

Freight Performance Measures: A Yardstick for Minnesota's Transportation System

Recommendations of the
Minnesota Freight Advisory Committee

November 1999

Based on MFAC Discussion Groups of May 1999

Prepared by
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**PROPOSED PERFORMANCE MEASURES FOR
MINNESOTA'S FREIGHT TRANSPORTATION SYSTEM**
Minnesota Freight Advisory Committee, November 1999

This report recommends performance measures for Minnesota's freight transportation system. The measures were developed by shippers and transportation companies who make up the Minnesota Freight Advisory Committee, an advisory body to the Minnesota Department of Transportation. This table lists the highest priority measures.

Performance Measures with Available Data

Predictable, Competitive Metro Area Travel Time	1.1 Metro freeway travel time, by route and time of day 1.2 Average speed on metro freeways, by route and time of day 1.3 Congestion ranking of metro freeways, by route 1.4 Congestion level compared to other major metropolitan areas
Economic Benefit-Cost	2.1 Benefit-cost ratio of major state transportation projects <i>(Data available for most projects showing benefit for heavy trucks. A project financial analysis model has been created by Mn/DOT Metro and piloted for I694.)</i>
Transportation Investment	2.2 Minnesota's transportation investment and spending as a percent of Gross State Product <i>(Public sector data is available)</i>

Performance Measures Requiring Development

Intercity Travel Time	1.5 Peak hour average travel speeds on major highway routes between 27 Minnesota regional centers <i>(Calculated speeds; preliminary development done for Mn/DOT Interregional Corridors Study)</i>
	1.6 Shipper point-to-point travel time <i>(Develop from private data)</i>
Freight Travel Time to Global Markets	1.7 Travel time to major regional, national and global markets—by rail, air, water, truck <i>(Requires development)</i>
Competitiveness of Shipping Rates	2.3 Shipment cost per mile—by ton or value, by mode, for major commodities <i>(Requires research and development)</i>
Crash Rate and Cost Comparison	3.1 Dollar cost of crashes and crash cost comparison by mode <i>(Some data available; requires development)</i>
	3.2 Crash rate per mile traveled (or other basis) by freight mode <i>(Requires development)</i>
Bottlenecks and Impediments	4.1 Number of design impediments to freight traffic, by mode, by type (at-grade rail crossings, restricted roads, deficient bridges, etc...) <i>(Data for some types is available; others need development.)</i>
Timely Access to Intermodal Terminals	4.2 Number of design impediments slowing access to truck, rail, air and waterway terminals <i>(Some data under development)</i>

I. Introduction

Performance measures tell public officials and citizens how well services are meeting customer needs. In this report, the Minnesota Freight Advisory Committee proposes performance measures for the state's freight transportation system. MFAC is a group of shippers and transportation company managers and executives that advises the Minnesota Department of Transportation on the needs of freight customers.

Twenty-one MFAC members met on May 4, 1999 to begin to establish goals for improving the state's transportation system and measures for tracking progress. Former U.S. Congressman Tim Penny, chair of the Freight Advisory Committee, led the session. Mn/DOT staff facilitated the sessions, compiled the results, and helped identify viable measures. MFAC made several revisions at its November 5. Recommendations were then reported to the Mn/DOT Freight Investment Committee and subsequently reviewed for inclusion in the department's performance measures.

The goals and measures recommended in this report will serve as a yardstick for MFAC to gauge its success. They are proposed to Mn/DOT for review and possible inclusion in its departmental, division, district, and office-level performance measures. Mn/DOT has acknowledged the need to strengthen the presence of freight customers in its planning and performance evaluation. Local governments should also consider the recommendations.

MFAC puts a priority on economic measures and ensuring that Minnesota's transportation system is globally competitive. All areas of system performance—time, safety, infrastructure, and access—have economic consequences for shippers. MFAC urges the state to invest in transportation projects and services with the highest economic return.

Shippers urge Mn/DOT to share performance data with them and the public. They envision a special role for Mn/DOT as the state's primary provider of information on transportation and the economy. They believe that a good information flow will build support for transportation investment and will help balance the interests of shippers and the traveling public.

In its Family of Measures the Minnesota Department of Transportation has five priority "outcomes," or goals, that relate to freight needs:

1. **Time/Directness** — A predictable travel time for length of trip is maintained so that customer expectations are met.
2. **Safety** — Incidents and crash rates are minimized to Mn/DOT's current and potential ability to influence infrastructure, partnerships/education, full range of solutions and driver behavior.
3. **Condition of Infrastructure** — An infrastructure that meets customer expectations is maintained.
4. **Access/Basic Levels of Service** — Services are provided to meet personal travel and shipping needs.
5. **Socioeconomics** — Transportation investments will yield the highest possible economic return to the region, tempered by an evaluation of community values and social impacts.

