VALUATION OF TEMPORARY TRANSPORTATION FACILITY USE LOSSES

By

Jeffrey T. Ryan
Graduate Research Assistant
Western Transportation Institute
Montana State University - Bozeman

And

Jodi Carson, Ph.D.
Assistant Professor
Department of Civil Engineering
Montana State University - Bozeman

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16. Abstract

Short-term, temporary events and activities such as construction or maintenance, infrastructure damage repair, overheight/overwidth vehicle movements, vehicular crashes, hazardous spills, etc. impair facility performance by fully or partially reducing the roadway capacity. Expressed in terms of delay, the impact of these temporary facility use losses has been extensively investigated and well documented. Lacking is a comprehensive examination of how these impacts are valued in monetary terms and how, if at all, these associated costs are recovered by facility owners. The intent of this investigation was to identify any and all costs associated with temporary facility use losses and determine what, if any, costs are recoverable by facility owners. A review of published literature, national department of transportation survey responses and informational shortcomings discovered through this investigation suggest the following. Traditional costs such as labor (including overhead), equipment and materials are easily justifiable and are commonly collected though not consistently across activities or public agency divisions. Cost recovery for motoring public delay costs is most frequently addressed in the context of delay "prevention" rather than delay "recovery." Incentives and consequent penalties for delay prevention are included in innovative construction contracts as a means to reduce impacts from public agency initiated road work. Capturing delay costs in a true "recovery" context (i.e., following the occurrence of a vehicular incident) would require definition of a uniform unit cost for delay, which to date has been challenged. Beyond the tangible costs currently being recovered from utility related activities (i.e., resultant road work, permits, inspections, etc.), there is little opportunity to recover motoring public delay costs attributable to their activities. Given these findings, recommended opportunities for improved cost recovery for temporary transportation facility use loss should focus on (1) more widespread and uniform capture of traditional and defensible costs including labor and overhead, equipment and materials and (2) continued and increased use of innovative construction contracting methods that provide incentives for prevention of unnecessary motoring public delay.

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1. INTRODUCTION

As Departments of Transportation shift from a construction-dominated regime to one of facility management and operations, performance indicators must also shift from traditional metrics focused on agency performance (i.e., the number of projects delivered or budgets expended) to traffic flow-based metrics that better describe facility performance. When facility performance is compromised, facility owners must monetarily quantify these effects to: (1) recover any associated due costs and (2) justify future system improvement expenditures.

Short-term, temporary events and activities such as construction or maintenance, infrastructure damage repair, overheight/overwidth vehicle movements, vehicular crashes, hazardous spills, etc. impair facility performance by fully or partially reducing the roadway capacity. Expressed in terms of delay, the impact of these temporary facility use losses has been extensively investigated and well documented. Lacking is a comprehensive examination of how these impacts are valued in monetary terms and how, if at all, these associated costs are recovered by facility owners.

The intent of this investigation was to identify any and all costs associated with temporary facility use losses. These costs may include direct and tangible costs such as materials, labor and equipment used for infrastructure damage repair or may include more intangible delay-related costs incurred by the motoring public. The residual effect of diverting funds from programmed activities to more immediate, unplanned facility needs was considered as well.

Once identified, this investigation determined what, if any, costs are recoverable by facility owners. A distinction was made between costs that are considered recoverable and costs that are actually recovered in practice. Specifically, this investigation determined: (1) the types of costs that are conceivably recoverable and actually recovered in practice, (2) how these costs are valued for recovery and (3) the actual mechanism used to recover the various costs.

The desired products from this investigation included the following:

- a comprehensive and well-defined list of costs associated with temporary facility use losses, both recoverable and non-recoverable;
- cost values or a range of cost values for each type of associated cost and
- detailed and application-oriented descriptions of various cost-recovery mechanisms in use by facility owners.

These products would promote uniformity in facility use loss valuation and provide facility owners with a mechanism(s) for equitable cost recovery. More directly, this information would provide facility owners with the means to justify various cost values associated with temporary facility use losses and the direction for recovery of those costs.

Unfortunately, information gathered in support of this investigation, both previously published literature and a national survey of practices, fell short in both extent and detail. As such, more general descriptions of activities, costs and recovery mechanisms related to temporary transportation facility use losses is provided. The remainder of this report details the methodology, results and conclusions related to the valuation of temporary transportation facility use losses.

2. METHODOLOGY

Information to support this investigation was obtained through (1) a review of contemporary published literature to identify potential facility use loss costs, values and recovery mechanisms and (2) a survey of state-level facility owners nationally to solicit information pertaining to the state-of-the-practice in facility use loss costs, values and recovery mechanisms.

2.1 LITERATURE REVIEW

A comprehensive literature review was conducted at the onset of this investigation. When reviewing the literature, three types of information were sought: (1) the types of costs associated with facility use losses (literature pertaining to either temporary or recurring facility use losses were considered for cost identification), (2) how these costs are valued and (3) mechanisms for facility owner cost recovery, either used in practice or suggested by study. Primary sources of literature included:

- the Transportation Research Information System (TRIS)
- conference compendiums such as Transportation Research Board's Annual Meeting, Institute of Transportation Engineer's District and International Meetings, etc.
- other related Internet sites and
- related material supplied by Montana Department of Transportation or other resources.

2.2 NATIONAL SURVEY

A review of the published literature was intended to capture the potential costs, values and recovery associated with temporary facility use losses. A national survey of state-level facility owners was intended to temper these findings with actual practice. The survey instrument design, administration and the analysis methods used are detailed below.

2.2.1 INSTRUMENT DESIGN

Following a brief overview of this investigation's intent and a general description of the events or activities likely to result in temporary facility use losses, the survey instrument was designed to solicit the following information:

- What types of activities do you encounter that result in temporary transportation facility use losses?
- When your facilities experience temporary reductions in capacity, do you track:
    a) the materials, supplies or product quantities/expenditures?
    b) labor hours/expenditures?
    c) equipment-related expenditures?
    d) motorist delay information such as length of time, time of day, direction and magnitude of capacity reduction?
    e) other?
- What cost values are attached to each of these items? How are these cost values determined? Are items such as overhead recovered?
- Does your agency consistently recover these costs? If yes, through what mechanism and from whom? Are costs attributable to utility work recovered?

