

MEMORANDUM

To: Project Team
From: Michael King, R.A.
Date: 23 February 2007
Subject: Traffic Evaporation

This memo seeks to summarize and explain traffic evaporation, discuss possibilities for trip conversions on Minnesota Avenue, and the need for good public relations in any capacity reduction scheme.

Traffic Evaporation

Traditional traffic planning holds that all vehicle trips must be accounted for when evaluating modifications to the layout or operation of a roadway network; all trips are reassigned and traffic growth is assumed. The typical outcome of a traffic analysis is then, unless capacity is increased (physically or operationally), congestion will increase. Recent research suggests that it is possible to reduce the number of vehicle trips simply by reducing capacity. The observed reduction is about 11 percent. Thus reducing a roadway's capacity does not necessarily increase congestion, and it might decrease vehicle trips.

The phenomenon known as "traffic evaporation," is based on the theory that peoples' travel choices are influenced by a complex set of decisions that have not been built into traditional vehicle traffic models. A 1998 study *Traffic Impact of Highway Capacity Reductions; Assessment of the Evidence*¹ investigated over 100 locations where roadway capacity had been reduced, either by design, omission or natural causes. There were 60 primary case studies from Austria, Canada, Germany, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, the United Kingdom, and the United States. They ranged from bridge and tunnel closures to converting vehicle into bus or HOV lanes to downtown street closings. The authors used traffic counts, interviews, travel surveys and panel surveys to ascertain the impacts of these capacity reductions.

The research found that "...in every case studied, even quite drastic reductions in road capacity have not been followed by prolonged gridlock, and major increases in existing levels of

¹ Cairns S., Hass-Klau C. and Goodwin P. B. *Traffic Impact of Highway Capacity Reductions; Assessment of the Evidence*. Landor Publishing, London, 1998.

congestion are typically only temporary...Instead, there is a fairly substantial body of evidence to suggest that some proportion of traffic effectively 'disappears'..."² Indeed, "...the most robust finding from the case studies appears to be that road capacity *can* be reallocated to other modes, or other uses, without prolonged gridlock or traffic chaos occurring. When real traffic problems do occur...they tend to be short-lived."³

The 1998 study was updated in 2002 by the article "Disappearing Traffic? The Story so Far."⁴ The authors reviewed the original case studies, described additional ones and calculated a median traffic reduction of 11 percent. As they put it, "...in half the cases, over 11% of the vehicles which were previously using the road or the area where roadspace for general traffic was reduced, could not be found in the surrounding area afterwards."⁵

If traffic disappears from certain roadways, does it evaporate completely, or does it rematerialize elsewhere in the network? The research suggests that it goes to one of three places:

1. if the surrounding network is under-capacity (in time or space), the displaced traffic is absorbed,
2. if the capacity of the surrounding network is increased (in time or space), the displaced traffic is reallocated, or
3. if the surrounding network cannot accommodate the displaced traffic (in time or space), then travelers shift mode, destination, frequency or other and the displaced traffic 'disappears'.⁶

Hence traffic *does* evaporate, but only to the extent that it needs to.

Trip Conversion

Traffic evaporation can partially be explained by trip conversion, meaning people switch from driving to taking transit, walking, or biking. In the case of Minnesota Avenue, trip conversion can be especially powerful in changing the transportation landscape. The study area, located in a major metropolitan area, contains a wealth of origins and destinations within easy walking and biking distance of each other, and the area is well served by Metro.

To investigate the opportunity for converting trips, we analyzed mode splits in the area. The hypothesis is that as Minnesota Avenue redevelops, walking, cycling and transit will become more attractive, thus reducing the inclination to drive. According to the 2000 Census, in the four tracts of the study area around half of commuters drove to work, while a substantial portion also took transit (see Figures 1,2). Very few people walked and no one said they biked to work.

² Cairns et. al. (1998). Page 29.

³ Cairns et. al. (1998). Page 37.

