Commission Briefing Paper 4B-11

Issues and Options Related to Passenger and Freight Traffic Sharing the Same Facilities

Prepared by: Battelle
Date: January 11, 2007

Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

This paper describes the impact on economic efficiency of transportation facilities shared by passenger and freight traffic. The "efficiency" of the transportation system is herein defined as the maximum throughput, both passenger and freight, obtainable given available resources and infrastructure. In that approach, congestion is considered to arise from the scarcity of a good demanded—namely, some reduction in transport link throughput at a specific place and time. When the quantity supplied (measured in lane or track miles) is less than the quantity demanded the result is congestion. The paper also discusses mitigation options in terms of link available capacity where an outcome is more efficient (improved throughput) if those that are made better-off could compensate those that are made worse-off.

Background and Key Findings

The interaction of passenger and freight traffic sharing the same facility is becoming a growing concern, specifically in urban contexts where congestion is creating several conflicting issues associated with mixed traffic, primarily delays and safety. This briefing paper focuses on trip delay, diminishing transportation system efficiency by reducing the throughput for a given time period. The briefing paper focuses on three areas where both passenger and freight traffic compete for the same right of way: highways, railroads, and at-grade crossings. The paper finally presents several mitigation options to reduce individual trip delay.

● HIGHWAYS – Traffic congestion in shared highway facilities is an urban phenomenon and is due to increased demand for travel space by both passenger and freight trucks. The level of throughput for urban corridors is further reduced when both suburban (urban sprawl) passenger cars compete with freight trucks. In addition, several conflicting operational characteristics of large freight trucks, such as larger headway and longer stopping distance in the mixed traffic stream, aggravate congestion, making it worse than congestion in a comparable facility with only passenger cars.[1]

[1] Kockelman, K. and Shabih, R. "Effect of Light-Duty Trucks on the Capacity of Signalized Intersections". *Journal of Transportation Engineering* 2000, vol. 126.

● RAILROADS - The scenario is similar for railroads, where intercity and urban transit services compete with freight shipments for limited rail capacity. As urban highway congestion grows, demand increases for passenger trains, both by metropolitan authorities and intercity service providers. This creates challenges for freight railroad carriers in already-crowded segments of the rail network. Slower unit and longer bulk trains also impact passenger and fast intermodal freight rail scheduling, on-time performance, and safety.

● AT-GRADE CROSSINGS - Roadway traffic (both freight and passenger) share the railroad right-of-way at highway-railroad grade crossings. Trip delay and safety at these crossings are growing issues.

The following list highlights the key findings:

- Freight forecasting developed by FHWA under FAF[2] shows that truck related freight is expected to double by 2035 from its base year 2002. [2] Passenger traffic, coupled with this faster-growing freight truck service that also competes for the same facility, is expected to reduce highway throughput considerably.
- A recent FHWA-sponsored study shows that the percentage of NHS miles that experienced reduction in throughput almost doubled from the 1998 base year when trucks are added to the network (i.e., 1.9% to 3.6%). A similar change is forecast for 2010 (4.9% to 9.6%) and 2020 (7.1% to 15.5%).
- The impact on system throughput for a given time period (a measure of economic efficiency) due to non-recurring delays is 21% higher than the impact caused by system physical capacity. Non-recurring delays due to crashes are further aggravated if the crash involves a large freight truck.
- In urban areas the pickup and delivery (PUD) activities of trucks partially or fully blocking a lane of traffic contributed approximately 949,000 hours of delay in 1999.[3]
- By 2035, rail freight is expected to grow by 88%[4] from its 2002 base year, thus putting significant pressure on rail system capacity.
- Continuing demand for passenger commuter train and faster intermodal rail freight services on existing freight rail corridors is creating challenges for both freight railroad carriers and metropolitan authorities in already-crowded segments of the rail network. These challenges bring with them a greater concern about scheduling, on-time performance, and reduction of system efficiency for services sharing common tracks.
- Bottlenecks or reduced capacity for highway traffic in the major urban areas at railroad crossings due to slower unit rail freight traffic is a growing concern due to significant reductions in the highway throughput, specifically at locations where slower freight trains, fast intermodal freight trains, and commuter trains share track.
- For some urban areas, the delay at railroad crossings costs each motorist approximately $250 annually (at a nominal value of $30/hour).[5] In 1999, nationwide, at-grade highway-