A copy of the survey instrument is included in Appendix 6.1.

2.2.2 SURVEY ADMINISTRATION

Once the survey instrument was finalized, a comprehensive national distribution list was developed. The target audience consisted of state-level transportation facility owners, namely, State Departments of Transportation. Because of the wide array of activities that can result in temporary, short-term facility use loss (i.e., construction or maintenance, infrastructure damage repair, overheight/overwidth vehicle movements, vehicular crashes, hazardous spills, etc.), the survey solicited multiple survey respondents from each State Department of Transportation (see Appendix 6.1). Specifically, survey respondents were requested in the areas of construction, maintenance, commercial vehicle operations and safety/operations. To help streamline the development of survey distribution list and to ensure that the survey reached the appropriate individuals, researchers requested assistance from the Montana Department of Transportation's

Transportation Research Board representative, who had access to a comprehensive network of State Department of Transportation designees.

The survey was distributed via email to further speed the distribution process. Options for returning the survey by the same means were clearly detailed in the survey (see Appendix 6.1). The electronic survey and cover letter were first sent on March 28, 2002. To ensure a successful response rate from contacts and to ensure that the investigation was completed successfully within the allotted timeframe, a definitive date of April 15, 2002 was provided. Immediately following the return date, a follow-up email was sent to ensure that the survey has not been forgotten or misplaced. Because of a low initial response rate, the initial deadline was extended.

In all, twelve completed surveys were received from eight states: Connecticut, Iowa, Maryland, Missouri, Nebraska, South Carolina, Utah and Wisconsin. Survey respondents represented a variety of expertise areas within the various Departments of Transportation including engineering, operations, maintenance, motor carrier services and other including research development and technology (see Figure 1 and Table 1). This diversity in survey response helped to ensure a comprehensive identification of temporary facility use loss activities, costs and recovery mechanisms.

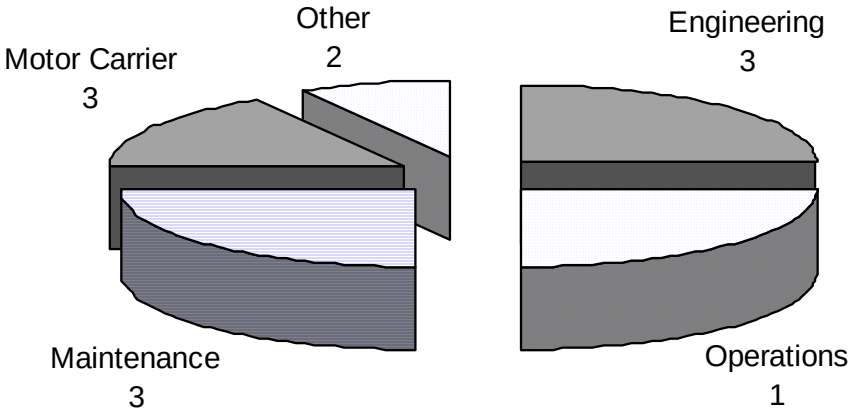

Figure 1: Survey Respondents

Table 1. Survey Respondents

Engineering		
Erika B. Smith Transportation Engineer III Connecticut Dept. of Transportation 280 West Street Rocky Hill, CT 6067 860-258-0701/860-258-0399 erika.smith@po.state.ct.us	John Smythe Construction Engineer Iowa Dept. of Transportation 800 Lincoln Way Ames, IA 50010 515-239-1503/515-239-1845 John.Smythe@dot.state.ia.us	Roger A. Henrichson Assistant Construction Engineer Nebraska Dept. of Roads 1500 Highway 2 Lincoln, NE 68509 402-479-4451/402-479-4854 rhenrich@dot.state.ne.us
Operations/Maintenance		
Will Zitterich Assistant Director, Maintenance Iowa Dept. of Transportation 800 Lincoln Way Ames, IA 50010 515-239-1396/515-239-1005 William.Zitterich@dot.state.ia.us		
Maintenance		
Dave Johnson Maintenance/Operations Engineer Illinois Dept. of Transportation 2300 S. Dirksen Parkway Springfield, IL 62764 217-782-2984/217-782-1927 johnsondb@nt.dot.state.il.us	Russell A. Yurek Director, Office of Maintenance Maryland State Highway Admin. 7491 Connelley Drive Hanover, MD 21076 410-582-5508/410-582-9861 ryurek@sha.state.md.us	James J. Feda, Jr. Director of Maintenance South Carolina Dept. of Transportation PO Box 191 Columbia, SC 29202 803-737-1290 fedajj@scdot.state.sc.us
Motor Carrier Services		
Ron Kontos Motor Carrier Permit Manager Nebraska Dept. of Roads 1400 Highway 2 Lincoln, NE 68509 402-479-4536/402-479-3771 rkontos@dor.state.ne.us	Richard Ollerton Motor Carrier Manager Utah Dept. of Transportation 4501 S. 2700 W. Salt Lake City, UT 84119 801-965-4880/801-965-4211 rollerto@state.dot.ut.us	Tom Cantwell Chief Motor Carrier Services Wisconsin Dept. of Transportation PO Box 7981 Madison, WI 53707 608-267-4541/608-267-0220 Thomas.Cantwell@dot.state.wi.us
Other		
Mike Shea Director, Technology Transfer Missouri Dept. of Transportation PO Box 270 Jefferson City, MO 65101 573-751-0852/573-526-4337 sheam@mail.modot.state.mo.us	Cindy Borland Claims Manager Utah Dept. of Transportation 4501 S 2700 W Salt Lake City, UT 84119 801-965-4961/801-965-4838 cborland@dot.state.ut.us	

2.2.3 SURVEY ANALYSIS

After the completed surveys were returned, the data was entered into an Excel spreadsheet for analysis. Because this is a non-scientific survey targeting only a small number of individuals within each State Department of Transportation, the analysis was limited to a qualitative summary of responses using descriptive statistical measures. The survey results are described both graphically and textually later in this report.