MFAC addressed these outcomes by proposing measures that reflect freight interests. Members responded to the following questions: *What are your critical issues? What changes in Minnesota's transportation system, policies or services would respond to freight needs? By what measure would you know if this outcome were being achieved?* All modes—truck, rail, water and air—were included. Each May 4 small group was assigned one outcome and selected up to six priority measures. This report combines those priorities into overall recommendations.

Following the MFAC meeting, Mn/DOT staff identified some additional potential measures that fit the committee's priorities. Staff also evaluated data availability and resource requirements of the proposed measures. Data for some of the proposed measures is readily available. Others require research and development, in some cases, substantial time or financial resources.

The next two sections of this report are organized by outcome area. The first describes all of the priority measures and the availability of data to implement them. The second section lists additional possible measures and issues raised by MFAC.

II. Priority Measures

MEASURES OF TIME/DIRECTNESS FOR FREIGHT

Maximizing the predictability of transport time and minimizing total time and its costs is a leading goal for shippers. All five May 4 MFAC discussion groups identified strategies or measures for this area, and three of them made it a priority.

Logistics management increasingly uses “just-in-time” delivery to reduce or eliminate storage and warehousing costs. Timely service, more than ever, is a critical element of competition. Couriers such as Federal Express and long haul truckers alike advertise one-day or two-day service, feeding rising customer expectations. Businesses typically expect delivery early in the morning and pickups late in the afternoon—pressuring delivery services to be on the roads during congested peak commuter hours.

MFAC proposes travel time measures for the Twin Cities metropolitan area, between Minnesota cities across regions, and between Minnesota and national and global markets. A priority for MFAC is setting targets for travel time and reducing deviation in trip time within the metropolitan area. Travel time measures for freeway routes are available, but data for connectors and other routes currently is not. A measure of predictability and deviation in travel time would be highly desirable, but requires substantial new resources to develop.

Predictable, Competitive Metro Area Travel Time

1.1 Metro freeway travel time, by route and time of day *[data available]*

Mn/DOT’s Metro Division Travel Management Center (TMC) computes travel times for segments of the Twin Cities area freeway system, including interstates and other limited access four-lane freeway routes, such as highway 169. TMC computes three “normal” travel times: AM Rush, PM Rush and Off Peak. The database goes back several years. Consistent data is not available for non-freeway routes. A method for computing the range and probability of deviation in travel time could be developed from the same database if funding were provided.

1.2 Average speed on metro freeways, by route and time of day *[data available]*

MFAC suggests a measure that compares the actual speeds of trucks and traffic to posted speed limits. Mn/DOT’s Travel Management Center can derive this data for general traffic with a modest effort. No major front-end development is required. TMC suggests that speed is a good measure because under congested conditions, below 30 miles per hour, average heavy truck speed is slower than that of automobiles due to slower starting and stopping. Speed alone is not a complete measure if it does not consider the distance over which it is maintained.

1.3 Congestion ranking of metro freeways *[data available]*

MFAC would like to see a ranking of freeway routes by level of congestion. This information is available in real time on a map via Mn/DOT’s web site.

1.4. Congestion levels of the Twin Cities compared to other metro areas *[data available]*

This measure is a barometer of economic competitiveness. Intensifying congestion is causing some major companies to avoid business expansion in such fast-growing areas as Atlanta. Annual indexes of congestion for some 70 major metropolitan areas, including the Twin Cities, are available from the Texas Transportation Institute. Its report, *Urban Road Congestion*, calculates roadway congestion, travel time, travel delay, wasted fuel, and congestion costs. Some of its measures include both freeways and principal arterials. Reporting lags two to three years behind the year being measured. TMC staff cautions that because of the methodology used in the report, the measures may be more useful for planning than for consumers.

Intercity Travel Time

1.5 Average travel speeds (peak hour) for major highway routes between 27 Minnesota cities that are regional centers *[calculated speeds; requires further development]*

Intercity travel time/speed is the single critical performance measure in Mn/DOT's 1999 Interregional Corridors Study. Performance targets were set at 60mph, 55mph and 50mph for three priority levels of corridors. The study found travel time to be the dominant issue for shippers around the state. Mn/DOT and a consultant developed a method for estimating travel time, but further testing and a commitment of resources is required to implement the measure.