[2] Freight Analysis Framework-2, FHWA, Washington DC, December 2006
[3] Temporary Losses of Highway capacity and Impacts on Performance: Phase 2, Oak Ridge National Labratory, October 2004.
[4] Freight Analysis Framework-2, FHWA, Washington DC, December 2006
[5] Motorist Delay at Public Highway – Rail Grade Crossings in Northeastern Illinois, Working Paper 2002-02, Illinois Commerce Commission, July 2002.

railroad crossings caused about 2.9 million hours[6] of delay on principal arterial highways, of which 91% occurred in urban areas.

- MITIGATION - FHWA, State DOTs, MPOs, and rail carriers are currently adopting or plan to adopt various mitigation strategies to reduce congestion in the nation's transportation system. Some of these promising options are exclusive truck lanes, incident response systems, ITS deployment, managed lanes, bottleneck improvement, positive train controls, urban freight rail re-alignment, increasing siding lengths to allow rail transit to pass the slower freight rail, and grade separation.

Staff Comments

This commission briefing paper describes congestion from competition between passenger travel and freight movement on highways and railroads, based in large part on forecasts from the Freight Analysis Framework. These forecasts differ from forecasts in other briefing papers due to different years, commodity classification systems, and geography.

Issues of Sharing the Same Facility

Passenger Car and Truck

Recent freight forecasting developed by FHWA under the Freight Analytical Framework (FAF)[7] shows that truck-related freight is expected to double by 2035 from its base year of 2002. The passenger traffic growth is coupled with the fast growing freight truck traffic reducing the throughput of shared facilities. This trend of throughput reduction is further fueled by rapid urban sprawl with the adoption of cars for work and home-based trips. A recent study[8] shows that un-priced traffic congestion has encouraged excess urban sprawl as well as increased the number and duration of work and discretionary trips. Considering the space-density relationship of the passenger car and the freight truck, the length of the truck is also a factor to reduce throughput with each truck occupying three times the space required by a car. For freight traffic, other factors that reduce highway throughput in a shared facility are its longer stopping, acceleration and deceleration distance, highway terrain, and turning radius. A study conducted by FHWA[9] showed that removing one truck from the rural Interstate system during peak travel hours would save three times more in travel time costs with flat terrain than that of mountainous terrain. The analysis indicates that the economic efficiency of a passenger-only system decreases rapidly as more and more freight traffic is added to the system, specifically in mountainous terrain.

Table 1[10] illustrates how freight trucks impact system efficiency by reducing the throughput in a shared facility (volume/capacity ratio). The level of throughput is measured in terms of the system physical capacity. "Within Capacity" indicates the level of maximum throughput while "Exceeding Capacity" indicates the lowest level of throughput at a given interval. Two sets of assumptions were modeled: (i) without truck traffic (i.e., 'no trucks') and (ii) with all traffic (i.e.,

[6] Temporary Losses of Highway Capacity and Impacts on Performance: Phase 2, ORNL, October 2004.
[7] Freight Analysis Framework-2, FHWA, December 2006
[8] Curbing Excess Sprawl with Congestion Tolls and Urban Boundaries, Alex Anas and Hyok-Rhee, August 2004
[9] Traffic Operation and Truck Weight and size, FHWA 1995
[10] Freight Analysis Framework-1, FHWA, Scenario Analysis Results, July 25, 2002

truck traffic included). The table shows the number and percent of miles of highway in the three capacity categories. The effect of truck traffic increases the percentage of highway miles that exceed capacity in all the three forecast years. For example, in 1998 the percentage of NHS miles exceeding capacity almost doubled (i.e., 1.9% to 3.6%) when trucks are added to the network. A similar change is observed in 2010 (4.9% to 9.6%), and in 2020 the change is 7.1% to 15.5%.