3. RESULTS

3.1 LITERATURE REVIEW

The dearth of literature regarding the effects of temporary transportation facility use losses on public agencies places a greater importance on the information gathered from the national survey. The lack of published literature may explain, in part, the noted variability in state-to-state practices.

3.1.1 TEMPORARY FACILITY USE LOSS ACTIVITIES

Published literature related to the valuation of temporary transportation facility use losses was limited, focusing on the impacts of vehicular incidents and construction/maintenance activities. Further, the literature focused almost exclusively on the incident and construction/maintenance related impacts to the motoring public. The impacts and subsequent costs related to these activities as they affect public agencies (i.e., costs currently tracked and valued by public agencies, recovery mechanisms that could be used either in theory or practice, etc.) were not discussed.

3.1.2 TEMPORARY FACILITY USE LOSS COSTS

Cost-related information reported in the published literature was twofold in focus: (1) monetary estimates of motoring public delay costs attributable to both vehicular incident and construction/maintenance related activities and (2) cost metrics for effectively capturing these effects.

Delay Costs

Motoring public delay and related costs attributable to incidents and construction/ maintenance related activities have most often been considered for urban environments although some estimates have been extrapolated annually or statewide. The amount of traffic congestion and subsequent delay caused by an incident or construction/maintenance is highly dependent on the duration of the event, the number of lanes that are blocked and the volume of traffic in the vicinity. The extent of the roadway blockage also influences the number of vehicles affected by the event.

Urban reconstruction costs for motoring public delay have been estimated to be over $50,000 per day (Small, Nolan, Chu, Lewis 1999). Numerous other studies have attempted to quantify, on average, the impacts that result from incidents.

Incident-induced congestion cost the nation 1.3 billion vehicle-hours of delay at a loss of nearly $10 billion in 1987 (Cambridge Systematics, Inc. 1990). Given this estimate, a large metropolitan city like New York loses $1.2 billion per year, or $100 per person per year, because of incidents (Cambridge Systematics, Inc. 1990). By 2005, incident-related congestion may account for 70 percent of urban freeway congestion at costs in excess of $35 billion (Lindley 1986).

Studies conducted in California indicated that every one minute of blockage during an off-peak period resulted in five minutes of congestion (Roper 1987). Similarly, Dudek (1987) found that by reducing the duration of a one-lane blockage on Houston's Gulf Freeway from 18 minutes to nine minutes, vehicle hours of delay were reduced from 800 to only 200 vehicle hours of delay.

In a study conducted by Mannering, Jones and Sebranke (1990), 58 percent of the 18.4 million hours of delay Seattle motorists experienced in 1984 were caused by freeway incidents (this number was predicted to rise to as high as 70 percent by the year 2000). A single accident that caused a 75 percent reduction in capacity and lasted 60 minutes during the afternoon peak period on Seattle's congested Interstate 5 in downtown Seattle would result in more than 15,000 hours of delay and incident-induced delay resulted in over $250 million in lost travel time per year on the 20 miles of urban Seattle interstate studied based on traffic simulations (Mannering, Garrison and Sebranke 1990).

Traffic congestion is obviously a strong motivation for improving incident management efforts in larger urban areas. However, the time delays and resulting costs are also significant in smaller urban areas. Computer simulation was used to estimate traffic impacts on a variety of roadway segments and for a variety of incident severities in Baton Rouge, Louisiana. Queue times ranged from 90 minutes to more than three hours and resulted in queue lengths up to 6.5 miles in length. Consider the extrapolation of these estimates to a one-year period. A conservative average estimate of delay per incident is

1,155 vehicle-hours based on the simulated incidents at the four locations considered. In 1992, 882 accidents were reported along I-10 that involved one vehicle colliding with another (Urban Systems, Inc. 1994). For this type of incident, one or more lanes would typically be blocked. In this case, the estimate of incident-induced delay jumps to 1,018,710 vehicle-hours of delay annually along I-10.

To express this delay in monetary terms, consider an average vehicle-hour value of $10.00; this value is based on a weighted average of motorist and trucker wages and an average vehicle occupancy of 1.2 persons per automobile (Cambridge Systematics, Inc. 1990). On the basis of this value, the monetary costs of incident delay would be $10,187,100 annually. This value is conservative in that it only considers delay costs associated with vehicle delay; clean-up costs are ignored.

As further evidence of incident-induced delay impacts in smaller urban areas, incident-related delay was estimated to be 2,035,800 vehicle-hours annually at a cost of $22,323,450 along I-235 in Des Moines, Iowa (Wells 1994).

Cost Metrics

The variability in these estimates is in part explained by the uniqueness of incident and construction/maintenance events. As such, recent efforts have focused on defining cost metrics that lend consistency to delay estimates and incorporating these estimates into public agency processes.

Road User Costs (RUC) are formally defined as the estimated daily costs incurred by motorists when traveling. Along a given length of roadway, the cost of vehicle operation (i.e., gasoline, vehicle wear-and-tear, prorated licensing, registration and insurance coverage fees) and the value of the driver's time comprise the costs incurred. Abnormal roadway condition including incidents, rerouting and detours due to construction and other capacity reducing factors can greatly increase these costs by adding delay to the time spent traveling. Aggregate RUCs are highly dependent on the volume of traffic using the roadway; high traffic volumes can result in significant RUCs (Daniels, Ellis and Stockton 1999).

The incremental increases in RUCs attributable to construction/maintenance related activities have recently been incorporated into traditional and innovative contracting processes as liquidated damages or A+B contracting penalties (discussed later in this Chapter). The intent is to provide contractors with sufficient incentive to minimize construction time and subsequent traffic disruption and delay.

A similar metric is defined as a *Value of Travel Time Savings* (VTTS). Several studies have attempted to define the single best estimate of VTTS. VTTS can vary by purpose of trip (i.e., work or leisure), by mode of travel or by income. Research suggests that while VTTS may vary with income, the relationship is not proportional. Curiously, research has also shown a noted decline in the value of time from 1987 to 1998. Motorists may have become accustomed to being delayed while traveling or desensitized to the severity of delay (Mackie, Jara-Diaz and Fowkes 2001).

