

## POTENTIAL MANAGEMENT STRATEGIES

The case studies of planning activities in chapter three provide some insights into the types of specific strategies being pursued to manage increasing truck traffic. The strategies range from design enhancements and capacity improvements, to systems technology innovations, to regulatory policies. These strategies are as varied as the challenges they are designed to address. The purpose of this chapter is to identify the range of potential management strategies being considered and the types of challenges to which the various strategies apply.

### POTENTIAL STRATEGIES

Potential strategies have been grouped into eight categories. The following discussion identifies specific strategies considered within each category. Tables 5 and 6 show the degree of implementation as reported by the responding state DOTs and MPOs, respectively.

#### Improved Highway Design

Improvements in highway design include upgrades implemented at specific locations and changes to the design standards used for future highway improvements. Strategies to improve highway design include

- Improved highway geometrics,
- New or upgraded structures,
- New or improved pavements, and
- Modified design standards.

More than 50% of the responding states (13 of 24) report that they are improving highway geometrics, upgrading structures (11 of 21), and improving pavement (14 of 23) in response to increasing truck traffic, with pavement improvement the most commonly implemented strategy. In addition, more than one-third of the states (8 of 21) report that they have modified design standards in response to increasing truck traffic. MPOs typically report a lower involvement with highway design improvements (2 to 3 of the 8 respondents), because this is usually a state responsibility.

#### Roadway Facilities for Trucks

In some locations, truck volumes or operational requirements may justify physical separation of trucks or com-

mercial vehicles from light-duty traffic (automobiles). The survey asked respondents whether the following types of roadway facilities have been studied or implemented:

- Dedicated roads for trucks or commercial vehicles,
- Special use lanes for trucks or commercial vehicles,
- Truck climbing lanes, and
- Dedicated truck ramps.

Some survey respondents identified other types of roadway facilities that have been implemented, including a truck route system, truck escape ramps, and designated parking or rest areas.

Climbing lanes for trucks are a common practice: more than 75% (20 of 26) of the states responding to the survey have climbing lanes. The other types of roadway facilities are much less common. Approximately 20% are developing special use lanes (6 of 26) or dedicated ramps (5 of 24), and only 1 state of 25 reports approval of a dedicated road for trucks (this is Edgewater Road in New York). In addition, although not part of the survey responses, Massachusetts has implemented the South Boston Bypass as a dedicated road for commercial vehicles. MPO responses indicate the same general order of frequency, although fewer MPOs are involved with truck roadway facilities because state DOTs are primarily responsible for highway improvements.

#### Operational Strategies

Operational strategies address the management and use of the available infrastructure. Survey respondents were asked whether the following strategies have been implemented for truck traffic:

- Lane restrictions,
- Time-of-day restrictions,
- Roadway restrictions or prohibitions,
- Parking restrictions or prohibitions,
- Incident management, and
- Improvements in intermodal operations.

Other operational strategies identified through survey responses included weight restrictions on bridges, congestion pricing, express truck lanes through toll plazas, and restriction of truck operations during peak travel time for loads requiring permits.