Table 1. Effect of Truck Traffic on Highway Capacity[10]

V/C Ratio	1998 NHS Mileage (%)		2010 NHS Mileage (%)		2020 NHS Mileage (%)	
	No Trucks	All traffic	No Trucks	All Traffic	No Trucks	All Traffic
v/c < 0.8 Within capacity	151,457 (95.7%)	145,969 (92.2%)	144,792 (91.5%)	131,203 (82.9%)	139,933 (88.4%)	118,839 (75.1%)
0.8 < v/c <1.0 Approaching Capacity	3,731 (2.4%)	6,577 (4.2%)	5,707 (3.6%)	11,940 (7.5%)	7,078 (4.5%)	14,849 (9.4%)
v/c > 1.0 Exceeding capacity	3,076 (1.9%)	5,716 (3.6%)	7,764 (4.9%)	15,120 (9.6%)	11,253 (7.1%)	24,576 (15.5%)

Congestion affects not only passenger traffic but also the reliability of business (on- time delivery) for freight companies. Congestion means longer delay and less reliable pick-up and delivery times for freight truck operators. Hypothetically, freight carriers may try to compensate by adding more vehicles and extending their hours of operation, eventually passing the extra costs along to shippers and consumers. Research on the trucking industry has shown that shippers and carriers value transit time in the range of $25 to $200 per hour, depending on the product being carried. The cost of unexpected delay can add another 20 percent to 250 percent.[11] The impact on system throughput for a given time period (a measure of economic efficiency) due to non-recurring delays can be 21%[12] higher than the impact caused by system physical capacity. Non-recurring delays due to crashes can be further aggravated if a large freight truck is involved. For example,[13] on December 7, 2006 a portion of Interstate 76 had to be closed for four hours in Portage County, Ohio after a tractor-trailer carrying automobiles jackknifed, causing a multi-vehicle crash. Though the crash resulted in no injuries, the 4-hour delay was mostly due to lack of heavy equipment to move the impacted trucks from the shared facility. This example amplifies the fact that the sheer size and weight of a truck (compared to a passenger car) has a larger contribution to non-recurring delays in a shared facility.

In urban areas, another factor that also contributes to delay is pickup and delivery (PUD) trucks parked illegally, causing roadway capacity reductions at shared facilities by partially or fully blocking a lane of traffic. One study[14] estimates that, in 1999, PUD activities on urban principal arterials caused a capacity reduction of about 117 million vehicles, resulting in approximately 947,000 vehicle-hours of delay. Nearly 90 percent occurred in very large urban areas during off-peak hours.

---

[11] Issues of Financing Truck only Lanes" David. J. Forkenbrock & Jim March, FHWA, September/October 2005, Vol.69

[12] Steve Lockwood, "The 21st Century Operations – Oriented State DOT, TRB, April 2005.

[13] http://www.newsnet5.com/news/10483376/detail.html

[14] Temporary Losses of Highway Capacity and Impacts on Performance: Phase 2, ORNL, October 2004

A number of strategies (for example, truck passing lanes in mountainous areas with steeper grade, on-board advance incident notification systems, or exclusive truck lanes) for dealing with the impact of passenger cars and freight trucks on roadway capacity have been developed. Congestion pricing for passenger cars and strategies to provide separate lanes (tolled truck way) for trucks and cars on freeways or Interstates in urban corridors are some of the promising options to minimize the conflict in a shared lane where quantity supplied (measured in lane or track miles) is less than the quantity demanded. However, since separate lane strategies have not been widely used, little is known about their economic and safety effects. A computer simulation model,[15] referred to as Exclusive Vehicle Facilities (EVFS), was evaluated to demonstrate the effectiveness of exclusive truck and car lanes. Ten lane separation strategies were evaluated for a 50.7-km (31.5-mi) segment of I-81 in Virginia. The results of the I-81 analysis indicate that user savings can be achieved if one or more lanes are designated for the exclusive use of trucks or cars.