1.6 Shipper point-to-point travel time *[requires development from private data]*

MFAC members propose developing a volunteer sample of shippers, brokers and haulers to establish targets for travel time and acceptable deviations for major routes. Many companies maintain this data and have their own targets.

Freight Travel Time to Global Markets

1.7 Travel time to regional, national and global markets *[requires development]*

Shippers, particularly those handling agricultural products or time-sensitive goods such as medical devices, are concerned about competitiveness in transportation to global markets. Improved transportation systems in Brazil's interior, for example, could diminish Midwest agriculture's historical advantage in transportation costs. Mn/DOT's 1999 Freight Flows study will help identify key markets. Research is needed to identify or develop a method for tracking travel time and cost for selected markets for key products. Time should be broken into segments: instate, Minnesota to end market or U.S. border, and beyond the U.S. to foreign destinations.

MEASURES OF ECONOMIC BENEFIT/COST AND COMPETITIVENESS

Minnesota Freight Advisory Committee members emphasize economics is the bottom line for all performance goals tracked by Mn/DOT—time, access/levels of service, infrastructure and safety as well as socioeconomics.

MFAC is concerned about how well transportation planning supports economic development and shippers' future needs, and how well the public is involved in and educated on such plans. They would like to see a master plan for the state's critical transportation infrastructure that is insulated from political factors and based on sound economic evaluation.

MFAC would like Mn/DOT and other public agencies to use ROI—return on investment — analysis in the same fashion as the private sector. Mn/DOT is now conducting it for most major highway projects. MFAC recommends that an analysis of the costs of doing nothing be conducted and compared to the costs of investing in transportation system improvements. For example, what, if any, are the potential costs to freight movement of not developing light rail?

A high priority for MFAC is information on how competitive Minnesota is in shipping and transportation costs compared to other states and nations. The group proposes that an independent competitive analysis be conducted. MFAC would like to benchmark Minnesota and the Twin Cities against other metropolitan areas, states, and nations on such factors as travel time, freight rates, and government-imposed costs. For example, differences in workers compensation costs between Minnesota and Wisconsin affect the ports of Duluth and Superior.

MFAC is very interested in how transportation investments and costs affect business productivity and competitiveness. A study to quantify these factors is being conducted by Dr. Gerard McCullough, chair of the Center for Transportation Studies at the University of Minnesota. It has the potential to be the basis for an ongoing measure. Specifically, MFAC suggests an evaluation of the productivity gains and benefit-cost of a statewide and regional 10-ton road system.

Economic Benefit-Cost

2.1 Benefit-cost ratio of major state transportation projects *[substantial data available]*
Shippers and transportation customers want to know the relative return on investment for public and private transportation investments. Benefit-cost, or ROI analysis, is now calculated for 70 percent of major Mn/DOT investments in STIP plans. With a year or two, it will be conducted on nearly all projects. A gross benefit-cost estimate for heavy trucks is available from Mn/DOT's Investment Management Office, which includes it as one component in evaluating construction projects. A benefit-cost for light trucks would require significant new resources for expanded traffic counts. The Mn/DOT Metro Division is developing 2-axle truck factors. The Metro Division Planning Office is also developing a financial analysis model using performance criteria for freight planning and investment decision-making, using I-694 as a pilot.

Transportation Investment

2.2 Minnesota's transportation investment and spending as a percent of Gross State Product (or goods output) *[public sector data available]*

The freight sector is concerned about whether public and private capital investment in transportation is keeping pace with Minnesota's economic growth and growth in the goods producing and related sectors that ship freight. A measure of public sector investment can be calculated by Mn/DOT's Economic Analysis Office using federal data on the state economy and state and local government transportation spending, although there is a three-year time lag. Staff cautions that this is an input indicator. It should correlate to improved transportation outcomes, but doesn't automatically do so. If the measure is used, an optimal target range for investment should be set and accompanied by a benefit-cost measure.

Competitiveness of Shipping Rates

2.3 Shipment cost per mile—by ton or value, by mode, for major commodities *[requires development]*

Shippers propose an independent analysis of how Minnesota compares with other states in transportation costs and efficiency based on cost per mile for selected goods. This is a Mn/DOT measure that has not been developed. Carriers know their cost per mile, but this measure would focus on cost to the customer—such as rail rates, airfreight rates, etc.. An alternative approach would break out the costs of publicly influenced components such as regulations and fuel taxes.

MEASURES OF SAFETY AND ECONOMICS

Several MFAC discussion groups raised safety issues as a priority. Strong emphasis was placed on the economic cost of motor vehicle crashes and incidents, and the impact of crashes in delaying traffic flow. MFAC members encourage state government to play a central role in educating the public on safety issues like aggressive driving and the physical limitations that trucks and trains have in responding to traffic situations.