Reliability of travel also influences the VTTS. Unexpected delays, unlike delays attributable to recurring congestion, cannot be planned for and typically carry some type of consequences (i.e., a person will be late for work as a result of unexpected delay). Hence, costs attributable to unexpected delay may have much higher perceived costs than delay resulting from recurring congestion.

3.1.3 TEMPORARY FACILITY USE LOSS COST RECOVERY

The most common type of temporary facility use loss cost recovery reported in the published literature related to innovative contracting methods. Contractors are rewarded or penalized based on public agency-defined completion times, reduced traffic delays and minimized incidents. Hence, public agencies are provided a straightforward recovery mechanism that directly relates to the disruption of traffic caused by construction.

Common types of innovate contracting of interest to this investigation include A+B, lane rental and liquidated damages contracting. For A+B contracts, A represents the standard bid component for the construction work to be completed and B represents time for construction multiplied by the Road User Costs for the given roadway. This latter component requires the contractor to be cognizant of traffic delays and motivates them to minimize those delays.

Lane rental methods charge the contractor a fee for occupying lanes or shoulders for the construction. These fees again are based on RUCs for the given roadway. Lane rental methods not only encourage an expedited construction timeline but also judicious road or lane closure policies (i.e., construction work may not require a full roadway closure, one lane could be kept open to improve the flow of traffic). Lane rental methods are usually reserved for smaller projects with minimal anticipated lane closures. Lane rental methods have been and are currently used in seventeen states (Tarnhof 2001).

A liquidated damage contract specifies the types of damages resulting from the construction and assesses a certain penalty. Damages, expressed in terms of costs, typically include administrative contract oversight, potential liability, traffic regulation, congestion and motorist delay (Tarnhof 2001).

3.2 NATIONAL SURVEY

The review of published literature was intended to capture the potential costs, values and recovery mechanisms associated with temporary transportation facility use losses. The intent of the national survey of state-level facility owners was to temper these findings with actual practice. Given the lack of published literature on the topic, information collected from the national survey served a dual purpose. Survey respondents were asked to identify activities resulting in temporary transportation facility use losses, costs associated with these losses and any cost recovery mechanisms that are in place.

3.2.1 TEMPORARY FACILITY USE LOSS ACTIVITIES

Following solicitation of introductory contact information, survey respondents were asked about the types of activities they encounter that result in temporary transportation facility use losses.

Question 3

What types of events or activities do you encounter that temporarily block the roadway and reduce roadway capacity? Activities may include construction, maintenance or repair activities; vehicle crashes, breakdowns or spills; overheight/overwidth vehicle movements or other.

Reported activities resulting in temporary transportation facility use losses were consistent across survey responses. Vehicular incidents (26 percent) and construction (23 percent) were the two most frequent activities reported. Maintenance (19 percent) and overheight/overweight commercial vehicle movements (13 percent) were also frequently reported as activities resulting in temporary transportation facility use losses. Other activities reportedly resulting in temporary loss of facility use included hazardous spills, inclement weather, floods and utility work. Figure 2 summarizes the frequency of reported activities resulting in temporary transportation facility use losses.

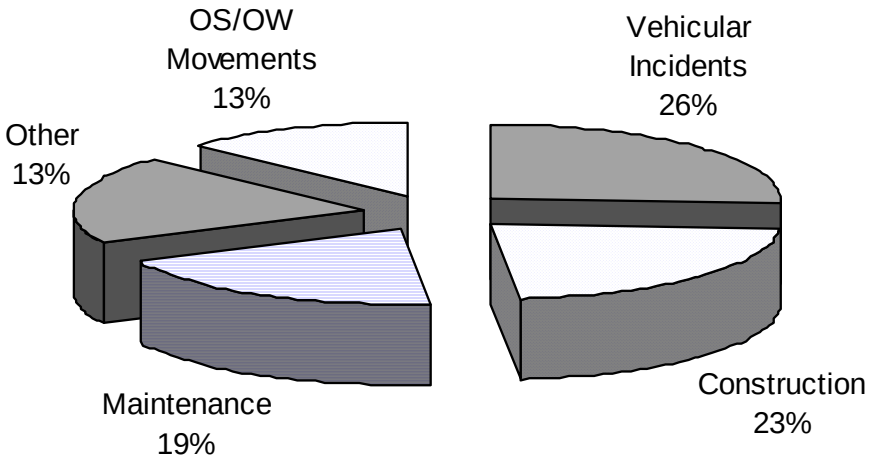

Figure 2: Temporary Transportation Facility Use Loss Activities

3.2.2 TEMPORARY FACILITY USE LOSS COSTS

For each activity identified in Question 3, information was solicited regarding the types of costs (i.e., labor, equipment, materials, motoring public delay, etc.) tracked by the public agency.

> ***Question 4***
>
> *What types of costs does your agency track related to these events or activities? Costs may include labor, equipment, materials, delay to the motoring public or other.*

Not surprisingly, the most common types of public agency costs tracked during temporary transportation facility use losses are labor (29 percent), equipment (25 percent) and materials (25 percent). For construction-related activities, contract administration costs were identified (5 percent). Other less frequently reported costs included delay to the motoring public, overhead and infrastructure damage recovery costs (likely comprised of labor, equipment and material costs). A number of survey respondents indicated that their agencies track no costs related to temporary transportation facility use losses (7 percent). Figure 3 summarizes the types of costs reportedly tracked for temporary facility use losses.