In a recent study,[16] large congestion benefits were estimated for the Atlanta region by implementing a truck-only lane. The traffic model used in this study showed a modest reduction in congestion due to shifting freight trucks from a shared lane. Table 2 illustrates major project costs and revenues derived from a Toll Truckway and Express Toll Lanes. The analysis shows that the toll revenues could pay for about 61 percent of the Toll Truckway system's cost and showed approximately 75% in revenue surplus for Express Toll Lanes. The analysis made assumptions that truckers would be willing to pay one-third of the value of the time savings as a toll to use the Toll Truckway System. Although many agencies have studied or are presently studying the benefit of exclusive roadways for trucks, the only facility close to a true Truckway is the 33.5-mile, "car only and car/truck" section of the New Jersey Turnpike. Therefore, quantifiable benefits that derive from exclusive truck and car lanes still remain questionable. Research by Trowbridge et al questions the validity of dedicated truck lanes[17] due to reduced operational flexibility of the facility, maintenance difficulties due to collisions, and trucker willingness to pay for the facility by tolls in exchange for the time saving.

[15] Exclusive Lanes for Trucks and Cars on Interstate Highway, Vidunas, JE; Hoel, LA, TRR-1567, 1997, Washington DC.

[16] "Reducing Congestion in Atlanta: A Bold New Approach to Increasing Mobility", Robert W. Poole, Jr, November 2006.

[17] "The Potential for Freight Productivity Improvements along Urban Corridors." Trowbridge, A; Nam, D; Mannering, F; and Carson, J.

Table 2. Cost and Revenue Analysis for Exclusive Truck Lanes

Major Project Costs and Revenues ($B)					
Project	**Cost, 2005 $**	**Base Year**	**NPV Cost**	**NPV Revenues**	**Differences**
ETL Network	$9.14	2008	$9.43	$17.02	$7.59
N - S Tunnel	$4.88	2012	$6.21	$2.41	−$3.80
Toll Truckway	$7.58	2015	$10.70	$6.56	−$4.14
Lakewood	$3.51	2018	$5.49	$1.80	−$3.69

Source: ***"Reducing Congestion in Atlanta: A Bold New Approach to Increasing Mobility"***

