September, 2007 – Trucks & Road Wear

Challenge: Reducing road wear by limiting the number of garbage trucks on streets seems like a simple fix. The reality is much more complicated.

For most residents, the cost "savings" (assuming they can be shown) do not offset the loss of choice in service providers. In addition, the public generally believes government management of waste and recycling service will result in higher costs, inefficiencies and less overall value.

1) Actual Truck Trips

The number of truck trips due to garbage and recycling services needs to be specifically identified. In Coon Rapids, with four haulers and three services, the implication is **12 truck trips per street per week**. Given every other week recycling and seasonal yard waste service the actual number is **8 truck trips per street per week**. If you consider that not all haulers service every street (a reality given the market in Coon Rapids), the actual truck trips is closer to **6 per street per week,** if 25% of the streets are served by only one hauler.

Coon Rapids - 4 Haulers				
Type	**Weeks**	**Potential Truck Trips per Year**	**% of streets with more than one hauler**	**Actual Truck Trips per Street per Year**
Garbage	52	208	75%	156
Recycling	26	104	75%	78
Yard Waste	32	128	75%	96
				330
			Weeks per Year	52
			Truck Trips per week	**6**

2) Truck Design

Garbage trucks are only full to capacity at the end of each load. Has this fact been considered in the road wear claims? What type of truck is causing the wear? Two axles or three? How long is the truck? What is wheelbase? Have tag axles been considered?

3) Minnesota DOT Loading Factors

The amount of load a truck puts on a road is subject to debate. It is important to know the source and context of truck to car equivalency claims. The Minnesota DOT website gives the following information:

ESAL Factor: Prior to completing a pavement design, the Mn/DOT requires that all traffic be converted into Equivalent Single Axle Loads (ESALs), which is a means of equating various axle loads and configurations to the damage done by a number of 18,000 pound single axles with dual tires on pavements of specified strength over the design life of the pavement.

Average ESAL factors by Vehicle Type		
Vehicle Type	**ESAL Factor**	**Equivalent Cars**
Cars & Pickups	.0007	1
2 Axle, 6 Tire Single Unit	.25	357
3 Axle, 10 Tire Single Unit - (Typical Garbage Truck)	**.58**	**829**
3 Axle Semi	.39	557
4 Axle Semi	.51	729
5+ Axle Semi	1.13	1614
Bus/Truck Trailers	.57	814
Twin Trailers	2.4	3429

Source: http://lrrb.org/apg/esal.htm#3

The ESAL factor is just one of many considerations when designing a road. Studies have shown frequency (number of trips) and environmental factors (freeze/thaw, moisture, heat/cold) are key contributors to road wear. Regardless, the data is available for engineers to design roads that balance loading against cost. We are past the days of more gravel and more pavement equaling better road wear. It is not a foregone conclusion that less truck trips will result in lower cost, especially when environmental factors are considered.

4) City of Arden Hills Analysis

In March 2005, the City of Arden Hills hired URS (the recognized engineering expert on this issue) to analyze what causes road damage

Nick Landwer P.E. from URS said the following:

Although vehicle types and loading contribute to the wear of the pavement section, environmental factors also contribute to the deterioration of the pavement section. A properly designed bituminous surface should be able to handle the traffic loading over its design life including heavy truck loadings experienced in Arden Hills. Reducing the number of heavy truck loadings should have positive effects on the lifespan and quality of local streets, however environmental factors are generally responsible for the majority of pavement wear and deterioration for Arden Hills streets and therefore significant extensions of pavement life are unlikely.

5) Spring Load Restrictions

A specific example of the complexity in determining road wear is a recent MN DOT study on the Cost/Benefit of Spring Load Restrictions.

Minnesota Department of Transportation Spring Load Restrictions Study

Report Date: March, 2005, **317 pages in length**
Performed by: University of Minnesota/Department of Civil Engineering
Report Scope: Cost/Benefit Study of Spring Load Restrictions

Findings: This study found that spring load restrictions (SLR) extend the useful life of asphalt roads (which reduces costs to agencies and thus taxpayers). However they also impose significant economic costs on road users, particularly shippers and carriers and their customers. After careful evaluation of both the extended pavement life and the costs to the trucking industry, it was found that the benefits of lifting the existing SLR policy outweigh the additional costs. This means that although roads may receive additional damage and in some cases fail prematurely if the SLR policy were lifted, the cost to reconstruct or perform early resurfacing on these roads will in general be less than the savings to carriers and shippers. This finding assumes that roads can be replaced as they are; it does not account for the spending of additional funds to upgrade roads to modern standards after they are damaged.

Special study within the report: In the City of Crystal, where garbage, recycling and yard waste trucks were studied it was determined: "Spring Load Restriction policy produces no benefit to the road owners in the City of Crystal, as it does not extend the life of the pavement within its normal lifetime. The roads would fail for other reasons (which MnPAVE is unable to model) before they would fail due to excessive loadings in the springtime".

Conclusion: If road wear is to be considered, further study is needed to determine the specific cost savings, if any.