TABLE 5  
POTENTIAL STRATEGIES—STATE DEPARTMENTS OF TRANSPORTATION

DOT Responses to Question 3*	Not considered	Identified, but not studied	Studied, but eliminated	Approved, but not implemented	Implemented, or being implemented	% of states in which approved or implemented
(a) Improved Highway Design						
Improved highway geometrics	4	7	0	3	10	54
New or upgraded structures	5	5	0	2	9	52
New or improved pavement	4	5	0	1	13	61
Modified design standards (geometric/structural/pavement)	6	7	0	0	8	38
(b) Roadway Facilities						
Dedicated roads for trucks or commercial vehicles	15	8	1	1	0	4
Special use lanes for trucks or commercial vehicles	7	10	3	3	3	23
Truck climbing lanes	3	3	0	2	18	77
Dedicated truck ramps	13	6	0	2	3	21
(c) Operational Strategies						
Lane restrictions for trucks	5	2	2	1	15	64
Time-of-day restrictions for trucks	12	5	2	1	3	17
Restriction of prohibition of trucks on some roads	8	2	0	1	15	62
Truck parking restrictions/prohibitions	6	3	0	2	13	63
Improved incident management	5	1	0	4	15	76
Improved intermodal operations	4	7	0	7	4	50
(d) Intelligent Transportation Systems						
ITS strategies to facilitate truck flow on roads	2	8	0	4	11	60
Intelligent warning devices	4	5	0	7	8	63
Weigh-in-motion	0	4	0	6	18	86
(e) Signing						
Improved warning signing	2	7	0	3	13	64
Improved directional or informational signing	3	7	0	3	9	55
(f) Vehicle Size and Configuration						
Increased size or weight limits	9	6	4	0	7	27
Reduced size or weight limits	12	8	1	1	4	19
Allow triple trailers on roadways	11	3	6	1	6	26
(g) Enforcement/Compliance						
Additional inspection stations	5	7	2	2	7	39
Additional truck inspections	5	5	2	3	9	50
Electronic screening	4	3	0	4	15	73
Enhanced enforcement or remove noncompliant trucks	5	4	0	2	12	61
Enhanced enforcement of operator hours	8	3	1	2	7	43
(h) Alternative Infrastructure Investments						
Improvements in port/shipping infrastructure	10	5	0	5	5	40
Improvements in air freight infrastructure	11	4	1	4	5	36
Improvements in rail infrastructure	8	4	0	7	5	50

\*Has your agency evaluated or implemented specific strategies to address the effects of increasing truck traffic?

Notes: Survey data (28 states responding).

With the exception of time-of-day restrictions, operational improvements are being implemented by most of the responding states, with incident management the most common strategy (19 of 25 states). Time-of-day restrictions have not been applied extensively: less than 20% (4 of 23) of the states have imposed such restrictions. MPO involvement in operational strategies varies according to their areas of responsibility. However, incident management is by far the most common (with six of seven MPOs reporting involvement in incident management).

### Intelligent Transportation Systems

ITS are systems that use information, communication, sensor, and control technologies to improve transportation system efficiency and safety. The U.S.DOT has developed a national ITS program plan that includes seven major elements—those most likely to be implemented by public agencies to enhance highway operations and safety for trucks fall into the categories of commercial vehicle operations (ITS/CVO) and Advanced Vehicle Control and Safety

TABLE 6  
POTENTIAL STRATEGIES—METROPOLITAN PLANNING ORGANIZATIONS

MPO Responses to Question 3*	Not considered	Identified, but not studied	Studied, but eliminated	Approved, but not implemented	Implemented, or being implemented	% of MPOs which have approved or implemented
(a) Improved Highway Design						
Improved highway geometrics	4	0	1	2	1	38
New or upgraded structures	4	0	1	2	1	38
New or improved pavement	5	0	1	1	1	25
Modified design standards (geometric/structural/pavement)	5	0	1	1	1	25
(b) Roadway Facilities						
Dedicated roads for trucks or commercial vehicles	6	2	0	0	0	0
Special use lanes for trucks or commercial vehicles	4	2	1	1	0	13
Truck climbing lanes	6	0	0	0	2	25
Dedicated truck ramps	6	1	0	1	0	13
(c) Operational Strategies						
Lane restrictions for trucks	6	2	0	0	0	0
Time-of-day restrictions for trucks	4	2	1	0	0	0
Restriction of prohibition of trucks on some roads	5	0	0	1	2	38
Truck parking restrictions/prohibitions	6	1	0	0	1	13
Improved incident management	1	0	0	1	5	86
Improved intermodal operations	2	2	0	2	1	43
(d) Intelligent Transportation Systems						
ITS strategies to facilitate truck flow on roads	1	1	0	1	3	67
Intelligent warning devices	2	0	0	1	3	67
Weigh-in-motion	3	0	0	1	4	63
(e) Signing						
Improved warning signing	4	0	0	2	1	43
Improved directional or informational signing	3	2	0	2	1	38
(f) Vehicle Size and Configuration						
Increased size or weight limits	7	0	1	0	0	0
Reduced size or weight limits	7	1	0	0	0	0
Allow triple trailers on roadways	7	0	0	0	0	0
(g) Enforcement/Compliance						
Additional inspection stations	8	0	0	0	0	0
Additional truck inspections	8	0	0	0	0	0
Electronic screening	5	0	0	2	1	38
Enhanced enforcement or remove noncompliant trucks	6	0	0	1	1	25
Enhanced enforcement of operator hours	8	0	0	0	0	0
(h) Alternative Infrastructure Investments						
Improvements in port/shipping infrastructure	4	0	0	3	1	50
Improvements in air freight infrastructure	3	0	0	3	2	63
Improvements in rail infrastructure	4	1	0	2	1	38