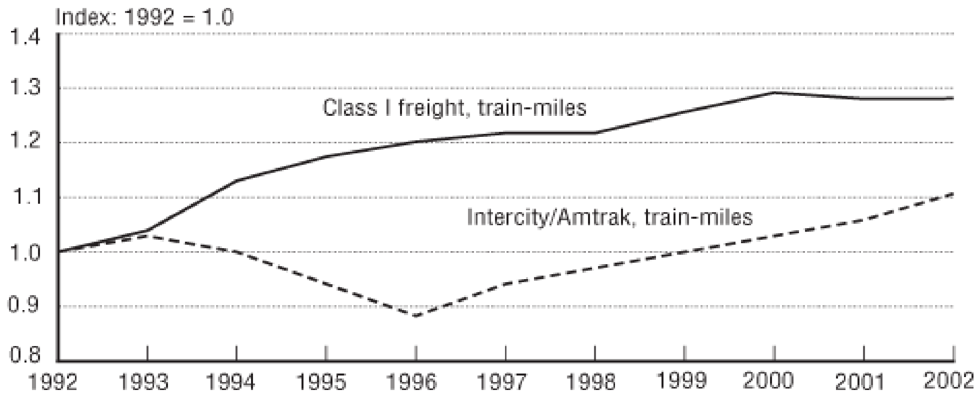
Passenger and Freight Rail

Like highways, the issues with passenger rail and rail freight cars sharing the same track are mostly centered within urban and inter-city commuter traffic. Delays caused by this mixed operation are largely dictated by individual operators and their overall operational policy. In urban areas, the challenges faced by both freight railroads and passenger rail operators is that the same rail segments where passenger service providers require additional capacity are often bottleneck areas of freight operations. As the demand for faster intermodal services increases and the competition between highway and rail freight grows, freight railroads have to be more efficient to retain revenue. This fact can make it even more difficult to share tracks among slower unit bulk trains, fast moving intermodal trains, and passenger trains. Freight railroads differ from highways in that carriers own and maintain their own infrastructure—rights-of-way, tracks, signaling equipment, and so forth. Rail carriers also have an investment goal to maximize their profit. Without direct incentive, or legal restriction, a freight railroad operator will allocate investments that maximize the company's freight system efficiency.

By 2035, rail freight tons is expected to grow by 88%[18] from its 2002 base year, thus putting significant pressure on the already scarce capacity of the rail system. Freight railroad companies have already responded to the growing demand for their services by running more trains, heavier trains, and faster trains with fewer, larger locomotives. The large railroads have essentially filled most of their long-distance corridor "train slots" and are in a position to ration that scarce capacity to the highest-margin long-distance traffic opportunities. Increasing demand for passenger trains by various metropolitan authorities and intercity service are also creating challenges to freight railroad carriers in already-crowded segments of the rail network. There is a greater commingling of freight and passenger trains, bringing a greater concern about the scheduling, on-time performance, and safety of these services. The share[19] of freight train-miles increased slightly between 1992 and 2002, as freight rail vehicle movements outpaced those of passenger rail over the period. Figure 1 shows the Freight and passenger train miles of travel from 1992 to 2002.

[18] FHWA Freight Analysis Framework-2, December 2006
[19] Class I rail freight train-miles: Association of American Railroads (AAR), Railroad Facts 2003 (Washington, DC: 2003),

Figure 1. Freight and Passenger Train Miles



Source: Association of American Railroads (AAR), *Railroad Facts 2003*

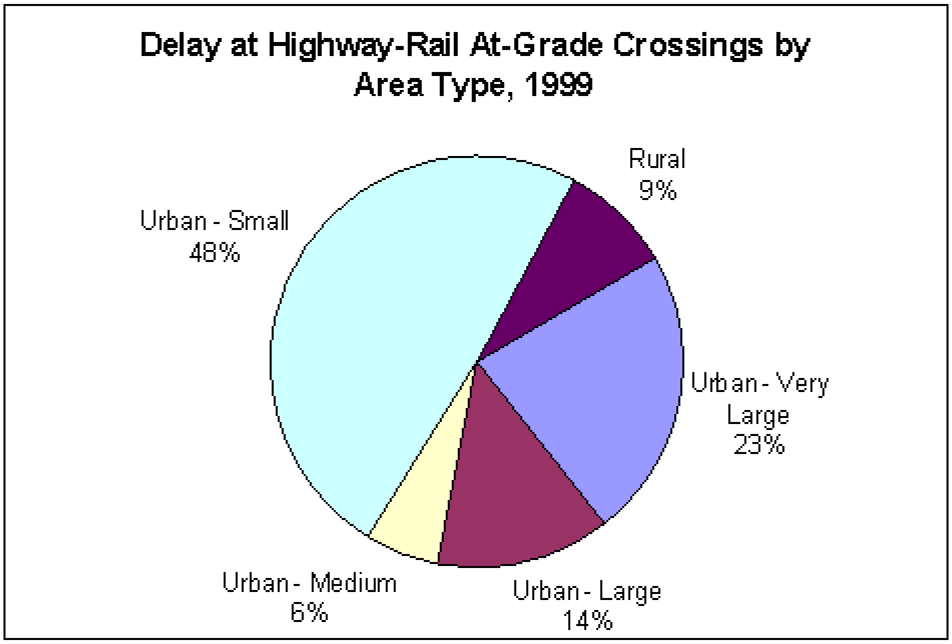
Several metropolitan transits (NJ Transit, Virginia Railway Express) are pushing more transit onto already congested freight lines. Several studies have identified the impacts on rail corridor performance due to the interference of freight rail on passenger rail. A recent study[20] by the New Jersey Institute of Technology surveyed 50 transit agencies to identify the best practices and factors contributing to sharing of the rail facility by transit and freight. The authors also examined critical issues and concerns due to sharing of track, right of way, facility, or corridors with each other. Some of the key issues that affect the mixed operations are: physical constraints (i.e., speed, platform height, right-of-way); dispatching and scheduling conflict; communication and mutual understanding; freight attributes and regulation, and insurance and liability. The survey showed that good-faith negotiations were the most important factors facilitating successful interaction between transit and rail freight.

