect shippers to a port or rail terminals. Key OSOW shippers and carriers within the state are relevant freight stakeholders that should be consulted during related outreach efforts.

<sup>12</sup> Data is based on a survey conducted with state DOTs and information collected during the literature review. 24 states responded to the following survey questions:

- Beyond permitting, how is OSOW data used in the DOT (freight planning, asset management, infrastructure design, etc.)?
- What data sharing (on routing, construction, permit information, etc.) occurs between the state DOTs and other jurisdictions (municipalities and neighboring states)?

OSOW Data Application	Example of Use	Frequency of Application	
		Common	Limited/ Emerging
Asset Management	Caltrans uses OSOW permitting and flow data to inform its Ten-Year Rehabilitation Plan and its Five-Year Maintenance Plan.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Motor Carrier Enforcement	Maryland monitors permit violations for repeat violations and trends.		<input checked="" type="checkbox"/>
Safety Analysis	Oklahoma reviews OSOW data as part of its comprehensive safety program.		<input checked="" type="checkbox"/>
Engineering Design	Many states use OSOW data to inform roadway design, especially related to curvature, interchange design, roundabouts, bridges and other vertical clearances. New York State DOT uses OSOW data to design roundabouts for superloads.	<input checked="" type="checkbox"/>	
Construction Scheduling	Pennsylvania uses OSOW permitting data to inform construction project scheduling.		<input checked="" type="checkbox"/>
Freight Planning	Missouri, Kentucky, and other states use OSOW data to assist in freight corridor identification, as recommended in the Moving Ahead for Progress in the 21st Century Act (MAP-21) freight planning guidelines. Oregon's freight planning efforts fully integrate OSOW data.		<input checked="" type="checkbox"/>
Geographic Information Systems	Georgia, Iowa, and other states will have the capability to display permitting data spatially, by route. GIS enables states to use permitting data more broadly.		<input checked="" type="checkbox"/>

**Figure 7-8. Interagency applications of OSOW data.**

### Corridor Identification in Minnesota and Wisconsin

The 2009 *Western Minnesota Regional Freight Study* recommended that Minnesota designate and maintain the clearances of corridors for OSOW movement. It was also recommended that “whenever possible, no roundabouts should be constructed along the identified Expanded Envelope routes, and counties/cities should provide adequate notice of at least two weeks before a road closes along portions of the routes.”<sup>13</sup> As of September 23, 2013, Minnesota produced a draft version of the Minnesota OSOW Super Load Corridors for vehicles up to 150 ft long, 16 ft wide, 16 ft high, and weighing 250,000 lbs.<sup>14</sup> Minnesota also created a 14 ft 6 in. wide and 16 ft wide load network.

Wisconsin has designated a subset of its freight network called the OSOW freight network to facilitate OSOW movement. Wisconsin’s *Facilities Development Manual* requires the design of infrastructure on those routes to accommodate five reference vehicles:

- 5-axle expandable-deck lowboy (DST Lowboy)
- Wind Tower Upper-Mid Section, 79.5 ft long × 11.5 ft wide
- Wind Tower Section, 78 ft long × 14.7 ft wide
- 55 m Wind Blade
- 165 ft Beam<sup>15</sup>

<sup>13</sup> *Western Minnesota Regional Freight Study*. Minnesota Department of Transportation, 2009. <http://www.dot.state.mn.us/ofrw/PDF/westernmnfreightstudy.pdf>. Accessed November 8, 2014.

<sup>14</sup> *Minnesota OSOW Super Load Corridors*. Minnesota Department of Transportation, 2013. <http://www.dot.state.mn.us/ofrw/PDF/SuperloadCorridors2013.pdf>. Accessed November 21, 2014.

<sup>15</sup> *Facilities Development Manual*. Wisconsin Department of Transportation, 2013. <http://roadwaystandards.dot.wi.gov/standards/fdm/11-25.pdf>. Accessed November 8, 2014.

### 7.6.3 Use OSOW Data in Engineering

The most common use of OSOW data outside of the permitting office is to inform engineering design. Some states require construction of OSOW corridors to meet specific OSOW size and weights. States mandating these design standards are essentially protecting the corridor from the construction of infrastructure that would further limit the allowable size of OSOW loads traveling on the roadway.

#### Oregon Highway Over-Dimension Load Pinch Points Study

The Oregon DOT's efforts to formally integrate the use of OSOW data across a number of engineering and planning functions is one of the most comprehensive programs available. The Department's freight planners are currently using OSOW data on a study identified in the Oregon Freight Plan called the Highway Over-Dimension Load Pinch Points (HOLPP) Study. The purpose of the HOLPP study is to identify and bring awareness to highway pinch points that restrict the movement of overdimensional loads.

*"Identify routes that have length, weight, or height restrictions and include these routes, as appropriate, in the state's assessment of needed highway improvements."*

Examples of overdimension loads in Oregon include construction machines (cranes, front loaders, backhoes, etc.), manufactured homes, bridge beams, generators, windmill propellers and other industrial equipment. For the purposes of this study, pinch points are due to height, width, weight, or length constraints and can include low overpasses, narrow roadways, sharp curves, weight-restricted bridges, narrow bridges, bridges with low overhead clearance, diamond interchanges, curbs, non-removable signs, medians, enhancements at pedestrian crosswalks, bridge signs, overhead wires, and other features.

After working with each of the DOT's maintenance districts, a statewide list of pinch points will be reviewed by the Motor Carrier Technical Advisory Committee (MCTAC), other freight stakeholders, and the Oregon Freight Advisory Committee. The project goal is to develop a list of pinch points that will be shared with the Regions and the Area Commissions on Transportation (ACTs) so that they may recommend projects that will remove some of these pinch points.

As part of a new GIS project, Oregon DOT has mapped the overdimensional loads for 2013 and users can now see the number of overdimensional loads per year on a state highway on a map similar to a traffic flow map (the wider the line, the more overdimensional trips), providing an opportunity to be used in other freight planning purposes in the future.

### 7.6.4 Encourage Regional Integration of OSOW Corridors

According to a survey of states undertaken by the research team, most communication and data sharing on OSOW issues among neighboring states are informal and depend on working relationships where permitting officials call and email each other as issues emerge. Many of these relationships have been established through activity in multi-state organizations, including

AASHTO's Regional Associations. The joint identification, coordination, and planning of OSOW corridors enables neighboring states to formalize communication for construction or to discuss other restrictions that affect the connections between states.

### 7.6.5 Learn from Past Issues: Information on Failed Applications

While states like Oregon have made great strides in leveraging OSOW data to improve system performance and economic competitiveness, several obstacles frequently inhibit interagency data sharing and application, preventing wide use of OSOW data in U.S. agencies. Challenges and potential areas for improvement include:

- **Lack of agencywide knowledge of data.** In many cases, offices outside of permitting are unaware of the data.
- **Limited skills and knowledge of how to apply the data.** The disciplines with the most advanced methods of applying OSOW data are engineering and planning, although the latter is still in early stages of broad adoption. Engineering teams frequently use OSOW data to create theoretical models to test designs on curvature, pavements, bridges, and other features.
- **Data not in usable format.** Use of OSOW data is often hampered by its present format. New York State provides the following example: "Routes are listed as text strings in the permit database so it is difficult to analyze typical OSOW corridors or routes used by heavier vehicles. Many of these issues will be rectified as the New York State DOT moves to a more automated system with GIS routing."

## 7.7 Recognizing Barriers to Implementing Identified Opportunities

Policy makers face a number of constraints when considering a change to OSOW regulations and permitting practices. The primary issues are:

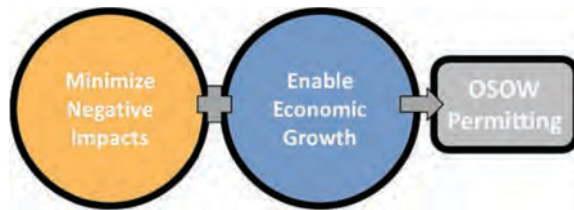
- Public and private transportation goals,
- Data availability and institutional knowledge, and
- State-specific constraints.

### 7.7.1 Public and Private Transportation Goals

State DOTs are tasked with both minimizing negative impacts and enabling economic growth (Figure 7-9).<sup>16</sup> Both these goals are exemplified in OSOW permitting; OSOW carriers need to balance efficient travel from origin to destination with the impacts the load has on roadway operation, condition, environment, and safety. At times these goals are at odds, and this conflict increases the difficulty in policy changes to OSOW regulations.

OSOW freight carriers seek to maximize efficiency by minimizing travel time and cost as well as maximizing the use of their equipment. In addition to maximizing efficiency, OSOW carriers seek to minimize risk, measured by reliability and safety (Figure 7-10). As with OSOW permitting officials, the goals of OSOW carriers are sometimes conflicting and at other times complementary. For example, some OSOW carriers will use an extra escort, a height pole, or conduct a route survey even when they are not required to minimize risk or delay, or avoid an accident. In this instance, the carrier is minimizing risk but is likely increasing cost and thereby decreasing its overall efficiency.

<sup>16</sup> Minimizing negative impacts and enabling economic growth encompass a variety of specific topics such as safety, environment, state of good repair, and economic competitiveness.



**Figure 7-9.** Goals of state permitting offices.



**Figure 7-10.** Goals of OSOW carriers.

State DOT and carrier goals are aligned on efficiency and minimizing risk, which suggests areas of mutual benefit. But the extent to which state DOTs and carriers prioritize each goal and their recommended actions may be different.

### 7.7.2 Data Availability and Institutional Knowledge

OSOW policies have changed and evolved over time to protect infrastructure and its users, address trends, and enable economic growth. As state DOTs assess OSOW policy changes, employee turnover may have removed the institutional knowledge on the rationale for an OSOW policy. Previous research on bridge rating practices suggests that this loss of knowledge significantly increases the difficulty of changing policy.<sup>17</sup> At the same time, permitting officials face local, state, and national calls for harmonizing OSOW regulations, which they must assess based on their institutional goals.

The balance between regulating the impacts of OSOW loads and enabling economic growth is a nuanced issue that suffers from a lack of data on the causal factors in OSOW accidents. A 2009 study of the safety implications of OSOW vehicles and the 2015 Comprehensive Truck Size and Weight Study both concluded that available safety data were insufficient to support an analysis of the determinants of truck accident rates.<sup>18</sup> As a result, permit officials and decision makers face a number of unknown variables when considering changes to OSOW policy and regulations, further complicating a complex issue.

### 7.7.3 State-Specific Constraints

The status of OSOW regulation is a result of a variety of factors, many of which are state-specific. Additionally, each state will encounter varying degrees of difficulty changing OSOW regulation. For example, states differ in the authority given to the state DOT regarding permitting. In some states, the state DOT can amend OSOW restrictions and approaches, but others require legislative

<sup>17</sup> Fu, G., and C. Fu. *NCHRP Synthesis 359: Bridge Rating Practices and Policies for Overweight Vehicles*. National Cooperative Highway Research Program, 2006. [http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp\\_syn\\_359.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_359.pdf). Accessed October 28, 2014.

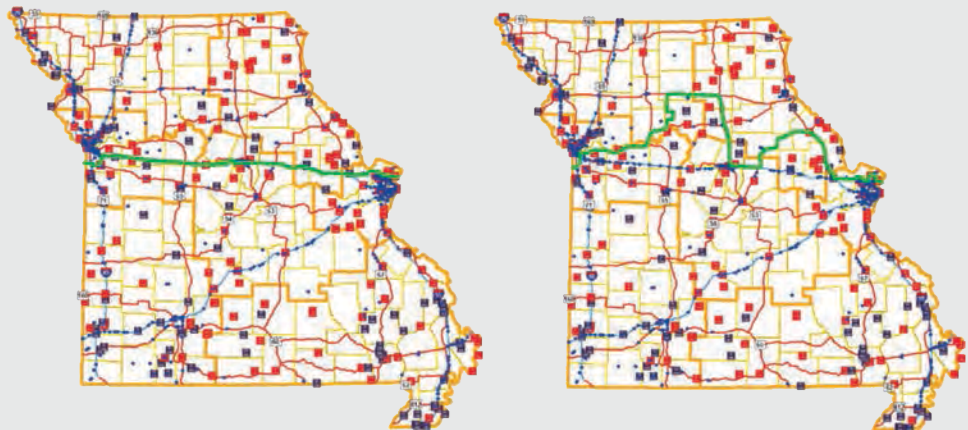
<sup>18</sup> Turner, D., and L. Nicholson. *A Synthesis of Safety Implications of Oversize/Overweight Commercial Vehicles*. University of Alabama, 2009. <http://utca.eng.ua.edu/files/2011/10/07115-Final-Report.pdf>, Accessed October 28, 2014.

changes, and still others are specific to the issue. Similarly, the infrastructure, size, population density, industries, geography, types of loads, and state DOT budget within a state and the surrounding region impact the development, implementation, and change of OSOW regulations. Budgetary constraints throughout the United States are a specific issue for both the permitting office and the DOT. Constrained budgets have the potential to limit permitting staff, purchasing of new permitting software, and the overall ability to analyze OSOW permits in an effective and efficient manner. Similarly, OSOW routes will become increasingly circuitous as infrastructure conditions worsen and the number of restricted bridges or roadways increases.

### OSOW Funding and Permitting Fees

OSOW permitting managers noted that funding affects their ability to permit OSOW loads. The number of superload permits is increasing and the overall state DOT funding has stagnated in many states. This development makes permitting exponentially more difficult. Not only do superload permits use more resources, but they are often heavy loads, which is problematic when a lack of state DOT funding has resulted in an increase in weight-restricted bridges in addition to construction and overhead restrictions along interstates. The final result is a circuitous route that uses county and local roadways to avoid restricted bridges and other restrictions.

Scott Marion of the Missouri DOT presented the maps below to demonstrate the difference in the optimal versus actual OSOW routing in Missouri. The optimal route totaled 271 miles and the actual route totaled 413 miles, a 52% increase in mileage. The OSOW load is routed off the optimal interstate because of vertical restrictions, construction, road closures, and posted bridges. The added cost of moving an OSOW load the extra miles decreases the competitiveness of industries producing or relying on OSOW freight, as well as increases the exposure of other roadway users to OSOW loads, oftentimes on rural roadways that are less able to accommodate the oversize dimensions.



Source: Missouri DOT

### ***Optimal (left) versus actual (right) OSOW routings.***

This example links overall transportation funding to the routing of OSOW loads. Additionally, the current trends suggest that these issues will only increase in severity as state DOTs continue to be underfunded and the size and frequency of OSOW loads increase.

# Conclusions and Next Steps

This report identifies challenges associated with multi-state OSOW transportation and puts forward several options to address these challenges.

Many, particularly within the industry, believe harmonization of state OSOW load regulations and permitting practices to be the obvious answer to most challenges. Greater harmonization would no doubt improve the efficiency of multi-state OSOW transportation, but harmonization is by no means easy to achieve. The level of coordination, negotiation, compromise, and supporting research and analysis required to advance harmonization, not to mention the significant associated time and cost, makes this a difficult solution if not impractical as a singular focus in the short to medium term. It is also unlikely that OSOW transportation issues garner sufficient attention at the highest levels of state DOTs to energize a serious institutional push toward harmonization. And those on the front lines in state permitting offices have little incentive (or resources) to push for change, particularly when such changes could be perceived—correctly or incorrectly—as potentially comprising safety or infrastructure preservation priorities.

This is not to suggest that harmonization of state OSOW regulations and permitting requirements should not be a vision, nor that efforts to advance harmonization are not worthwhile. On the contrary, these represent positive steps forward and are no doubt well received by the OSOW transportation industry. This report can hopefully help advance these discussions. But these efforts—as challenging as they are—should not detract from other, more easily achievable, and incremental opportunities to improve OSOW transportation.

Improving the availability and consistency of information on physical infrastructure constraints and restrictions, setting clearer expectations on permit turnaround times, involving OSOW stakeholders on state freight advisory committees, and including a review of OSOW needs, issues, and corridors within the scope of statewide freight plans are all relatively easily achievable and relatively low-cost incremental steps that individual states could take to improve OSOW transportation.

As an information resource, this report and the associated interactive website, [www.osowfreight.com](http://www.osowfreight.com), can hopefully go some way in informing efforts to achieve these and other incremental improvements to OSOW transportation as well as bigger, bolder, and longer-term discussions to advance harmonization.

One immediate next step could be a joint summit of state DOTs and OSOW industry stakeholders to jointly discuss the findings in this report and opportunities to effect incremental improvements. A leadership push at this summit would be beneficial.



## Acronyms and Abbreviations

AAR	Association of American Railroads
AASHTO	Association of American State Highway Transportation Officials
ACTs	Area Commissions on Transportation
BNSF	Burlington Northern Santa Fe
CAD	Canadian dollars
CICA	Crane Industry Council of Australia
CO <sub>2</sub>	Carbon dioxide
DMV	Department of Motor Vehicles
DOT	Department of Transportation
ESAL	Equivalent single axle load
ESTA	European Association of Abnormal Road Transport and Mobile Cranes
EU	European Union
GIS	Geographic information system
HOLPP	Highway Over-Dimension Load Pinch Points
HVNL	Heavy Vehicle National Law
ITAP	Illinois DOT automated permitting program
MAASTO	Mid America Association of State Transportation Officials
MAP-21	Moving Ahead for Progress in the 21st Century Act
MCTAC	Motor Carrier Technical Advisory Committee
NASTO	Northeastern Association of State Transportation Officials
NETC	New England Transportation Consortium
NHS	National Highway System
NHVR	National Heavy Vehicle Regulator
NJUNS	Georgia National Joint Utility Notification System
NO <sub>x</sub>	Nitrogen oxide
NTSB	National Transportation Safety Board
NWP	New West Partnership
OSOW	Oversize/overweight
PM	Particulate matter
SASHTO	Southeastern Association of State Highway and Transportation Officials
SC & RA	Specialized Carriers & Rigging Association
SCOHT	Standing Committee on Highway Transportation
SCT	Secretariat of Communications and Transport
SO <sub>x</sub>	Sulfur oxide
TILMA	Trade, Investment and Labour Mobility Agreement



TRAVIS	Transportation Routing and Vehicle Information System
TTI	Texas Transportation Institute
WASHTO	Western Association of State Highway and Transportation Officials
WIM	Weight-in-motion
WINNDOT	Wisconsin Cross-Border Permit Portal



## APPENDIX A

# Inventory of OSOW Truck Permitting Differences

### Maximum Permitted Axle Weights

The maximum permitted axle weight specified by states along an OSOW route affects the configuration of overweight loads and the multi-state movement of those loads. When planning multi-state shipments, carriers must identify the state with the lowest maximum axle weight along their route to select and configure a trailer that is compliant in each state along the route.

Carriers add axles in order to meet state maximum weight thresholds, but more axles mean heavier total weights, lower gas mileage, higher fees for equipment use, and ultimately a more expensive move for shippers.

Variance in weights can affect the routing of a load. Depending on the available equipment, load origin and destination, and state axle weights, shippers may choose to route around states with lower weights. Routing around states with lower maximum permitted axle weights is more of an issue for superloads that may be unable to meet the axle weight limitations. Additionally, adding axles increases the weight and length of a load, which can change the way a load is classified (OSOW load or superload). The load may cross the threshold for the hours of travel allowed or require additional escorts and additional permitting in the states along the route. The configuration of load and the route choices carriers make directly impact the restrictions an OSOW load encounters.

State-to-state differences in the maximum permitted axle weights on tandem axles (two axles in a group shown in Figure A-1) and tridem axles (three axles in a group shown in Figure A-2) present larger challenges for OSOW carriers than the weights on a single axle. Tandem axles and tridem axles vary most widely in the lowest and highest weights allowed. The difference between the lightest and the heaviest allowances is amplified as the number of axles affected by the maximum weight restriction increases.

For each axle configuration, a number of states have a case-by-case calculation for the maximum axle weight, which varies by spacing, route, tire width, and the legal bridge limit. When possible, the permit maximums for routes within states that covered the majority of interstates and the majority of roadways have been shown.

### Single Axle

Across the country, the most prevalent maximum single axle weight is 20,000 lbs. This maximum is consistent across a swath of the Mississippi Valley states, allowing for movement from Minnesota to Mississippi. Maximums across the United States range from 20,000 lbs to 29,000 lbs, and more than a dozen states set the maximum single axle weight on a case-by-case basis (Figure A-3).



Source: TheTruckersReport.com

**Figure A-1.** *Excavator on a removable gooseneck tandem axle trailer.*

### Tandem Axle

The state-by-state variation in maximum allowable weights for tandem axles is larger than single axles with very few clusters of states with contiguous values. Similar to single axles, a number of states have a case-by-case calculation for the maximum weight on a tandem axle (Figure A-4).

### Tridem Axle

The maximum weight for tridem axles shows less variation across states than maximum weights for single or tandem axles. The map shows that more than 20 states have maximum tridem axles between 60,000 and 63,000 lbs, and within this group many states maintain a 60,000 lb limit (Figure A-5).

### Quad Axle

The maximum quad axle weight varies widely across the country with only a few clusters of states with similar maximums. The most frequently observed value for quad axle configurations is by a case-by-case calculation (Figure A-6).



Source: Perkins Motor Transit

**Figure A-2.** *OSOW load traveling on a tridem trailer.*

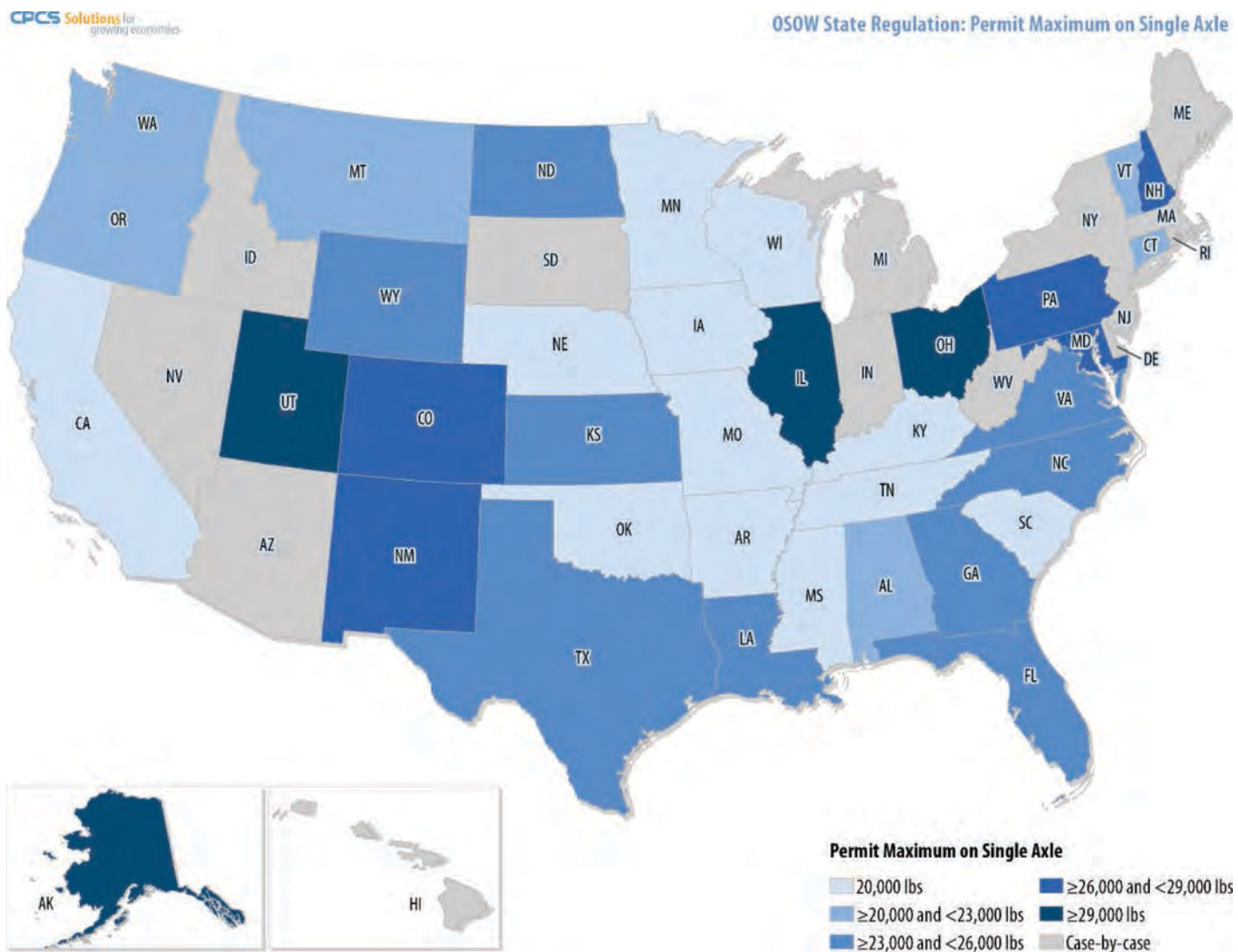


Figure A-3. Permit maximum on single axle.

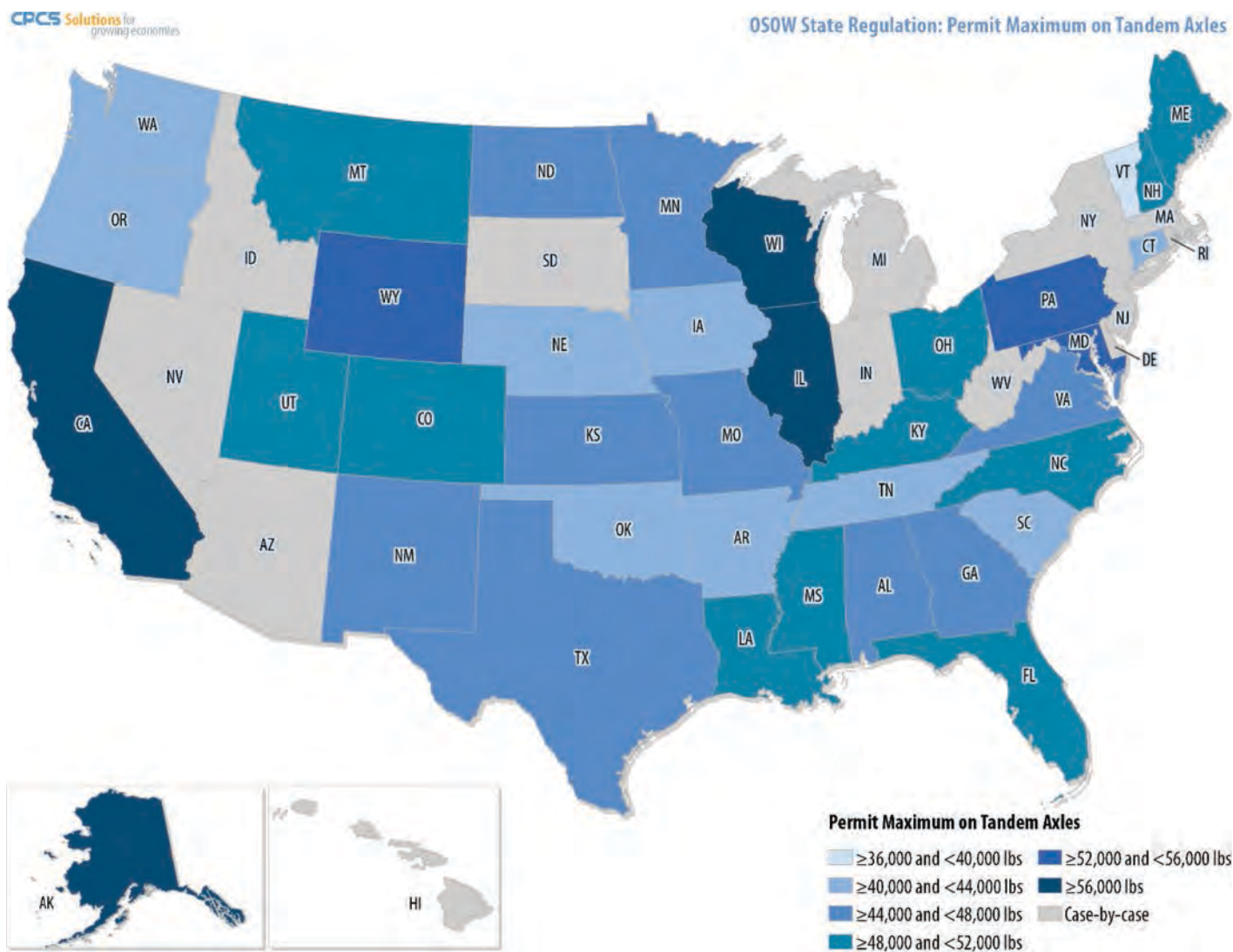


Figure A-4. Permit maximum on tandem axles.

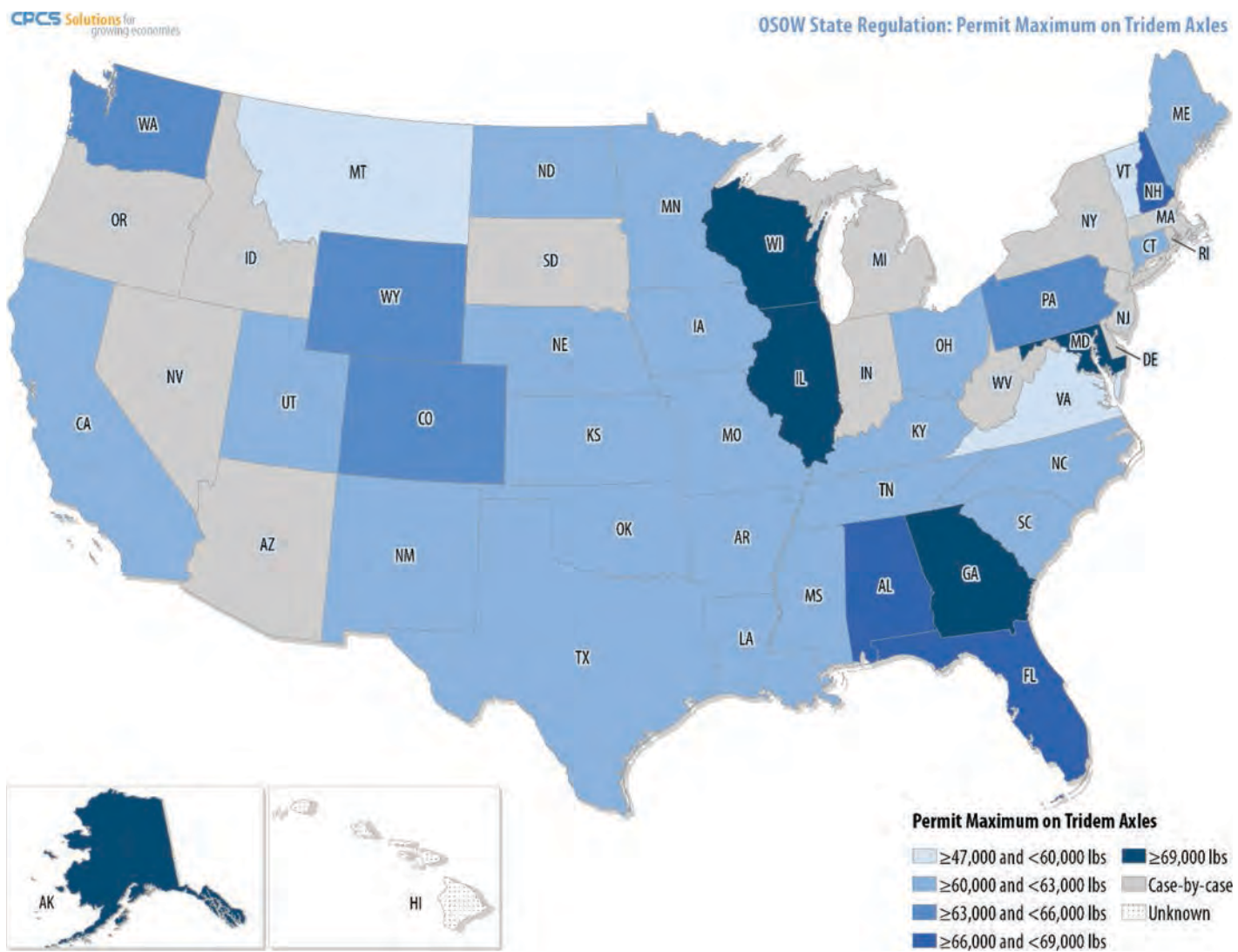


Figure A-5. Permit maximum on tridem axles.