\*Has your agency evaluated or implemented specific strategies to address the effects of increasing truck traffic?

Notes: Survey data (8 MPOs responding).

Systems (AVCSS). (For additional information, refer to the U.S.DOT ITS website at: <http://www.its.dot.gov/>.)

ITS/CVO elements include information systems, networks, sensor systems such as weigh-in-motion, technologies such as brake testing equipment, border crossing systems, and the components of intelligent commercial vehicles. ITS/CVO user services include commercial vehicle electronic clearance (including weigh-in-motion and PrePass), automated roadside safety inspection, onboard safety monitoring, commercial vehicle administrative processes, hazardous materials incident response, and freight mobility (24). Most states have devel-

oped ITS/CVO plans, such as the Nevada plan described in chapter three, within the framework of the nationwide initiative sponsored by the FHWA, and are instituting information systems and communications networks that support commercial vehicle operations. These networks are known as Commercial Vehicle Information Systems and Networks (CVISN).

AVCSS technologies include motorist warning systems (for example, detecting when a truck is moving too quickly to negotiate an upcoming curve and then flashing a warning beacon) and collision avoidance systems.

The survey question focused on implementation of three types of ITS elements related to roadway operations and safety.

- Strategies to facilitate truck flow,
- Intelligent warning devices, and
- Weigh-in-motion—devices to communicate truck identity and weight information electronically to enable the truck to bypass roadside weigh stations.

Other ITS strategies reported by survey respondents include on-line vehicle registration and automatic vehicle identification.

ITS strategies are popular among states for addressing truck-related challenges, largely because of their cost-effectiveness and the federal initiative, including guidance and funding, to plan and implement these systems. Of the responding states, 60% (15 of 25) have implemented or approved ITS strategies to improve truck flow; 63% (15 of 24) have implemented or approved intelligent warning devices; and 86% (24 of 28) have implemented or approved weigh-in-motion. Actual implementation is highest for weigh-in-motion, with 64% (18 of 28) reporting that implementation is complete or under way. Responding MPOs report equally high involvement (4 or 5 of 8) with ITS strategies, so these improvements can be considered some of the most popular current methods for managing certain aspects of increasing truck traffic.

## Signing

Two types of signing improvements are particularly relevant to managing increasing truck traffic.

- Improved warning signs, used to warn drivers of safety hazards; and
- Improved directional or information signs, to help drivers reach a destination or find a location.

More than half of the responding states (12 of 22) have improved informational or directional signing in response to the increasing volume of truck traffic, and almost two-thirds (16 of 25) have improved warning signs. There is less involvement of MPOs in improvements because roadway signing is primarily the purview of the state DOTs or local agencies.

## Vehicle Size and Configuration

Increasing the size or load limits permitted on state highways has been discussed by some states as a means of accommodating greater volumes of freight with the same number of trucks. However, some states are moving in the

opposite direction, lowering size or weight limits in specific locations, usually in response to a potential safety hazard, infrastructure deficiency, or community impact. Specifically, in such instances, three types of changes are usually considered

- Increases in size or weight limits,
- Decreases in size or weight limits (instances reported in the survey responses involve imposition of size or weight restrictions in specific locations), and
- Allowing triple trailers on highways.

Diversion of trucks from the federal and state highway system onto local roads not designed to handle truck traffic (usually overloaded trucks that are avoiding weigh stations) was also identified as an issue in the survey responses.