At-Grade Highway and Rail Crossings

Roadway traffic (both freight and passenger) shares the railroad right-of-way at the highway-railroad grade crossings. Congestion and safety of rail operations through at-grade crossings in major urban areas are currently perceived as a great concern, specifically at crossings where both rail freight and rail transit share the same facility. Railroad-highway at-grade crossings cause delays when highway vehicles must stop to yield the right-of-way to trains. This reduces the highway capacity to zero for a brief period of time, depending on the speed, the length of the train, and the frequency of the trains. In a recent study,[21] Oak Ridge national laboratories (ORNL) estimates that in 1999, nationwide, at-grade highway-railroad crossings caused about 2.9 million-hours of delay on principal arterials highways; 91% of this delay occurred in urban areas. Crossings in small urban areas accounted for nearly 48 percent of the delay, followed by those in very large urban areas (23 percent). Another study by the Illinois Commerce Commission estimates that for Northeastern Illinois, the delay at railroad crossings costs each motorist approximately $250 annually (at a nominal value of $30/hour).[22]

[20] "Survey of Transit and Rail Freight Interaction", Liu, Rongfang. Published by NJDOT, March 2004.
[21] Temporary Losses of Highway Capacity and Impacts on Performance: Phase 2, ORNL, October 2004
[22] Motorist Delay at Public Highway – Rail Grade Crossings in Northeastern Illinois, Working Paper 2002-02, Illinois Commerce Commission, July 2002

Figure 2. Delay at Highway-Rail At-Grade Crossings



Source: Oak Ridge National Laboratory, October 2004

Mitigation Options

States, MPOs, and rail industries are currently adopting or plan to adopt various mitigation strategies to reduce congestion on the nation's transportation system. It is expected that current and planned mitigation options may result in economic efficiency by increasing system throughput. Recurrent congestion or the overloading of the roadways with more vehicles than they can handle results from a basic mismatch of highway capacity with vehicles, or demand for road space exceeding the supply. This type of congestion is costly—and requires adding more lanes. The second type of congestion is called non-recurring and results from a whole variety of incidental causes, e.g., collision, vehicle breakdown, weather, etc. Some planned and ongoing options related to the mitigation of both recurring and non-recurring congestion for highway facilities are:

1. Bottleneck Improvement: A bottleneck is a specific segment of the facility that restricts the flow both up and downstream. Examples are narrow bridges, close proximity of on and off ramps, short acceleration and deceleration lanes, inadequate interchange ramp capacity during peak hours, inadequate left turn storage lanes, and inefficient traffic signal cycle length.
2. Capacity Expansion: Adding lanes to existing facility to mach the projected/or current demand.
3. Increasing Throughput by Managing Lanes: Mostly in urban settings as well as some international border crossings, traffic demand is matched with supply by allocating more lanes for the peak demand flow direction. Some states, e.g., California, have successfully managed lanes through value pricing options. By raising the price as demand increases, roadway managers are able to keep traffic moving at an acceptable Level Of Service (A

to C where A is excellent throughput and F is extremely reduced throughput) where the system offers both high speed and high throughput.