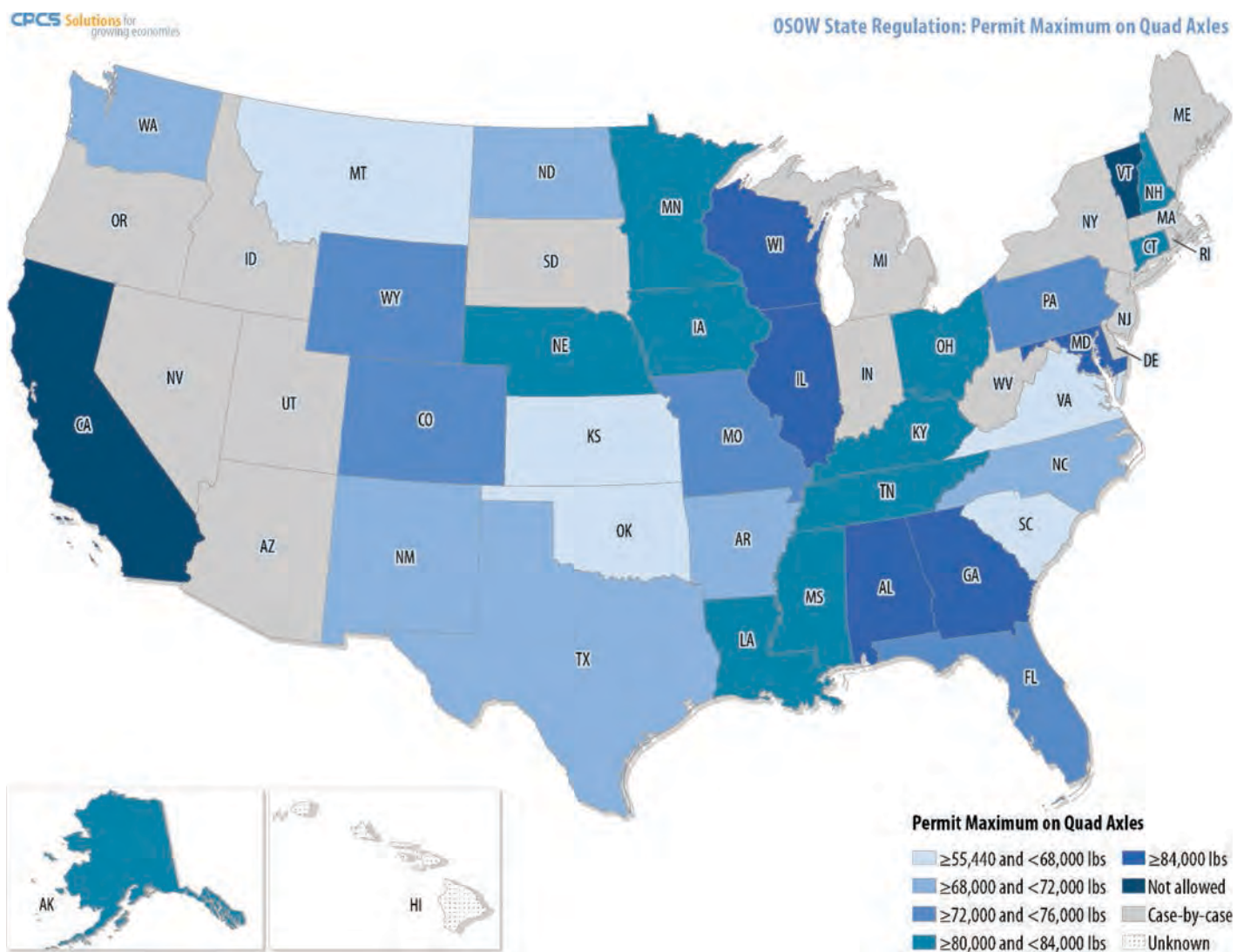


Figure A-6. Permit maximum on quad axles.

## General Civilian Escort Requirements

The number one role of an escort is safety. Escorts notify other roadway users that an OSOW load is ahead. Escorts may be required to lead and/or follow an OSOW load, depending on which of the dimensions are over the legal limit and the overall size of the load. For example, the first escort for an overheight load drives in the front of the load, and once the overheight load passes a second threshold an additional escort may be required, depending on the state. Other dimensions such as width and length may require three or more escorts, depending on the state or the route. Each additional escort drives in a specific position in relation to the load, in front of or behind the load, and each position serves a different purpose. The following explanation of civilian escort requirements is generalized for all escorts and applies to this section, as well as the next two sections (Figure A-7).

Every state requires an escort once an OSOW configuration exceeds the length, width, or height limits. Furthermore, some states require escorts for loads that are above a certain weight or overhang threshold. States require OSOW escorts for certain loads because the performance characteristics and dimensions of those loads are significantly different than those of normal roadway users. For example, an overheight or overlength load may need to reduce its speed to one much lower than other traffic to navigate around a turn or under an overhead structure. The speed differences that occur when OSOW loads are operating necessitates added visibility in the form of lights, flags, and signs on both the load and the escorts. Also, overwidth loads may partially or substantially extend into the next lane, which calls for roadway users to exercise caution when passing or meeting an OSOW load on a roadway. Similarly, overweight loads and loads that hang over the front or end of the trailer may need escorts. States that require an escort for weight may be concerned about slow-moving vehicles due to performance or mandatory speed limits on bridge structures. Loads that have a front or rear overhang (rear more often requiring an escort) use escorts to warn other roadway users about the overhanging load and the possibility of hitting the load before coming into contact with the trailer. Escorts are very important on roadways with changing gradients where a vehicle could blindly come upon an OSOW load going at a different speed or extending into the vehicle's lane.

States may require a civilian escort at different thresholds depending on the route or roadway type. Generally, states will vary the escort thresholds for length, width, and height, but have the same thresholds for weight and overhang regardless of route or roadway type. Therefore, the weight and overhang thresholds are shown in the general category and the thresholds for



Source: Perkins Motor Transport

**Figure A-7. Civilian escorts.**



two-lane and multilane roadways are shown in the following sections. Note that in some states lights can replace escorts under specific conditions. When given the option, the research team assumed the carrier would prefer to use lights rather than hire an escort.

## Weight

As shown in Figure A-8, only nine states have requirements for a first civilian escort based on weight. Of the states with a weight threshold, most require escorts based on a set weight threshold. However, some states such as Montana and Wyoming require escorts when a load is limited in speed over bridges and other structures. In the case of Illinois, the findings of a bridge analysis determine whether an escort is required or not.

## Overhang

When a load overhangs the trailer in the front or the rear, states may require a flag, flashing light, or a civilian escort. Figure A-9 displays the states that require a first civilian escort for rear

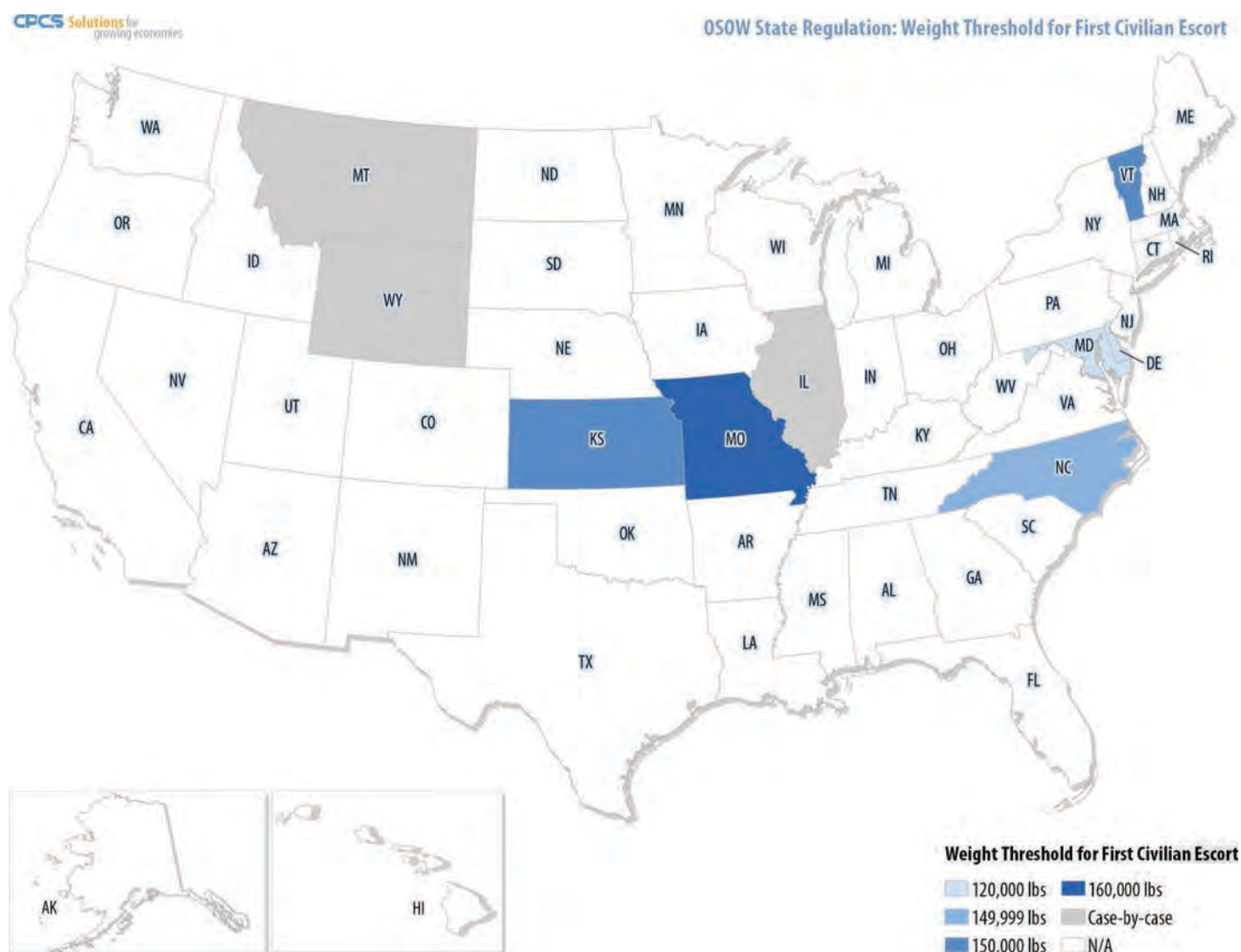


Figure A-8. Weight threshold for first civilian escort.

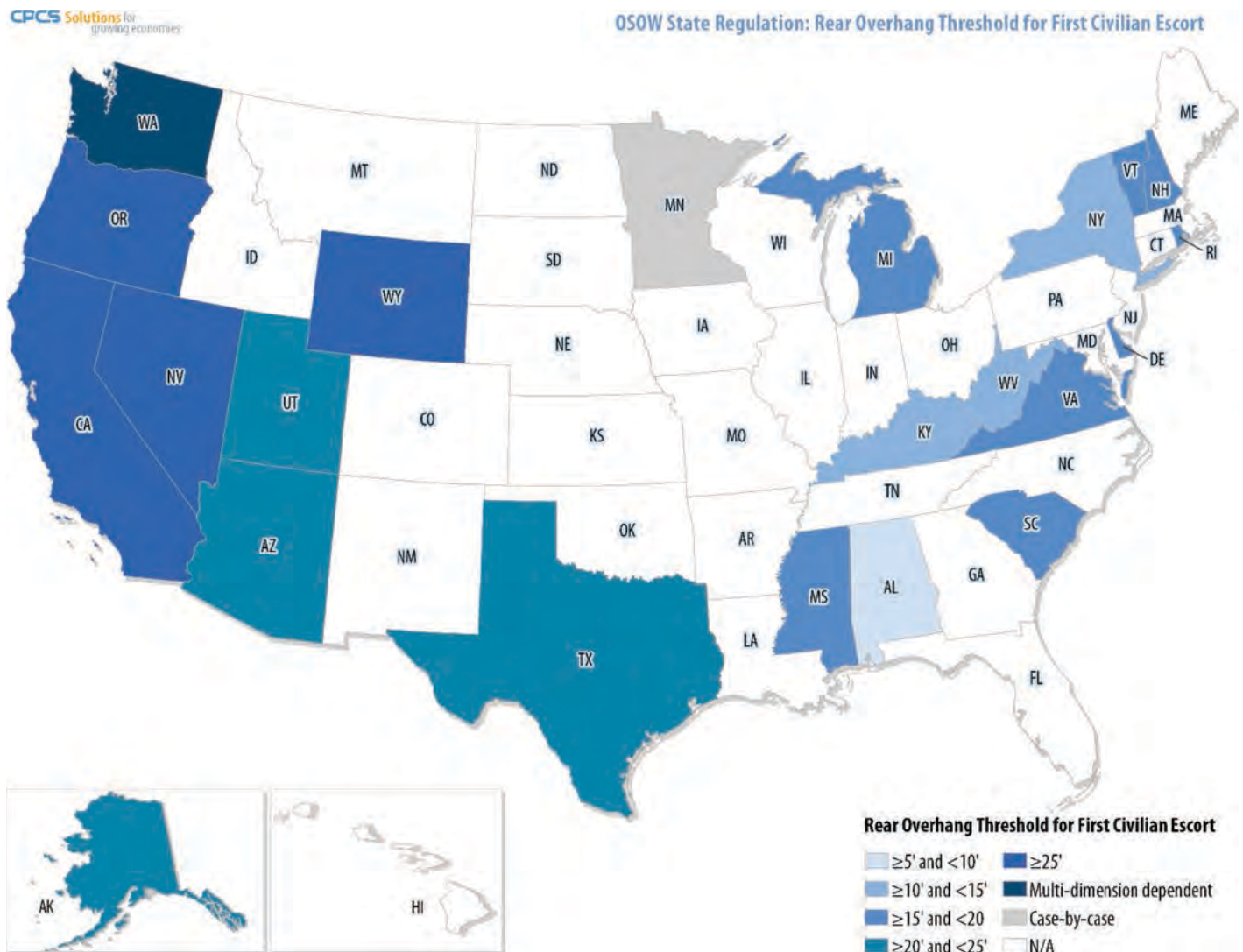


Figure A-9. Rear overhang threshold for first civilian escort.

overhang. Rear overhang more frequently requires an escort than front overhang. Some states have overhang thresholds that are not specific in number and vary based on the load or roadway. For example, both Oregon and Minnesota may require an escort for a rear overhang, depending on the length of the overhang and the roadway on which it is operating. Additionally, Washington requires an escort if the overhang is more than one-third of the trailer length. Overhang escort thresholds vary widely from state to state, ranging from states requiring an escort when rear overhang is greater than 5 in. to those requiring an escort when rear overhang is greater than or equal to 25 in. Western states generally have much higher thresholds than Eastern states. The majority of the Midwestern states and the Plains states do not require escorts for overhang.

### Two-Lane Civilian Escort Requirements

As previously noted, civilian escort requirements vary significantly among states and may vary depending on the roadway or route network within a state. Most states differentiate escort requirements based on roadway type, typically for two categories: two-lane and multilane

highways. Other states implement roadway-specific escort requirements based on whether the roadway is divided, is an interstate, or belongs to a defined roadway network. For example, California differentiates among five route classes, each with its own requirement for civilian escorts. This section introduces escort requirements for two-lane roadways and undivided highways. When a state has multiple route classes such as California, the maps are developed assuming a single route class.

## Length

### First Civilian Escort

As displayed in Figure A-10, the first civilian escort required for length shows very little regional consistency outside of the Northeastern states from New York to Maine. Beyond the Northeast, only a few contiguous states share the same length regulation. With a few exceptions, states west of the Mississippi have higher thresholds for the first escort than those east of the Mississippi.

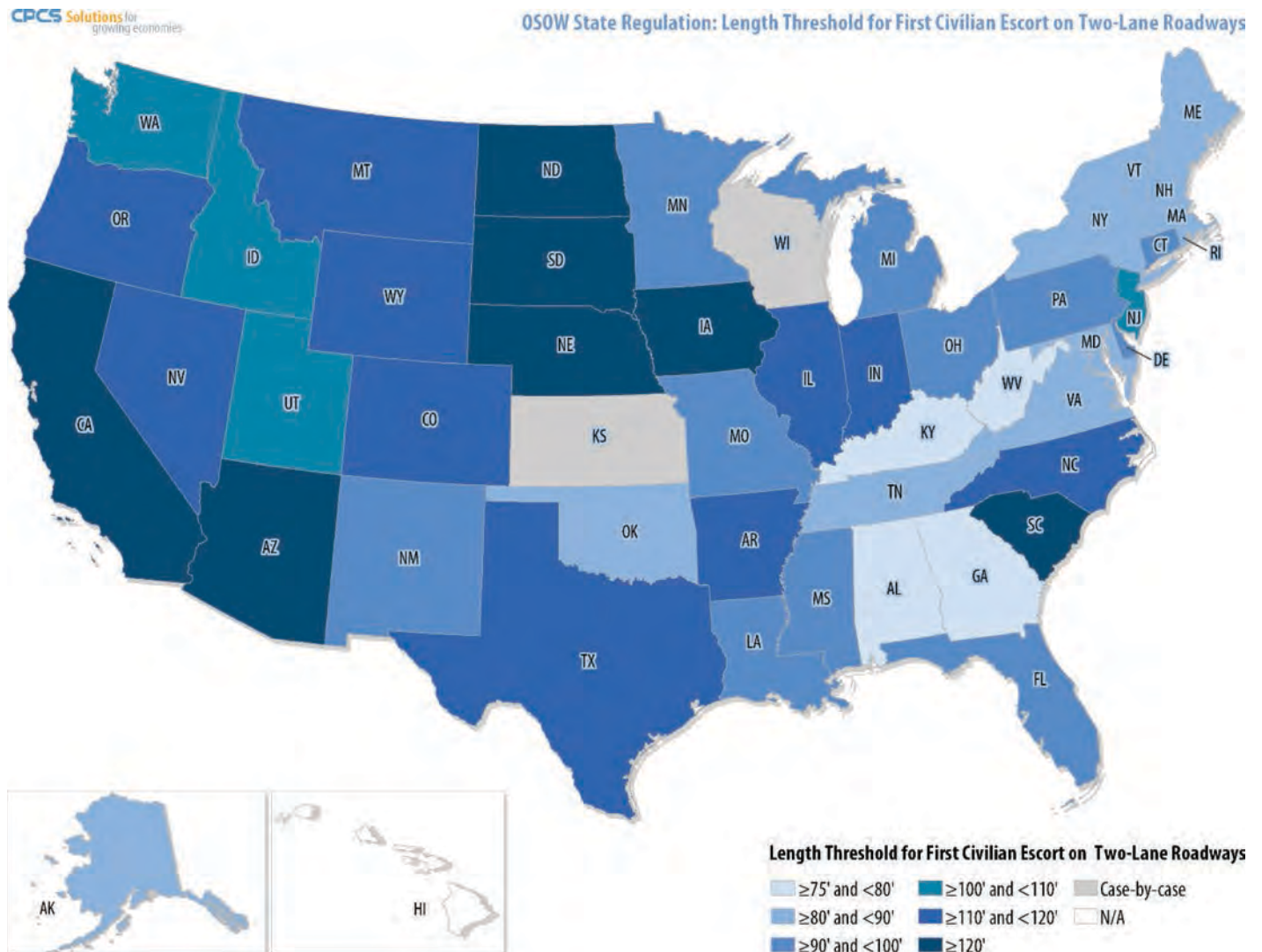


Figure A-10. Length threshold for first civilian escort on two-lane roadways.

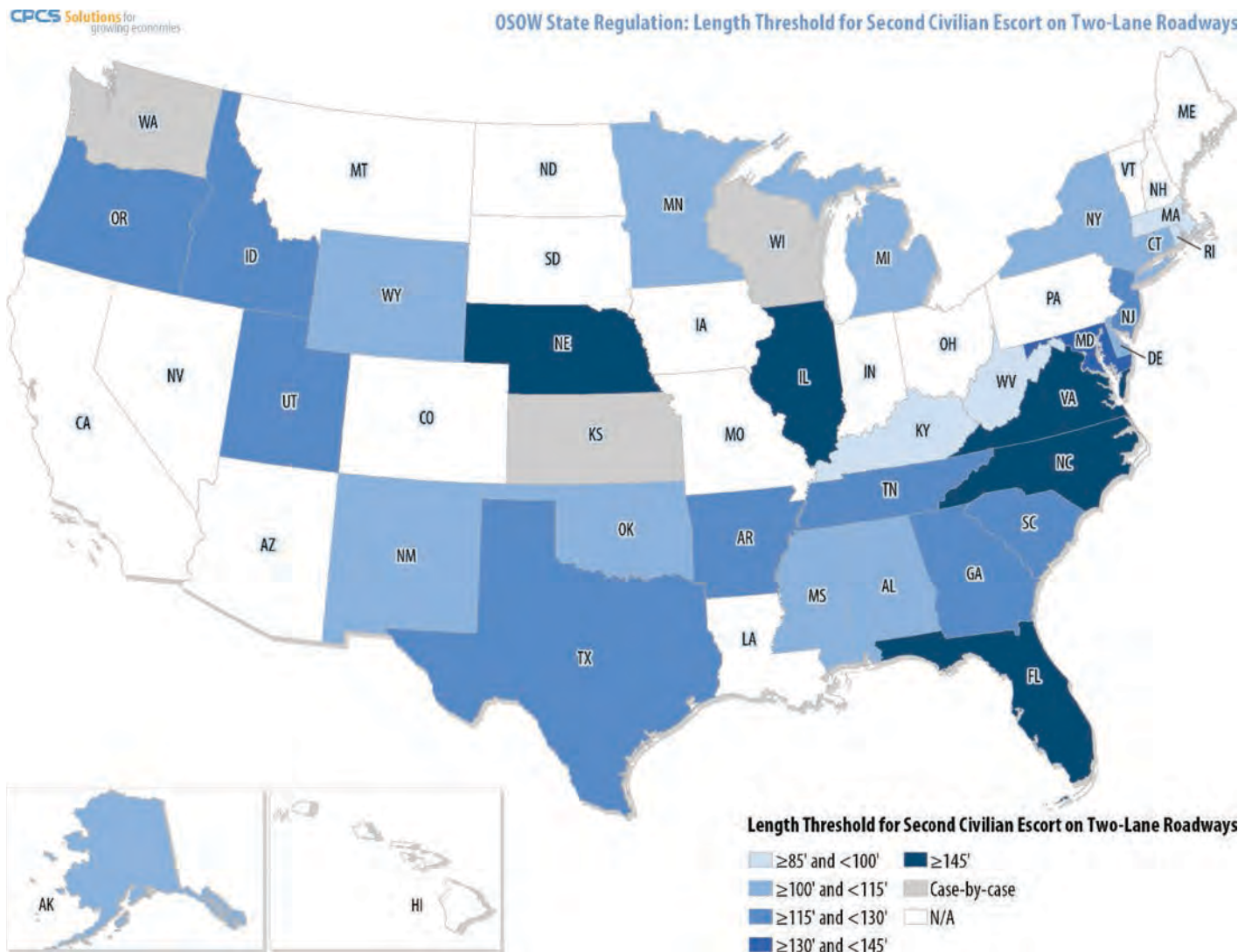


Figure A-11. Length threshold for second civilian escort on two-lane roadways.

### Second Civilian Escort

Figure A-11 displays the length thresholds for a second civilian escort on two-lane roadways. Compared to the first civilian escort, fewer states require a second civilian escort, with a couple of states reserving the right to add an escort based on the load or the route. The Southeast has the highest concentration of states requiring a second escort. Illinois requires a second escort if the load is more than 145 ft long or if it is 110 ft long and more than 14 ft 6 in. wide or 14 ft 6 in. high.

### Width

#### First Civilian Escort

Figure A-12 displays the width thresholds where states require the first civilian escort. Compared with the length regulations, the width threshold displays large contiguous groupings of states with similar regulations. For example, there are blocks of Southeastern and Northeastern states with similar regulations. Thresholds of interior states are higher than those in the coastal regions.

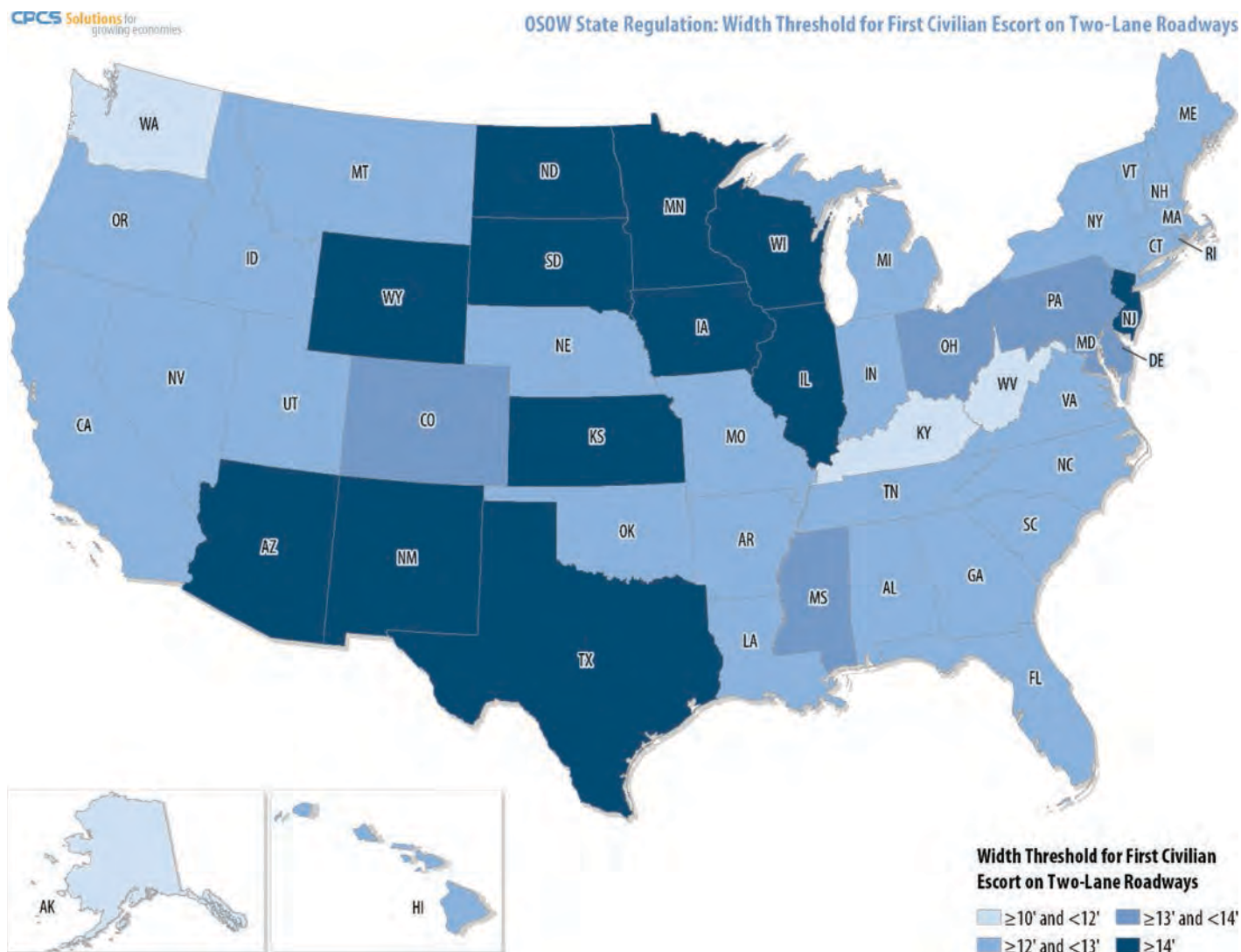


Figure A-12. Width threshold for first civilian escort on two-lane roadways.

### Second Civilian Escort

There are fewer states with width thresholds for a second civilian escort on two-lane roadways (Figure A-13). A number of states do not require a second civilian escort or require the second civilian escort on a case-by-case basis.

## Height

### First Civilian Escort

Figure A-14 displays the height threshold for the first civilian escort on a two-lane roadway. States exhibit significant variation in height thresholds for escorts. Some states such as Minnesota do not require a civilian escort but instead rely on route surveys to ensure safe operations. In the case of Montana and Kansas, the need for an escort is a function of route and load size. Montana requires an escort if the load requires utilities to cut power to electric lines.

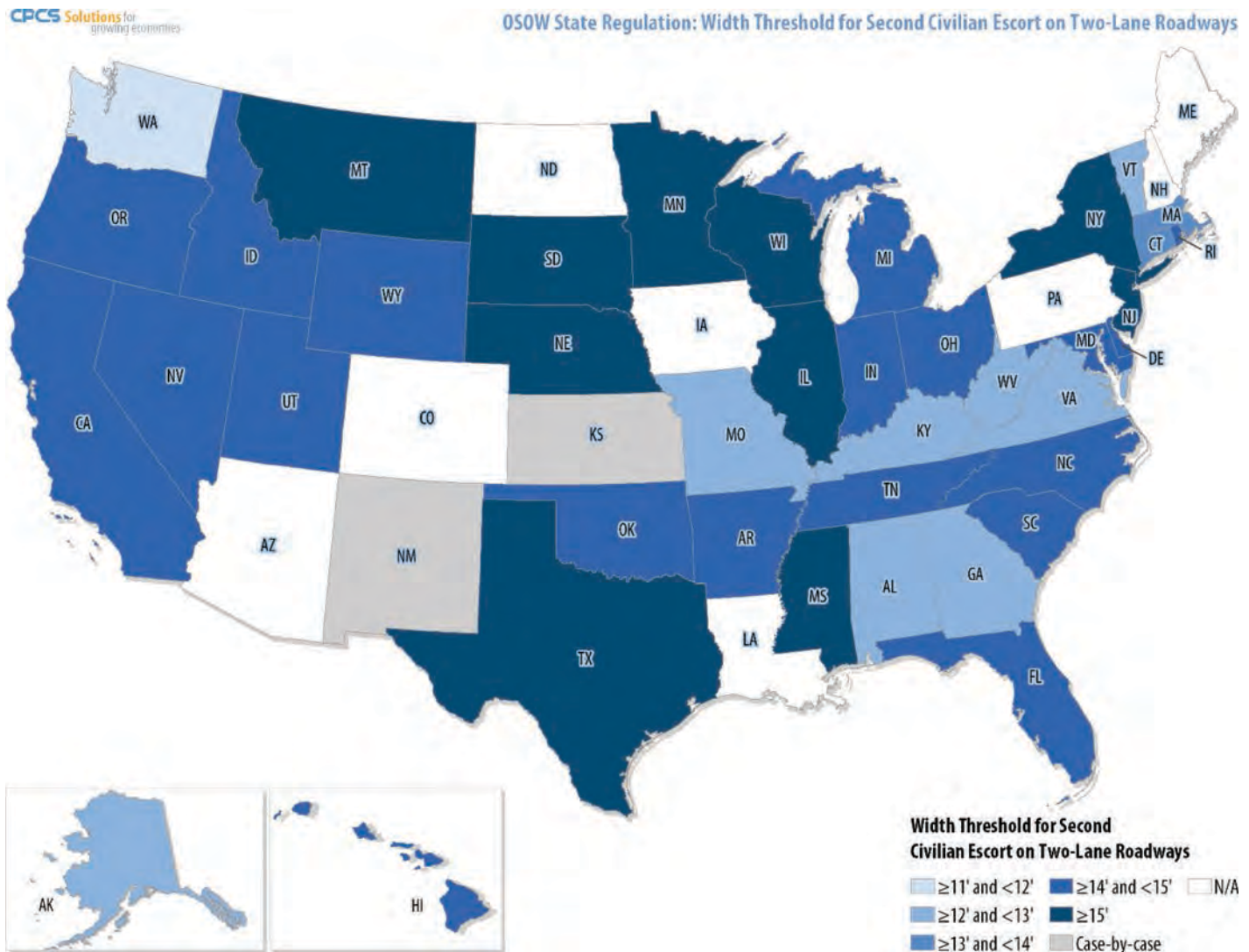


Figure A-13. Width threshold for second civilian escort on two-lane roadways.

There are only a few clusters of states with similar regulations. A cluster from Iowa to Pennsylvania has relatively conservative height thresholds compared to the other Midwestern and neighboring states. The states on the East Coast have the highest concentration of conservative height thresholds, which is likely due to concerns about the heights of the existing infrastructure.

#### *Second Civilian Escort*

Nine states have specified height thresholds that require a second civilian escort. An additional four consider the second escort on a case-by-case basis. In the Central states, a chain of states from Texas to Wisconsin have case-by-case thresholds or require the second civilian escort after a certain height. See Figure A-15.