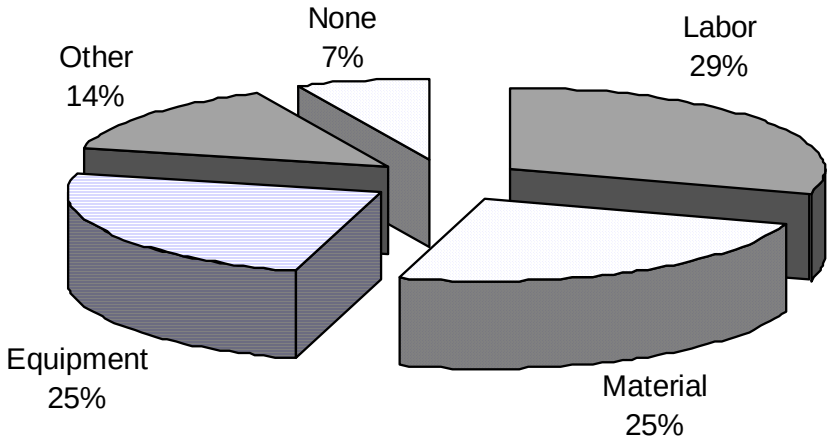

Figure 3: Temporary Transportation Facility Use Loss Costs

Survey respondents were next asked to attach a monetary value to the cost categories identified previously in Question 4.

Question 5

What monetary value does your agency attach to these costs? Please report only unit cost values such as $ per labor hour.

Little monetary cost information was obtained from this question. Instead, most survey respondents indicated categorical units for costs (i.e., actual labor plus benefits per hour) or reported too much variability in unit costs for the context of this survey (each

employer, piece of equipment or type of material used has a different unit cost associated with it). Only the Nebraska Department of Roads reported a range of monetary costs associated with construction events as $250 to 800 per lane per hour. This range of costs is charged to contractors for the delay of the motoring public through innovative contracting methods.

3.2.3 TEMPORARY FACILITY USE LOSS COST RECOVERY

With increased competition for public funds, efficient and effective cost recovery mechanisms for public agencies are of paramount importance. Cost recovery for planned activities, such as construction and maintenance events, can be more readily incorporated into public agency processes during planning and budgetary phases. Costs related to unplanned events, such as vehicular incidents, are more difficult to capture. Survey respondents were asked to describe both cost recovery mechanisms and sources used by their agency.

> ***Question 6***
>
> *What mechanism is used to recover these costs and from whom? Please be specific when describing both the mechanism for recovery and the cost recovery sources internal and external to your agency.*

Figure 4 depicts the relative frequency of cost recovery mechanisms reported by survey respondents. Federal and state funding sources were listed most frequently (37 percent), though most often in the context of routine operating budgets rather than as a true cost recovery mechanism. Nearly 30 percent of respondents reported invoicing the responsible party for costs though the success rate for securing these funds was not discussed. Contracting methods for cost recovery during construction or maintenance activities was reported by 17 percent of the survey respondents.

These findings related to temporary transportation facility use loss activities, costs, unit costs and cost recovery mechanisms are further summarized in Table 2.

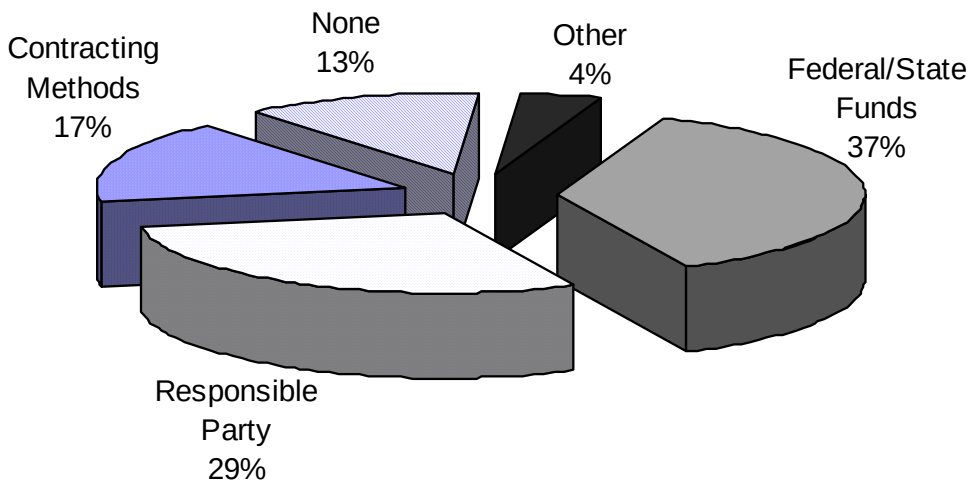

Figure 4: Temporary Transportation Facility Use Loss Cost Recovery Mechanisms

Vehicular Incidents

For costs related to vehicular incidents, the target for recovery varied by type of cost incurred. Any infrastructure maintenance or repair costs resulting from vehicular incidents were most commonly assessed against the responsible party involved in the incident through their insurance coverage. If the responsible party damaged the state's facility through his/her own faults or actions, their insurance company will pay for any costs incurred by the state agency once all the necessary repairs are made.

Labor, equipment and material costs expended during the management of the incident (i.e., traffic control, clean up, etc.) was more commonly covered through state or federal level funds; incident management programs are often provided annual budgetary resources similar to maintenance programs, particularly in urban areas where incidents occur with some level of predictable frequency.

Though not formally responding to the survey, the Washington State Department of Transportation developed an incident management database in 1994 to address the issue of cost recovery for their Incident Response Team (IRT):

Table 2. Temporary Transportation Facility Use Loss Activities, Costs, Unit Costs and Cost Recovery Mechanisms