4. Dedicated Freight Highway Connector: Demand for rail/truck intermodal freight is generally centered in major urban areas, creating special challenges for those charged with planning facilities in areas that are already crowded. Exclusive truck lanes or Toll Truckways are some of options that can alleviate corridor-specific urban freight-related congestion by lowering corridor traffic volume.
5. Improved Incident Response: Rapid response and rapid clearance of collisions can significantly reduce the duration of non-recurring congestion, allowing the freeway's capacity to be reclaimed. The Bay Area Toll Authority[23] estimates a benefit/cost ratio for such projects as 8 to 1.
6. ITS Applications: Incident-related congestion can be reduced with the development of ITS technologies that provide a way to collect and share information about the current system condition and actions required to keep the traffic moving. The data are collected from surveillance cameras, detection cameras, traffic sensors, vehicle probes, etc. at various locations along the highway. The data are then shared through the implementation of variable message signs, highway advisory radio, the 511 roadway information phone number, web sites, and specialized warning systems that let travelers make their own decisions about when and how to travel.
7. Minimizing Collisions through Publicity and Outreach. More than 38% of the non-recurring congestion in major urban areas is due to traffic collisions. Congestion or delay is often further aggravated when a freight truck is involved in the collision. In recent years, FHWA has started various outreach programs to educate and change the driving behavior of both passenger-vehicle and truck drivers, so that they may interact safely with one another on the road. Share the Road Safely (STRS) is one such program that aims to support the federal Motor Carrier Safety Administration's (FMCSA) goal. Other education and outreach activities include a safety belt program, Click It or Ticket, [24] aimed at increasing safety belt use among commercial drivers, and to inform drivers about motor carrier safety standards and regulations. Another outreach program, Ticketing Aggressive Cars and Trucks (TACT), was modeled after the Click It or Ticket program, combining public education with the use of media, highway message signs, and high-visibility law enforcement to reduce aggressive driving and develop mutual respect while using a shared facility.
8. Time-of-Day Restriction: Several MPOs (New York City, Winnipeg, Chicago, etc.) have implemented time-of-day operating restrictions for trucks on major urban arterials to alleviate congestion during peak hours. Though time restrictions for the operation of trucks would mitigate traffic congestion during peak hours, the regulation conflicts with business operation, specifically, local deliveries, and can have a negative impact on freight productivity. With the increase in online shopping and the demand for just-in-time delivery, this restriction may conflict with freight movement efficiency goals.
9. Positive Train Control: This is one of most promising options for the future. Positive train control provides train position and control using Global Positioning System information

[23] "Reducing Congestion in Atlanta: A Bold New Approach to Increasing Mobility", Robert W. Poole, Jr, November 2006

[24] "Share the Road Safely Pilot Initiative Showed Promise, but the Program's Future Success Is Uncertain", GAO report. September 2006. http://www.gao.gov/new.items/d06916.pdf.

to serve as the backbone of the ITS architecture. The utilization of ITS in the rail industry has been demonstrated in the past few years. Illinois will be the first to employ ITS standards jointly developed by the railroad industry and the government.
10. Urban rail corridor realignment.
11. Adding longer siding length to allow faster transit rail to pass slow-moving freight trains.
12. Grade separation improvement for at-grade rail crossings at places where tracks are shared by both transit and freight rails.

CONSOLIDATED COMMENTS FROM MEMBERS OF THE BLUE RIBBON PANEL OF TRANSPORTATION EXPERTS - PAPER 4B-11

One reviewer commented as follows:

On page 2 the paper states: "Trip delay and safety at these crossings are growing issues." This statement is open to question. Grade crossing collision rates have fallen every year since 1978. In 2006, grade crossing collisions and related injuries reached all time lows, despite substantial long-term increases in both train and vehicle traffic. Trip delay for motorists is perhaps a growing issue, but the paper's assertion that delays "due to slower unit rail freight traffic is a growing concern due to significant reductions in the highway throughput, specifically at locations where slower freight trains, fast intermodal freight trains, and commuter trains share track" (bottom of page 2) seems to be stretching a minor point relevant to a limited number of locations.