#### *Height Pole Requirement*

Height poles are used to test clearances on the route. They are a relatively inexpensive yet effective means of protecting infrastructure and OSOW loads from damage if they are used

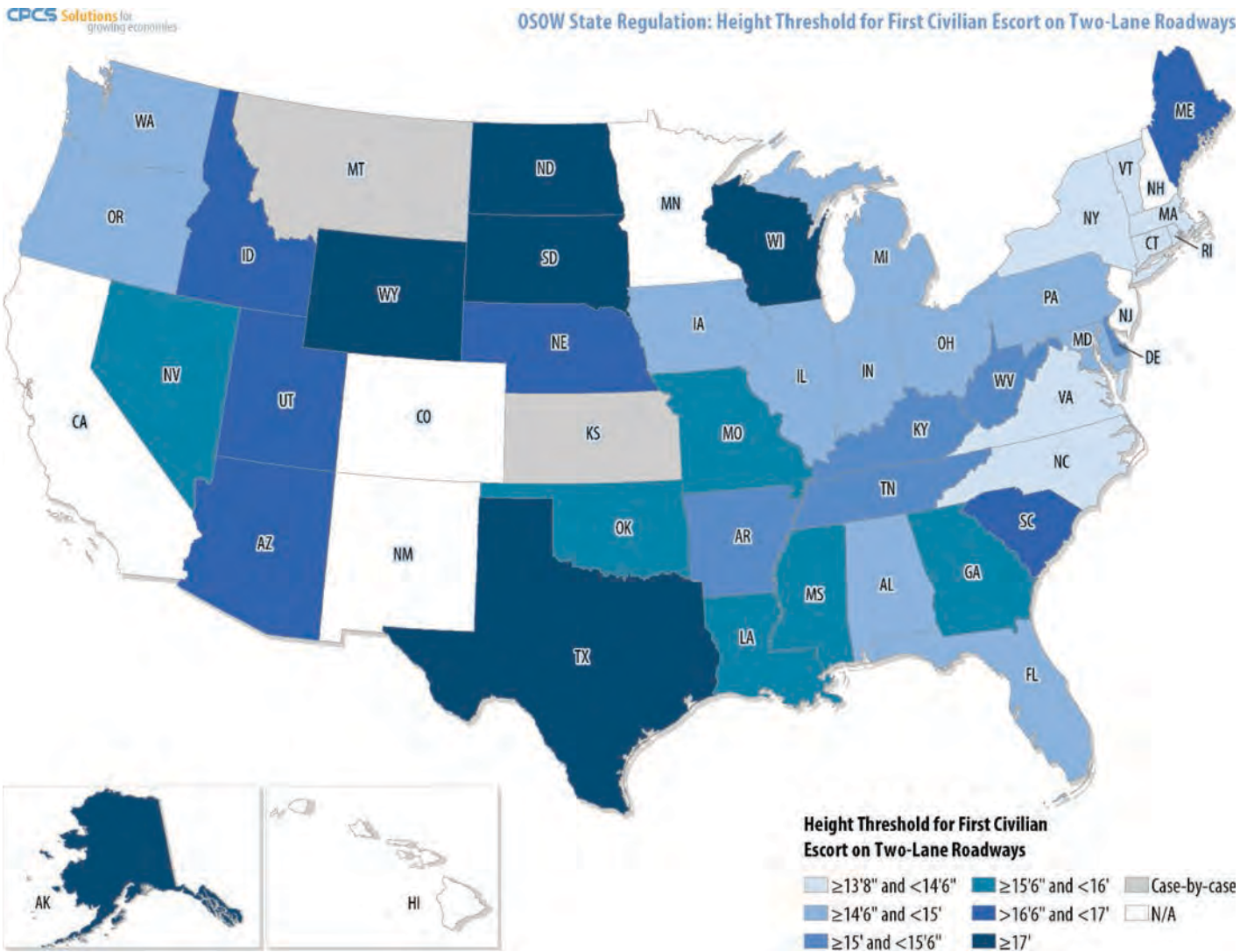


Figure A-14. Height threshold for first civilian escort on two-lane roadways.

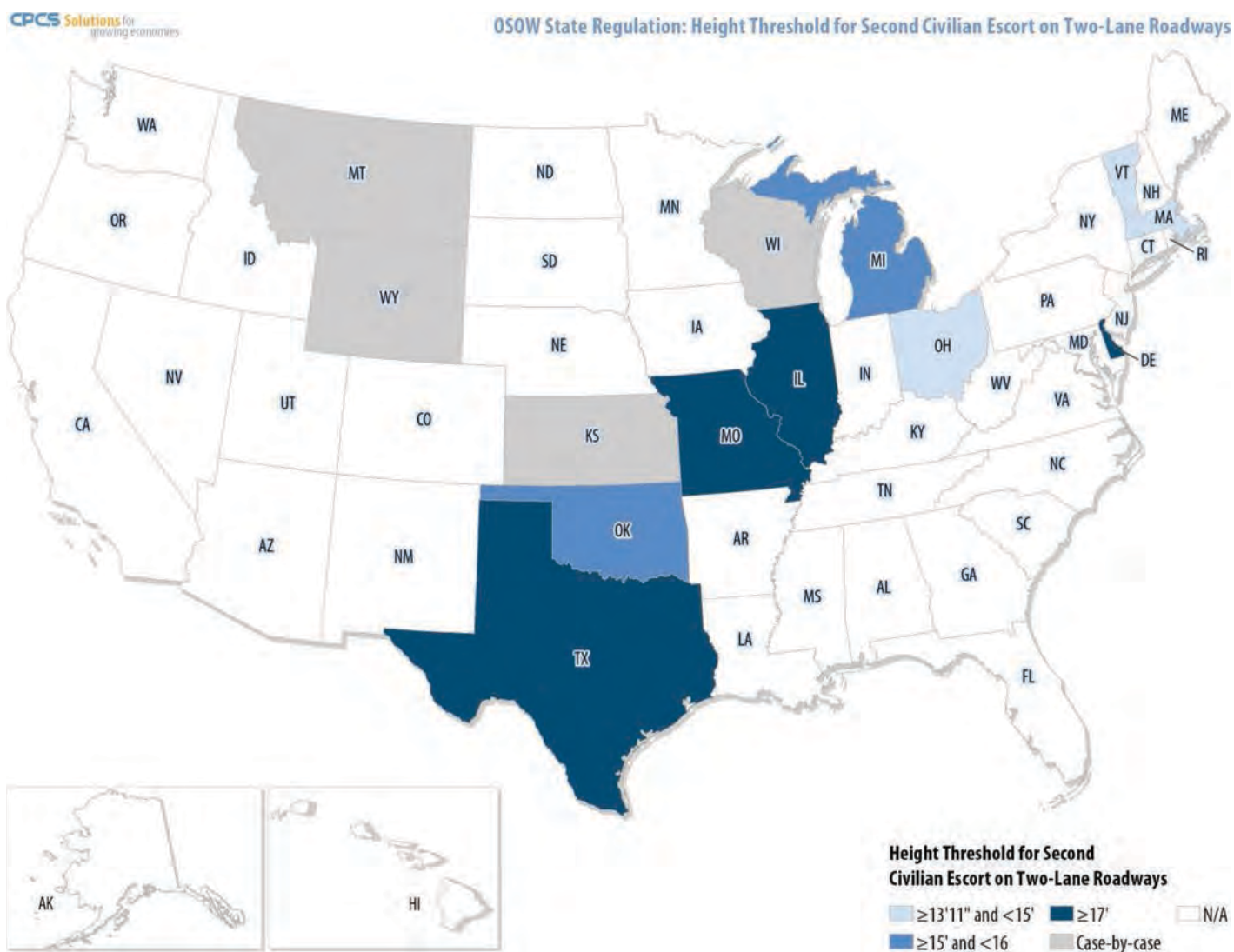


Figure A-15. Height threshold for second civilian escort on two-lane roadways.



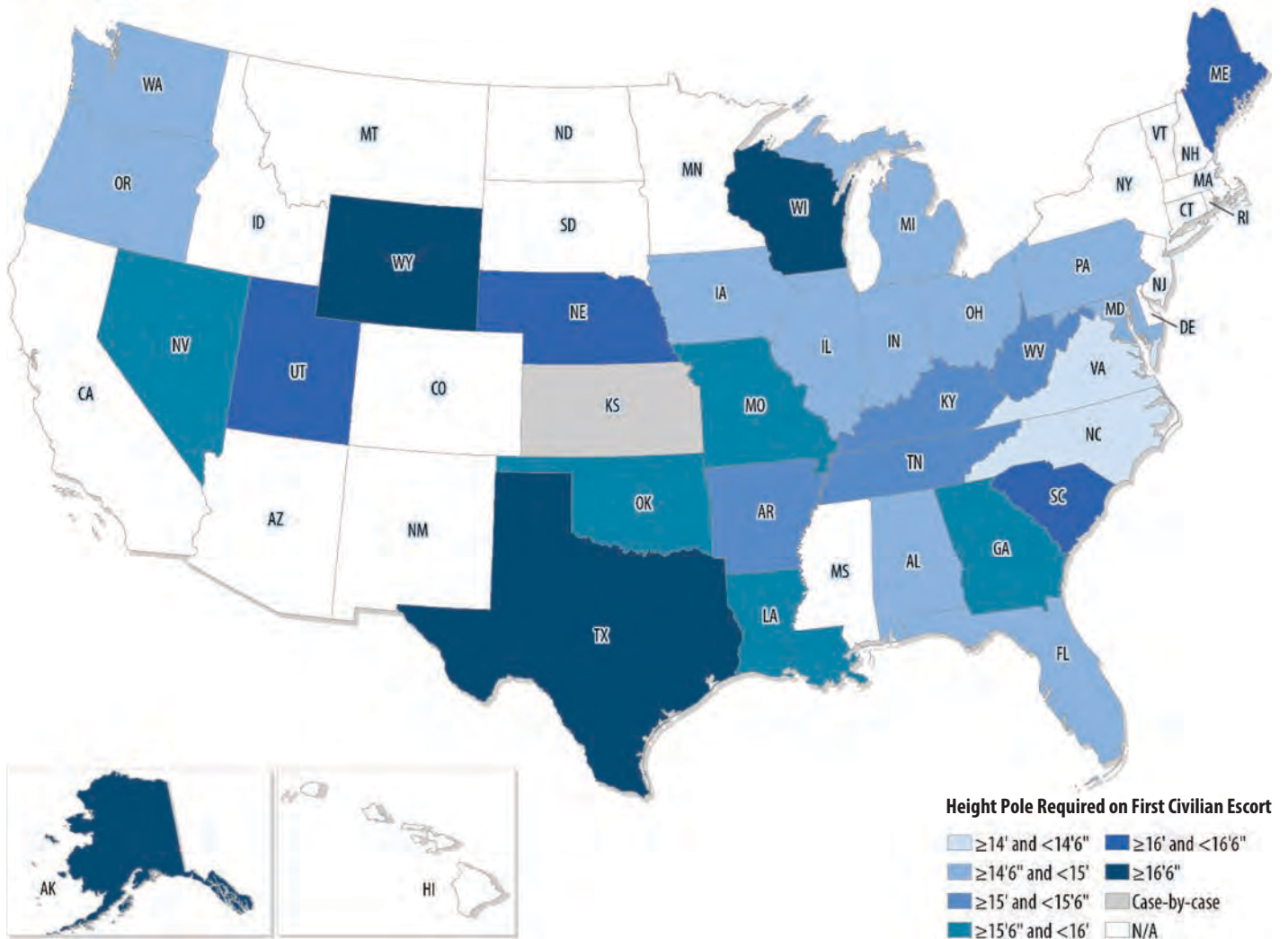


Figure A-16. Height pole required on first civilian escort.

correctly. Height poles are typically placed 6 in. higher than the height of the load on the front of the first civilian escort. It is the responsibility of the front escort to notify the driver of the load if the height pole strikes an overhead structure. Upon notification, the driver would stop and the overhead structure would be assessed to ensure that the load can safely proceed under the structure. When a load is over the height threshold, carriers may be required or they may choose to survey overhead structures. Under those circumstances, some states will not require a height pole. As seen in Figure A-16, with the exception of Maine, every state requiring a height pole is contiguous. Additionally the Midwest, the Southeast, and the Northwest have high concentrations of states requiring height poles.

### Multilane Civilian Escort Requirements

Thresholds for escorts on multilane divided highways are generally higher than those found on two-lane roadways because the loads are not moving against oncoming traffic. In the case of multilane civilian escorts, the values for interstates were reported when states had different requirements for interstates and non-interstates.

## Length

### *First Civilian Escort*

The length threshold for the first civilian escort on multilane roadways is very similar to the length threshold on two-lane roadways (Figure A-17). With a few outliers, the most notable similarity is that the Mississippi River splits the country into less stringent regulations in the west and more stringent regulations in the east. The Northeast administers similar regulations. The states on the West Coast and the Plains states have similar thresholds with a couple of states outside the 115 ft to 125 ft threshold range.

### *Second Civilian Escort*

Compared with the length threshold for the first civilian escort, fewer states require a second civilian escort for overlength vehicles (Figure A-18). Many of the Western, Plains, and some of the Midwestern states do not require a second civilian escort for length. With the exception of Florida, Pennsylvania, New Hampshire, and Maine, the states on the East Coast typically require a second civilian escort for length.

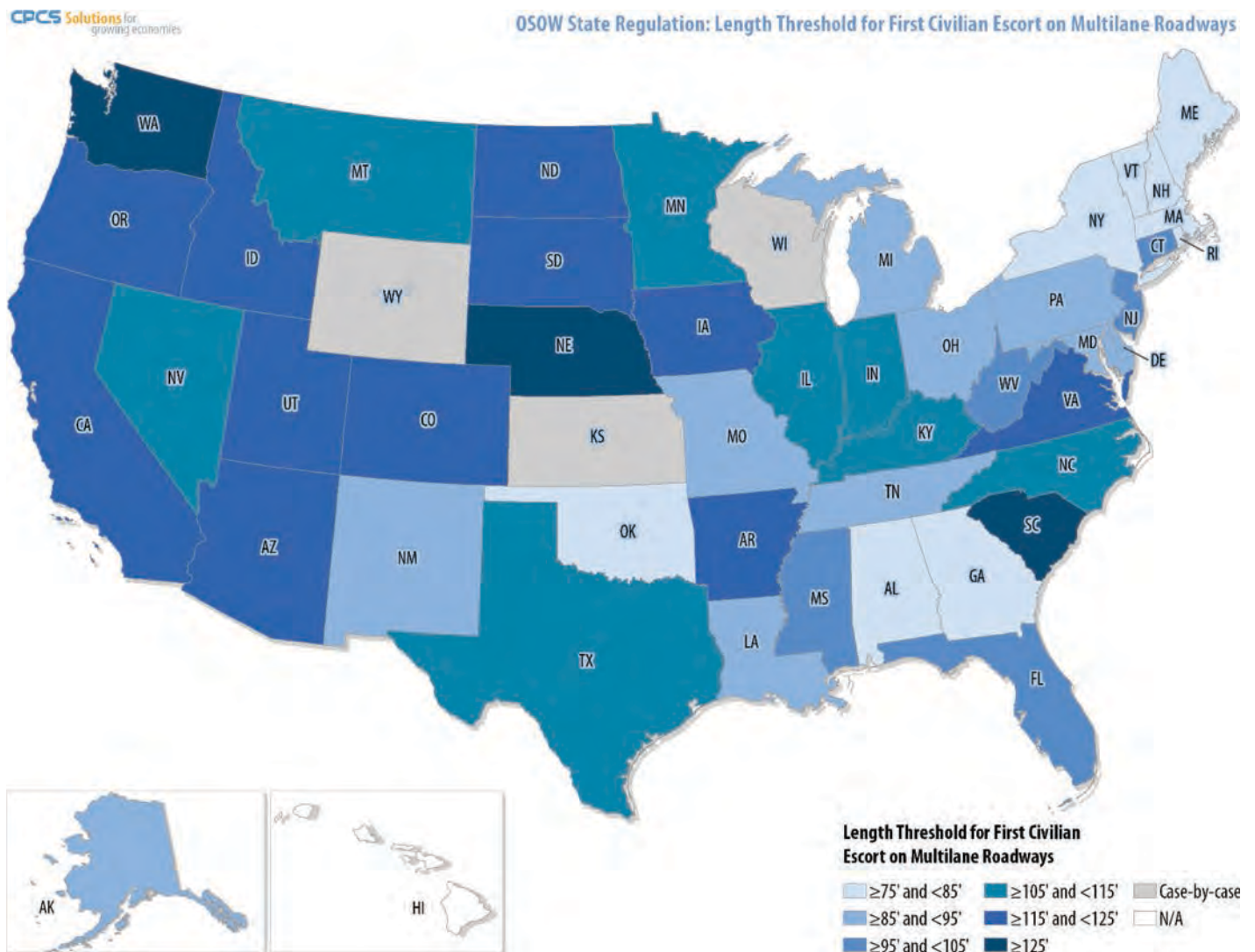


Figure A-17. Length threshold for first civilian escort on multilane roadways.

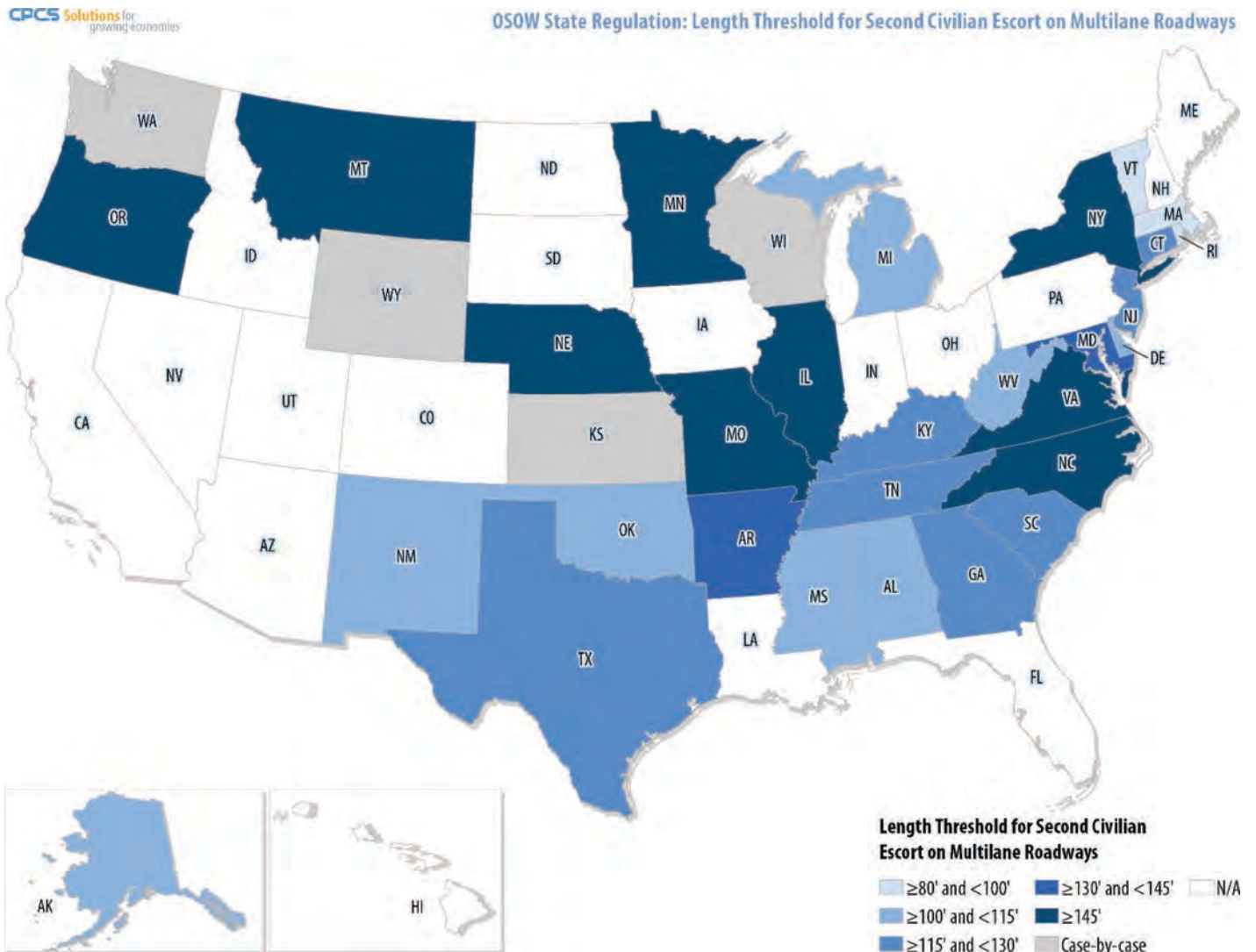


Figure A-18. Length threshold for second civilian escort on multilane roadways.

## Width

### First Civilian Escort

The most noticeable pattern in the width threshold for the first civilian escort is that there are three major clusters of states: one extends from Idaho to Illinois, the other encompasses the states from Indiana to the East Coast, and the final includes the remainder of the states in the Southern Plains and the states in the Pacific Northwest (Figure A-19). While there are a couple of states within each block that have different regulations, the pattern is still highly grouped. Colorado is a notable deviation requiring an escort or a flashing rear light on multilane roadways. When a flashing light can replace an escort, the research team assumed the carrier would use the light rather than hire an escort.

### Second Civilian Escort

Figure A-20 shows the width threshold for the second escort on multilane roadways. Compared with Figure A-19, the regional clusters have either decreased or disappeared. The Northern

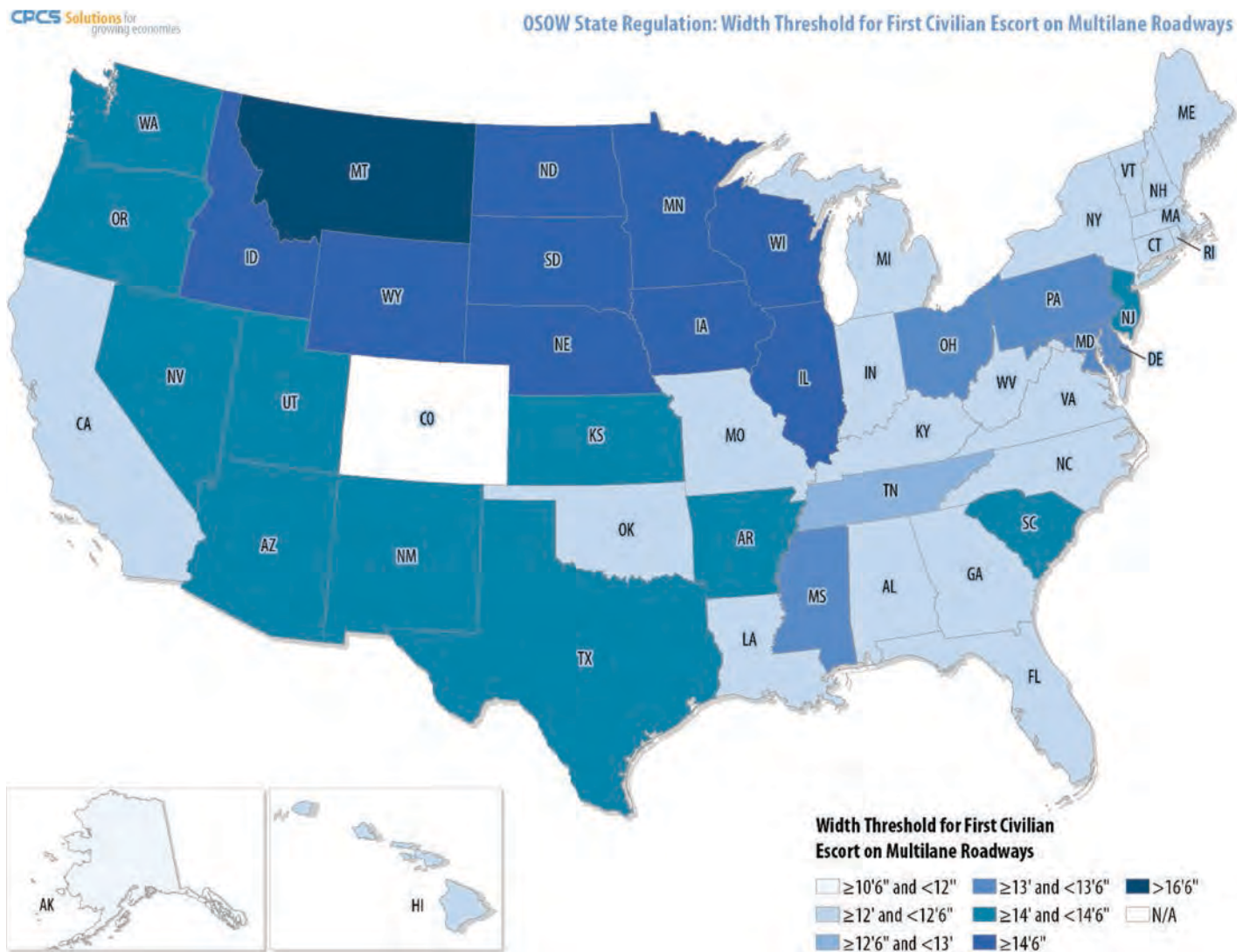


Figure A-19. Width threshold for first civilian escort on multilane roadways.

Plains states and from Maryland to South Carolina remain as a cluster of states with similar regulations. Again, the Eastern states typically impose more restrictive regulations compared with the Midwestern and Western states.

Compared with two-lane roadways, about twice as many states do not require a second civilian escort on multilane roadways for overwidth vehicles. It is not surprising that states have more relaxed regulations on multilane roadways compared with two-lane roadways, given their differences in design and safety barriers.

## Height

### First Civilian Escort

With the exception of Kansas, the height threshold maps for two-lane roadways and multilane roadways are the same (Figure A-21). The safety issues for overheight vehicles on two-lane

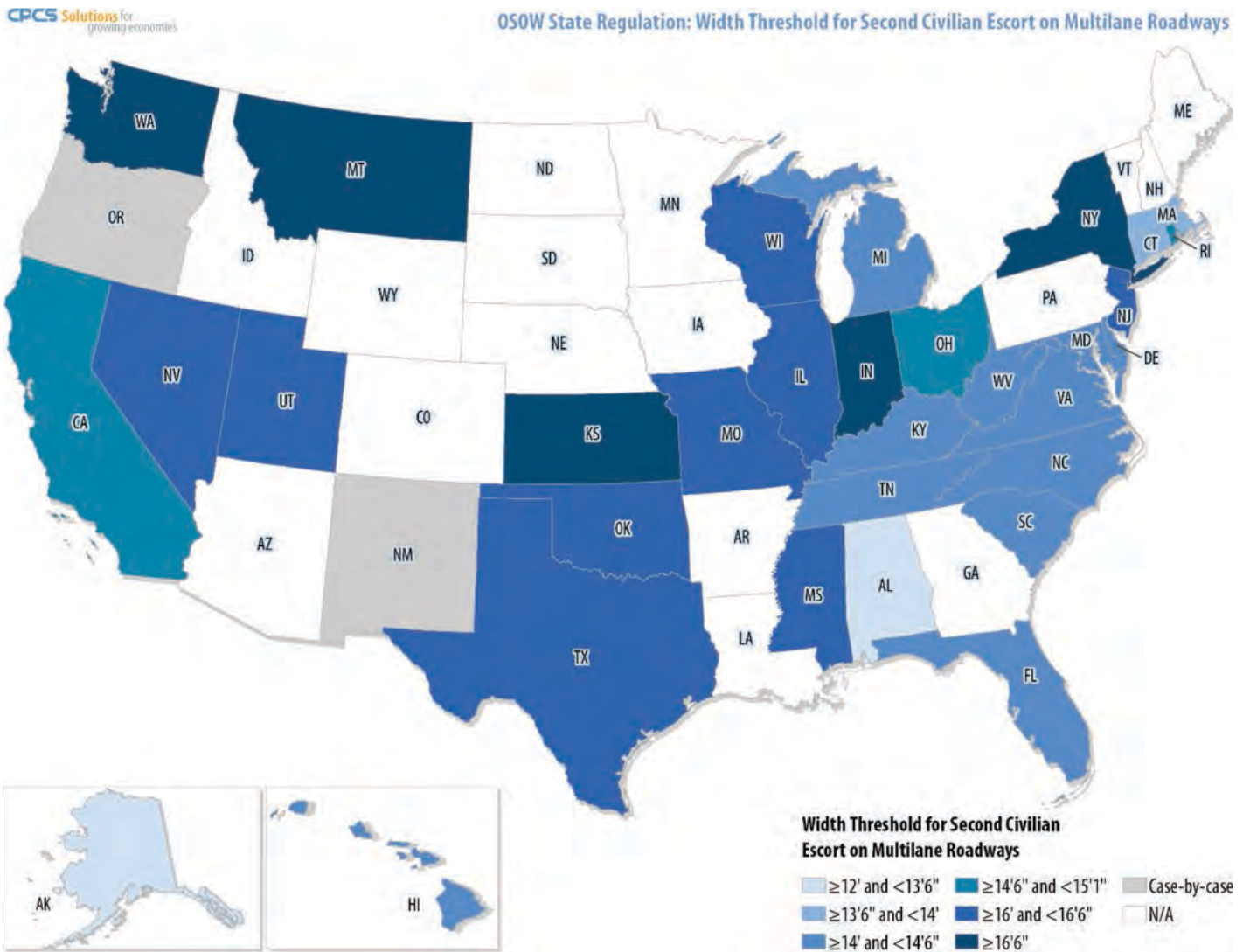


Figure A-20. Width threshold for second civilian escort on multilane roadways.

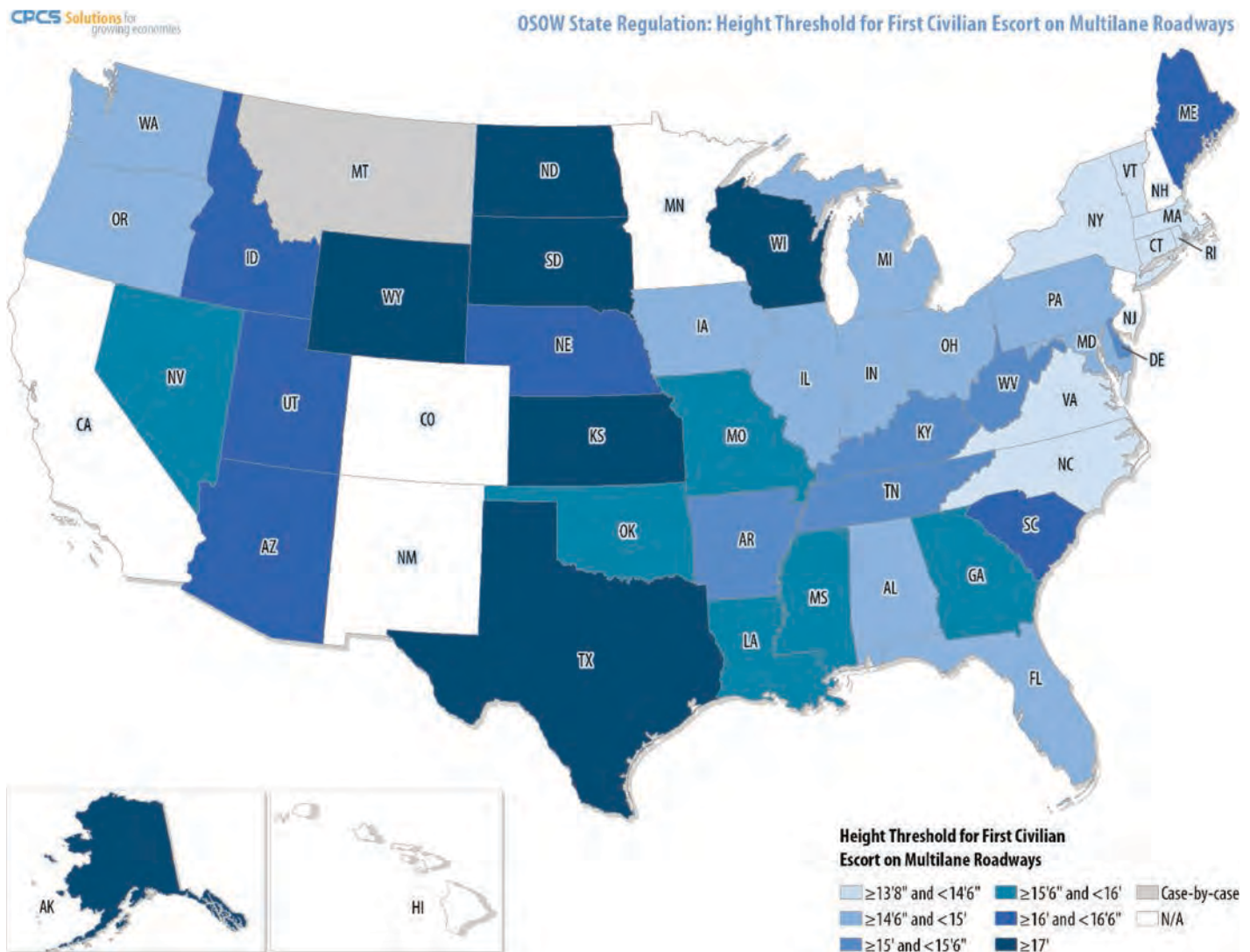


Figure A-21. Height threshold for first civilian escort on multilane roadways.

roadways and multilane roadways are very similar, as is evident from the maps, which are also very similar.

### Second Civilian Escort

The height threshold for the second civilian escort on a multilane roadway (Figure A-22) is very similar to the threshold on a two-lane roadway. The main differences are that Kansas has a value rather than being case-by-case, and Montana and Wyoming do not require a second escort. Overall, most states do not require a second escort and the Central states have the highest concentration of states requiring a second escort for height.

### Height Pole Requirement

The requirement of a height pole on a multilane highway is very similar to the requirement of a height pole on a two-lane highway (Figure A-23). Height poles continue the trend of the states east of the Mississippi, which have more stringent regulations than those west of the Mississippi.