Relatively few states have implemented such changes, however, largely because of constraints imposed by federal law. Minimum weight limits on the Interstate system and minimum trailer lengths on the National Network were established in the Surface Transportation Assistance Act of 1982. Also, ISTEA (1991) established a freeze on longer combination vehicle operations, which prohibits the expansion of such vehicles. Less than 30% of the states (7 of 26 responding) have increased size or weight limits or allowed triple trailer combinations on highways. Almost 20% of the states (5 of 26) have implemented regulations in the opposite direction, reducing size or weight limits in some locations. MPOs have been essentially uninvolved in vehicle size and configuration, because these concerns are the responsibility of the state government.

## Enforcement and Compliance

Enforcement of existing laws and regulations is often viewed as an effective means of ensuring safety and protecting infrastructure investments. Some of the significant enforcement challenges include trucks that exceed weight limits and excessively damage pavement, trucks that fail to meet equipment standards, and drivers who exceed limitations on hours of operation. In addition, technological advancements have led to electronic screening procedures for improving the efficiency of enforcement. Specific improvement strategies in this category include

- Additional inspection stations,
- Additional truck inspections,
- Electronic screening,
- Enhanced enforcement to remove noncompliant trucks, and
- Enhanced enforcement of operator hours.

Almost three-fourths of the states (19 of 26) are using electronic screening as part of their enforcement and

compliance efforts. One-half of the states (12 of 24) have increased the number of inspections being conducted, and approximately 40% (9 of 23) have added inspection stations. More than 60% (14 of 23) have stepped up enforcement to remove noncompliant trucks, whereas 43% (9 of 21) have increased enforcement of operator hours.

Because enforcement and compliance are the responsibility of state and local governments, MPOs have been essentially uninvolved in these activities, although some have supported electronic screening and enforcement of operator hours regulations.

### Investments in Alternative Infrastructure

The increasing volume of truck traffic has led almost half of the states to explore investment in alternative types of goods movement infrastructure. Three types of alternative infrastructure can be used to reduce the amount of trucking: (1) waterborne, (2) air freight, and (3) rail.

Improvements being recommended or implemented include safety and capacity improvements in freight rail corridors, new or improved intermodal transfer facilities, port freight shuttle trains, and improved airport ground access. The greatest number of responding states (12 of 24, or 50%) look to rail to take some of the freight handled by trucks, whereas approximately 40% are pursuing improvements for waterborne transportation (10 of 25) and air freight (9 of 25). MPOs report greater levels of involvement in improvements to air freight (5 of 8, or 63%) and ports and shipping infrastructure (4 of 8, or 50%) than in rail improvements (3 of 8, or 38%).

### APPLICATION OF STRATEGIES TO CHALLENGES

Survey respondents were asked to identify the primary challenges addressed by each of the improvement strategies as identified previously (multiple responses were allowed). This section discusses the respondents' perception of the relationship between the improvement strategies and the challenges being addressed (definitions and descriptions of the challenges are provided in chapter two). The relationship between improvement strategies and challenges identified by state DOTs is shown in Table 7, and MPO responses are provided in Table 8. Because of the limited number of MPO responses to this question, this discussion focuses on the responses of the state DOTs.

Strategies to improve highway design are all perceived to be significantly directed to improve safety, although each type of design improvement has additional benefits.

- Highway geometric improvements are overwhelmingly directed to improve safety, and secondarily to provide congestion relief.
- Improvements to structures address both safety and deteriorating infrastructure.
- Pavement improvements primarily address infrastructure needs, with improved safety a secondary objective.
- Changes to design standards address issues of both infrastructure and safety.

Development of roadway facilities for trucks (whether dedicated roads, special lanes, climbing lanes, or dedicated ramps) is perceived as being primarily directed to improving safety and reducing congestion. Interestingly, more respondents considered climbing lanes and truck ramps to be primarily directed to safety issues rather than to congestion relief, whereas respondents consider dedicated roads and special lanes as addressing both safety and congestion.