	ACTIVITIES	COSTS	UNIT COSTS	COST RECOVERY
ENGINEERING				
Connecticut Dept. of Transportation	Construction		Varies	Liquidated damages assessed per day past project deadline (not allowed by hour of lane closure)
	Infrastructure damage from vehicle crashes	Labor, equipment, materials for damage (i.e., guardrail)	Varies based on employee and extent of damage	Invoice sent to person/insurance company at fault
	Lane or highway closures from vehicle crashes	Overhead if DOT personnel are used for traffic control	Varies based on employees used	Invoice sent to person/insurance company at fault
Iowa Dept. of Transportation	Construction, roadway repair	Contract items	Contract price	None
Nebraska Dept. of Roads	Construction	Delay to public	$250-$800/lane/hr	Deducted from contractor estimates
OPERATIONS/MAINTENANCE				
Iowa Dept. of Transportation	Vehicle crashes, spills, infrastructure damage	Labor, equipment, materials, not delay costs	Actual costs including overhead costs	Actual costs referred to claims section, Office of Accounting
MAINTENANCE				
Illinois Dept. of Transportation	Crashes	Labor, equipment, materials	Varies	Varies by crash, state funds, trucking companies, court of claims
	Floods			FHWA, FEMA, IEMA, state funds
	Maintenance activities			State funds
	Wind storm/tornadoes			FEMA, IEMA, state funds
	Vehicle breakdowns			State funds in Chicago, E. St. Louis
	Weight enforcement			State funds
	Overweight/overdimensional movements	None, direct to permitee		None
Maryland State Highway Admin.	Maintenance	Labor, equipment, materials		
South Carolina Dept. of Transportation	Maintenance or repair Vehicle crashes Spills	Labor, equipment, materials	Actual labor plus benefits, equipment rental rates reflect operating/ depreciation costs	Responsible party billed, if identified

Table 2. Temporary Transportation Facility Use Loss Activities, Costs, Unit Costs and Cost Recovery Mechanisms (Continued)

MOTOR CARRIER SERVICES				
Nebraska Dept. of Roads	Lane or highway closures	None	None	None
Utah Dept. of Transportation	OS/OW permits	None	Labor, tracking, permit	Risk management, structures
Wisconsin Dept. of Transportation	Construction Construction Lane or highway closure from natural disaster			
OTHER				
Missouri Dept. of Transportation	Construction	Labor, equipment, materials	Varies	Part of construction contract - no recovery
	Maintenance			Part of general maintenance procedures - no recovery
	Vehicle incidents			Part of incident management plans - no recovery
Utah Dept. of Transportation	Vehicle crashes Bridge hits	Infrastructure damage, labor	Actual labor, materials or contracts	Subrogation against owner and/or owners insurance
	Construction	Contracted	None	None
	Maintenance	Contracted and/or employees		
	Permits issued	None		

"One of the most important reasons accurate incident records are needed is that they allow the IRT to recover more of the costs of the incident response effort from the insurance companies of the parties at fault. Accurate records are needed of the WSDOT personnel, equipment and materials required and the maintenance and cleanup activities resulting form the incident. This information will allow the IRT to bill the party at fault for the cost of having these resources on the scene. This recovery is currently a problem and money is being taken mostly from the IRT budget but complete, accurate records would allow the IRT to recover a higher percentage of its response costs. If the IRT could document the amount of recovery costs being contributed to the state's general fund, it might be able to retain some of those funds" (Cutting, Porter and Mannering 1994).

For larger scale incident events, costs may be recovered from state or federal emergency assistance sources including the Federal Emergency Management Agency (FEMA). When there is a severe weather event or a natural disaster, states may request federal relief funds to repair state roadways.

Only the Connecticut Department of Transportation reported recovering delay related costs from the responsible party involved in the incident. If the incident results in a lane or roadway closure, the responsible party and their insurance company is invoiced for related damages. No information was provided related to the monetary value of delay assumed.

Construction

For construction activities, the most common type of temporary facility use loss cost recovery reported in the survey related to innovative contracting methods, as was the case in the published literature. The most common type of innovative contracting reported in the survey was a liquidated damage contract that specifies the types of damages resulting from the construction and assesses a certain penalty.

OS/OW Commercial Vehicle Movements

With respect to oversize/overweight (OS/OW) commercial vehicle movements and their temporary impact on traffic, no formal recovery mechanisms were reported. Permit fees for OS/OW movements help to support the administrative functions associated with their issuance but do little to capture capacity reduction and motoring public delay effects.

Other

In addition to soliciting responses related to general activities resulting in temporary transportation facility use losses, information about specific cost factors was requested. These specific cost factors included public agency overhead costs, utility work impacts and resultant costs and delay costs to the motoring public.

> ***Question 7***
>
> *Does your agency recover overhead-related costs?*

Most public agencies responding to this survey (80 percent) reported recovering overhead-related costs, however the recovery mechanisms varied by response. Overhead-related costs were reportedly: (1) included in effective hourly rates for labor and equipment, (2) negotiated in incident claims and (3) included as additional charges to permit fees.

> ***Question 8***
>
> *Does your agency recover costs attributable to utility work?*

Comparatively, only 30 percent of survey respondents reported recovering costs related to utility work. Further, the types of utility-related costs recovered were limited; utility companies were invoiced for road repairs resulting from any utility work and for permits and inspections if performed within public agency right-of-way. None of the survey

respondents reported recovering motoring public delay costs attributable to utility work impacts.

Question 9

Does your agency quantify the impact of delay to the motoring public in non-monetary terms such as vehicle-hours of delay or queue length?

To further investigate the capture of motoring public delay costs, survey respondents were asked whether their agency tracked delay in non-monetary terms such as vehicle-hours of delay or queue lengths. Consistent with previously reported survey findings, most public agencies do not consider recovery of motoring public delay costs in either monetary or non-monetary terms. Only three of the twelve survey respondents (25 percent) reported tracking motoring public delay impacts but for purposes other than cost recovery; as part of alternative construction project selection, liquidated damage contracts or incident management program evaluations.

These findings related to temporary transportation facility use loss overhead, utility work and public delay costs are further summarized in Table 3.

Findings from both the review of contemporary literature and the national survey suggest that cost recovery for temporary transportation facility use losses has focused on vehicular incidents and construction/maintenance activities. Reasonably, these are likely the most frequently occuring activities that result in temporary transportation facility use losses. Traditional cost categories, including labor and overhead, equipment and materials, are tracked most commonly by public agencies. Delay costs are most often recovered or prevented through innovative construction contracting methods. For vehicular incidents, the responsible party is often liable for incurred public agency costs such as labor, equipment and materials resulting from infrastructure damage or incident management though incident management activities are just as frequently supported by state-level operating budgets.

Though some consistent trends were observed in the literature and survey responses, sufficient variability exists to suggest a lack of public agency awareness or guidance in the area of cost recovery for temporary transportation facility use losses.