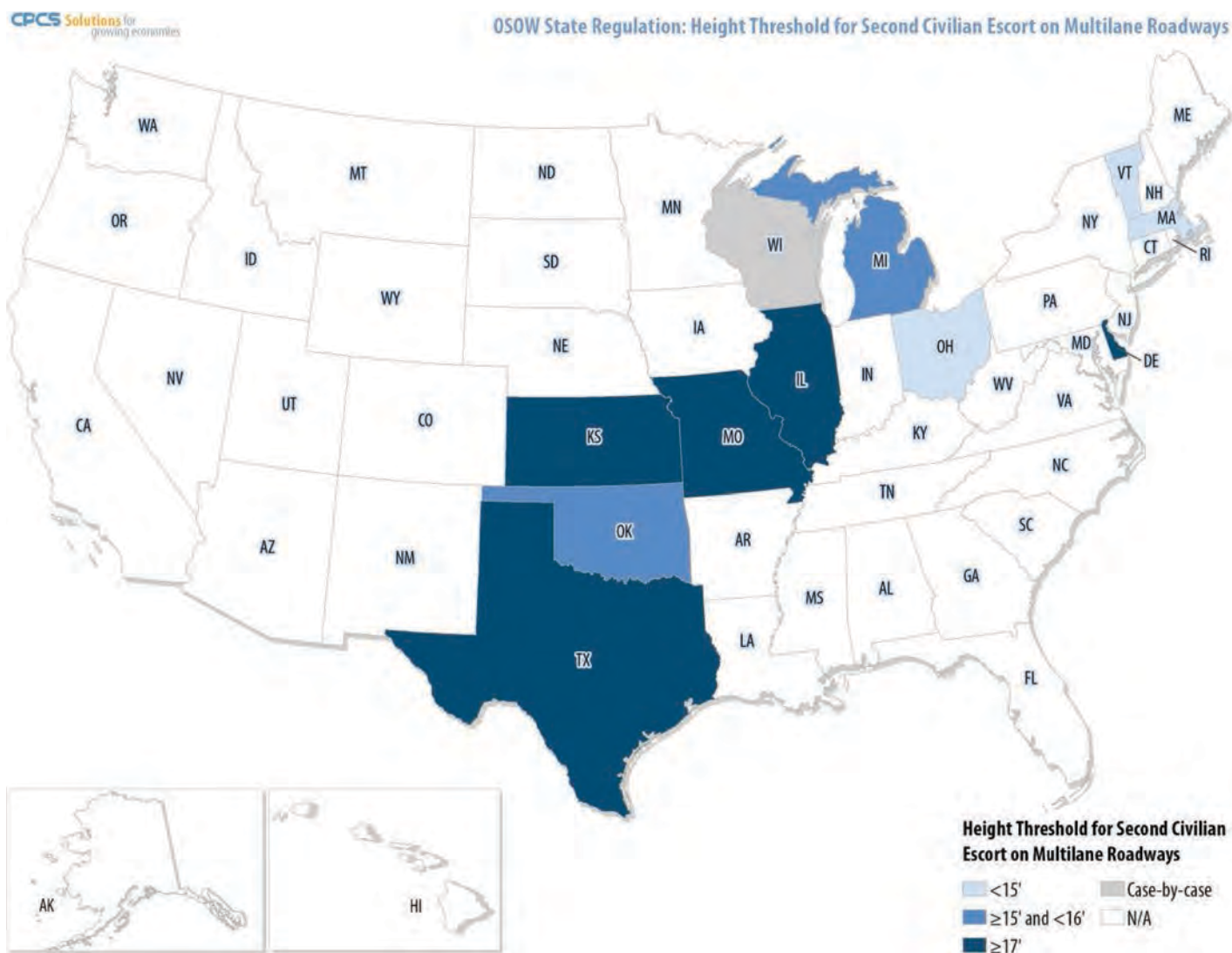


Figure A-22. Height threshold for second civilian escort on multilane roadways.

OSOW State Regulation: Height Pole Required on First Civilian Escort on Multilane Roadways

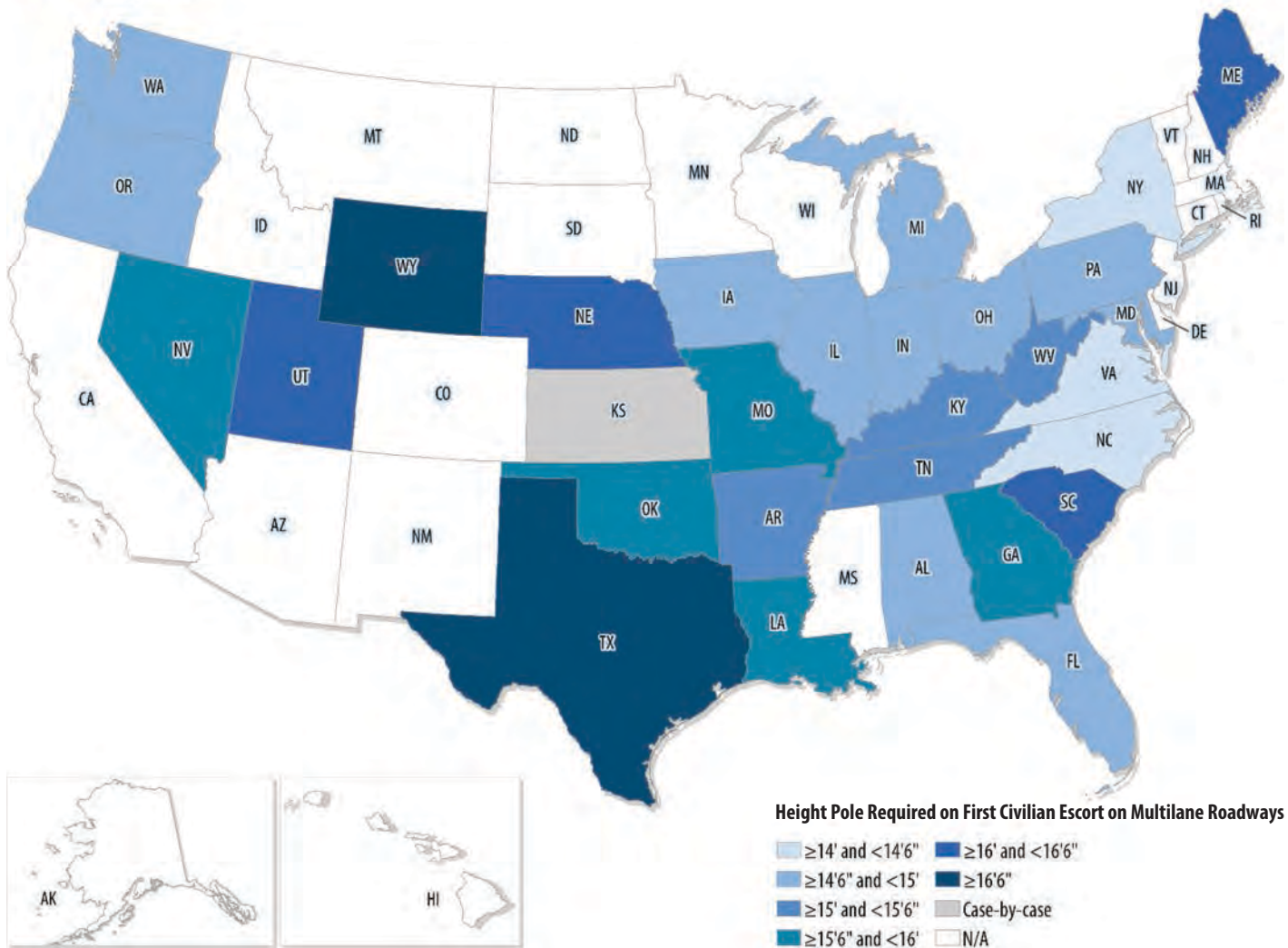


Figure A-23. Height pole required on first civilian escort on multilane roadways.



## State Police Requirements

Police escorts are required when states believe that civilian escorts are insufficient to ensure that a load moves safely through the jurisdiction. If required, a police escort procurement is an expensive element of an OSOW move, driven in part by the variability in regulations governing police hours of duty and jurisdiction. Some states do not allow civilian escorts to control traffic, requiring the state police to shut down intersections as shown in Figure A-24. In cases where an OSOW load needs to control an intersection so that it can use both lanes of the roadway to make a turn, a police escort may be required to stop and direct traffic during the maneuver. The number of state police officers required for a particular move is frequently specified by the state permitting office, but can also be defined by the district offices. OSOW carriers often bid jobs as cost plus police cost because they are often unsure of how many police officers will be required when the states leave the choice up to the district offices or require police officers on a case-by-case basis.

From a cost perspective, states often require a minimum number of hours the police must be paid per OSOW move. In some cases, even if police escorts are only needed for a small portion of a move, regulations require that the police accompany the load for the entirety of its trip within the jurisdiction. From an operational perspective, carriers have to work around the hours police will work, plan with district offices, and plan for exchanges of escorts at jurisdictional boundaries. There are states where police are only available during the eight-hour standard business day, which includes traveling home from the load's location. When limited to less than a full workday, travel can be slowed significantly. Some states require carriers to hire police from the district the load is traveling through, which requires coordinating and potentially waiting for escorts at district boundaries.

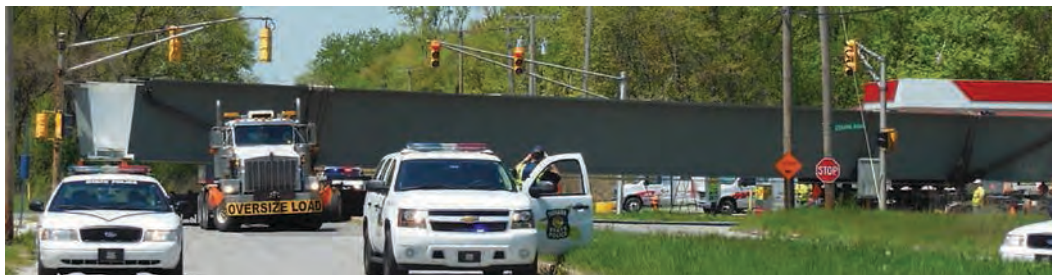
## Length

### *First Police Escort*

From a national perspective, much of the United States does not require a police escort when an OSOW load is overlength (Figure A-25). The Northeastern states are generally the strictest in requiring a police escort after a load reaches a specific length threshold. Outside the Northeastern states, there are very few contiguous states that require a police escort for overlength OSOW loads.

### *Second Police Escort*

Even fewer states require two police escorts for overlong OSOW loads (Figure A-26). Five states have specified thresholds and four states reported that a second police escort is required on a case-by-case basis. Overall, states do not typically require two police escorts if an OSOW load is above its length threshold only.



Source: Perkins Motor Transport

**Figure A-24.** *Police-controlled intersection.*

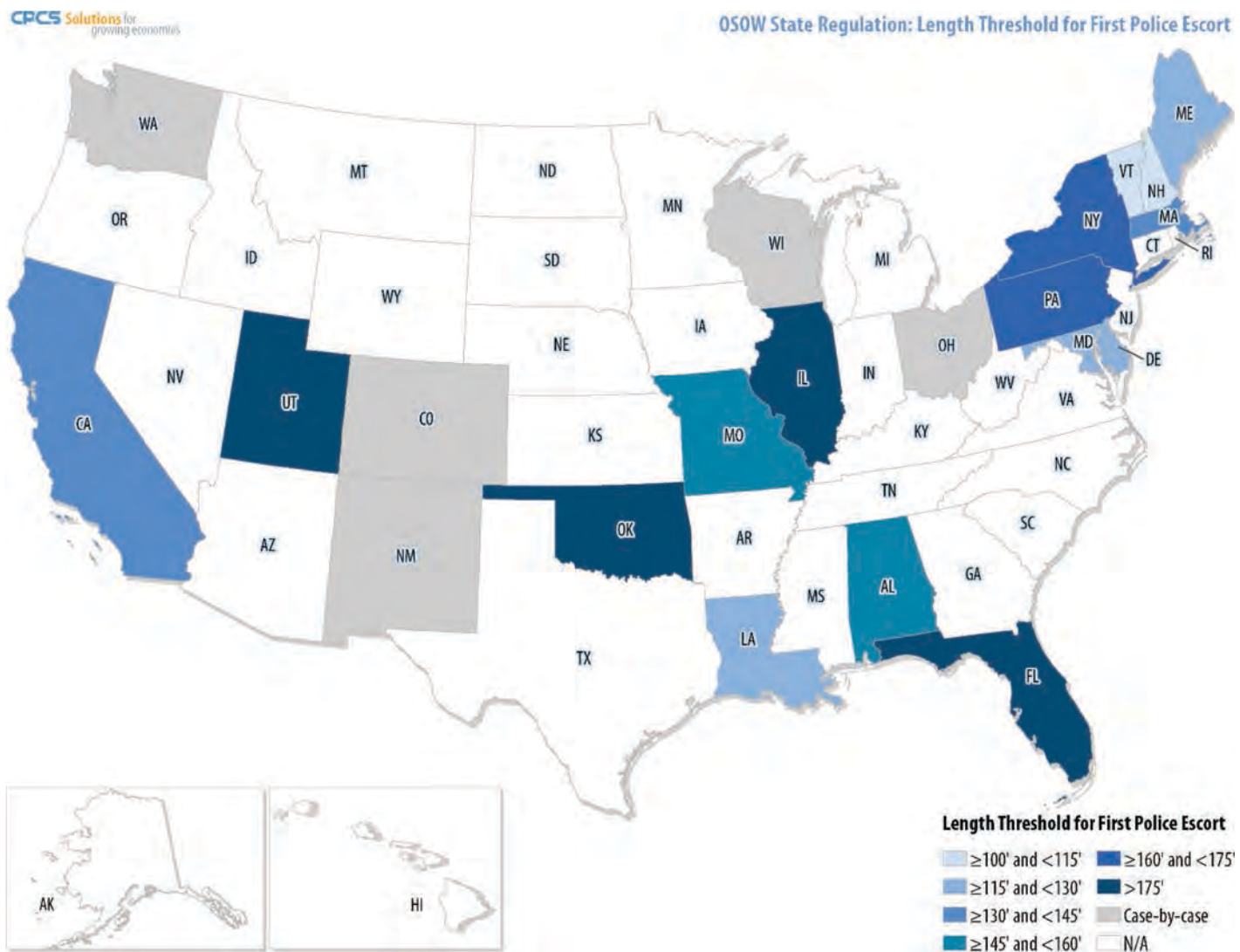


Figure A-25. Length threshold for first police escort.

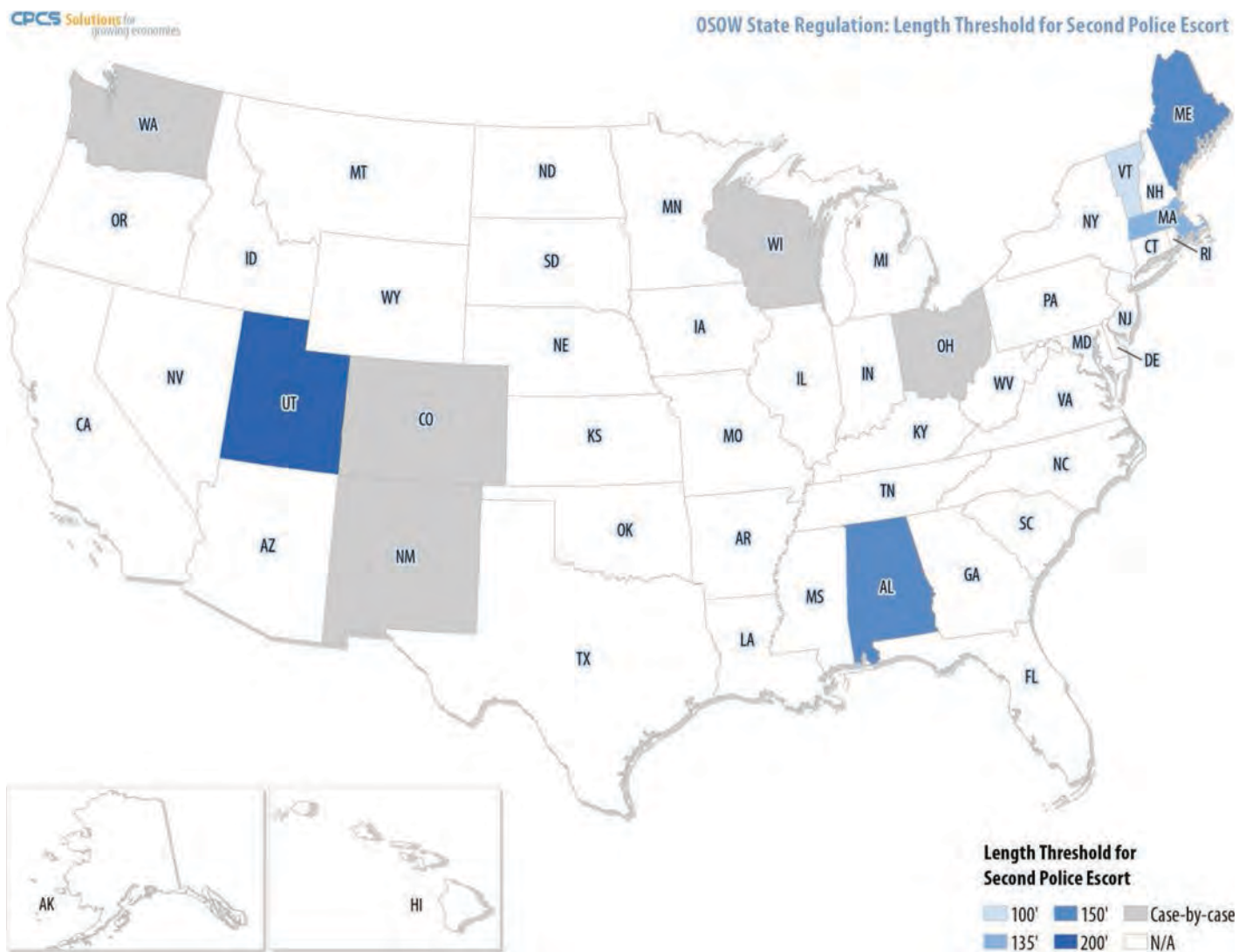


Figure A-26. Length threshold for second police escort.

## Width

### First Police Escort

Relative to overlength OSOW loads, overwidth loads are much more likely to require police escorts. A chain of states from the Midwest extending east and west require police escorts for overwidth OSOW loads. The Southeast states, like the Northeast, have stricter regulations than the rest of the country. Connecticut bases police escorts on multiple dimensions, requiring a police escort if a load is more than 13 ft 5 in. wide and more than 15 ft high (Figure A-27).

### Second Police Escort

The number of states requiring a second police escort greatly decreases compared to the states requiring a first police escort. In fact, more than half the states with a requirement of one police escort did not require a second for loads with larger widths. The central and western parts of the

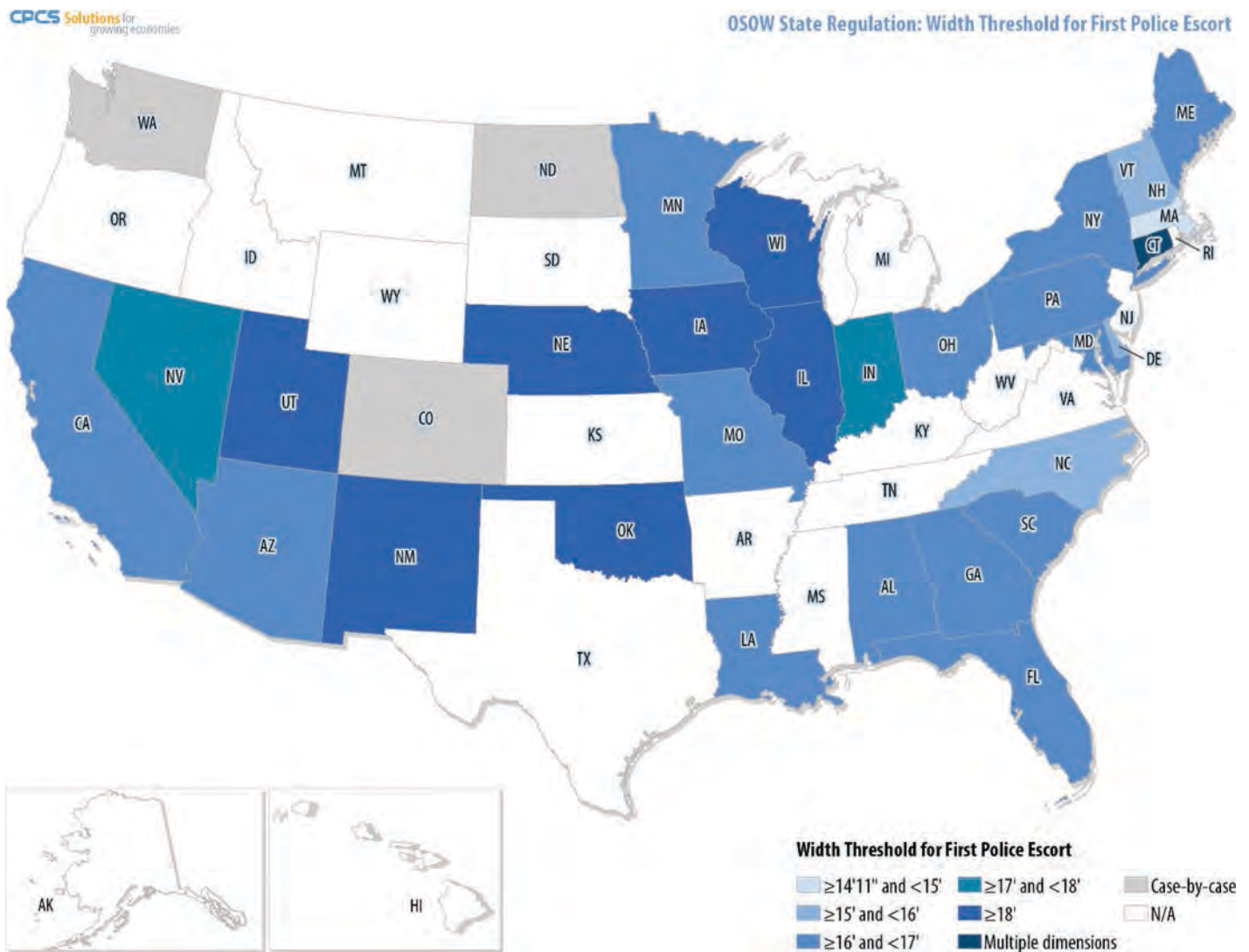


Figure A-27. Width threshold for first police escort.

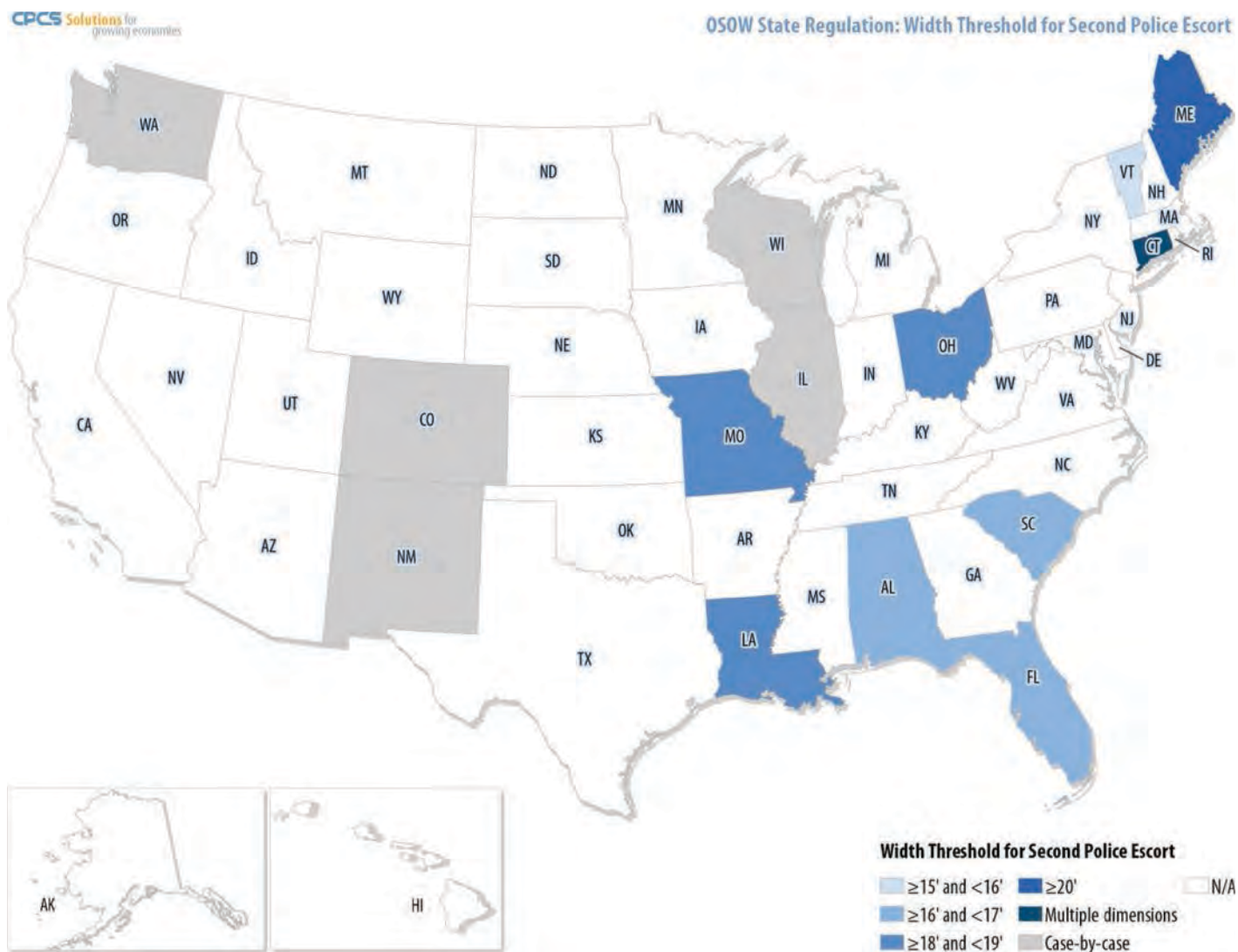


Figure A-28. Width threshold for second police escort.

country contain very few states with any requirement for a second escort. Overall, there are very few states with a second police escort requirement (Figure A-28).

## Height

### First Police Escort

Less than half of the states have police escort requirements for the height of an OSOW load, with wide geographic variability (Figure A-29).

## Weight

### Weight for First Police Escort

The majority of the states do not require a police escort for weight and those that do are geographically diverse (Figure A-30).

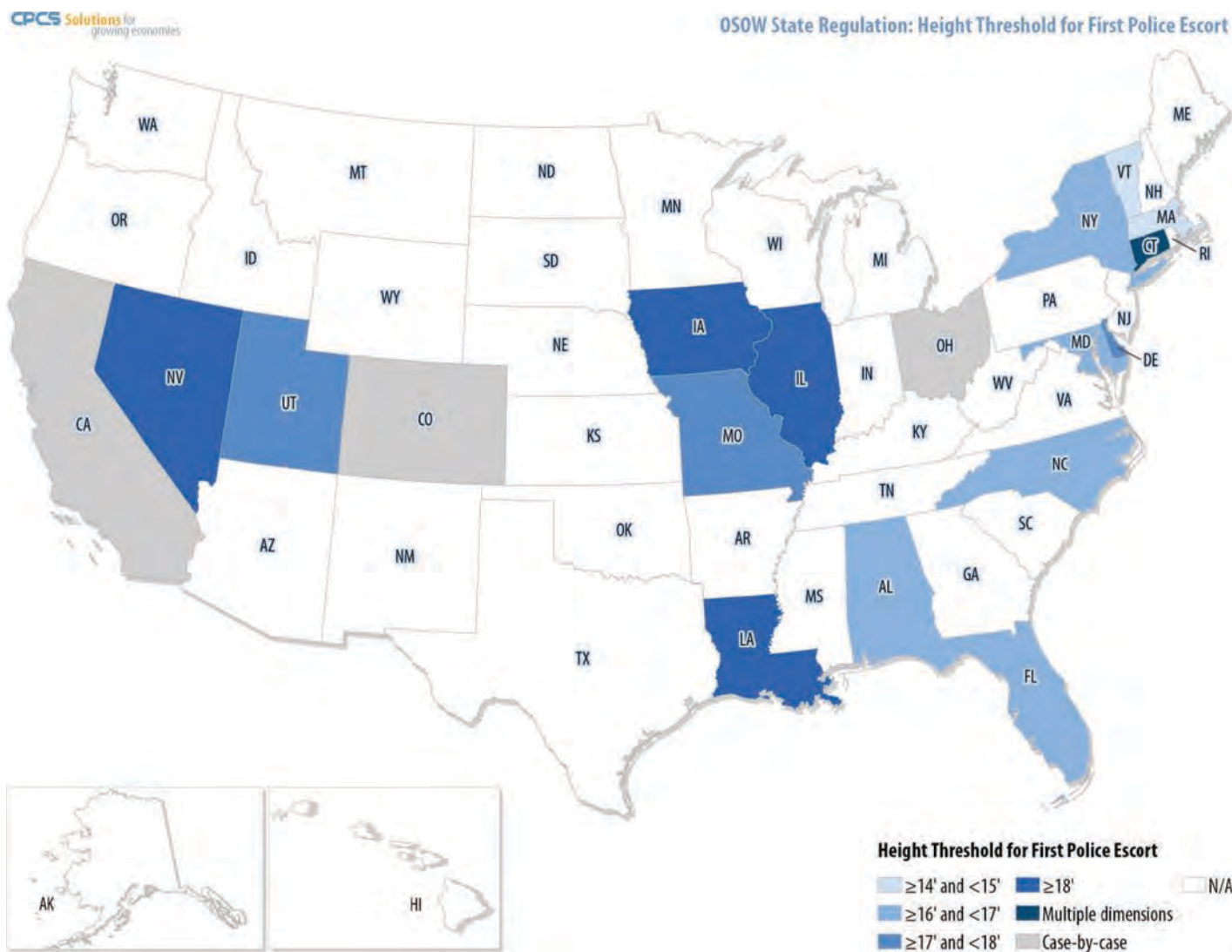


Figure A-29. Height threshold for first police escort.

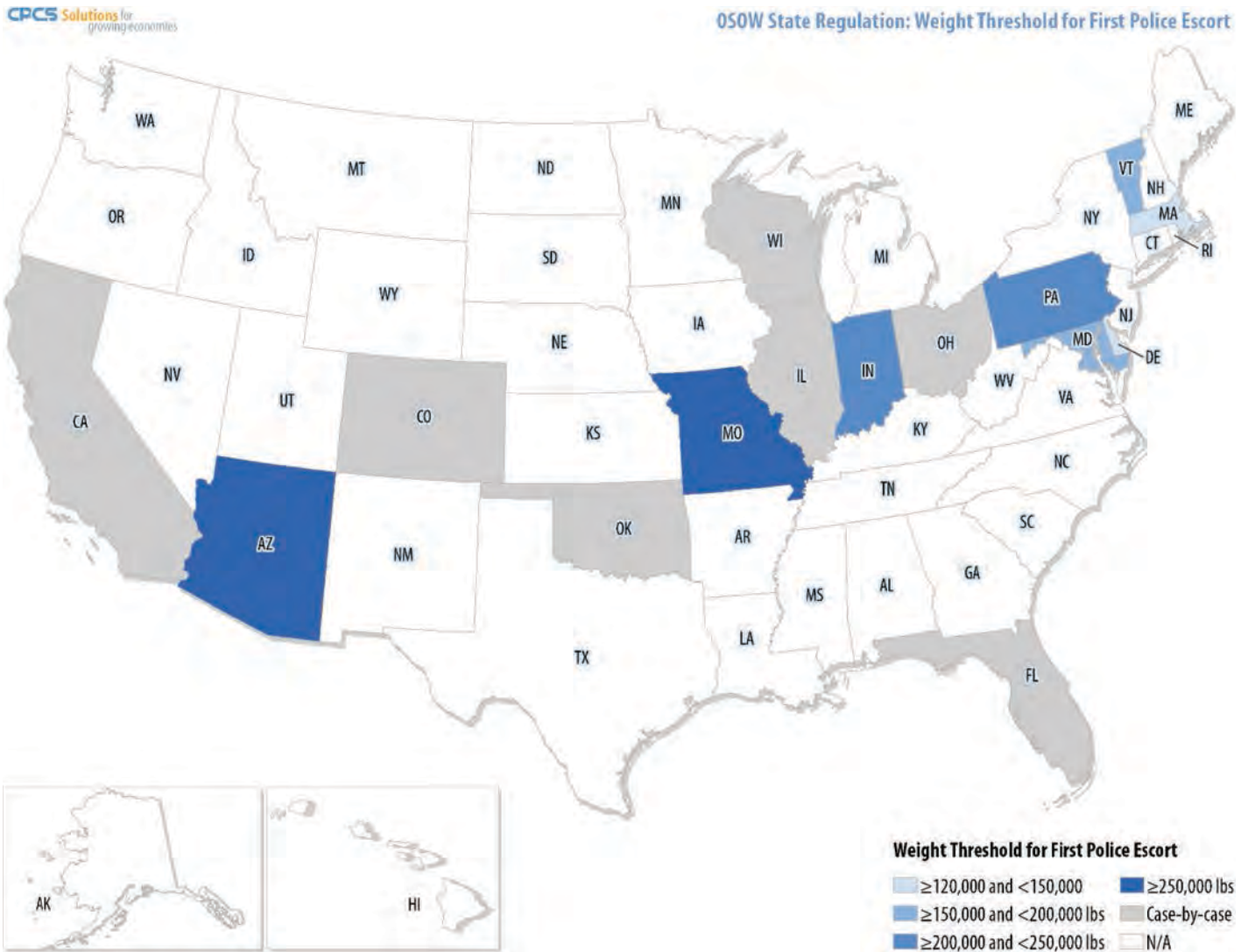


Figure A-30. Weight threshold for first police escort.