Operational strategies cover a diverse array of improvements, and the respondents perceive that the challenges being addressed are as follows:

- Lane restrictions for trucks and improved incident management primarily address safety, and secondarily address congestion.
- Time-of-day restrictions primarily address congestion, and secondarily address safety.
- Truck restrictions on roads primarily address safety, and secondarily address infrastructure deterioration and congestion.
- Truck parking restrictions primarily address safety, and secondarily address congestion and quality of life.
- Improved intermodal operations primarily address congestion and intermodal connections, and secondarily address economic development, safety, and transportation system issues.

ITS improvements are perceived to primarily address safety and congestion issues. In addition to addressing safety and congestion, some of the specific strategies are significantly directed to other challenges.

- Strategies to facilitate truck flow also address transportation system deficiencies and losses in productivity.
- Intelligent warning devices also address transportation system deficiencies.
- Weigh-in-motion also addresses transportation system deficiencies and infrastructure deterioration.

Signing improvements are overwhelmingly perceived as being directed to improving safety. They are also perceived as reducing congestion and addressing transportation system deficiencies.



TABLE 7  
RESPONDENT PERCEPTIONS OF CHALLENGES BEING ADDRESSED BY POTENTIAL STRATEGIES—STATE DEPARTMENTS  
OF TRANSPORTATION

DOT Responses to Question 3*	Congestion	Transportation System	Safety	Infrastructure	Environment	Intermodal Connections	Quality of Life	Economic Development	Losses in Productivity
(a) Improved Highway Design									
Improved highway geometrics	10	6	21	7	4	4	1	1	2
New or upgraded structures	6	9	17	15	2	3	0	2	3
New or improved pavement	3	8	12	18	2	2	0	1	4
Modified design standards (geometric/structural/pavement)	5	7	13	12	2	3	2	2	0
(b) Roadway Facilities									
Dedicated roads for trucks or commercial vehicles	8	2	7	3	2	2	3	4	0
Special use lanes for trucks or commercial vehicles	12	5	11	7	2	0	3	5	2
Truck climbing lanes	16	6	21	4	2	0	2	1	2
Dedicated truck ramps	5	2	9	2	2	2	0	4	1
(c) Operational Strategies									
Lane restrictions for trucks	14	3	18	5	3	0	4	1	0
Time-of-day restrictions for trucks	9	1	5	1	3	0	1	0	2
Restriction of prohibition of trucks on some roads	9	4	13	11	5	2	6	1	1
Truck parking restrictions/prohibitions	7	5	13	2	3	3	6	1	1
Improved incident management	16	5	17	3	4	2	4	4	5
Improved intermodal operations	8	6	6	4	2	8	2	7	4
(d) Intelligent Transportation Systems									
ITS strategies to facilitate truck flow on roads	14	9	17	3	3	4	1	5	8
Intelligent warning devices	11	7	17	2	2	1	1	0	2
Weigh-in-motion	11	11	16	13	2	0	1	2	11
(e) Signing									
Improved warning signing	5	6	22	1	2	1	1	1	0
Improved directional or informational signing	9	7	16	1	3	3	1	2	3
(f) Vehicle Size and Configuration									
Increased size or weight limits	4	6	11	7	1	0	0	6	7
Reduced size or weight limits	2	4	14	7	2	1	1	2	3
Allow triple trailers on roadways	3	6	13	4	2	1	2	5	5
(g) Enforcement/Compliance									
Additional inspection stations	2	3	17	7	1	0	3	1	0
Additional truck inspections	2	2	20	6	2	0	2	0	0
Electronic screening	7	7	18	4	2	1	2	3	5
Enhanced enforcement or remove noncompliant trucks	1	1	19	6	1	0	2	1	0
Enhanced enforcement of operator hours	1	1	13	2	0	0	1	1	1
(h) Alternative Infrastructure Investments									
Improvements in port/shipping infrastructure	7	9	3	5	1	9	1	7	4
Improvements in air freight infrastructure	7	9	3	4	1	9	1	7	3
Improvements in rail infrastructure	8	10	2	6	2	9	1	8	4

\*Primary challenges being addressed by the strategy.

Notes: Survey data (28 states responding).

Policies on vehicle size and weight—whether increasing or decreasing the measurements—are perceived as being directed primarily to improving safety. Secondarily, these strategies are used to address transportation system deficiencies, infrastructure deterioration, economic development, and losses in productivity.