Crash Costs and Comparisons by Mode

3.1 Dollar cost of crashes and crash cost comparison by mode *[requires development]*

Shippers would like information on the total cost of crashes measured by such factors as slowed traffic, loss of time, extra fuel consumption, injuries and fatalities, damage to vehicles, and clean up costs. They suggest using private insurance data and linking costs with specific crash sites and highway design factors where they are relevant. Some of this data, for the highway mode, is available from Mn/DOT's Traffic Engineering Office, which uses private insurance data from the National Safety Council.

3.2 Crash rate per mile (or other basis), compared by freight mode *[requires development]*

MFAC proposes a measure comparing crash rates per mile for truck, rail and other modes. Development work is required to make this measure a reality. Current numbers on truck vehicle miles traveled are of limited quality and not well matched to crash data by road or truck type.

MEASURES OF ACCESS AND INFRASTRUCTURE

Perhaps because Minnesota's transportation infrastructure is relatively well maintained, MFAC members put more emphasis on the design adequacy and location of the transportation infrastructure than its maintenance. Nevertheless, they want to see preventive repairs before pavements break down, and long-term fixes rather than repeated overlays or repairs on the same stretch of road, causing repeated traffic disruption.

Weight-restricted roads, bridges and rail beds, and hard-to-access intermodal facilities in locations distant from economic hubs are factors that increase shipping time and costs.

Shippers want to see master planning for critical infrastructure. MFAC members find opposition from residential neighborhoods making it more difficult to keep freight and intermodal facilities in central locations. Members would like to have planning for industrial zones performed hand-in-hand with road building.

Bottlenecks and Impediments

4.1 Number of design impediments to freight traffic, by mode, by type *[data available for some types]*

A variety of impediments in the design or condition of the transportation infrastructure may negatively affect all goal areas —Time/Directness, Access, Infrastructure, Economics, and Safety. To the degree impediments correlate with negative outcomes, they can form a useful performance measure. Mn/DOT's Metro Division is developing a method of inventorying freight impediments. Some are already counted statewide as part of Mn/DOT's measures. Some suggested impediments to track for key freight routes are:

- Weight-restricted bridges *[data collected for all state and local bridges]*
- Weight-restricted roads (miles) *[data available for state, CSAH and MSAH roads]*
- At-grade rail crossings *[data available]*
- Low-clearance bridges
- Lane weaves, lane drops, substandard merge lanes, substandard intersections

Timely Access to Intermodal Terminals

4.2 Number of design impediments slowing access to truck, rail, air and waterway terminals *[some data under development]*

MFAC would like improved truck and rail access to intermodal terminals such as river ports and the Minneapolis-St. Paul International airport. One measure is the number of impediments slowing access to intermodal terminals such as weight-restricted bridges and roads, low bridges or substandard intersections. Some of this data will be collected in Mn/DOT's new freight facilities database. Another approach suggested by MFAC would be a measure based on sample reports of travel times to and from terminals from airfreight companies, couriers, draymen (intermodal haulers), and other transportation companies.

III. Additional Measures and Issues

TIME/DIRECTNESS

Mn/DOT Goal/Outcome:

Time/Directness: A predictable travel time for length of trip is maintained so that customer expectations are met.

Goal	Measure	Data Availability
<p>Reduce Peak Hour Metro Freeway Congestion Make commuter and commercial delivery schedules more flexible to reduce overlap during rush hours.</p>	Annual average miles of recurrent AM and PM freeway congestion.	Yes. This is a Mn/DOT departmental measure. Counts 40% of total delay; doesn't include delay due to crashes, incidents or ramp meters.
<p>Predictable Travel Time on Metro area freeways.</p>	<p>Range and probability of deviation in travel time on Metro freeway routes.</p> <p>Shipper point-to-point travel time in metro area.</p> <p>Number and duration of freeway incidents by location, time of day, and type of vehicle.</p> <p>Travel time for 2-axle commercial vehicles on metro freeway routes.</p>	<p>Developmental Measure. Requires consultant to develop method, at substantial cost. Once developed could be maintained at moderate cost.</p> <p>Developmental Measure. Utilize existing data from a sample of shippers, brokers and delivery firms.</p> <p>Yes, but not every incident is logged by TMC.</p> <p>Future Measure. Under development by Mn/DOT Metro Division.</p>
<p>Reduce Travel Time and Congestion</p>	Number of stoplights on major highway routes.	Yes. Note: Roads with stoplights have one-third the capacity of freeways.
<p>Reduce Truck Delay at Scales</p>	<p>Number and percentage of scales and enforcement sites with CVISN electronic bypass capability.</p> <p>Number and percentage of trucks bypassing scales via CVISN.</p>	<p>Yes. First site, St. Croix, projected to be operating in April 2000. No others yet on construction schedule.</p> <p>Developmental Measure. Data anticipated but CVISN will not be statewide for a number of years.</p>