## Permit Processing Time

Issuing OSOW permits is the primary role of state permitting offices. Each state has different forms, requirements, technology, and staffing for permitting OSOW loads, which means that the time needed to process permits can vary greatly by state. Additionally, states have different thresholds for loads requiring additional analysis, such as bridge or district reviews.

Carriers maintain internal knowledge about the time needed to permit a load in each state and order permits that take the longest first to make sure that all permits are in hand when the load is scheduled to move.

The trend in OSOW permitting is a move toward the automation of OSOW loads up to a specific size envelope. A 2012 study found that at least 19 states have investigated and implemented technologies referred to generically as advanced permitting and routing systems.<sup>1</sup> These systems can quickly find, approve, and return permits, taking into account infrastructure restrictions, construction, weather, and other limiting conditions. Each state automates the OSOW permitting process to varying degrees, so the impact of automation varies with state. Generally, automated systems allow the permit office to quickly approve loads up to a specific size envelope, thereby leaving more time for large loads that require greater attention.<sup>2</sup>

## Single-Trip Permits

Most states with online permitting services can issue routine OSOW loads almost instantaneously as long as the load is below a certain size and weight requirement. Some states require an individual to review each permit regardless of size, a process that typically requires up to a day for a permit to be issued.

The speed with which an OSOW permit is issued is directly related to the thresholds for route surveys, district reviews, utility notification, and bridge reviews. Once a load exceeds the threshold and needs additional analyses, the time and cost of permitting the load also increase.

Generally, the processing times for single-trip routine OSOW permits do not cause major delays. Even when a permit requires resubmittal, most states reported a turnaround time of less than one day.

Figure A-31 displays the processing time for single-trip routine OSOW permits, based on data collected from state DOTs. The processing time for a single-trip OSOW permit is similar throughout a cluster of states that extends from Idaho to North Dakota in the north and Utah to Arkansas in the south. Adding to this cluster, Texas, Louisiana, Missouri, and Illinois have processing times that are quicker, making this grouping of states one of the fastest to process permits. The East Coast and the West Coast generally have longer processing times.

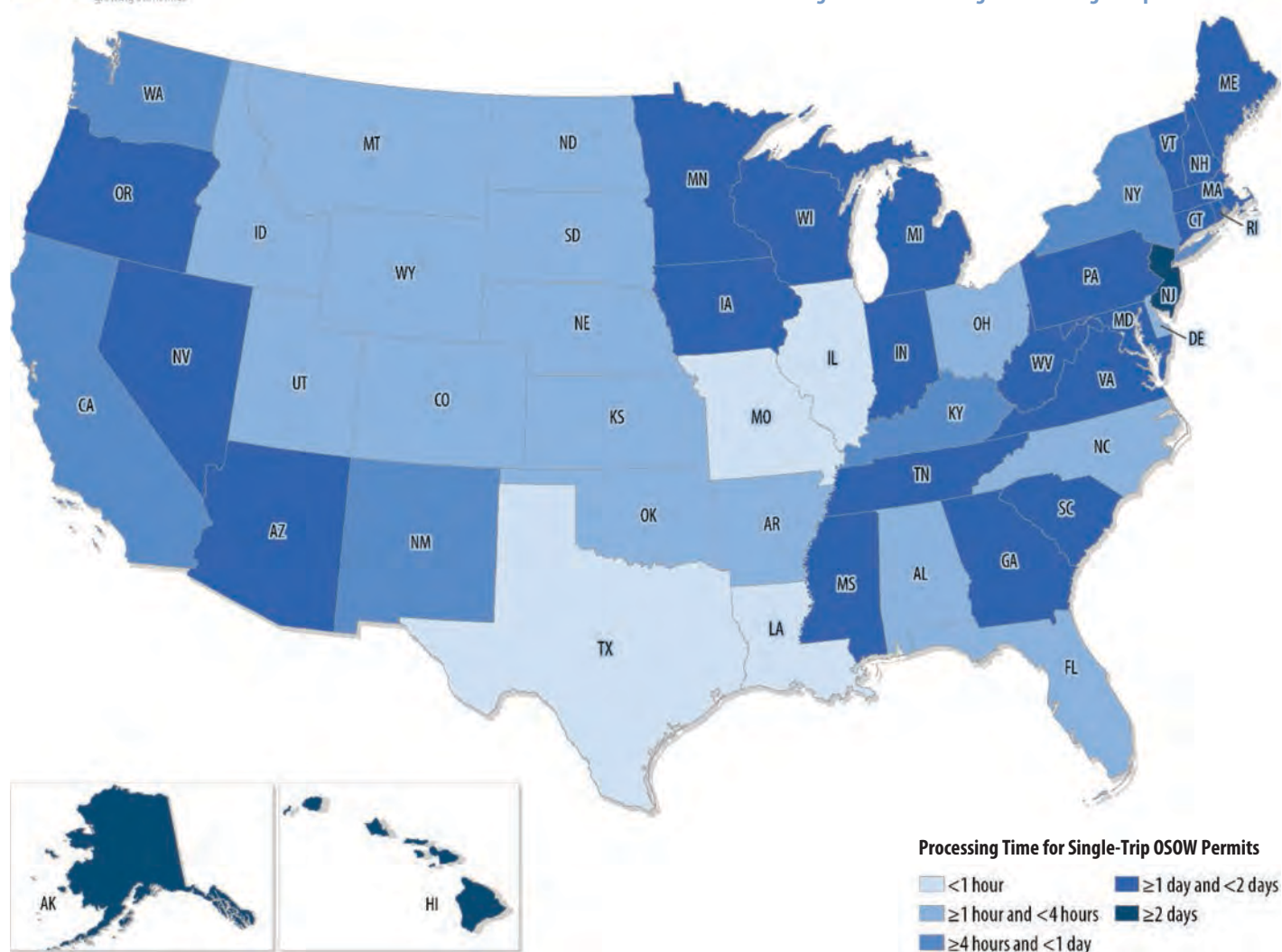
## Superloads

The time it takes to process a superload permit is dependent on the infrastructure and the load's size and weight. The infrastructure may require numerous bridge analyses, a route survey, utility notifications, and district reviews. Superload permits on routes with relatively few bridges can generally be processed within 2 days. At the other end of the spectrum, some states

<sup>1</sup>Middleton, D., Y. Li, J. Le, and N. Koncz. *Accommodating Oversize and Overweight Loads: Technical Report*. Texas Transportation Institute, 2012.

<sup>2</sup>C. Titz. *Oversize/Overweight Permitting Practices Review*. New Jersey Department of Transportation, 2011. <http://www.nj.gov/transportation/refdata/research/reports/NJ-2011-002.pdf>. Accessed November 16, 2015.





**Figure A-31.** Processing time for single-trip OSOW permits.

can take 6 to 8 weeks for superload approvals. Superloads with complicated routing challenges may take several weeks to receive permits because state DOTs can only permit roadways that are state-maintained. States with numerous infrastructure impediments such as low or weak bridges rely on city and county roadways for routing around impediments. In some instances, carriers are required to have approval from cities and counties to use their roadways before the state will issue the state permit. Therefore, states with many OSOW impediments that rely on local roadways will typically have longer permit processing times.

Compared to the processing time for single-trip, routine OSOW permits, superloads are more varied. States have different thresholds for characterizing a load as a superload, which contributes to the variation in processing times. Geography and infrastructure, especially bridges, also add to the variability in processing times for superloads. States reported values anywhere from 1 day to up to 8 weeks for processing superloads. Figure A-32 displays the variation in the permit processing time for superloads. While there are a few regional clusters, superload carriers can expect variation in superload processing times when permitting a multi-jurisdictional OSOW load.

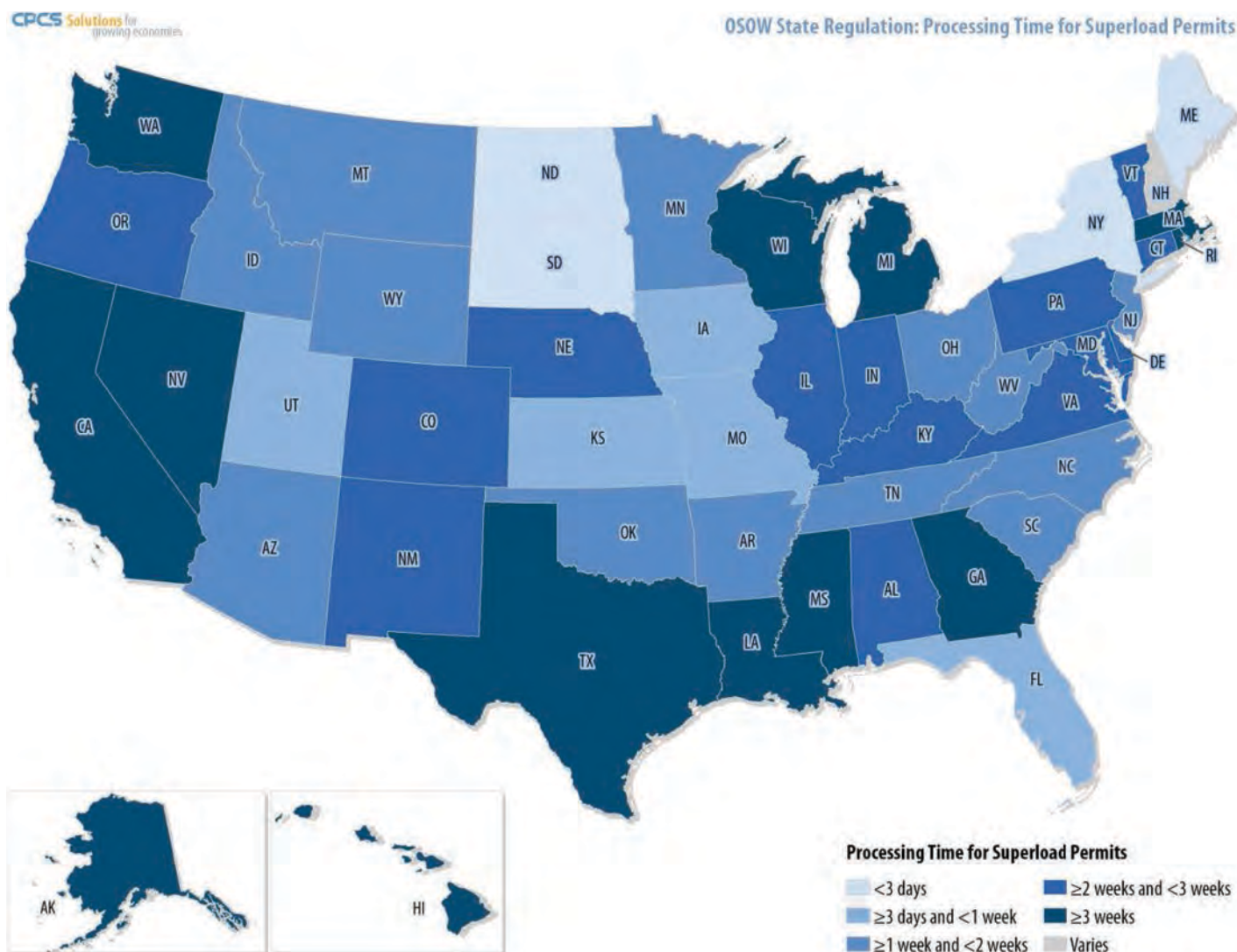


Figure A-32. Processing time for superload permits.

## Hours of Travel

The hours of travel an OSOW load can move are regulated in every state. Typically, states will allow loads within a specified size envelope to move 24 hours per day through their state. When loads exceed the specified size envelope, they are restricted in their hours of travel.

The most common hours of travel for OSOW loads are sunrise to sunset. But states define sunrise and sunset differently. Some states allow loads to move one-half hour before sunrise and one-half hour after sunset, and others are limited to the exact time of sunrise until sunset.

Beyond the daylight restrictions, states and municipalities limit travel during rush hour near cities, during school bus travel hours, on holidays, or during special events in local jurisdictions. States also may allow their districts and localities to specify when travel is allowed on their permits, creating an additional layer of restriction. Hours of travel restrictions are used to limit the travel of OSOW loads to a time when it is determined safe to move.

Generally, states have similar regulations governing movement on weekdays, in that they allow envelope vehicles to move 24 hours per day within daytime travel limits (e.g., sunrise to sunset). Weekend travel comes with much more variation. Some states do not allow weekend travel while

others restrict weekend travel to Sunday only. Overall, carriers are much more likely to face travel restrictions on the weekend than during the week.

## Monday Through Friday Hours of Travel

### *Length for Continuous Travel*

Less than half of the states allow 24 hours of travel per day Monday through Friday for OSOW loads that are overlength. Figure A-33 displays length thresholds for 24 hours of travel per day. Loads moving in states in the non-applicable category mean all overlength loads are subject to hours of travel restrictions. Western states are more likely to allow 24 hours per day travel for overlength loads along with a grouping of Central states.

### *Width for Continuous Travel*

States do not allow 24 hours of travel per day for loads with overwidth dimensions as often as they do allow loads with overlength dimensions. Most of the states in the Upper Midwest and the West allow 24 hours of travel per day for overwidth vehicles up to a certain threshold only.

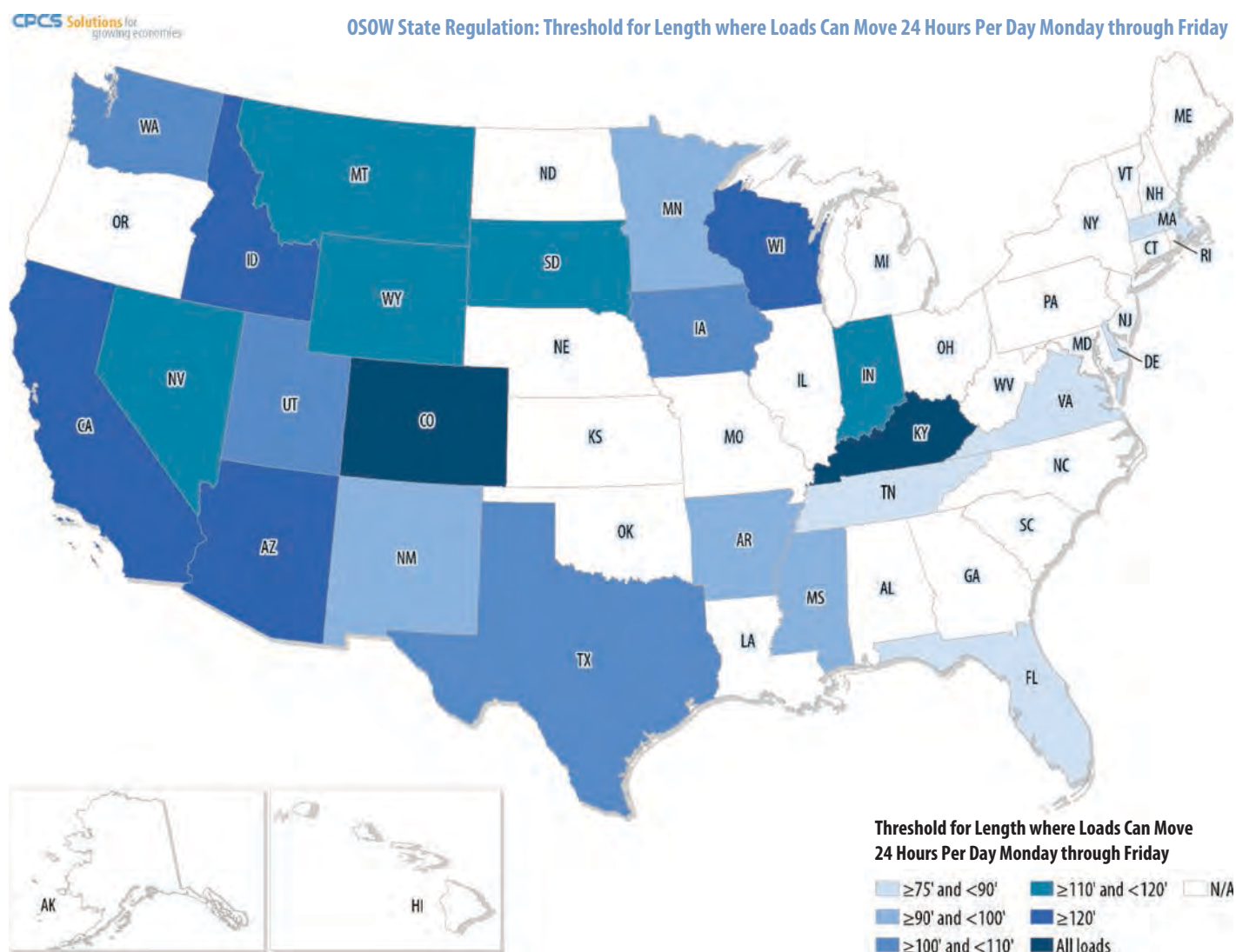


Figure A-33. Threshold for length where loads can move 24 hours per day Monday through Friday.

Additionally, there are two major clusters of states with similar regulations: one from California to Washington and the other from Idaho through the Dakotas. But the states in the lower Midwest, Northeast, and Southeast do not allow 24 hours per day travel for loads that are overwidth (Figure A-34).

### *Height for Continuous Travel*

Compared to width, fewer states allow OSOW loads to move 24 hours per day if they are overheight (Figure A-35). Again, the West Coast has the highest concentration of states that allow 24 hours of travel per day for overheight loads, but the most frequent policy is to prohibit 24 hours of travel per day for overheight loads.

### *Weight for Continuous Travel*

Figure A-36 displays weight thresholds for 24 hours of travel per day. The majority of Midwestern, South-Central, Northeastern, and East Coast states allow 24 hours of travel per

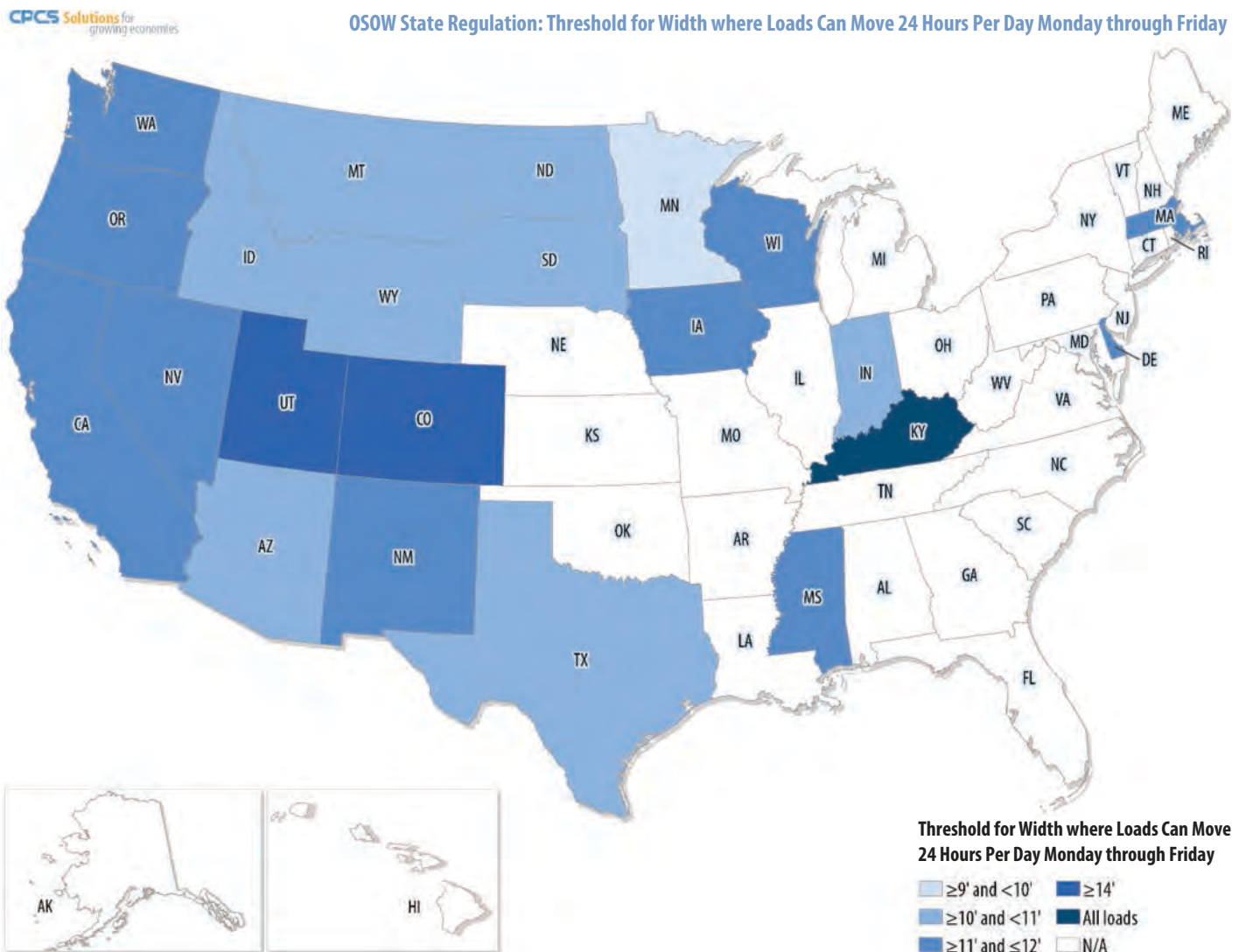


Figure A-34. Threshold for width where loads can move 24 hours per day Monday through Friday.



OSOW State Regulation: Threshold for Height where Loads Can Move 24 Hours Per Day Monday through Friday

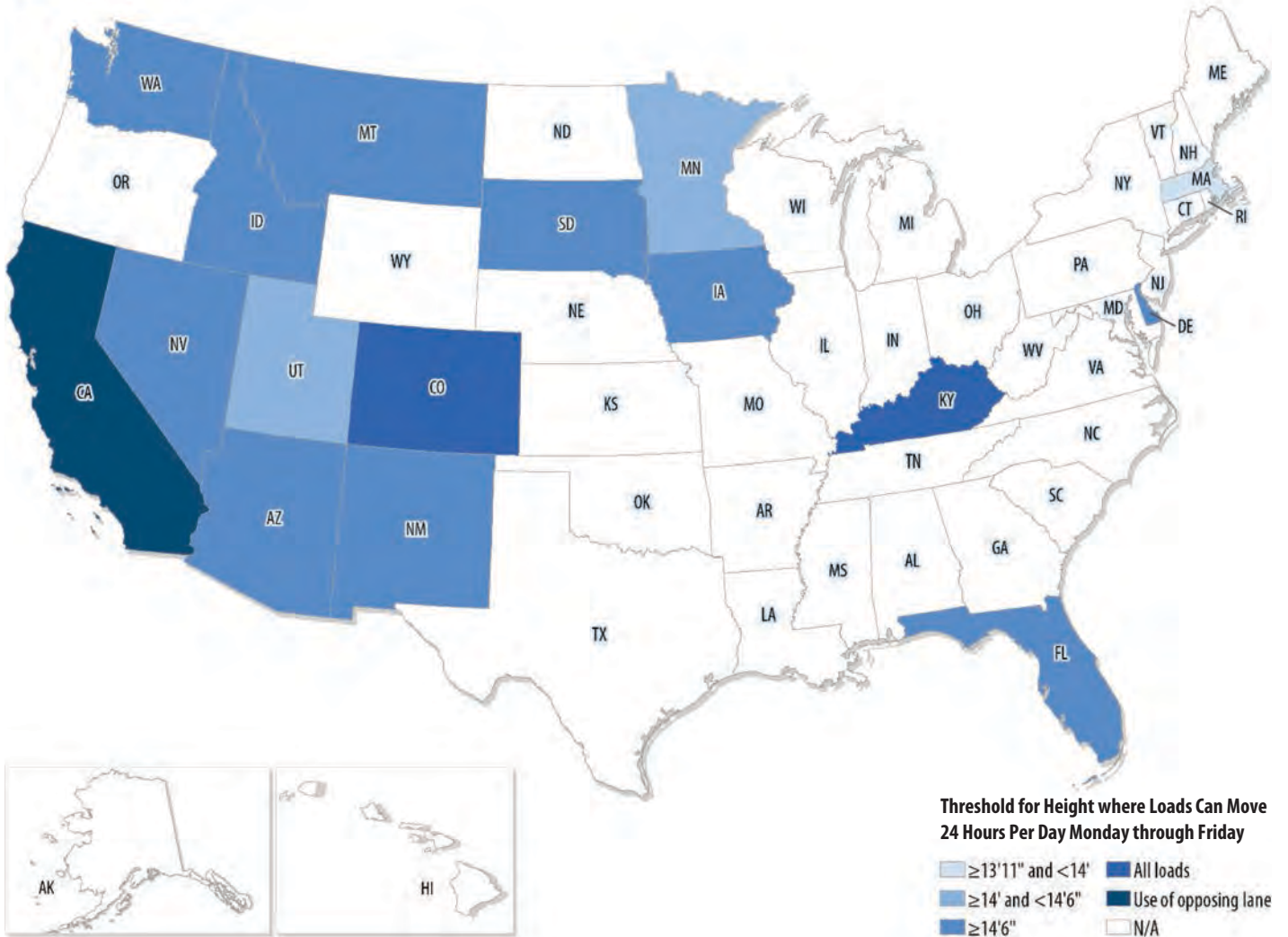


Figure A-35. Threshold for height where loads can move 24 hours per day Monday through Friday.

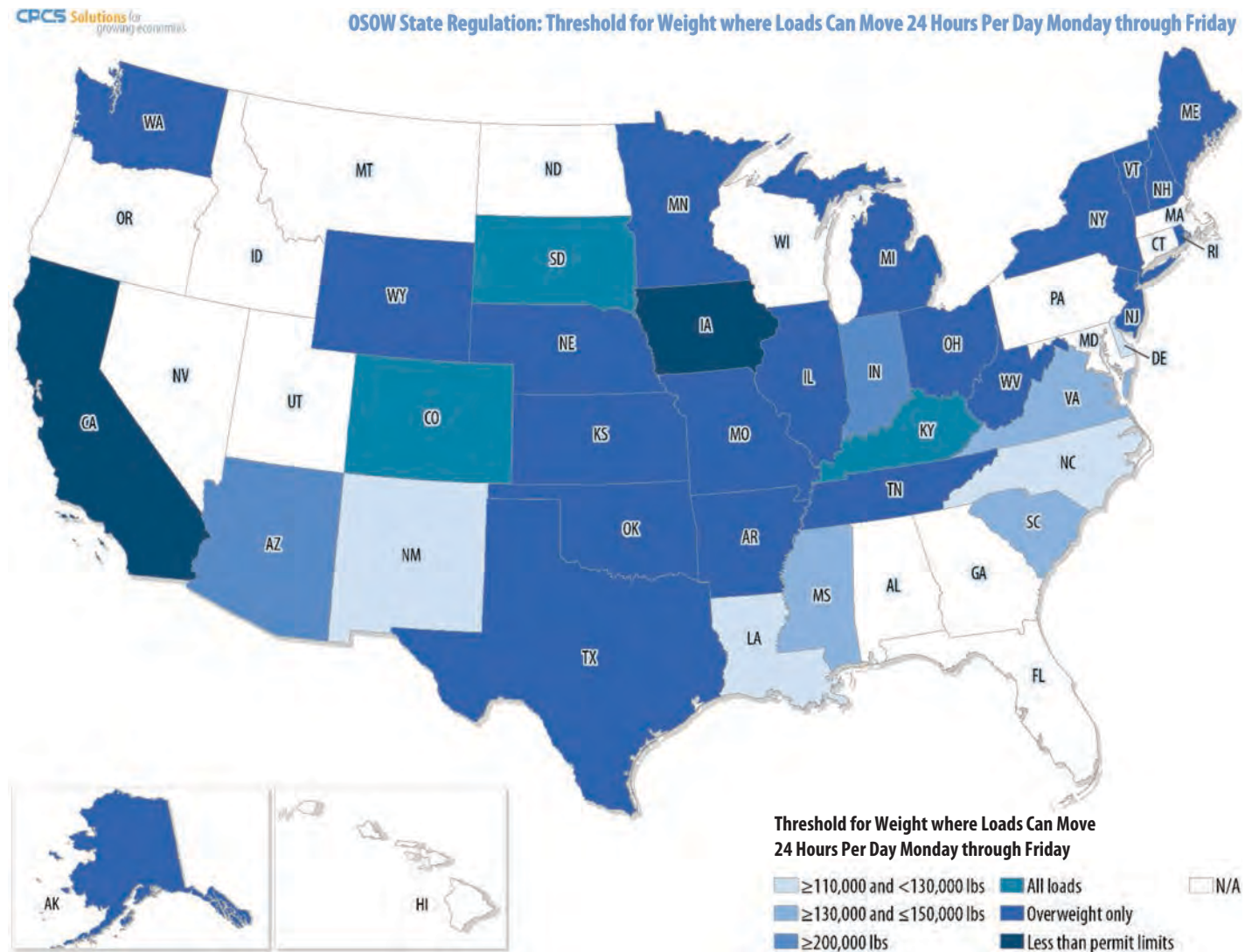


Figure A-36. Threshold for weight where loads can move 24 hours per day Monday through Friday.

day for overweight vehicles. Overall, the majority of states that allow 24 hours of travel per day for overweight vehicles require the load to be overweight only. Conversely, other states allow length, width, and height dimensions to be over the legal size in addition to the load being overweight as long as none of the dimensions are above the 24 hours of travel per day envelope.

### Weekend Hours of Travel

States implement weekend hours of travel restrictions in a variety of ways. Some states bar all OSOW travel on Saturdays and Sundays, others restrict Sunday travel only, and still others restrict OSOW movement for loads up to specified weights and dimensions. Weekend hours of travel are important to OSOW carriers because of their impact on route planning and the potential delay they may cause. To the extent possible, carriers plan their routes such that they get through states with weekend travel restrictions by Friday or begin travel in those states on

Monday. The research team simplified the OSOW restrictions on weekend travel to display states that bar all OSOW travel.

### *Saturday Travel Allowed*

All but a few states allow Saturday travel for loads within a specified dimension and weight envelope. Figure A-37 displays the states that restrict all OSOW loads from traveling on Saturdays. Generally, states allow Saturday travel with the exception of New Hampshire and Rhode Island. Additionally, Maine restricts Saturday travel during the months of July and August.

### *Sunday Travel Allowed*

OSOW travel is restricted on Sunday in more states than it is on Saturday. In total, 10 states have either a seasonal or an annual restriction on OSOW travel on Sundays. Among the states

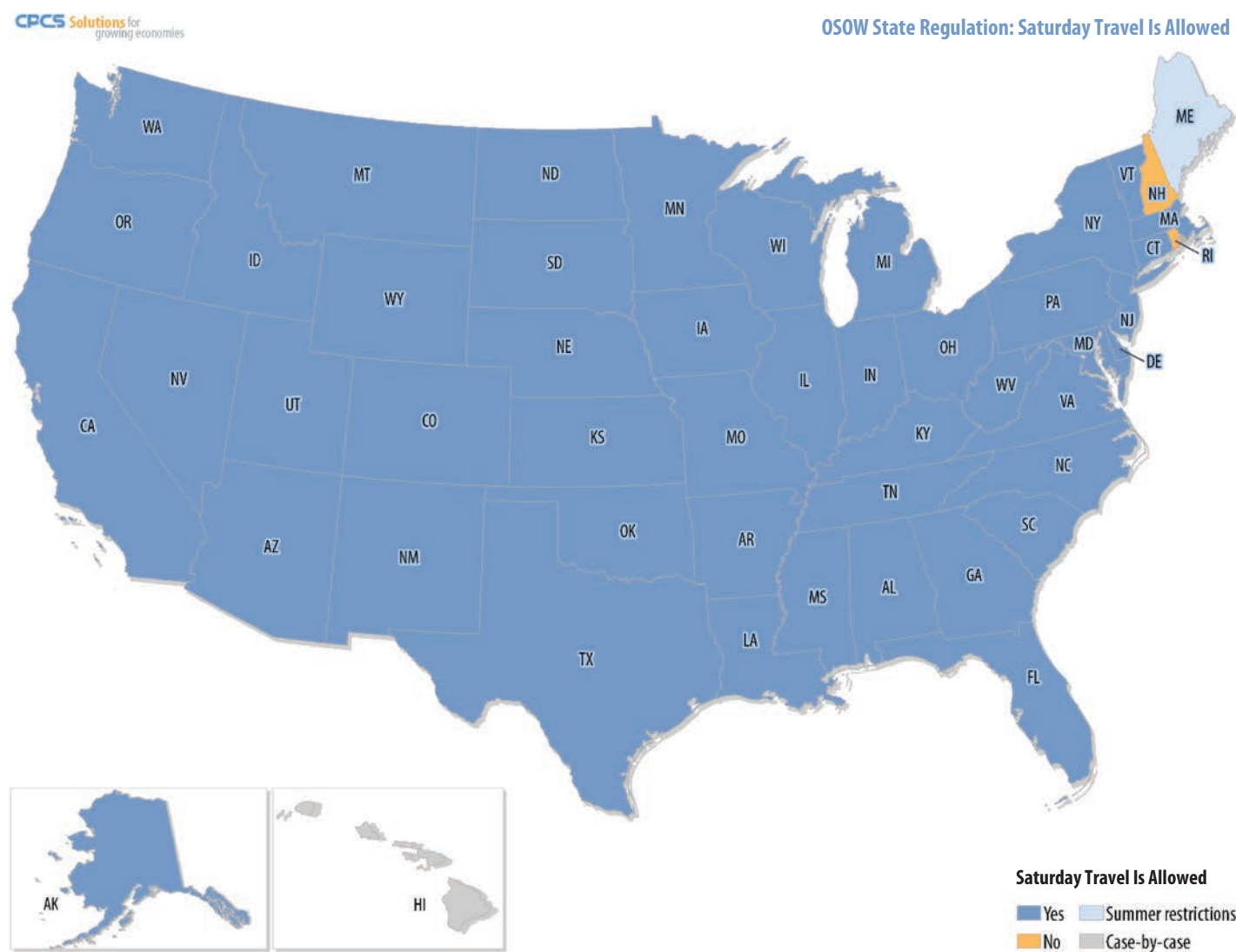


Figure A-37. Saturday travel is allowed.