Strategies to improve enforcement and compliance are overwhelmingly perceived as being directed toward improving safety. Most such strategies are perceived secondarily to address infrastructure deterioration.

Although the smaller number of respondents indicates that the linkage is weaker than the other strategies, investments in alternative types of infrastructure are perceived to address several of the challenges.

- Transportation system deficiencies,
- Intermodal connections,
- Congestion, and
- Economic development.

Significantly (with the exception of investments in alternative infrastructure), safety problems are perceived as

TABLE 8  
RESPONDENT PERCEPTIONS OF CHALLENGES BEING ADDRESSED BY POTENTIAL STRATEGIES—METROPOLITAN  
PLANNING ORGANIZATIONS

MPO Responses to Question 3*	Congestion	Transportation	Safety	Infrastructure	Environment	Intermodal Connections	Quality of Life	Economic Development	Losses in Productivity
(a) Improved Highway Design									
Improved highway geometrics	3	0	3	1	0	1	0	2	2
New or upgraded structures	1	1	2	2	0	2	0	2	2
New or improved pavement	0	0	2	1	0	1	0	1	1
Modified design standards (geometric/structural/pavement)	0	0	2	0	0	2	0	1	1
(b) Roadway Facilities									
Dedicated roads for trucks or commercial vehicles	1	0	2	0	0	0	0	0	0
Special use lanes for trucks or commercial vehicles	3	1	4	0	1	0	0	2	2
Truck climbing lanes	2	1	3	0	0	0	1	0	0
Dedicated truck ramps	1	1	2	0	1	0	0	1	1
(c) Operational Strategies									
Lane restrictions for trucks	0	0	1	0	0	0	0	0	0
Time-of-day restrictions for trucks	0	0	0	0	0	0	1	0	1
Restriction of prohibition of trucks on some roads	0	0	1	0	0	0	2	0	0
Truck parking restrictions/prohibitions	0	0	0	0	0	0	0	0	0
Improved incident management	5	1	5	0	0	0	0	0	1
Improved intermodal operations	2	2	1	2	0	3	0	2	2
(d) Intelligent Transportation Systems									
ITS strategies to facilitate truck flow on roads	3	1	2	0	0	2	0	3	1
Intelligent warning devices	3	1	1	0	0	1	0	1	2
Weigh-in-motion	2	1	3	0	0	1	0	2	2
(e) Signing									
Improved warning signing	2	0	0	0	0	0	1	0	0
Improved directional or informational signing	1	1	0	0	0	0	1	0	1
(f) Vehicle Size and Configuration									
Increased size or weight limits	0	0	0	0	0	0	0	0	0
Reduced size or weight limits	0	1	1	1	0	0	0	0	0
Allow triple trailers on roadways	0	0	0	0	0	0	0	0	0
(g) Enforcement/Compliance									
Additional inspection stations	1	0	1	0	0	0	0	0	0
Additional truck inspections	1	0	1	0	0	0	0	0	0
Electronic screening	1	0	1	0	0	0	0	0	1
Enhanced enforcement or remove noncompliant trucks	1	0	1	0	0	0	0	0	0
Enhanced enforcement of operator hours	1	0	1	0	0	0	0	0	0
(h) Alternative Infrastructure Investments									
Improvements in port/shipping infrastructure	1	1	0	1	0	1	0	3	2
Improvements in air freight infrastructure	1	1	0	1	0	2	0	3	3
Improvements in rail infrastructure	2	1	0	1	0	1	0	3	2

\*Primary challenges being addressed by the strategy

Notes: Survey data (8 MPOs responding).

being the predominant challenges addressed by truck-related improvement strategies. Congestion and infrastructure deterioration are the next most important challenges being addressed.

It is important to note that, in each improvement category, one or more of the strategies addresses each type of challenge associated with increased trucking. It

can therefore be concluded that each type of improvement strategy can address more than one truck-related challenge, and a particular challenge can be addressed by more than one type of improvement strategy. In each case, the specific details of the challenge, combined with local conditions and preferences, should determine the preferred strategy for addressing a truck-related challenge.