Table 3. Temporary Transportation Facility Use Loss Overhead, Utility Work and Public Delay Costs

	OVERHEAD	UTILITY WORK	PUBLIC DELAY
ENGINEERING			
Connecticut Dept. of Transportation	Hourly rates as well as personnel fringe benefit are billed	If utility company works within state right-of-way, will bill for permit, inspections and corrective measures if work is not satisfactorily performed	No
Iowa Dept. of Transportation		No	Sometimes, liquidated damage clauses
Nebraska Dept. of Roads	Liquidated damages	No	No
OPERATIONS/MAINTENANCE			
Iowa Dept. of Transportation	Added to labor costs	Yes, if the costs are incurred by the department	Not in operation or maintenance areas
MAINTENANCE			
Illinois Dept. of Transportation	Owners pay direct costs themselves or a settlement is negotiated through claims	Utility work is done with their own forces or by their own contractors	No
Maryland State Highway Admin.	For reimbursement accident billing	No	Yes, incident management
South Carolina Dept. of Transportation	Use an effective hourly rate for labor and rental rate for equipment	Yes, if repairs or work resulted from utility work, utilities would be billed	No
MOTOR CARRIER SERVICES			
Wisconsin Dept. of Transportation	For OS/OW permitting, additional charges for district route and bridge reviews	No, permitted carriers arrange with and pay utility directly	Not from OS/OW permitting perspective
OTHER			
Missouri Dept. of Transportation	No	No	Traffic impacts studied during preliminary engineering for each project alternative
Utah Dept. of Transportation	Only for maintenance hours, not engineering although considering adding	No	No

4. CONCLUSIONS

The intent of this investigation was to identify direct and tangible costs such as materials, labor and equipment used for infrastructure damage repair or more intangible delay-related costs incurred by the motoring public associated with temporary transportation facility use losses and to determine what, if any, costs are recoverable by facility owners.

Information to support this investigation came from two sources: (1) a review of contemporary literature and (2) a national survey of public agency practice. Published literature focused almost exclusively on vehicular incident and construction related impacts and specifically, delay impacts to the motoring public. Hence, much of the information to support this investigation was gathered via the national survey. Despite the relatively low response to the survey (i.e., 12 completed surveys returns representing state departments of transportation in Connecticut, Iowa, Maryland, Missouri, Nebraska, South Carolina, Utah and Wisconsin,), each area of expertise including Engineering, Operations, Maintenance, Motor Carrier Services and Other was represented.

4.1 TEMPORARY FACILITY USE LOSS ACTIVITIES

Consistent in both the published literature and the national survey, the most common activities resulting in temporary transportation facility use losses included:

- vehicular incidents
- construction
- maintenance and
- oversize/overweight commercial vehicle movements.

These responses are not surprising; each of these activities is a common occurrence in the day-to-day operation of a public roadway system.

Published literature focused on the impacts of these activities on the motoring public (i.e., delay) rather than costs incurred directly by public agencies. Further, the literature

focused on the determination of appropriately defined cost metrics but provided little information on the use or application of these cost metrics.

4.2 TEMPORARY FACILITY USE LOSS COSTS

The types of costs tracked by public agencies were traditional in nature comprising

- labor
- equipment and
- materials.

Secondary costs tracked by public agencies, as reported in the national survey, included administrative labor, OS/OW permit fees and delay to the motoring public (most commonly included for innovative construction contracting methods). Survey respondents did not provide monetary unit cost values for many of these costs, indicating too much variability in personnel hourly rates, equipment rental rates and materials costs. Only the Nebraska Department of Roads provided a range of costs for motoring public delay resulting from construction activities as $250 to $800 per lane per hour.

4.3 TEMPORARY FACILITY USE LOSS COST RECOVERY

In the published literature, the most common type of cost recovery mechanism discussed was innovative contracting methods for construction related activities. The most applicable innovative contracting methods for temporary transportation facility use losses include A+B contracts, lane rental fees and liquidated damage contracts. The appropriateness of each contracting method varies depending on the type and size of the construction project. All three contracting methods take into account the delay caused to the motoring public on the basis of pre-determined Road User Costs (RUCs) quantifying the value of the public's time. Innovative contracting was also identified as a common construction-related cost recovery mechanism in the national survey.

For vehicular incidents, the responsible party, through their insurance coverage, was most commonly liable for damages. However, damages typically included labor, equipment

and materials related to management of the incident or infrastructure damage and did not include costs related to delay of the motoring public.

Public agency overhead costs were frequently recovered but through a variety of means (included in effective hourly rates for labor and equipment, negotiated in incident claims and included as additional charges to permit fees, etc.).

Few survey respondents reported recovering costs related to utility work. Further, affirmative responses reported recovering only limited types of utility-related costs; utility companies were invoiced for road repair resulting from any utility work and for permits and inspections if performed within public agency right-of-way. None of the survey respondents reported recovering motoring public delay costs attributable to utility work impacts.

4.4 RECOMMENDATIONS

The review of published literature, the national survey responses and informational shortcomings discovered through this investigation suggest the following:

- Activities resulting in temporary transportation facility use losses were consistently reported in both the literature and the national survey, suggest that greater consistency in cost recovery for these activities is attainable.

- Traditional costs such as labor (including overhead), equipment and materials are easily justifiable and are commonly collected though not consistently across activities or public agency divisions. For example, the responsible party involved in a vehicular incident may be charged labor, equipment and materials for the maintenance personnel used to make the repairs but not for the engineering labor that was also required for redesign of the rail. These inconsistencies are most often noted in the area of vehicular incidents as opposed to construction or OS/OW commercial vehicle movements.

- Cost recovery for motoring public delay costs is most frequently addressed in the context of delay "prevention" rather than delay "recovery." Incentives and consequent penalties for delay prevention are included in innovative construction contracts as a means to reduce impacts from public agency initiated road work. In addressing motoring public delay costs in this manner, the actual unit cost defined for delay is irrelevant as long as the contractor agrees to the contract terms.