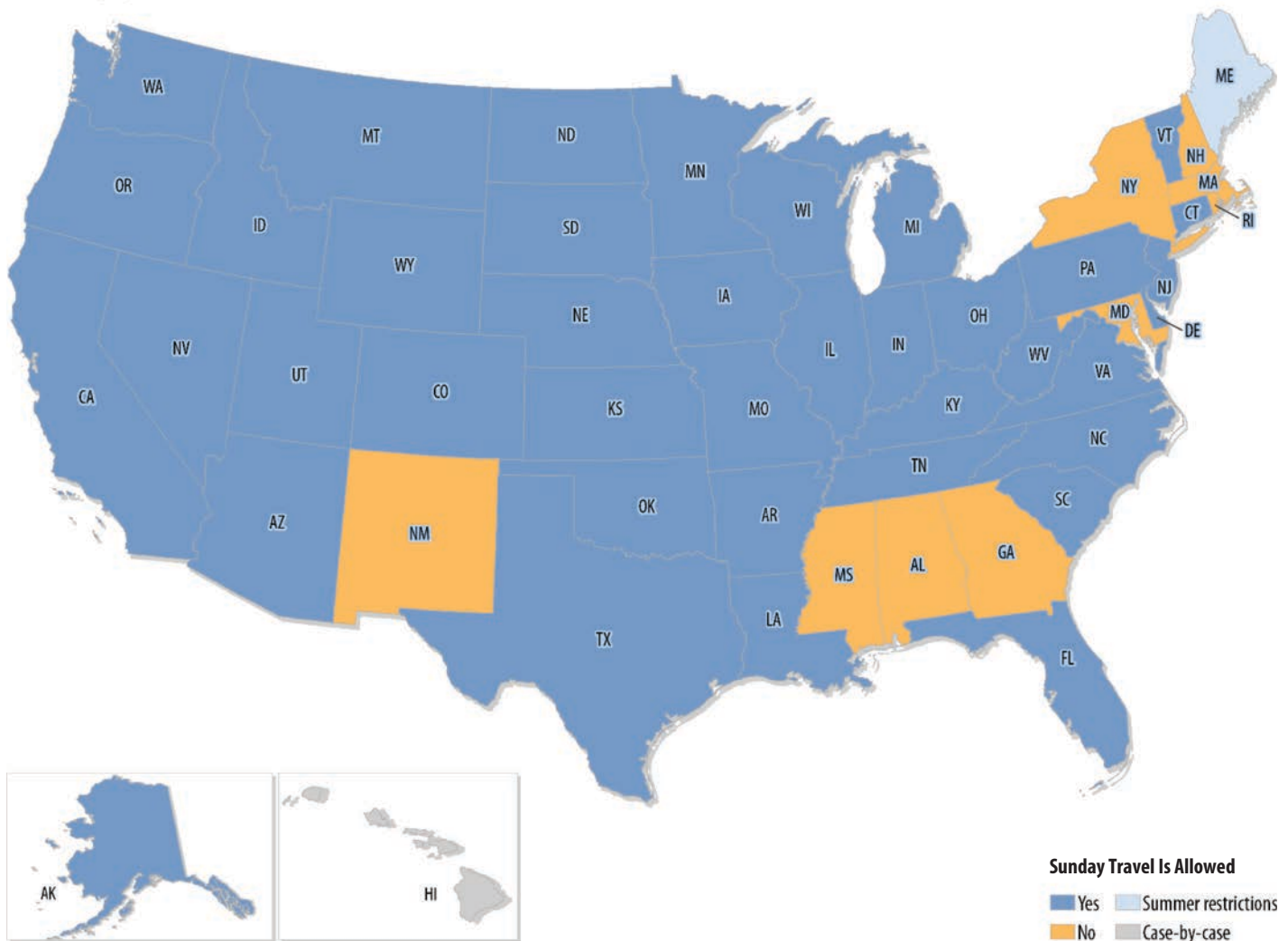


Figure A-38. Sunday travel is allowed.

that restrict OSOW on Sunday, Maine enforces seasonal restrictions on Sunday travel during July and August (Figure A-38).

### Civilian Escort Certification

While all states require civilian escorts once a load exceeds state-defined dimensions, some states require escorts to become certified through a training course to promote safe operations. The number of states requiring certification is trending upward and should continue to increase given recent NTSB recommendations that AASHTO and the commercial vehicle safety alliance work together to institute a model training and certification process for escorts.<sup>3</sup> While states with escort certification requirements typically recognize escort certification from other states, New York does not recognize any other state's civilian escort certification program.

<sup>3</sup> Collapse of Interstate 5 Skagit River Bridge Following a Strike by an Oversize Combination Vehicle, Mount Vernon, Washington, May 23, 2013. NTSB, 2014. <http://www.nts.gov/investigations/accidentreports/reports/HAR1410.pdf>.



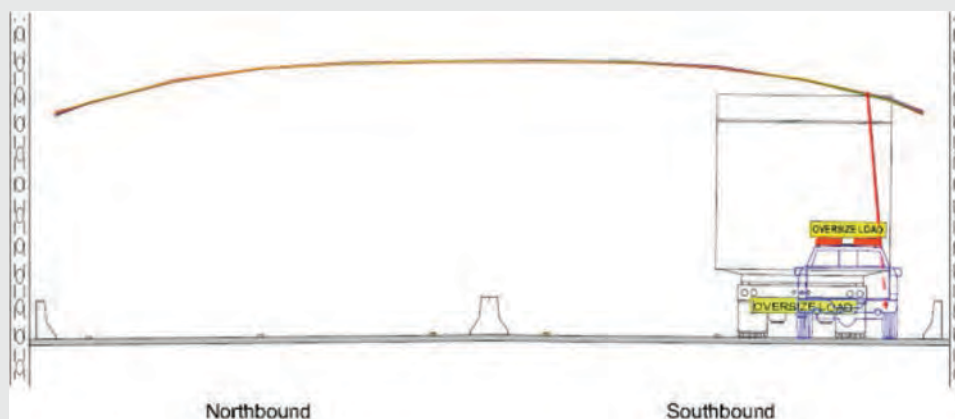
### Additional Escort Requirements

Like other aspects of OSOW transportation, states regulate escort operations differently. For example, there are requirements on the type of escort car, following distance, and the duties an escort is allowed to perform (e.g., traffic management).

Beyond certification, some states have requirements on what escorts must carry as well as the size and weight of the escort vehicles. One carrier noted that its company uses vans as its escort vehicles in order to carry the necessary equipment to support OSOW operations, but vans are not allowed to be escort vehicles in Louisiana. When escorting a load originating or destined for Louisiana, carriers have to hire a local escort company to follow the load, essentially doubling the cost of moving through the state.

### Importance of Civilian Escorts in OSOW Operation

Civilian escorts play an integral role in safely moving OSOW loads. Evidence of the importance of civilian escorts can be found in the conclusions of the NTSB study of the Washington State I-5 bridge collapse. On May 23, 2013, an OSOW load hit the I-5 bridge above the Skagit River. The bridge collapsed shortly after it was struck, injuring three motorists in the process. The OSOW load was led by an escort vehicle equipped with a height pole to identify overhead structures that the load could potentially hit. The escort vehicle driver reported not hitting the bridge with the height pole, but another motorist reported seeing the pole hit four or five bridge elements. The approximate locations of the truck and escort vehicle are shown below.



Source: *Collapse of Interstate 5 Skagit River Bridge Following a Strike by an Oversize Combination Vehicle, Mount Vernon, Washington, May 23, 2013*

#### **Approximate position of OSOW truck and escort vehicle.**

The NTSB report from the Skagit bridge accident sheds light on the permitting and operational oversight needed for safe OSOW travel. NTSB outlines numerous actions that the carrier, the state, and the escort company could have taken to avoid the I-5 accident. One conclusion was, "The lack of standardization of training for pilot/escort vehicle drivers among the states and the failure of the majority of states to require certification or training of such drivers leaves some pilot/escort vehicle drivers poorly prepared to carry out their duties." Additionally, NTSB stated, "Carriers should not have to change escorts at state lines. Standardization of training for pilot/escort vehicle drivers would facilitate reciprocity among the states."<sup>4</sup> NTSB is heavily in favor of an escort certification program and argues for standardization of training and implementation of escort certification.

<sup>4</sup> *Collapse of Interstate 5 Skagit River Bridge Following a Strike by an Oversize Combination Vehicle, Mount Vernon, Washington, May 23, 2013.*

Civilian escort certification is another issue for OSOW carriers to consider when planning a move. Some carriers maintain their own escort fleet, whereas others hire escorts from private companies when they are needed. As carriers expand their areas of operation into states that require escort certification, they will have to ensure that company escorts are certified within the state or they may have to hire escorts from the state. Carriers may choose not to certify company escorts in a state such as New York where they work infrequently or they may be certified in a state that has limited reciprocity. In such instances, carriers hire escorts to move them through a state while their own escorts follow the hired escorts. This means that the carrier is paying its personnel and also paying for fuel to follow the load because the escort is not certified in that state. Carriers who want their escorts to be certified in every state could get Utah's certification, which is recognized in every state with the exception of New York, and New York's certification. There is no guarantee that states with new escort certification programs will recognize Utah's or New York's program. Figure A-39 displays the states that have an escort certification program currently in place. This trend will continue to evolve as a number of states are in the process of implementing escort certification programs.

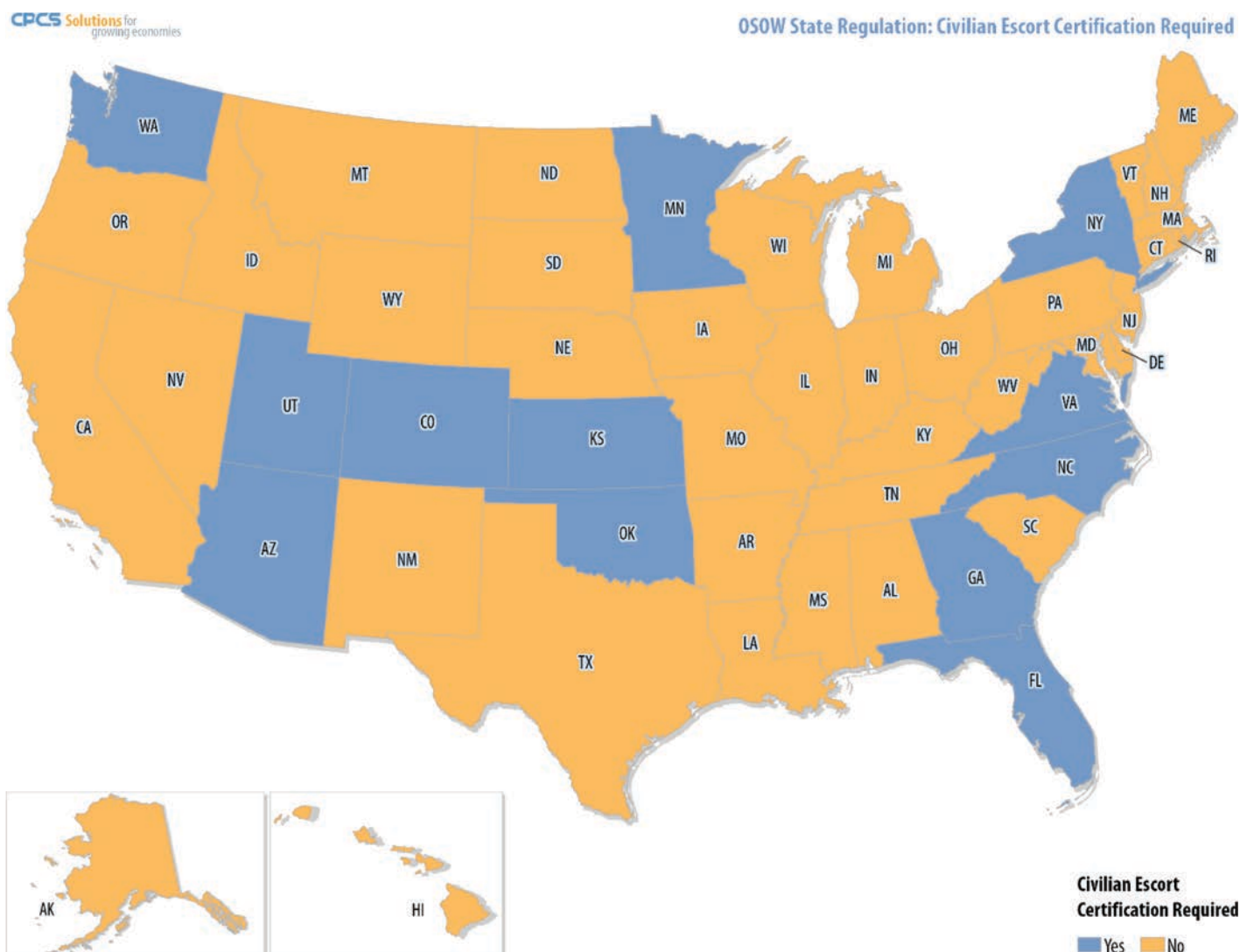


Figure A-39. Civilian escort certification required.

## Route Surveys

Route surveys are required after loads exceed specified dimensions. Most states require route surveys above a specific height threshold, while others have route survey thresholds for length, width, and height. In a route survey, a surveyor drives the route with a height pole set slightly higher than the load's maximum height to identify conflicts with overhead structures. Surveyors are looking for bridges, walkways, highway signs, or low wires in the path of the load. Route surveyors also measure road widths on corners to determine if the load can pass through safely. They also check to ensure there are no construction zones along the route.

Carriers complete route survey forms to prove that they conducted a survey and to verify that there were no issues along the route. The route survey forms contain the carrier's name, the names of escort companies, the size and weight of the load, the origin and destination of the load, the date of the survey, and the route. Surveys act as the schematics for the operational planning of OSOW moves. As such, the surveys must be exact and thoroughly completed. A route survey can inform the choice of trailer if there are infrastructure constraints that prevent the use of a truck configuration. For example, an at-grade rail crossing could have a steep enough slope to cause a lowboy trailer to bottom out.

### Route Survey as a Safety Tool

Route surveys act as an overall check on permitted routes assigned during the permitting process. A carrier described a load to be moved through three states that did not require a route survey, but the carrier conducted a survey to ensure the load could make it through the assigned route. During the survey, the surveyor identified two bridges that were too low for the load being transported. The carrier requested a different route around the bridges to clear the overhead obstacles. If the load had moved without the survey, the low bridges would have been identified by the lead escort through the height pole, but the load would have had to back down the two-lane roadway until it could safely park and wait for a new route.

Route surveys are an example of alignment between the permitting office and OSOW carriers. In the example given, the route survey conducted by the carrier saved time and money as well as reduced the chance of an accident during the move. Areas where the incentives align for regulations suggest agreement on the need for the regulation, which leaves agreement on the threshold as the final piece for state DOT and industry buy-in.

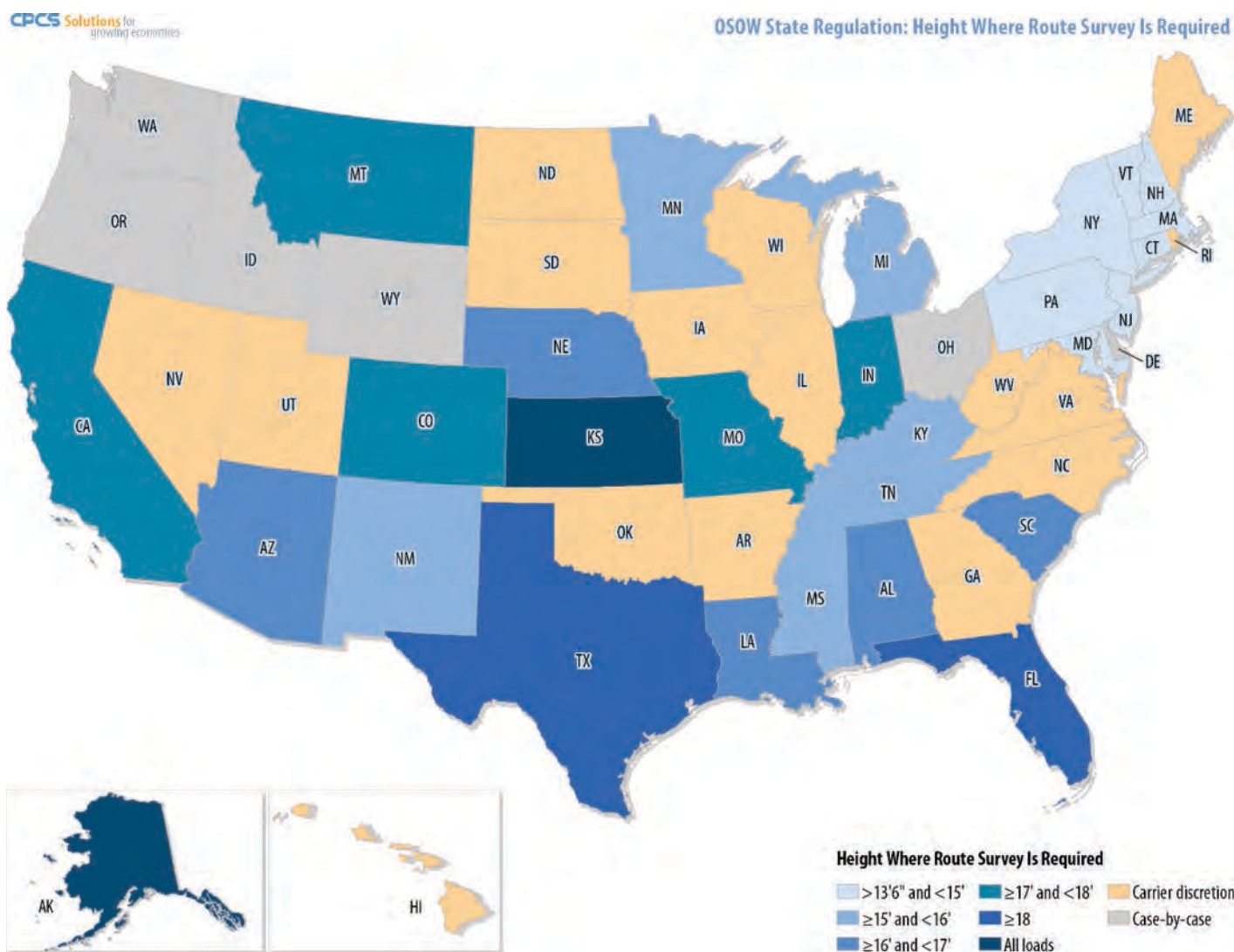
Figure A-40 shows a load maneuvering around a telephone pole using rear steering to make the corner. A route survey identified problem corners and ensured that the loaded truck would be able to complete the route. Faulty route surveys can result in delays or serious damage to infrastructure because overhead structures such as utility lines have not been moved.

Figure A-41 displays the height threshold when state permitting offices require a route survey. Fourteen states allow carrier discretion to determine whether a route survey is needed. Other states determine route survey needs on a case-by-case basis or by using specific thresholds. In some cases it is required for all loads. Route survey requirements are widely variable with only a few clusters of states with similar values. The Northeast, with the exception of Maine and Rhode Island, is the largest cluster of states with similar regulations.



Source: Perkins Motor Transport

**Figure A-40.** OSOW load cornering a two-lane roadway.



**Figure A-41.** Height where route survey is required.

## Utility Notification

According to industry representatives, permitting and operational requirements that accompany utility notification are a time-intensive and expensive part of moving high loads. Utility notification encompasses power, phone, and cable infrastructure that would obstruct a load along its route. Carriers must contact all potentially affected utilities, including local cooperative utilities, city and regional power companies, telephone companies, and cable companies. The utility notification phase follows the route survey where overhead issues are identified by the surveyor. During the route survey, surveyors will note the name on utility poles to determine whose lines are obstructing the load. When the pole does not have a name on it, the carrier must independently identify the owner of the utility line.

Identifying the owner of a low line is one of the biggest impediments to efficiently notifying and moving utilities.

Some states have resources that lay out the utility service territory maps and provide contact information to facilitate the notification.

### The Impact of Utility Notification on OSOW Cost

Utility notification is a high cost aspect of OSOW loads. The cost is heavily concentrated on the operations side because of the cost of contracting utilities to raise wires. A load from Wisconsin to Alberta encountered 64 different utilities and resulted in a total additional cost of \$230,000. Another load traveling within Wisconsin traveled less than 100 miles, but the utilities cost was more than \$200,000. In some cases, the identification, notification, and/or the cost of lifting lines is equal to the total operational cost of moving the load.

The cost of lifting utility lines is not the responsibility of permitting officials. Additionally, there is a clear need for carriers to safely pass overhead utilities. Some states and localities provide resources such as territory maps and utility contact information for utility notification to increase the efficiency of identifying and organizing the raising of overhead utilities. The overall goal of increasing the ease of compliance is to increase the number of compliant carriers.

Once the utilities are identified and notified of the low line, carriers coordinate with the utilities companies to accompany the OSOW load and raise low-hanging utility lines (Figure A-42). Each company handles scheduling utility assistance differently, with some requiring a two-month notice. After utilities are scheduled, carriers relay changes in their progress to ensure that the utilities are ready. Many utility companies will not work on weekends, which delays the load if it is allowed to travel on weekends and encounters wires during weekend hours.

Carriers and permitting agencies share the same goal of minimizing utility conflicts with OSOW moves. For permitting officials, the goal is to preserve the infrastructure and for carriers the goal is to protect the load and avoid the cost of utility repairs.

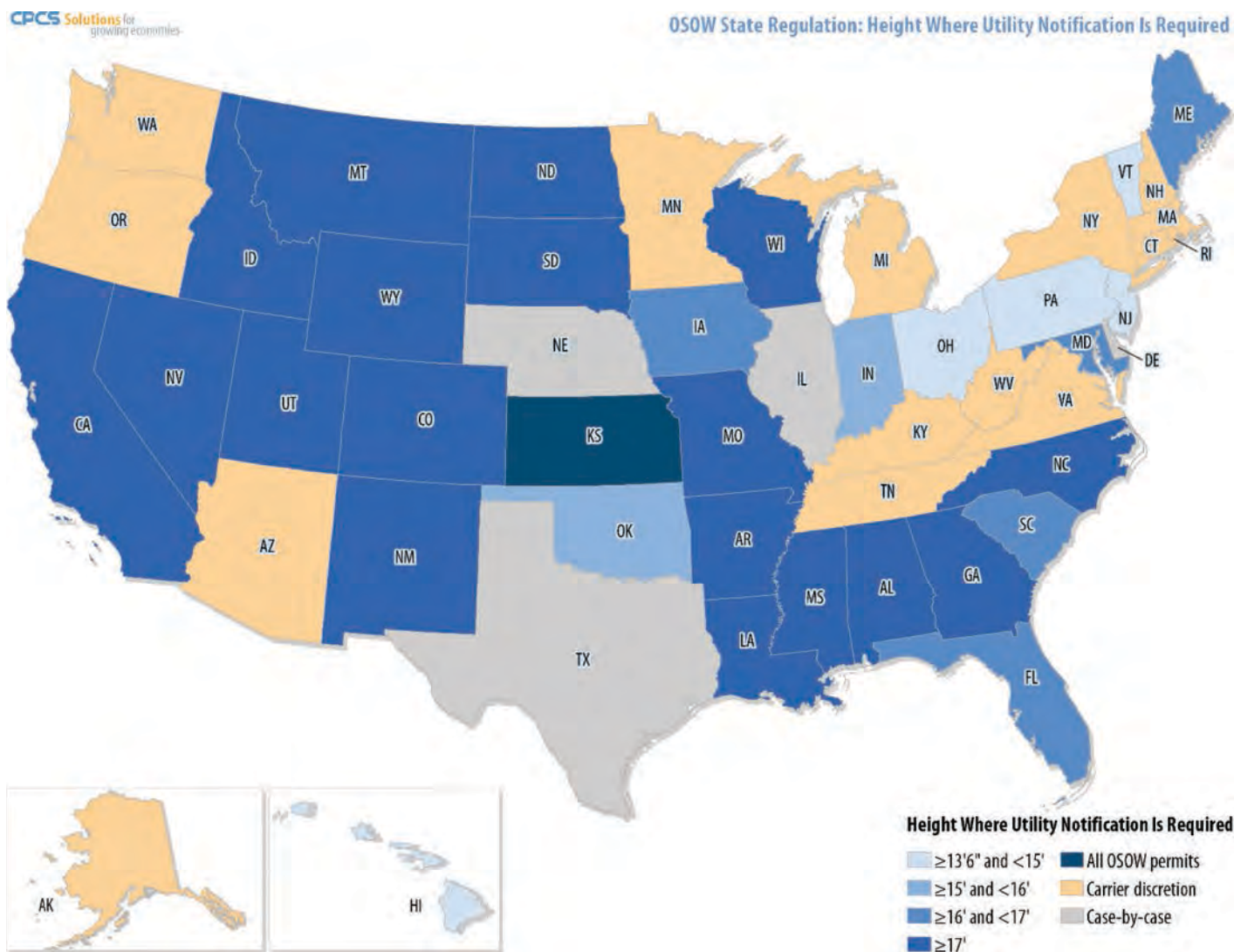
Figure A-43 displays the height threshold when utility notification is required. States typically follow one of four approaches to the utility notification threshold:

- Define specific height thresholds,
- Require all OSOW loads to notify utilities,
- Leave the decision to the carrier, or
- Make a determination based on the load and route.



Source: Perkins Motor Transport

**Figure A-42.** Bucket trucks lifting utility line.



**Figure A-43.** Height where utility notification is required.

Western states have relatively relaxed standards for the height threshold compared to the Midwest, Southeast, and Northeast. Outside the Western states, the rest of the country displays more diversity for the height threshold for utility notification.

## Permit Extensions

Permit extensions allow OSOW carriers to prolong the number of days a permit is valid. Some states issue an extension on a single-trip permit, but some require the carrier to refile the permit. A permit extension can be completed more quickly than refiling a permit. In the case of a refile, the permit is added to the queue of new permits, whereas an extension progresses quickly because it is not subject to the analysis required of a new permit.

The number of days that a permit could be extended and the reasons for the extension vary across states.

As identified by the research team through a survey of states:

- States reported offering anywhere from a 1-day to a 15-day extension.
- Many states reported that extensions were issued on a case-by-case basis, with weather and mechanical problems being the most-cited reason for granting an extension.
- States differ in their definition of weather delay. Alabama noted that extensions were most likely under emergency issues, such as a hurricane or ice storm.
- Some states such as Oklahoma require carriers to have a receipt for maintenance of the equipment in order to get an extension due to a breakdown (while other states do not have this requirement).
- States that do not allow for extensions require the carrier to refile and pay for a new permit. Similarly, some states charge for the extension of the permit. While both refiles and extensions can cost money, refiles also need time to be issued.

### The Impact of Permit Extensions on OSOW Transportation Costs

Carriers use permit extensions when they encounter a delay during hauling and require additional time. Extensions allow OSOW carriers to continue to move without stopping if they are allowed to extend a permit before it expires. Some states will not allow the carrier to extend a permit until the last day the permit is valid. If the last day falls on a weekend, the carrier may have to wait until Monday, causing further delay.

Carriers must reapply for their permit in states that do not allow permit extensions. Carriers must pay for the permit to be refilled and may have to wait days for a new permit to be issued, especially if the permit enters the queue with all new permits. Some states will expedite “refiles” because they already have most of the approvals necessary to ensure safe travel. In cases where an extension is filed on a weekend or if the refile goes to the bottom of the queue, carriers face anywhere from an \$800 to \$7,500 per day cost in wages and lost productivity depending on the nature of the load and the move. Variability in cost is particularly a function of the size of the crew and the equipment being used.

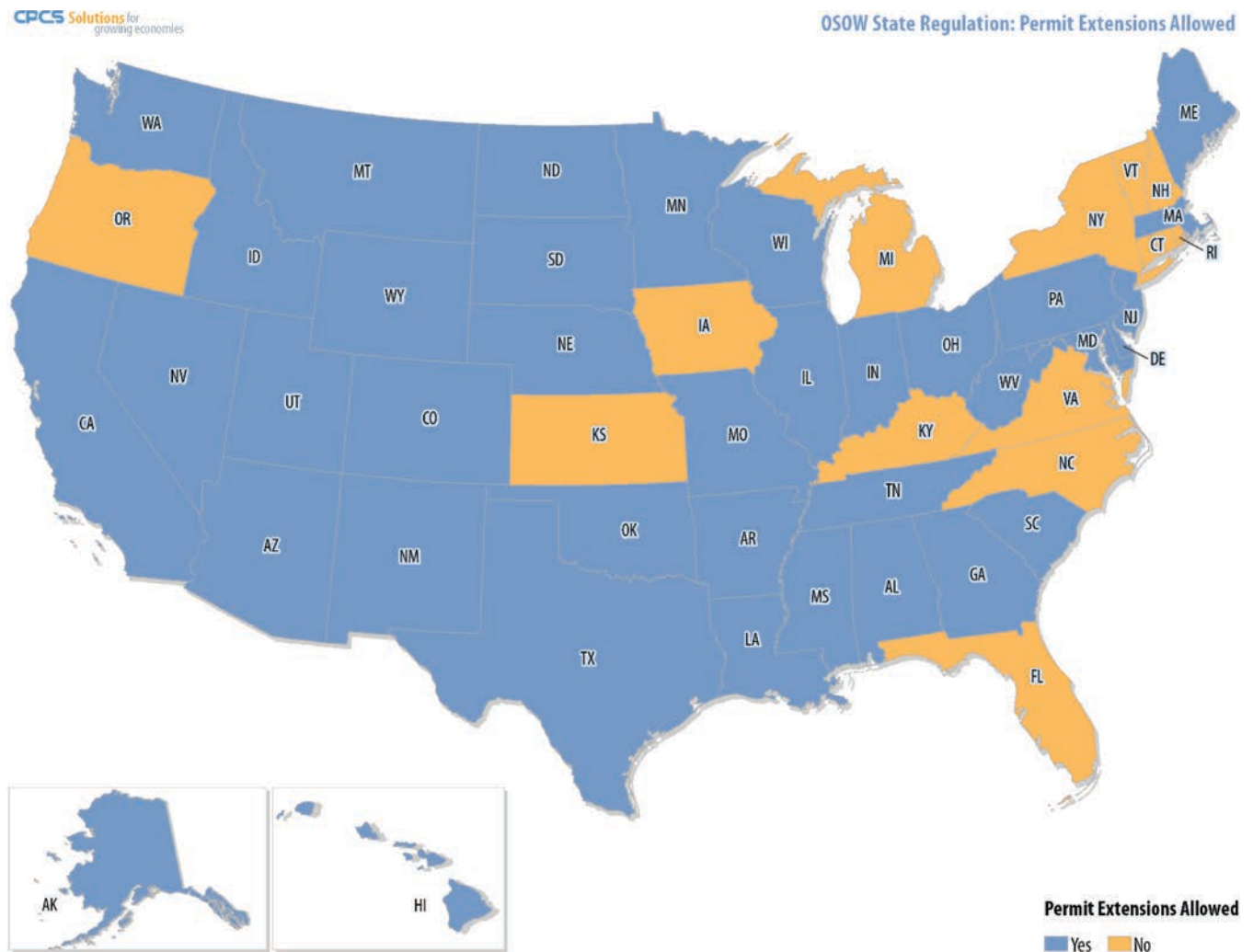


Figure A-44. Permit extensions allowed.