Page 6 states: "The large railroads have essentially filled most of their long-distance corridor "train slots" and are in a position to ration that scarce capacity to the highest-margin long-distance traffic opportunities." It should be noted that railroads have made substantial additional investments in main line track capacity to eliminate bottlenecks. Class I capital commitments in 2007 will be around $9.4 billion. In 2003, just five years earlier, Class I capital spending was $5.9 billion. These actions are not consistent with an industry which intends to focus on rationing scarce capacity.

Another reviewer commented as follows:

The paper offers an overview of some recent research on the growing occurrence of congestion on portions of the nation's rail and highway system and the compounding effects in allowing both freight and passenger traffic to share those systems. However, the paper inappropriately views freight as an intrusion on shared railways and highways – treating passenger service as allowed by right. In addition, absent from the paper is a discussion on the impact of changing land use patterns on urban and suburban congestion. Finally, while mentioning some potential solutions, more critical analysis is needed in order to support investment and policy decisions.

Another reviewer commented as follows:

The interaction of passenger and freight traffic sharing the same facilities is becoming a growing concern, particularly on the rail system where shared infrastructure is limited to narrow corridors. The fact that freight must give the right of way to passenger traffic unduly penalizes freight throughout the system. Because of this, each passenger train takes up capacity equivalent to 5 freight trains. Strategic planning and initiatives by the railroads are progressing in ensuring appropriate levels of capacity are in place as and when needed. There are a number of technological and operating innovations designed to move more traffic over limited rail capacity.

Another reviewer commented as follows:

The definition on page 1 is good, and the background and key findings make sense. The key finding of the paper is that truck freight traffic is expected to double by 2035 from base 2002. This must assume an extrapolated rate of growth not interrupted by unexpected events. Passenger traffic will also grow and competes for the same highway space. More congestion will occur that is presently experienced. This is a good observation.

Another finding is that rail freight is expected to increase by 88% in the same period, almost double, this is about the same percent as truck, "thus putting significant pressure on the rail system capacity".

- "Bottlenecks or reduced capacity for highway traffic in the major urban areas at railroad crossings due to slower unit rail freight traffic is a growing concern due to significant reductions in the highway throughput, specifically at locations where slower freight trains, fast intermodal freight trains and commuter trains share track".
- Delays at railroad crossings cost motorists $250 annually (@$30/hr., which is above the average wage.
- Issues of Sharing the Same Facility are reasonably explained. Several strategies are reported (from other reports).

Sharing track by passenger and freight is mostly in urban and suburban areas. Delay varies by location and kind and frequency of freight traffic. Some segments where capacity is needed for passenger rail are already bottlenecks for freight. Fig. 1, on page 7 shows passenger vs. freight train miles with passenger growing more. An example was cited of Virginia Railway Express paying to expand capacity (add track) to CSX since CSX insisted it had no more capacity to add trains. At grade highway and rail crossings were cited as places of conflict, especially with slow heavy freight trains delaying highway traffic.

Mitigation options were discussed and described. Among them were bottleneck improvement/elimination and capacity expansion as well as increased highway throughput from managing lanes by pricing. A total of 12 specific mitigation efforts was listed. Items 10, 11 and 12 related to rail and are on target.

To summarize, the main observation is that additional capacity in both highway and rail modes will be needed to cope with increased traffic brought about by a growing economy. A growing economy needs more capacity in all modes, or at least a total increase in capacity by shifting traffic among modes, and increasing some more than others. Railroad and water, where available, could absorb some truck freight, if service could be provided that would meet the needs of shippers and receivers.