- Capturing delay costs in a true "recovery" context (i.e., following the occurrence of a vehicular incident) would require definition of a uniform unit cost for delay, which to date has been challenged. Further, the philosophical argument as to why these "societal" delay costs should be paid to a public agency may have some merit.

- Similarly, utility companies are neither performing work at the request of public transportation agencies (except in unique situations) nor bound by any type of contractual arrangement with the public agencies. Hence, beyond the tangible costs currently being recovered from utility related activities (i.e., resultant road work, permits, inspections, etc.), there is little opportunity to recover motoring public delay costs attributable to their activities.

Given these findings, recommended opportunities for improved cost recovery for temporary transportation facility use loss should focus on (1) more widespread and uniform capture of traditional and defensible costs including labor and overhead, equipment and materials and (2) continued and increased use of innovative construction contracting methods that provide incentives for prevention of unnecessary motoring public delay.

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6. APPENDICES

6.1 SURVEY INSTRUMENT

Dear Department of Transportation representative,

Short-term, temporary events and activities such as construction or maintenance, infrastructure damage repair, overheight/overwidth vehicle movements, vehicular crashes, hazardous spills, etc. impair facility performance by fully or partially blocking the roadway and reducing roadway capacity. Expressed in terms of vehicle delay, the impact of these temporary facility use losses has been extensively investigated and well documented. Lacking is a comprehensive examination of how these impacts are valued in monetary terms and how, if at all, these associated costs are recovered by facility owners, such as Departments of Transportation.

Montana State University in cooperation with the Montana Department of Transportation is currently conducting an investigation which will identify (1) any and all costs associated with temporary facility use losses including direct and tangible costs such as materials, labor and equipment, and intangible costs such as delay to the motoring public; (2) the types of costs that are conceivably recoverable and actually recovered in practice, (3) how these costs are valued for recovery and (4) the actual mechanism used to recover the costs. This investigation will promote uniformity in facility use loss valuation and provide facility owners with a mechanism(s) for equitable cost recovery.

Please distribute this survey to individuals within your agency responsible for the following.

ENGINEERING:	responsible for routine construction activities and infrastructure damage repair
OPERATIONS:	responsible for incident management activities including hazardous spills
MAINTENANCE:	responsible for routine facility maintenance and infrastructure damage repair
MOTOR CARRIER SERVICES:	responsible for overheight/overwidth movements

If you have any questions regarding this survey or the investigation in general please feel free to contact Dr. Jodi L. Carson at (406) 994-7998 or JodiC@ce.montana.edu. Thank you for you time and cooperation.

SURVEY QUESTIONNAIRE

VALUATION OF TEMPORARY FACILITY USE LOSSES

Short-term, temporary events and activities such as construction or maintenance, infrastructure damage repair, overheight/overwidth vehicle movements, vehicular crashes, hazardous spills, etc. impair facility performance by fully or partially blocking the roadway and reducing roadway capacity. Expressed in terms of vehicle delay, the impact of these temporary facility use losses has been extensively investigated and well documented. Lacking is a comprehensive examination of how these impacts are valued in monetary terms and how, if at all, these associated costs are recovered by facility owners, such as Departments of Transportation.

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Please assist us in this effort by completing this survey questionnaire. Return your completed survey no later than APRIL 15, 2002 via email, fax or mail to Dr. Jodi Carson.

Also, feel free to contact Dr. Carson at (406) 994-7998 or JodiC@ce.montana.edu with any questions you may have regarding this survey or the investigation in general. If you feel that you have received this survey questionnaire erroneously, please either forward this to an appropriate individual or contact us so that we may redirect the survey.

Email: JodiC@ce.montana.edu

Facsimile: (406) 994-6105

Mail: Dr. Jodi Carson

ABOUT YOU

Name _____ Title _____ Agency _____

Address _____ City _____ State _____ Zip Code _____

Telephone _____ Facsimile _____ Email _____

1. Which best describes your area of expertise?

   ☐ ENGINEERING: responsible for routine construction activities and infrastructure damage repair
   ☐ OPERATIONS: responsible for incident management activities including hazardous spills
   ☐ MAINTENANCE: responsible for routine facility maintenance and infrastructure damage repair
   ☐ MOTOR CARRIER SERVICES: responsible for overheight/overwidth movements
   ☐ OTHER (*please describe*) _____

2. Would you like to receive a copy of this report upon its completion? ☐ YES ☐ NO

TEMPORARY FACILITY USE LOSSES

3. What types of events or activities do you encounter that temporarily block the roadway and reduce roadway capacity? Activities may include construction, maintenance or repair activities; vehicle crashes, breakdowns or spills; overheight/overwidth vehicle movements or other. *(Please respond below under 3. ACTIVITIES.)*
4. What types of costs does your agency track related to these events or activities? Costs may include labor, equipment, materials, delay to the motoring public or other. *(Please respond below under 4. COSTS.)*
5. What monetary value does your agency attach to these costs? Please report only unit cost values such as $ per labor hour. *(Please respond below under 5. UNIT COST VALUE.)*
6. What mechanism is used to recover these costs and from whom? Please be specific when describing both the mechanism for recovery and the cost recovery sources internal and external to your agency. *(Please respond below under 6. COST RECOVERY or feel free to attach additional materials to this survey if you feel it would be beneficial to this investigation.)*

3. ACTIVITIES	4. COSTS	5. UNIT COST VALUE	6. COST RECOVERY
a.	a.	a.	a.
b.	b.	b.	b.
c.	c.	c.	c.
d.	d.	d.	d.
e.	e.	e.	e.
f.	f.	f.	f.
g.	g.	g.	g.
h.	h.	h.	h.

7. Does your agency recover overhead-related costs? (*Please explain*) _____

8. Does your agency recover costs attributable to utility work? (*Please explain*) _____

9. Does your agency quantify the impact of delay to the motoring public in non-monetary terms such as vehicle-hours of delay or queue length? (*Please explain*) _____

0. Do you have any other information, lessons learned, etc. that you feel would benefit this study? If yes, please provide us with a copy of any pertinent information. _____