Figure A-44 displays the states that allow and do not allow permit extensions. When a state responded that it allowed extensions on a case-by-case basis, the research team classified it as allowing extensions. Most states allow permit extensions of some kind. Western states issue permit extensions much more frequently than other regions. Most states allow for extensions in case of inclement weather or vehicle breakdowns.

## Permit Revision

Though similar to permit extensions, permit revisions are needed for a larger variety of reasons including changes to route, equipment, moving date, dimensions, or weights. Similar to extensions, states allow revisions for varying reasons and charge varying costs to revise a permit.

The need for revisions is largely due to the lead time required to plan and permit an OSOW move. As noted in the typology, OSOW carriers moving superloads and megaloads take varying lengths of time to obtain permits. In the case of superloads, a permit can take months to get issued, during which the information about the equipment, dates, route, or load could change. OSOW loads require revisions for the same reasons, even though their planning times are much shorter, making revisions less of a concern. The information on a permit could change for a



variety of reasons, such as a piece of equipment being repaired, replacement of equipment, construction along the route, the shipper miscalculating the weight or size of the load, etc.

In states that allow revisions, the carrier can generally make adjustments to the permit and remain on schedule. In states that do not allow revisions, the carrier must refile the permit and wait for that permit to be issued. Even in states that allow revisions, there are limitations on what can be revised. Generally, permit office errors and equipment changes such as truck and trailer information can be revised. Conversely, there are states that will not allow a revision if the revision changes the route or weight, or if the new dimensions require additional escorts. Some states require the permit revision to occur within a certain timeframe, ranging from 30 minutes to 72 hours from the time the permit was issued.

Revisions contribute to the same delays and costs as extensions, but for a greater number of reasons. In addition to those cited, there is the potential for delay in travel when a carrier has to reorder a permit because the state does not allow revisions or the field that needs revising is not allowed. As noted for extensions, the potential for delays is larger for superloads than for regular loads because superloads take a much longer time to be processed. Additionally, superload permits cost more than regular load permits, ranging from \$10 to several thousand dollars.

Figure A-45 shows whether states allow permit revisions. Most states allow permit revisions after they have been filed. The West Coast and New England have the highest concentration of

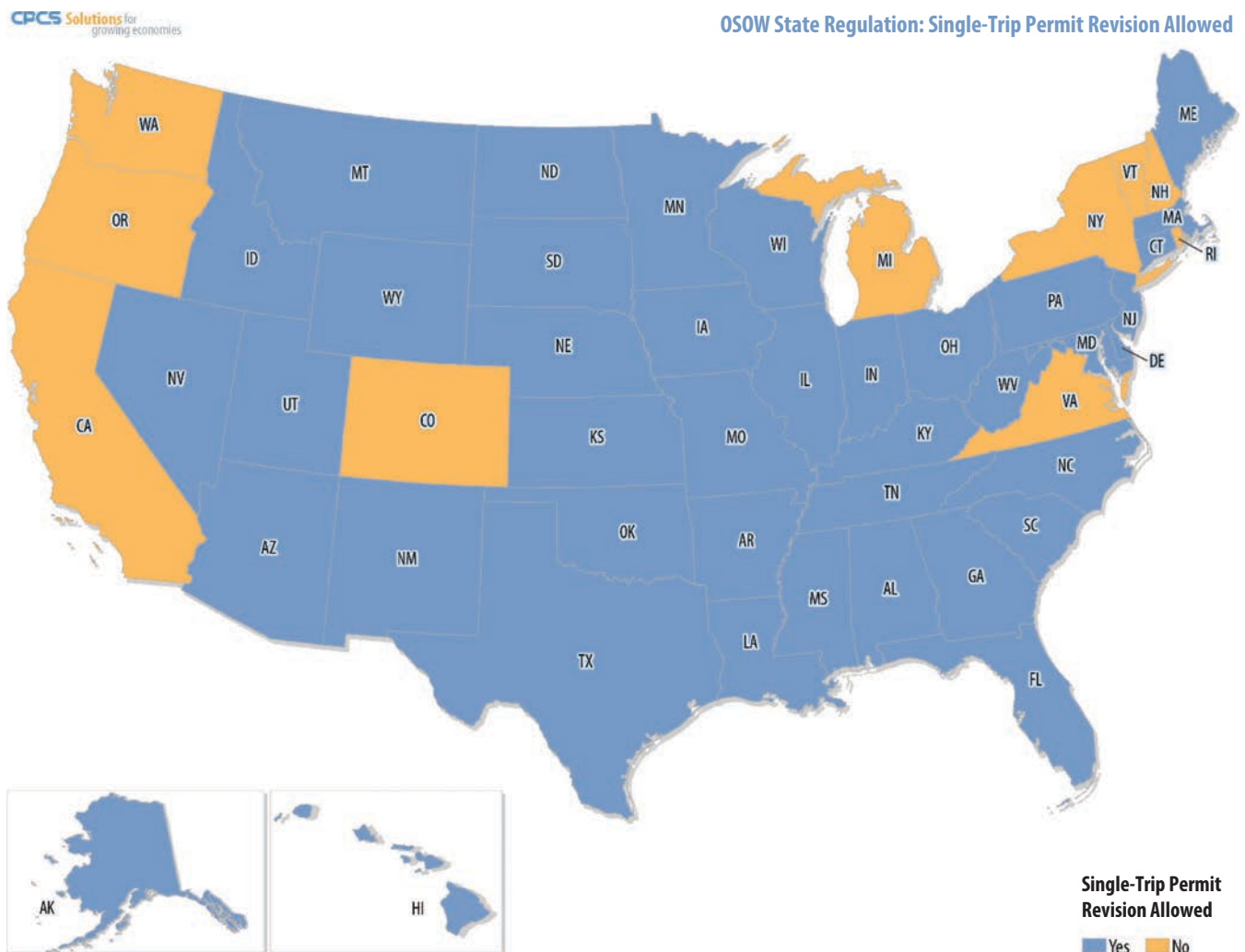


Figure A-45. Single-trip permit revision allowed.

states that do not allow permit modification, while the Southeast, Midwest, and Plains states have large contiguous clusters of states that allow modification. As previously discussed, permit revisions are allowed for a variety of reasons throughout the country. The states that reported revisions on a case-by-case basis were placed in the yes category.

### **Number of Days a Single-Trip Permit Is Valid**

Each permit type, other than multi-trip permits, is valid for a set window of time, meaning that the load must move from origin to destination within that window or the carrier must obtain an extension of the current permit or refile for a new permit.<sup>5</sup> The number of days a single-trip permit is valid ranges from 3 days in a number of states to 15 days in Indiana.

Carriers must coordinate the windows that permits are valid for when making multi-state moves to ensure that the permit will not expire en route.

Beyond coordinating the windows, carriers must ensure that they can transit a state within the permit window. While more of an issue for superloads, it may take a load the whole permit duration to travel through a state if weather, congestion, or operational restrictions slow the speed of travel. Additionally, if a permit expires on a weekend the carrier may have to wait until the permitting office opens on Monday to apply for a new permit or extension.

Carriers will often order multiple permits for the same load to ensure they will have enough time to travel through a state.

Figure A-46 displays the national patchwork of the duration of a single-trip permit. The number of days a permit is valid varies throughout the United States, but the figure shows a concentration of states in the Northeast and along the East Coast having permit durations of at least 5 days. The Midwest and Western states display a variety of durations with only a couple of contiguous states sharing the same number of days a permit is valid.

### **Minimum Clearance**

Minimum clearance is the distance between the top of the load and the bottom of the overhead structure. Permitting offices and carriers assess minimum clearance as part of route surveys, which look at restrictions along the route. The purpose of a route survey is to ensure that no overlays, pavement heaves, or any other issue will affect the clearance.

Once the survey has been completed, carriers must ensure a gap equal to or greater than the minimum clearance between the measured height of the overhead structure and the height of the load.

Minimum clearance acts as a buffer for dips in the roadway and bouncing or shifting loads that make a load taller than initially measured. For example, a load might shift in transit, making one side sit higher than the other. More importantly, the load's highest point may have increased, which could come close to hitting an overhead structure.

The majority of states require 3 in. clearance with some requiring as little as 1 in. or as much as 6 in.

Minimum clearance is calculated differently depending on the state. Some states base the minimum clearance on the lane with the lowest height to take into account slanted roadways or overhead structures. Others will allow the carrier to calculate the clearance based on the lane with the greatest gap between the pavement surface and the overhead structure, the idea being that the load must travel in the lane with the greatest gap when it goes under the overhead structure. Minimum clearance affects loads differently depending on their configuration. Cylindrical

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<sup>5</sup> Each single-trip permit contains an origin and a destination.

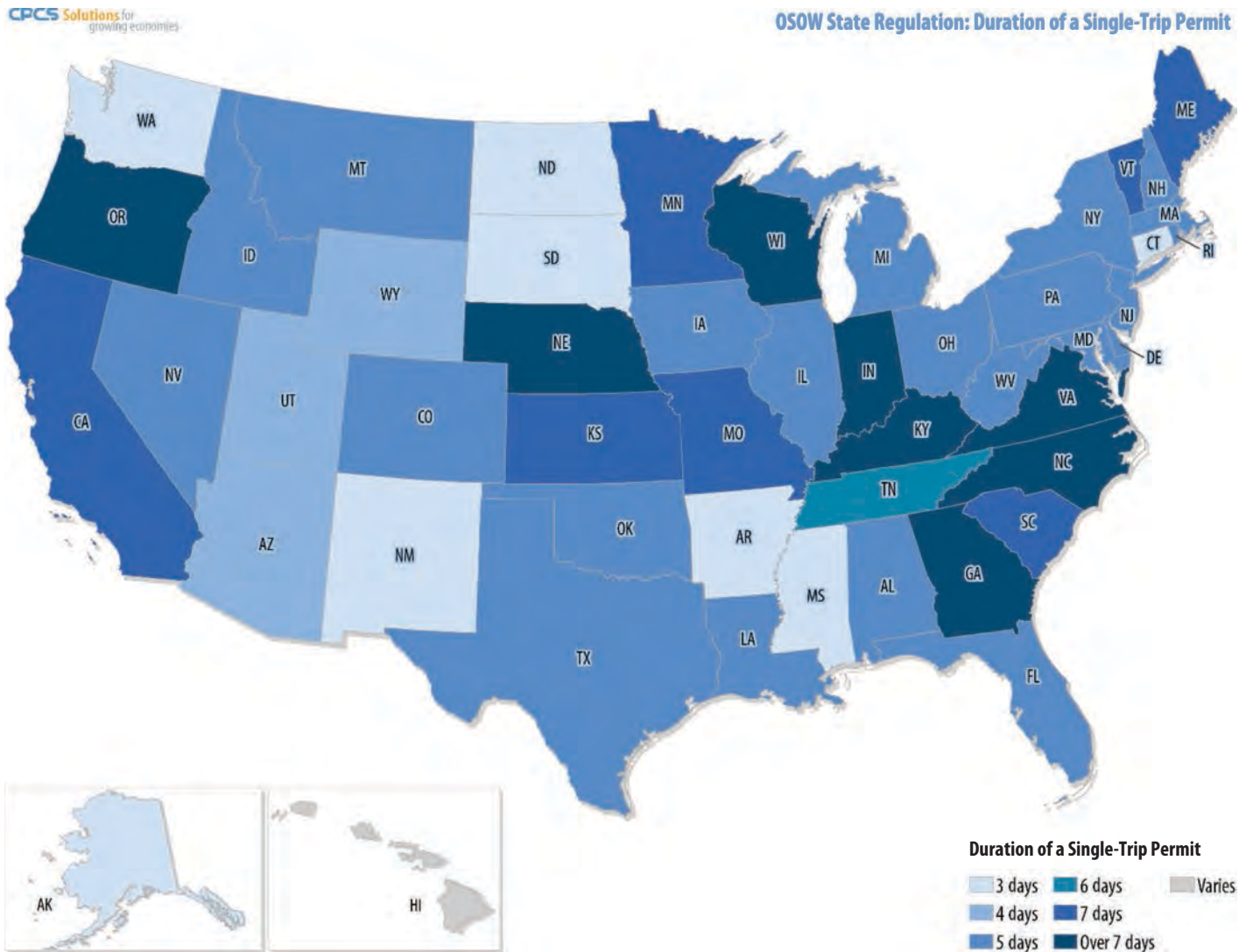


Figure A-46. Duration of a single-trip permit.

loads have a single point where clearance is an issue, whereas rectangular loads have to worry about corner clearances due to the angle of the road or overhead structures.

Minimum clearance restrictions can be avoided by taking off ramps to detour over the structure rather than under it. In some cases, there are no on and off ramps allowing such detours over the structure and the load is routed around the structure. When an alternate route is not feasible, carriers and permitting agencies use ad hoc approaches, such as lowering speed, using a lane with greater clearance, or using hydraulic trailers to lower a load.

Minimum clearance is a good example of state permitting offices and carriers having aligned safety and infrastructure preservation goals. The goal for the permitting office is to move the load safely and to avoid infrastructure damage. Safety is also the desired outcome for shippers and carriers, along with avoiding damage to the load and potentially paying for infrastructure reconstruction. In some cases, carriers have noted that they will use a front escort even when they are not required to ensure that they will not hit overhead structures.

Figure A-47 displays the various values required by state permitting offices for minimum clearance. Some states allow the state DOT the discretion to choose the minimum clearance required

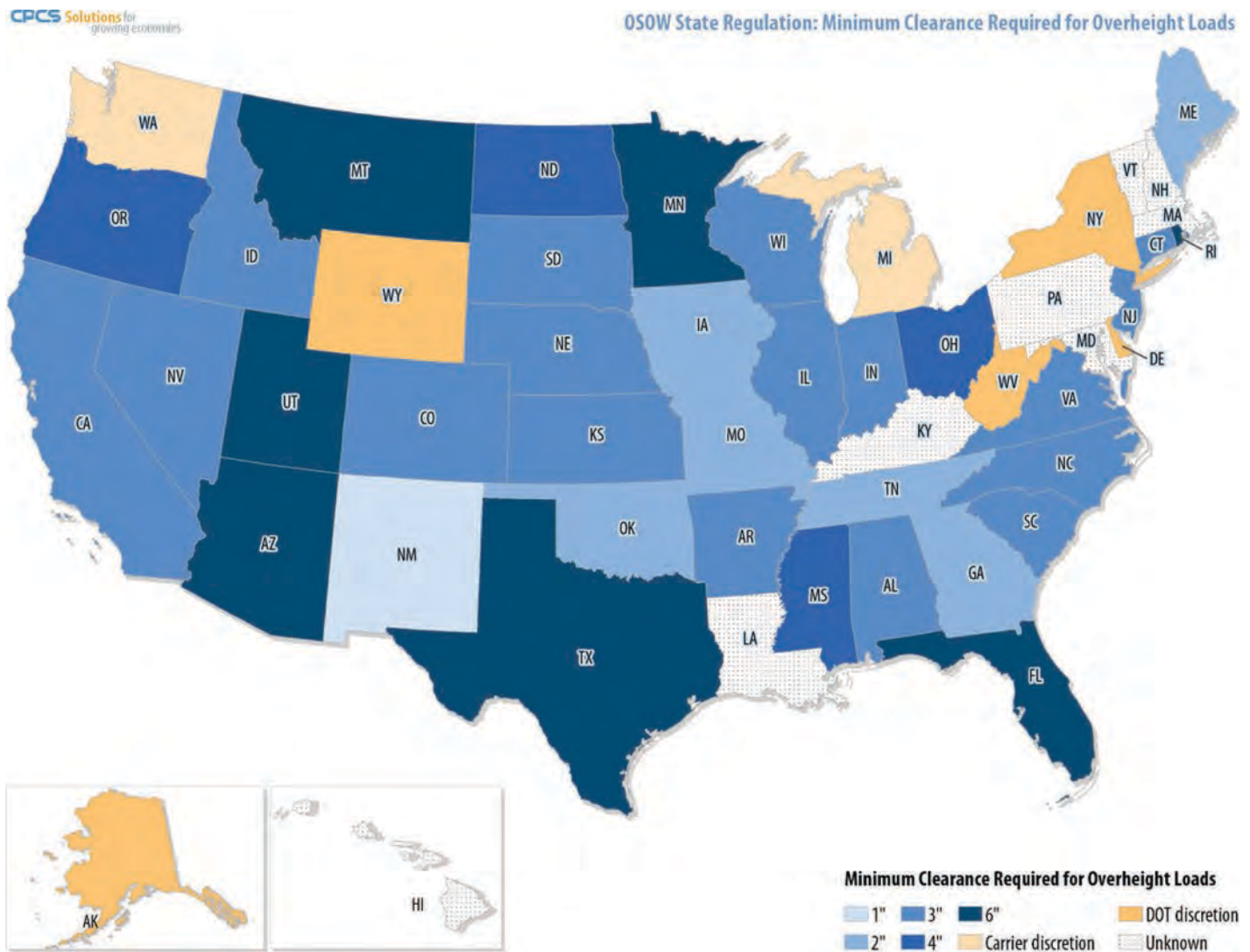


Figure A-47. Minimum clearance required for overheight loads.

### Impact of Minimum Clearance on OSOW Permitting

When minimum clearance requirements are not met and no alternate route is available, carriers and permitting offices work closely to find a safe solution. One example occurred on a roadway that pitched the width of the two lanes, giving one lane greater distance between the roadway and the overhead structure. The minimum clearance for the overhead structure was based on the lane with the smallest clearance to ensure that a load was safe to travel under the structure regardless of the lane. Yet the OSOW carrier received special permission to use the lane with more clearance, but with the requirement to hire two police escorts to ensure that the load could get into the correct lane before passing under the structure, costing between \$500 and \$800.

In another move, a carrier used hydraulics on the trailer to lower the load and passed under a bridge slowly to minimize bouncing. This case also required state police to escort the load and required that the load move at night. The additional cost to move under the bridge was \$12,500 because of the delay and the additional police escort cost.

Both cases allowed the carrier to pass the overhead structure safely when there was either no alternative routing available or the alternative was significantly longer and therefore more expensive than the option used.

and others leave it to the carrier's discretion. Minimum clearance is widely varied throughout the United States with pockets of states ranging from three to four having similar regulations.

## **Frost/Spring/Thaw Restrictions**

Frost/Spring/Thaw Restrictions (frost restrictions) are seasonal weight restrictions, most common in Northern states, to protect roadways during the thaw. Generally, frost restrictions start in early March and typically last eight weeks. Frost restrictions are kept in place until the roads, shoulders, and ground are thawed and dry, but can be reinstated if low temperatures refreeze the ground.

Frost restrictions directly affect the configuration that an OSOW carrier uses when moving a load. States vary the size and implementation of the restriction. Some states such as Minnesota split the roadway network into zones, so restrictions can independently be lifted in a zone that is fully thawed. Other states specify the roadways that are restricted, placing all primary and secondary roadways under restriction, or gradually relax the restriction as the ground thaws. Finally, frost restrictions can be set by municipalities or counties on roadways regardless of whether the state has or had its own frost restriction.

Coordination among jurisdictions is another challenge for carriers. For example, a state permit may specify a route that detours a load off a state-maintained roadway and onto a local road to avoid a frost-restricted road. Yet the local roadway could also be under frost restrictions, making that route unfeasible and requiring amending or refile of a permit. During the permitting process, the applicant would have to check local restrictions as part of permitting the OSOW load to use local roads. While inconvenient, a much larger issue arises if restrictions are put in place while a load is being transported. At this point, a carrier may be knowingly or unknowingly violating the frost restriction. This is also an issue for carriers with multi-trip permits that may or may not have to submit the routes of their loads when approved. Ultimately, frost restrictions rely on communication between the state, counties, and carriers to both protect the roadways and ensure that loads are moving as efficiently as possible.

### **Impact of Frost Restrictions on OSOW Planning and Permitting**

Frost restrictions vary by state, requiring OSOW carriers to carefully plan moves to account for state-by-state differences. For example, when frost restrictions are in force, Minnesota and Michigan limit the width and axle weights of the load allowed to travel on state highways. During this period, a load which is more than 14 ft wide in Michigan and 16 ft wide in Minnesota would be unable to move in the state. Carriers will route around states with frost restrictions in order to complete their load. For example, a 16 ft load from Green Bay, Wisconsin, to Billings, Montana, would need to wait for the restriction to be lifted or route around Minnesota using Illinois, Iowa, South Dakota, Wyoming, and finally Montana. The frost restriction route adds 30% more miles and costs anywhere from an additional \$2,500 to \$5,000 depending on the size of the load, according to industry sources.

For loads that are only overweight, carriers will use longer trailers with more axles to reduce the overall weight per axle. For instance, an overweight truck with a gross vehicle weight of 135,000 lbs would normally be hauled by a 7-axle trailer, but under frost restrictions a carrier would use a 13-axle trailer. As the size of the trailer increases, it crosses the threshold for one escort and requires two in some other states. Between the increased cost of using a larger trailer and the escort cost, moving from a 7-axle to a 13-axle trailer can cost an additional \$2,000 per day.

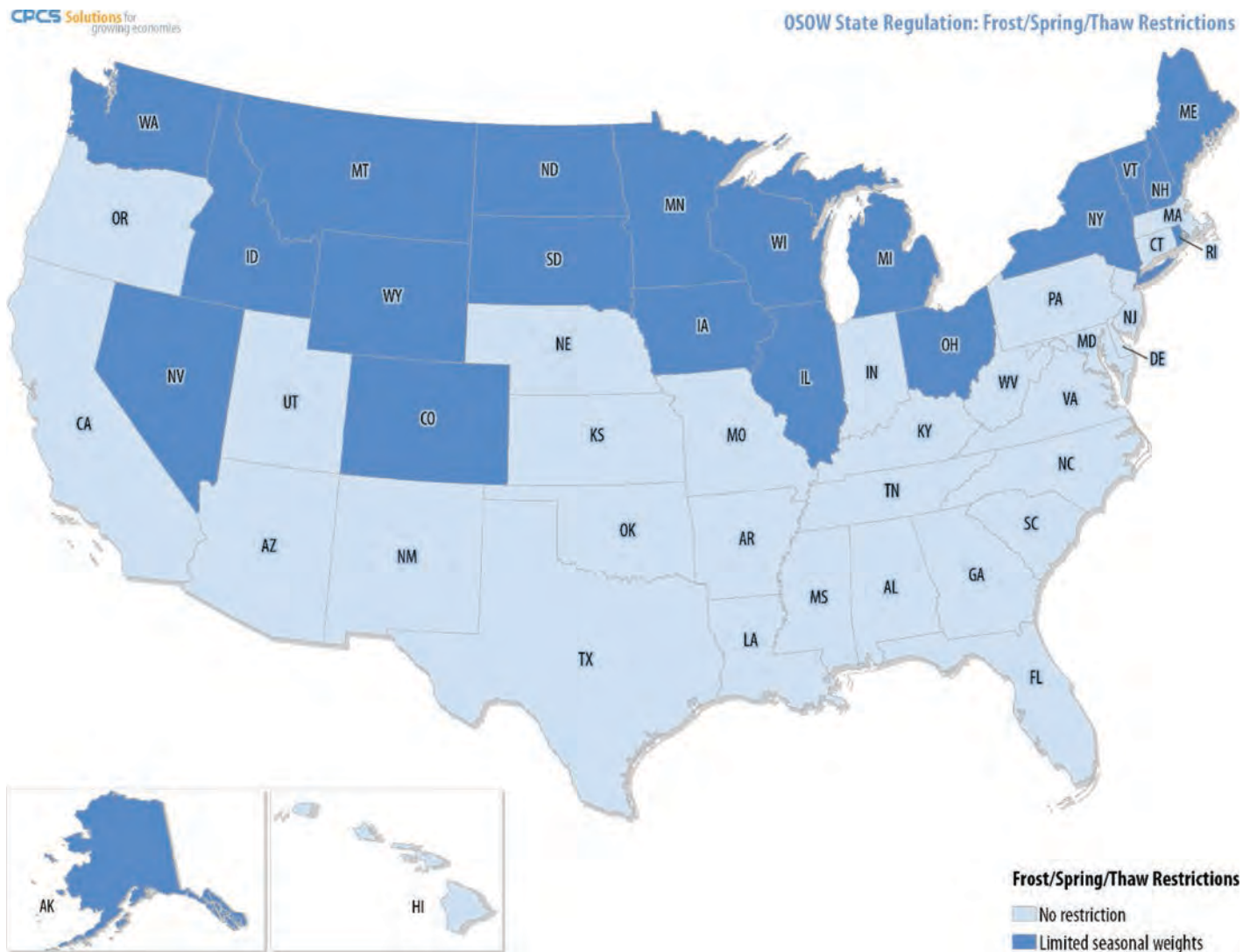


Figure A-48. Frost/spring/thaw restrictions.

Figure A-48 displays states with frost restrictions on local, state, or county roadways.

Frost restrictions are focused in the Northern states where there are low enough temperatures to freeze the ground.

Frost laws can be variable in timing and apply to different roadways. A number of states such as Vermont, Illinois, and Ohio have restrictions only on roadways not maintained by the state, such as city or county roadways.

### Lift-Axle Restrictions

OSOW carriers use a variety of different axle types in order to meet axle weight restrictions and to be able to traverse a variety of infrastructure. Lift axles allow the carrier to spread the load over an additional axle; lowering the lift axle achieves this, and enables meeting the maximum weights within the state. Figure A-49 is an example of a lift axle in the up position on a semi-truck. The user of the lift-axle trailer has the option of making the final axle grouping a tandem or tridem.



Source: Perkins Motor Transport

**Figure A-49. Truck with lift axle in up position.**

### Impact of Lift Axles on OSOW Configuration and Movement

If carriers move an OSOW load from Illinois to Ohio, and the weight on the rear axle grouping is 50,000 lbs, they are under the legal limit for a tandem axle, allowing them to place the lift axle in the up position, thereby saving wear and tear on the tires and trailer. As soon as the load reaches the Indiana border, they are over the maximum weight for a tandem and need to drop the lift axle to make the trailer a tridem trailer that is now permitted to travel in Indiana. The same is true for Ohio, where they would keep the lift axle down.

Most states allow lift axles, with most placing no additional restrictions on the positioning of the lift axle.

Some states allow lift axles, but carriers are directed to keep them in the position described in the permit. Additionally, a number of states allow lift axles at only a fraction of the weight they allow when adding a standard axle to an axle grouping. For example, Oklahoma allows lift axles, but if they are controlled in the cab, the axle only counts for 8,000 lbs when distributing the load. In this case, carriers need to calculate how the lift axle will be counted and how that affects their ability to receive a permit and travel through multiple states.

Figure A-50 displays the states that allow and do not allow lift axles. Most states allow lift axles, many with restrictions on their position. Overall, only four do not allow lift axles.

### Truck Configuration Restrictions

A variety of truck configurations are used to move superloads throughout the United States. Superload configurations must meet axle weight restrictions and be maneuverable enough to navigate the infrastructure along the route. Superload trailers come in two varieties: long and wide. Long configurations use anywhere from seven to 19 axles to spread the weight of the load. Wide configurations or dual-lane configurations use trunnion axles to spread the weight of the load over many axles and across a wide portion of the roadway, but are shorter (Figure A-51). Depending on their infrastructure, states will limit the use of 19-axle loading or dual-lane loading. Carriers need to know the configurations allowed within the state to determine the movement of superloads.

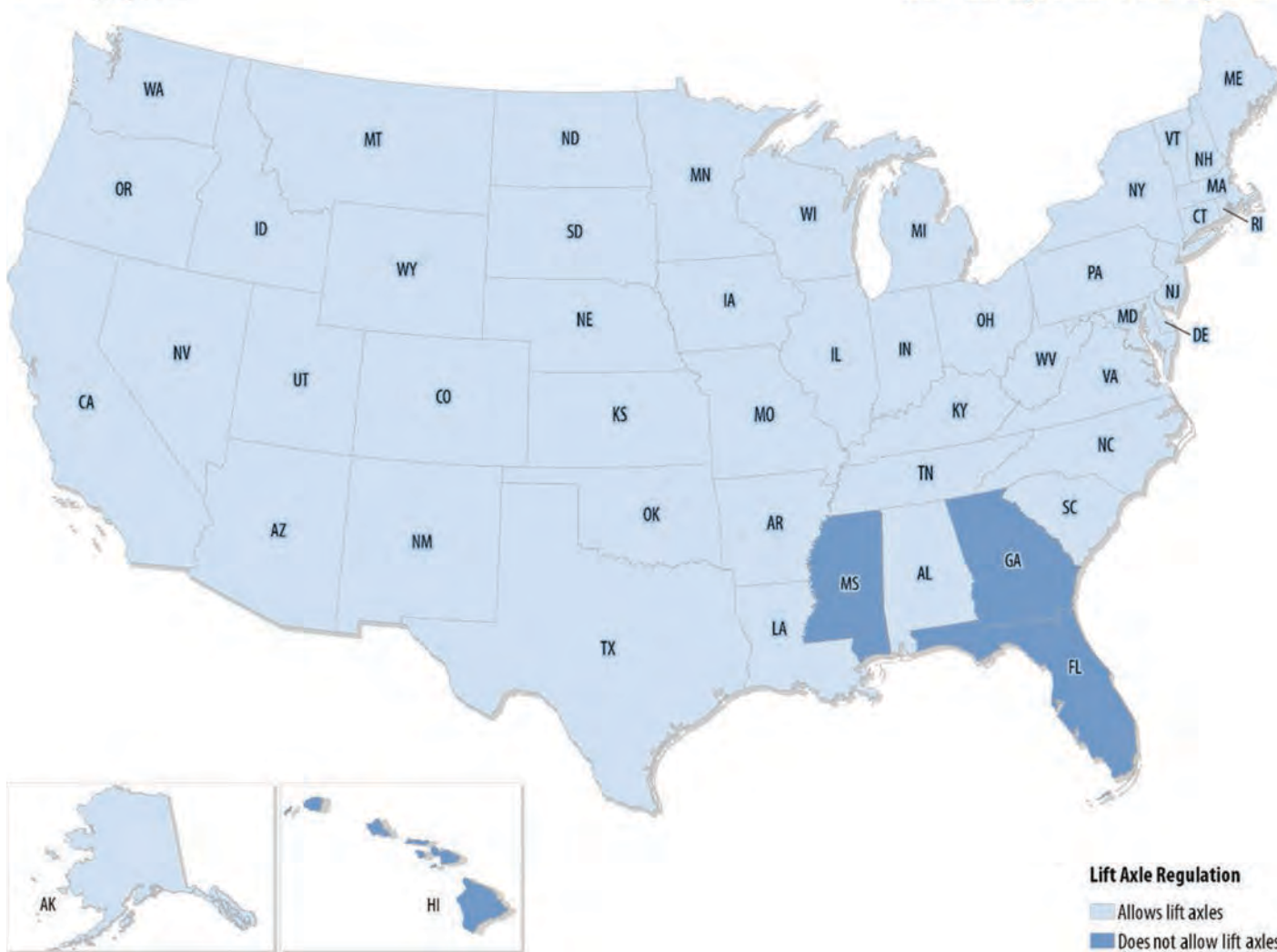


Figure A-50. Lift axle regulation.



Source: Perkins Motor Transport

Figure A-51. Dual-lane loading.



The difference between long trailers and dual-lane trailers is primarily their length, width, and weight. Dual-lane trailers are 6 ft to 10 ft wider, 60 ft to 80 ft shorter, and around 40,000 lbs lighter. Often wide trailers with trunnion axles are the only option for moving heavy loads as they can maneuver turns that long trailers cannot.

With the exception of Connecticut and Rhode Island, most states allow dual-lane loading. But many states mentioned that bridges were the biggest impediment to dual-lane loading. Virginia allows dual-lane loading but requires bridge engineers to grant its use, and it is not typically recommended. North Dakota stated that its system and bridges are not set up for dual-lane loading and each load requires a special bridge analysis to be approved. Expanding on this point, an industry representative noted that generally 19-axle configurations are favored east of the Mississippi whereas dual-lane loading is favored west of the Mississippi. A 19-axle configuration spreads the weight of the load over a longer distance and is able to carry heavy loads lower than a dual-lane loading configuration. Carriers use their experience in permitting when deciding on a truck configuration. This experience is vital to deciding whether to use dual-lane loading or 19-axle configurations in order to maximize the chance that a permit will be approved.

### Single-Trip OSOW Permit Fee

The cost of a single-trip OSOW permit varies throughout the United States. A 2013 study of the costs to permit OSOW loads in the Midwest found that the difference in the cost of permitting an OSOW load ranged from \$10 to \$1,779, depending on the load and the state.<sup>6</sup> The difference in the cost stems from different approaches to OSOW permitting fees. Generally, states use one of three approaches to assessing a permit fee:

- Flat fee,
- Incremental cost, or
- Flat fee and incremental cost.

A flat fee means that all loads that fit in a category are charged the same fee. For example, Iowa charges \$10 regardless of the size or weight of an OSOW load. Similarly, Kansas charges \$20 for an OSOW permit, and when a load is classified as a superload, the cost increases to \$50. Incremental permitting costs are those that do not have a fixed fee and vary based on dimensions, weight, and/or miles. For example, Washington charges an increasing fee per mile as the weight of an OSOW load increases. Lastly, some states charge a flat fee up to a size and/or weight threshold and then begin charging incremental costs. For example, Maryland charges \$30 for an OSOW permit and \$5 for every 2,000 lbs above 80,000 lbs.