ACCESS/BASIC LEVELS OF SERVICE

MFAC members are concerned about the adequacy and optimal utilization of the transportation infrastructure. They perceive HOV lanes as underutilized capacity and want data showing how well that capacity is being used. With growing regional truck traffic, they view expanded rest areas on the perimeter of the Twin Cities area as important to achieving safety and time goals.

Mn/DOT Goal/Outcome:

Services are provided to meet personal travel and shipping needs.

Goal	Measure	Data Availability
<p>Adequate Truck Rest Areas Increase the number of parking places on the metro perimeter, and the number of rest areas in the state.</p>	<p>Capacity utilization rate of state rest area parking bays, by day and time.</p> <p>Number and location of rest areas and parking bays for trucks on the perimeter of the metro area, and statewide.</p>	<p>Yes, 1995 through 2000. Moderate funding required to continue data.</p> <p>Yes, for state rest areas only. No data identified for private truck stops.</p>
<p>Timely Access to Intermodal and Freight Facilities Do master planning for infrastructure. Plan for industrial zones as roads are built. Educate citizens to reduce residential conflicts.</p>	<p>Location/distance of freight facilities from commercial/ economic centers.</p> <p>Travel time to intermodal terminals from economic centers.</p>	<p>Some data being compiled by Mn/DOT Metro as an element of modal planning, but a universal measure is not yet available.</p>

INFRASTRUCTURE

MFAC members want to see a preventive approach to road maintenance, fixing pavements before they break down. They want timely responses to pavement breakdowns in rural areas where they believe some problems are not noticed. They prefer long-term fixes to repeated overlays or repair projects on the same road segment, causing repeated traffic disruption.

Mn/DOT Goal/Outcome:

Condition of Infrastructure. An infrastructure that meets customer expectations is maintained.

Goal	Measure	Data Availability
<p>Timely Rural Road Repair Get roads fixed before they break down.</p>	<p>Pavement Quality Index (PQI) on roads with heavy truck traffic.</p> <p>Instances of pavement breakdown and elapsed time before repair.</p>	<p>Yes. PQI and heavy truck traffic counts (HCADT) by state trunk highway segment. PQI is a Mn/DOT measure with performance targets.</p> <p>No data. Could be expensive.</p>

SAFETY

Safety issues raised, but not prioritized included: the need for more rest stops, truck driver fatigue and speeding encouraged when drivers are paid by the load, an aging automobile driver population, greater use of reflective lane striping, hazards of overloading and underloading vehicles, road construction, deer crashes, ongoing training and recertification of truck and automobile drivers, and updating regulations.

Mn/DOT Goal/Outcome:

Safety. Incidents and crash rates are minimized to MnDOT's current and potential ability to influence infrastructure, partnerships/education, full range of solutions and driver behavior.

Goal	Measure	Data Availability
Predict and Prevent Crashes Identify and take corrective action respond to characteristics and causes of crashes	Number of crashes by type of vehicle, location, time of day, road design factors, weather and other factors— per Vehicle Mile Traveled or other normalized unit of measure.	Yes, data is available by type of vehicle, location, roadway type, and human and physical factors. Crashes by roadway type is a Mn/DOT departmental measure.

INFORMATION

Minnesota's Commissioner of Transportation, Elwyn Tinklenberg, has made Information a top strategic objective for his administration. Coincidentally, MFAC members suggest that Mn/DOT shift from seeing itself in primarily a regulatory role to that of an educator and disseminator of information to balance shipper interests and other public interests.

No measures are proposed, but MFAC members see Mn/DOT having a unique potential role as the largest comprehensive transportation organization in Minnesota to inform industry and the public on the transportation needs of the state and the benefits of transportation to the economy. For example, members suggest that Mn/DOT could do more to reduce congestion and conflict between commuters and trucks at peak hours by promoting wider use of alternative work hours and pickup and delivery schedules. MFAC members also emphasize the importance of Mn/DOT being a supplier of state-of-the-art technology to advance the productivity of transportation carriers.

Mn/DOT Strategic Objective:

Information. To ensure Mn/DOT is a trusted source of transportation information essential for decision making by a variety of customers both internal and external, public and private.

Participants

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