Most states have a base permit fee and add an incremental cost that make larger and heavier vehicles more costly to permit, with an incremental fee based on weight as the most frequent additional cost. Figure A-52 displays the flat fees charged throughout the United States. Note that most states charge additional incremental fees above the initial permitting fee. Also note that the initial fee is only the beginning of the cost of an OSOW permit in many states. Depending on the load, the cost of the incremental charge can greatly outweigh the initial permitting fee.

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<sup>6</sup>Adams, T., E. Perry, A. Schwartz, B. Gollnik, M. Kang, J. Bittner, and S. Wagner. *Aligning Oversize/Overweight Permit Fees with Agency Costs: Critical Issues*, 2013. <http://wisdotresearch.wi.gov/wp-content/uploads/WisDOT-CFIRE-project-0092-10-21-final-report.pdf>. Accessed October 27, 2014.

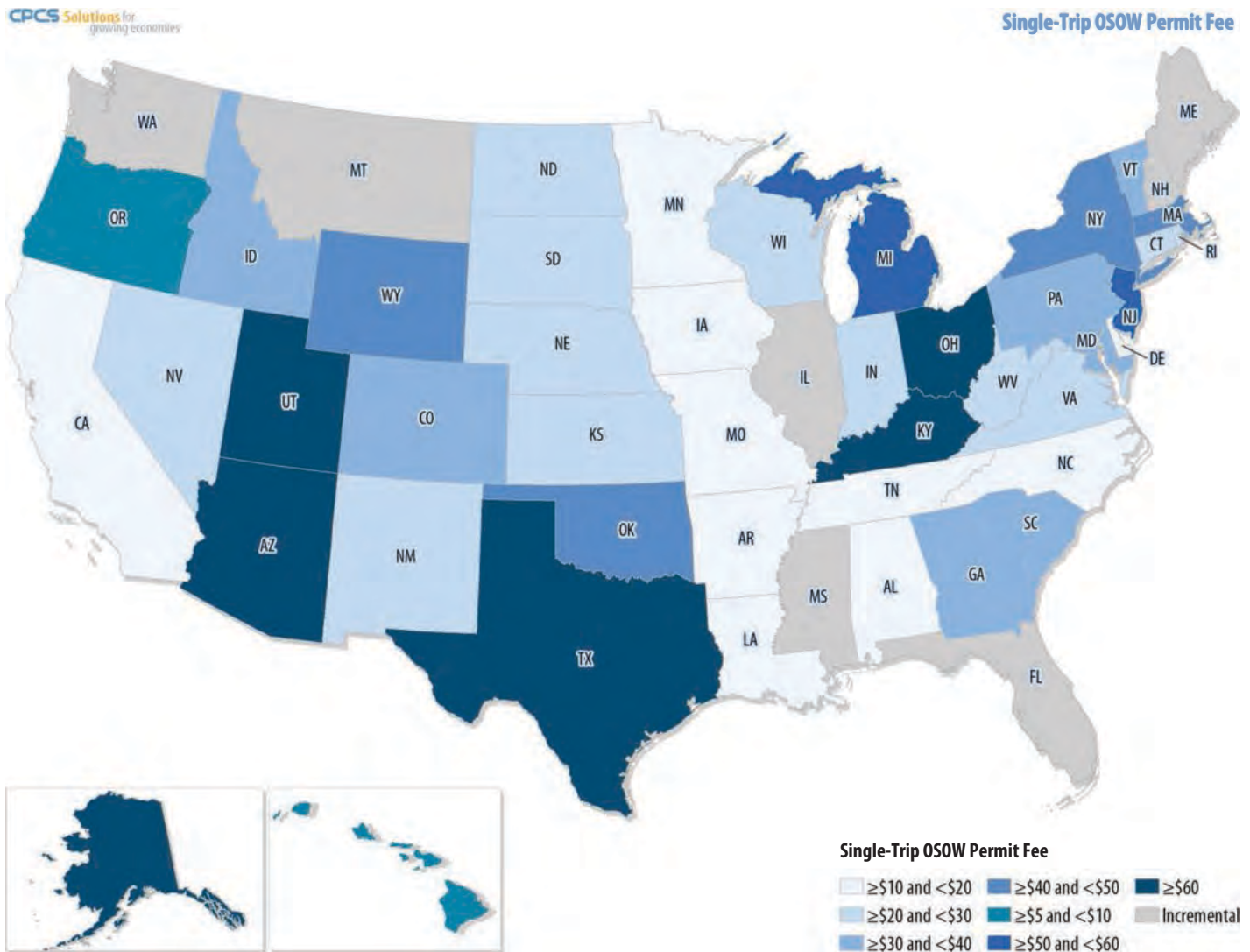


Figure A-52. Single-trip OSOW permit fee.



## APPENDIX B

# Global Scan of Best Practices and Lessons for the United States

## Global Scan of OSOW Transportation and Permitting Practices

OSOW permitting is a complex and time-consuming process throughout the world, particularly when related to moves across jurisdictional boundaries. A high-level global scan was undertaken to identify potential lessons from other jurisdictions. Upon the recommendation of the project panel, four international jurisdictions—Australia, Canada, the European Union, and Mexico—were initially focused on. Of these jurisdictions, primary focus was placed on Canada and Australia. The European Union and Mexico displayed vast institutional differences and processes for OSOW permitting, such that lessons learned were likely not transferrable to the U.S. context.

Australia and Canada provided the best corollary for the U.S. system because permitting of OSOW loads is handled by the province, state, territory, or locality in both the countries.

### Australia

Australia provides an example of a national method of OSOW permitting. Australia's permitting structure is similar to the United States, in that both state and local jurisdictions issue permits for OSOW vehicles (Figure B-1). Furthermore, states and territories have different operational requirements, such as the dimensions for which civilian and police escorts are required.

Australia passed the Heavy Vehicle National Law (HVNL) on February 10, 2014, which focused on safety, efficiency, and innovation by creating a single set of rules for all vehicles over 4.5 tons. HVNL included an opt-in policy for OSOW permitting that covers the Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania, and Victoria. Not all Australian states and territories have opted for HVNL at this time; the Northern Territory has plans to join in future and Western Australia has no plans to participate in the HVNL.<sup>1</sup> HVNL did not address operational issues such as escorts or hours of travel.

HVNL created the National Heavy Vehicle Regulation (NHVR), which administers the rules and laws enacted under HVNL. While HVNL affected a number of different safety-related trucking issues, it also created a central permit office and registration process. The central permit office administered by NHVR is the only place to apply for OSOW permits in participating states and territories. NHVR was set up to receive permit applications from the carriers and to then ask road managers in the affected states, territories, and local governments to sign off on the permits.

<sup>1</sup> *Heavy Vehicle National Law*. National Heavy Vehicle Regulator, 2014. <https://www.nhvr.gov.au/law-policies/heavy-vehicle-national-law-hvnl>. Accessed November 11, 2014.



Source: Main Roads Western Australia

**Figure B-1. Australian OSOW vehicle.**

In effect, NHVR was intended to act as a one-stop shop for permits, allowing for a single permit application that covers all participating jurisdictions.

NHVR took over the permit administration on February 10, 2014, and just 11 days later permitting administration was returned to the states and territories. The introduction of national permitting under NHVR ran into a series of problems that prevented the efficient issuing of permits. Therefore, permitting was reverted to the states with the plan to re-introduce the national permitting system at a later date. Consultations with the Crane Industry Council of Australia (CICA) and NHVR revealed that implementation and the limited capacity of local jurisdictions were the issues that hindered the successful use of the national permitting system.

Australia's national OSOW permit failed for two reasons. First, although this empowered local jurisdictions to approve permits, some localities—particularly those that had only a passive role in permitting prior to HVNL—did not have the capacity or capability to assess and approve permits, resulting in delays in permit approval. Additionally, localities were given 28 days to approve permits, which caused some permits to take the full 28 days to be issued. Second, NHVR tried to take on all permitting rather than stage the introduction of the permitting process. Essentially, all permits that were currently being applied for and all future permits as of February 10, 2014, were the responsibility of NHVR. The process that was designed could not handle the amount of permits that needed to be issued in the time frame that industries expected. As a result the national permitting system quickly reverted to the states and territories.

## Canada

Canada provides multiple examples of approaches to multi-jurisdictional OSOW harmonization on an intrastate, regional, and national level. Canada is also of interest with respect to bi-national OSOW moves, crossing the U.S.–Canadian border (Figure B-2). Nationally, the Canadian federal government has taken on the role of a facilitator to reduce barriers to inter-provincial travel, but the focus of the government has been on harmonizing legal loads throughout Canada. While the provinces of Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador have harmonized OSOW regulations, our consultations highlighted western Canada's harmonization initiatives as part of the NWP, which covers British Columbia, Alberta, and Saskatchewan. Lastly, on a provincial basis, Alberta provides a good



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**Figure B-2. Canadian OSOW load.**

example for facilitating multi-jurisdictional permitting of OSOW loads on both provincial and local roadways.

### *New West Partnership*

NWP began as an agreement between British Columbia and Alberta called the Trade, Investment and Labour Mobility Agreement (TILMA). Originally, TILMA was a mandate from the premiers of British Columbia and Alberta to identify rules that hinder the free movement of goods, services, and people across and between the provinces. Moving beyond the rules and regulations of TILMA and adding Saskatchewan, the NWP took a practical look at the issues and irritants of industry when moving within NWP states.

Officials used stakeholders from the heavy-haul, petroleum, and trucking industries, among others, to identify the biggest issues for OSOW travel.

Additionally, stakeholders identified the best practices and similarities between provinces to improve the permitting process.

The NWP is an ongoing working group built upon the relationships between provincial counterparts. A representative of the Ministry of Transportation and Infrastructure in British Columbia identified the close working relationships between the members in the provinces to be the main reason for the success of NWP.

Provinces notify the members of NWP in other provinces of proposed measures that are covered by the agreement. Effectively, notification across provincial boundaries keeps NWP officials up to date about other provinces, with the goal of identifying potential regional issues caused by new measures.

The NWP has had some successes in harmonizing OSOW regulations, including night move regulations, escort vehicle specifications, holiday restrictions, and escort vehicle warning signs. The NWP continues to move forward on OSOW issues by identifying OSOW corridors in the region, when civilian escorts are required, and the weights allowed for OSOW.

### *Alberta Transportation Routing and Vehicle Information System (TRAVIS)*

Alberta's Transportation Routing and Vehicle Information System (TRAVIS) provides a unique example of a one-stop shop for provincial and local OSOW permits.

TRAVIS is a single point of contact for the OSOW industry to order permits for both provincial and local roadways.

In the United States, as well as in other Canadian provinces, the OSOW carrier has to get separate approvals from local and provincial jurisdictions to travel on roadways maintained by each jurisdiction. The process of contacting multiple jurisdictions can be tedious for OSOW carriers and the routing of the provincial permit may not account for local restrictions or construction.

TRAVIS begins by establishing a route that identifies whether the permit is approved on a provincial level automatically or manually. After the provincial level is established, TRAVIS applies the rules whereby local jurisdictions can either automatically approve or send to the jurisdiction to manually approve. Once local jurisdictions have automatically or manually signed off, one permit is issued for one fee for the entire route in Alberta. According to an Alberta permitting official, permits take an average of three hours to be approved. TRAVIS eliminates duplicate efforts for industry, which according to an industry survey saves an estimated \$3 million CAD annually.<sup>2</sup>

Local jurisdictions are allowed access to TRAVIS at no cost. They are automatically consulted on OSOW moves on their roadways and have access to OSOW reporting. This reduces the time spent reviewing permits that TRAVIS can automatically issue.<sup>3</sup> Permit officials in Alberta highlighted both the revenue and knowledge of OSOW loads in the local jurisdiction as key for getting local buy-in. In some cases, OSOW loads were traveling through local jurisdictions without asking permission. In this instance, the locality was not receiving any revenue and it was unaware of OSOW loads in the area, creating the potential for accidents. TRAVIS allows localities to charge a fee for permitting and then apportions a marginal fee based on the weight of the load and length of travel on their roadways. In total, 80% of localities are on the TRAVIS system, presenting a large benefit to OSOW carriers. Lastly, the consensus from our consultation with the Alberta permit office and Canadian OSOW shippers is that TRAVIS is easy to use and one carrier noted it's one of the best systems available for permitting (Figure B-3).

## European Union

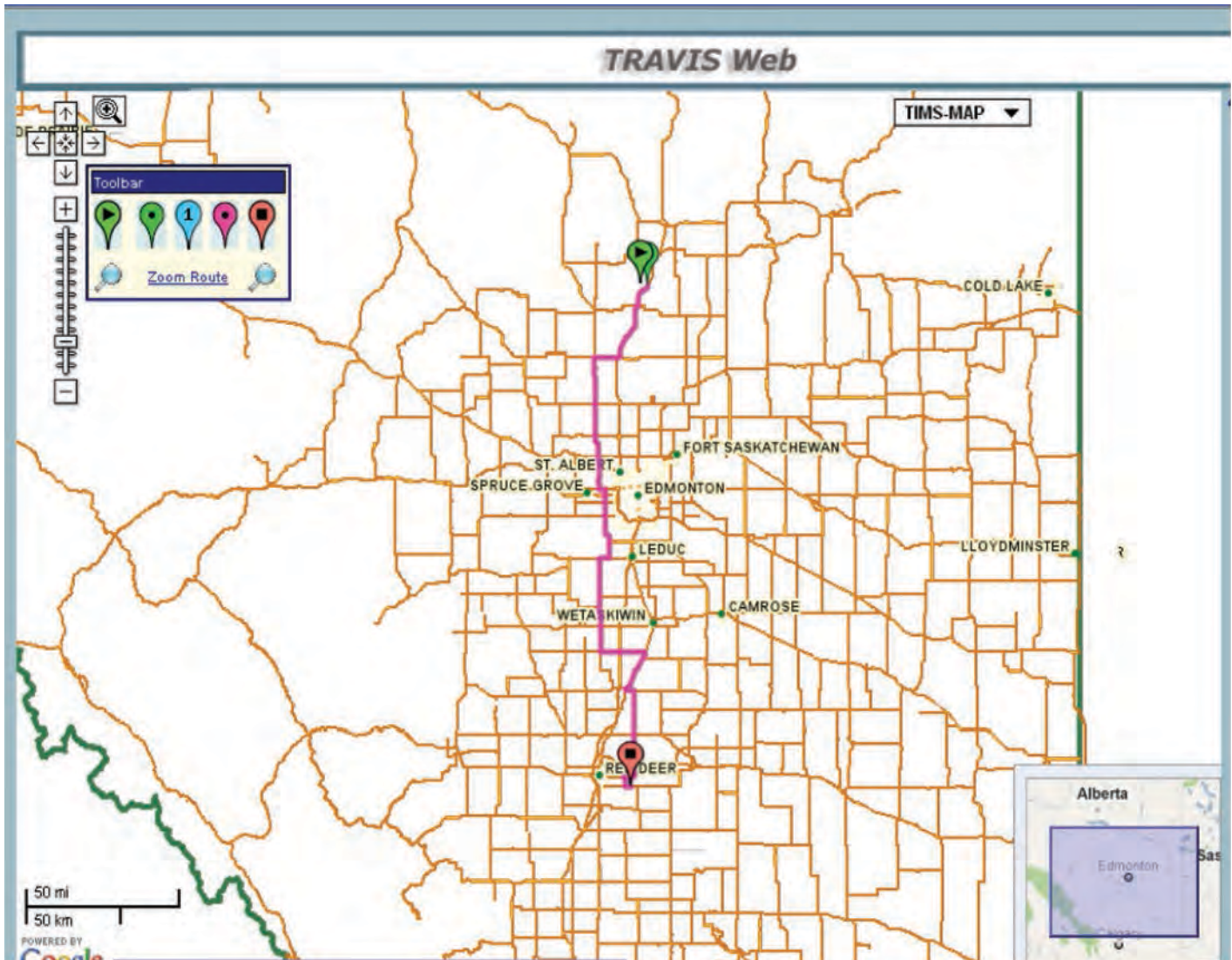
The European Union (EU) is an economic and political partnership of 28 European countries. One outcome of the EU is the creation of a single market where goods, services, capital, and people can travel.<sup>4</sup> A 2005 report by the European Commission, an executive body of the EU, found a “huge variety in rules and procedures” between the member states, causing delay and difficulties for carriers.<sup>5</sup> For further explanation of OSOW permitting in the EU, the research team consulted with The European Association of Abnormal Road Transport and Mobile Cranes (ESTA). ESTA has been a strong advocate for EU harmonization and has called for implementation of the best practices identified in the European Commission report of 2005. ESTA reports that, while harmonization was recommended in 2005, the only harmonization occurring was happening by accident. Big European countries are changing OSOW regulations independent of other countries, which ESTA attributes to the lobbying efforts on the part of domestic companies trying to limit competition. Reportedly, smaller countries have been more likely to harmonize because they have a heavier reliance on trade but, in general, OSOW harmonization is not a priority in

<sup>2</sup>Krumins, I., and K. Leslie. *TRAVIS Multi-Jurisdiction Oversize Vehicle Permitting System*. Alberta Transportation, 2011. <http://conf.tac-atc.ca/english/annualconference/tac2011/docs/u1/krumins.pdf>. Accessed November 13, 2014.

<sup>3</sup>Krumins, I., and K. Leslie. *TRAVIS Multi-Jurisdiction Oversize Vehicle Permitting System*. Alberta Transportation, 2011.

<sup>4</sup>*How the EU works*. European Union, n.d. [http://europa.eu/about-eu/index\\_en.htm](http://europa.eu/about-eu/index_en.htm). Accessed November 11, 2014.

<sup>5</sup>*European Best Practice Guidelines for Abnormal Road Transports*. European Commission, 2005. [http://ec.europa.eu/transport/road\\_safety/vehicles/doc/abnormal\\_transport\\_guidelines\\_en.pdf](http://ec.europa.eu/transport/road_safety/vehicles/doc/abnormal_transport_guidelines_en.pdf). Accessed November 11, 2014.



Source: Alberta Ministry of Transportation

**Figure B-3.** TRAVIS routing interface.

the EU. OSOW issues have not been a focus for member states as illustrated by the 2014 revision of EU's transport directive 96/53 completely excluding OSOW issues.

Compared to the United States, the EU encounters different barriers to OSOW harmonization. First, each border is a country border that has local and regional jurisdictions, a private infrastructure, and its own political system and culture. These factors, along with industry lobbying efforts in big countries against harmonization, make the EU context very different from the U.S. context.

## Mexico

Mexico operates a federally administered OSOW program. Essentially, the federal government establishes the size restrictions on federal highways. Compared to the United States, Mexico's federal government is much more involved in OSOW regulation. The Secretariat of Communications and Transport (SCT) is tasked with permitting OSOW loads, including all associated analysis of routes, bridges, and clearances. SCT organizes OSOW loads in six categories based

on length, width, and height dimensions. Based on the category, SCT sets the number of escorts and hours of operation allowed for each permit.<sup>6</sup>

Overall, examples from Mexico's OSOW permitting are not transferrable to the United States.<sup>7</sup> Mexico has been regulating truck size federally since 1980, so the system is well established. Additionally, because Mexico's system is federally mandated, harmonization goes through one governmental process rather than multiple jurisdictions as is the case in the United States. Therefore the systems are too different to draw substantial inferences to apply in the United States.

## Important Lessons for the United States

Three major lessons can be drawn from the global scan: the importance of implementation, multi-jurisdictional communication, and multi-jurisdictional permitting.

### Implementation

As shown by Australia's implementation of HVNL, the implementation process of any change to OSOW rules or regulation is critical to its success. In the case of HVNL, CICA noted that there was minimal industry involvement in the process and that the outreach that did happen did not involve working substantially with the software used to file permits. NHVR has involved OSOW carriers including CICA in its efforts for future HVNL implementation, identifying industry input as an important factor in implementation. Recently, NHVR created a group to obtain industry feedback as part of its planning to re-launch the national permit.

NHVR tried to take on all OSOW permitting from day one, including permits that were in process, starting off with a backlog in permits. In this case, a rolling implementation may have identified issues before the software was implemented for all permits in all participating jurisdictions. For example, Alberta tested TRAVIS in four local jurisdictions before fully implementing the system. Lastly, the implementation of HVNL did not account for variations in the capacity of local jurisdictions to handle permitting. By changing local jurisdictions from passive to active participants in OSOW permitting, HVNL placed a large administrative burden on jurisdictions that may or may not have the internal capacity to assess permits.

As shown by HVNL, implementation is essential to the success of any change in rules or regulation. A number of important lessons can be identified through Australia's experience, one being the importance of assessing the institutional capacity of organizations tasked with new roles or oversight. In the case of HVNL, some localities did not have the capacity to respond to permit requests, which resulted in delays.

### Multi-Jurisdictional Communication

Both TILMA and NWP are examples of removing barriers between jurisdictions, in this case at a provincial level.

The initial effort of TILMA and NWP reduced barriers between the provinces, but importantly, the agreement of the NWP also institutionalized regulatory communication between jurisdictions.

<sup>6</sup>Prozzi, J., M. Murphy, L. Loftus-Otway, A. Banerjee, M. Kim, H. Wu, J. P. Prozzi, R. Hutchinson, C. M. Walton, J. Weissman and A. Weissmann. *Oversize/Overweight Vehicle Permit Fee Study*. Center for Transportation Research, 2012. [http://www.utexas.edu/research/ctr/pdf\\_reports/0\\_6736\\_2.pdf](http://www.utexas.edu/research/ctr/pdf_reports/0_6736_2.pdf). Accessed November 11, 2014.

<sup>7</sup>OSOW permitting in Mexico is handled nationally. This is obviously simpler than having to obtain permits from multiple jurisdictions. The primary lesson for the United States is the simplicity of the permitting process when administered centrally.



When one NWP member is proposing a change to regulation, all members look at the regulation. This approach institutionalized working relationships between provincial regulators and serves as a forum for regulations to evolve within the region in response to industry input, trends, or new opportunities.

In the U.S. context, the various AASHTO subcommittees and subregions serve a similar function, but the relationship is not necessarily institutionalized. Institutionalized communication ensures a base level of communication occurs regardless of changes in staffing or priorities. As an extension of the TILMA framework, the NWP has been used by officials in British Columbia, Alberta, and Saskatchewan to begin to identify and remove multi-jurisdictional OSOW barriers.

### **Multi-Jurisdictional Permitting**

Finally, the model that Alberta used for implementing multi-jurisdictional permitting provides an example for other states or regions that are considering pursuing multi-jurisdictional permits. Alberta allowed localities to opt into using TRAVIS for permitting at no cost and allowed localities to charge for permits. The user fills out one permit and is approved for multiple jurisdictions. Additionally, TRAVIS allows jurisdictions to set thresholds for permits to be automatically issued, decreasing the burden on permit officials for routine permits.

According to multiple U.S. OSOW carriers, local permitting is increasingly becoming an issue. A 2014 Wisconsin DOT OSOW working group highlighted this issue with a carrier requesting a single interface and payment system for OSOW permits. Carriers voiced concerns with the inefficiency of permitting through every locality. TRAVIS provides an example of successful implementation of a one-stop shop for multi-jurisdictional OSOW permits. The TRAVIS model, implementation process, and software provide an example of multi-jurisdictional permitting that can be catered to a state or region interested in designing such a system.



## APPENDIX C

## Methodology for Ranking Border Friction

There are several factors driving the ranking of border friction, as shown in Figure 5-2 (Relative ranking of issues that cause delay based on frequency and total delay) on page 53. Border friction ranking reflects the degree of impedance between two states on the basis of the differences in their regulations and permitting requirements. It is intended to reflect the additional delay, risk, administrative burden, and ultimately cost that derive from differences in regulations. Border friction does not reflect the degree of regulatory restrictiveness itself: for example, two states that both have restrictive axle weights or strict civilian escort requirements are shown as sharing a border with a low-friction ranking.

The ranking is computed by scoring 72 unique indicators on a scale of 1 to 100, and aggregating these indicators into six broad categories using a weighting scheme that reflects the importance of each indicator (for example, a third civilian escort has a lower weight than a second civilian escort). The six categories are then weighted using the scheme shown in Figure C-1.

For most of these categories, border friction is computed as the degree of harmony in the regulations of neighboring states. For example, Louisiana and Texas have similar maximum axle weights, whereas Arkansas's weight maximums are lower; thus Arkansas' borders with these states show greater friction. However, for hours of operation, two states with restrictive regulations cause the highest friction while two states that allow continuous travel have the lowest friction. This is because the hours of operation cannot entirely be planned for and costed out ahead of time and restrictive regulations by their nature increase the degree of risk and delay. For most of the states a linear scoring scale is assumed: for example, the difference between 90 ft and 100 ft length thresholds is identical to the difference between 100 ft and 110 ft length thresholds. The exception to this is axle weights, for which a non-linear score that disproportionately penalizes lower thresholds is applied. The rationale is that low thresholds affect not only a single border but an entire route as OSOW carriers plan the route on the basis of the single state with the lowest axle weight maximums. Taking tandem axles as an example, the fact that Kentucky allows 48,000 lbs but Tennessee only 40,000 is much more significant than Kentucky allowing 48,000 and Illinois 58,000.

The friction score also significantly penalizes states with non-standard, case-by-case regulations (i.e., regulations at the state DOT discretion) compared to states with clear, well-defined, and standard regulations as the former can impose a large administrative and planning burden on carriers. The states judged to have the highest penalty on this basis are Delaware, West Virginia, Idaho, and New York; while there are 16 states that receive no penalty because their regulations are clearly spelled out and in a standard format.

### Limitations

As with any single aggregated measure, border friction ranking is complex. There is no way that it can capture all relevant dynamics. Important limitations are shown in Figure C-2.

Category	Weight (Points)	Consists of
Permitting	3	Processing times, height for utility notification and route surveys, minimum clearance for overheight loads
Axle weights	3	Permit maximums on single, tandem, tridem, and quad axles; frost/thaw restrictions
Hours of operation	2	Saturday/Sunday travel allowed, thresholds for continuous 24-hour travel
Police escorts	2	Length, width, height, and weight thresholds for first and second escort
Civilian escorts	2	Length, width, height, and weight thresholds for first, second, third, and fourth escorts
Revisions/extensions	1	Duration of permit, revisions and extensions allowed

**Figure C-1. Categories of border friction ranking.**

Consideration	Description
Only considers two states	In reality, OSOW moves often take place over a large number of states. Obviously, this is an inherent limitation of ranking individual borders.
Generalized priorities not tailored to individual moves	Some OSOW moves may be affected to a very high degree by a single regulation, which may appear “watered down” in the overall border rankings. A border judged as having low friction may still have individual regulatory differences that are very important for individual OSOW movements.
Some regulations not reflected	Seventy-two different regulations, which were deemed to be most relevant by the team, were considered. There were many regulations that were left out or could have been considered from a different angle. There is a trade-off between exhaustiveness and tractability.
Scoring and weighting of regulations	The regulations were scored and weighted according to the collective experience and judgment of the team. Although the approach is highly objective and data-driven, there is also some subjectivity involved (e.g., weighting categories).
Case-by-case penalties	In some cases, the regulations were route-dependent, case-by-case, or otherwise at the discretion of the state DOT. A consistent and high penalty (75 out of 100, where 0 is no difference between states and 100 is the most extreme [theoretical] difference) was assigned. There may have been vast differences between states in how they actually enforce the case-by-case regulations but this is very hard to systemically capture.
No weighting by actual OSOW movements data	Actual OSOW movements based on flow data was not considered as this would have been well out of scope. However, in principle the rankings could reflect the actual distribution of vehicles by classes (e.g., if most OSOW vehicles are in a certain weight range, differences between states within that range can be disproportionately penalized). Similarly, OSOW origins and destinations could be used to draw attention to borders that are both high friction <i>and</i> most critical to OSOW freight. This could be a future improvement.

**Figure C-2. Limitations of border friction ranking.**

These limitations notwithstanding, the ranking of border friction helps to draw attention to particular borders and parts of the country with significant friction and regulatory discrepancies. Examples of high and low friction are profiled below.

### High Friction Examples

#### New York–New Jersey and the Northeast



New York, New Jersey, and most of the New England states are among the most restrictive states when it comes to OSOW regulations. However, they are not necessarily restrictive in a coordinated way. An example is the New York–New Jersey border, which ranks as the number one border with highest friction in the United States. In a corrective effort, New Jersey DOT, New York DOT, New York City DOT, and the Port of New York and New Jersey are currently exploring ways to coordinate their permit systems in order to streamline the permitting process across their jurisdictions. Unlike New Jersey, New York has fairly strict restrictions regarding police and civilian escorts. New York also does not allow Sunday travel and does not allow permit revisions or extensions. In addition to this, New York City only allows OSOW permitted loads at night. New Jersey has a much longer processing time for trip permits (3 to 5 days as opposed to 1 to 2 for New York) and New Jersey has fairly strict utility notification requirements whereas New York leaves it up to the carrier.

#### Midwest



Some of the friction in the Midwest comes from variability in the restrictiveness of the regulations imposed by the states. For example, Kentucky is generally among the most permissive states in the United States, particularly in terms of police escorts and hours of operation, whereas most other states are middling to restrictive. Much of the friction also owes to a lack of coordination among states. A good example is axle weights. Illinois and Ohio are very liberal while Wisconsin and Kentucky are restrictive for single axles but permissive for larger combinations. Iowa is overall quite restrictive. Michigan, Indiana, and West Virginia treat axle weights on a case-by-case basis. There are virtually no borders in this region that could be considered to be coordinated on axle weights. This part of the country is also heavily penalized for case-by-case decision making, with West Virginia, Michigan, and Indiana ranking particularly poorly and Wisconsin, Illinois, and Ohio also standing out.

#### Colorado–Kansas



This border is possibly the most extreme example of an uncoordinated border between two states that are in the larger picture rather similar in being fairly permissive. Colorado generally allows continuous 24-hour operations while Kansas does not allow 24-hour operations in virtually any case. Kansas allows permit revisions but not extensions, while Colorado is the opposite. Kansas tends to not require police escorts and treats civilian escorts on a case-by-case basis, while the opposite is true of Colorado, which does not require civilian escorts but treats police escorts on a case-by-case basis. In addition, the border between Wyoming and Colorado and that between Nebraska, Kansas, and Oklahoma have a high degree of friction in terms of axle weights, with the permit maximums being lower in the Eastern states.

## Low Friction Examples

### The Dakotas (and the surrounding region)



The Northern Plains states are among the most harmonized in the United States. The lowest friction border is that between the two Dakotas. A single-trip permit lasts for 3 days in both states and is issued in 1 hour (1 to 2 days for superloads). The thresholds at which civilian escorts are required for multilane roadways are the same in both states in terms of length, width, height, weight, and overhang. Few regulations differ significantly and almost all regulations are clearly spelled out rather than applied on a case-by-case basis at the DOT's discretion. The same is true of other states in this geographic area, including Montana, Idaho, Wyoming, and Minnesota.

### South-Central states



The borders between the South-Central states such as Oklahoma, Arkansas, Mississippi, and Tennessee rate as having low friction. Axle weights are aligned east to west, with Oklahoma, Arkansas, and Tennessee all having identical permit maximums for single, tandem, and tridem axles. The states are also reasonably coordinated in terms of permitting. The borders of Alabama and Louisiana are somewhat worse than the others largely because of strict police escort regulations. Of course, it is important to remember that the overall high level of coordination can obscure individual factors that may be extremely important to individual OSOW moves. Axle weights are a telling example. In terms of single axle maximums, Tennessee is broadly coordinated with neighboring states such as Kentucky, Missouri, and Arkansas. However, for tandem axles the coordination is along an east–west but not north–south axis. At 40,000 lbs, the maximum tandem axle weight for Oklahoma, Arkansas, and Tennessee is lower than that of all neighboring states, both to the north and south.

### Maryland–Pennsylvania and Pennsylvania–Ohio



Pennsylvania's borders with Maryland and Ohio rank as fairly low friction, even though Maryland and Ohio are overall fairly restrictive and Pennsylvania is about average. These borders demonstrate that it is possible to achieve low border friction even in a region where regulations tend to be less liberal. The Maryland–Pennsylvania border scores poorly in terms of hours of operation (e.g., Maryland does not allow Sunday travel), but overall scores well. Single and tandem axle weights are close, and most civilian escort thresholds are low but identical or similar (e.g., 13 in. width and 85 to 90 in. length for first escort). The regulations for both states are spelled out, rather than being at the state DOT's discretion. Ohio relies heavily on case-by-case decisions for police escorts, but is more permissive on hours of operation and is fairly coordinated with Pennsylvania on axle weights and civilian escorts.

*Abbreviations and acronyms used without definitions in TRB publications:*

A4A	Airlines for America
AAAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI-NA	Airports Council International-North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FAST	Fixing America's Surface Transportation Act (2015)
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HMCRP	Hazardous Materials Cooperative Research Program
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
MAP-21	Moving Ahead for Progress in the 21st Century Act (2012)
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
PHMSA	Pipeline and Hazardous Materials Safety Administration
RITA	Research and Innovative Technology Administration
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TDC	Transit Development Corporation
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation

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