⁴ Cairns, Sally, Stephen Atkins, and Phil Goodwin. "Disappearing Traffic? The story so far." *Municipal Engineer* 151(1): 13-22, 2002. Page 14.

⁵ Cairns et. al. (2002). Page 16.

⁶ Cairns et. al. (1998). Page 57.

Figure 1: Census Tracts abutting Minnesota Avenue between East Capitol Street and Nannie Helen Burroughs Avenue

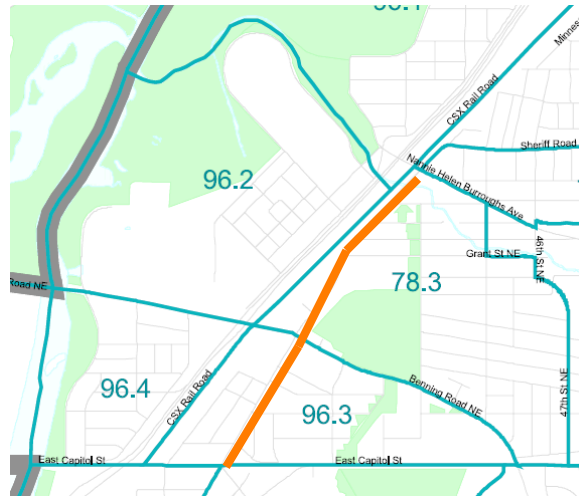


Figure 2: Travel to Work Mode in Study Area⁷

Travel to Work Mode	Census Tracts 78.3, 96.2, 96.3, 96.4
Private Vehicle	57.8%
Transit	38.7%
Walk	2.6%
Bicycle	0.0%
Other or Worked at Home	1.0%

Journey to work numbers skew differently than other travel patterns. The table below breaks down mode by trip purpose, as per the 2001 Nationwide Household Transportation Survey (NHTS). Walking to school, church, or for social activities increases several times the walk rate for work. Thus the Minnesota Avenue Census commuting numbers most likely reflect only a portion of walk trips, which will keep increasing as the area gains retail and becomes more of a traditional main street.

Figure 3: Breakdown of total person trips by trip purpose⁸

	To/From Work	Work-Related Business	Family/Personal Business	School or Church	Social & Recreational	Other
Private Vehicle	92.4%	91.2%	91.0%	72.4%	80.6%	68.4%
Transit	3.7%	1.8%	1.1%	2.1%	1.0%	3.9%
Walk	2.8%	4.2%	7.0%	9.3%	14.7%	15.3%
Other	1.0%	2.7%	0.9%	16.1%	3.6%	11.9%

⁷ 2000 U.S. Census, Summary File 3.

⁸ U.S. Department of Transportation. 2001 Nationwide Household Transportation Survey, Table A1-6.

With an understanding of the modal splits in the study area, we now turn to opportunities for trip conversion. According to the American Association of State Highway and Transportation Officials (AASHTO), most pedestrian trips are one-quarter mile or less, with pedestrians willing to walk a maximum of one mile to their destination. In general, 25 percent of all transportation trips cover a distance of one mile or less, meaning that walking could handle a quarter of all trips taken.⁹

While the AASHTO numbers quoted above are estimates, the NHTS presents a picture of actual mode splits. To limit our analysis to large cities, we took numbers only for Metropolitan Statistical Areas over 3 million in population (see Figure 4). This data shows that about 12 percent of all trips in large cities are on foot.

Figure 4: Modal Splits in MSA with 3 Million or More Population¹⁰

Average Annual Person Trips per Household	
Private Vehicle	81.1%
Transit	3.5%
Walk	11.9%
Other	3.5%

In summary: The current walk to work rate in the study area is 2.6 percent. We assume that walking for other trip types is higher, possibly up to 15 percent. The walking mode share in large cities is about 12 percent. It is estimated that walking could handle up to 25 percent of all trips. Taken together we surmise that there is underutilized capacity in the study area for walking. Thus the area is ripe for converting driving to walking trips, which bodes well for traffic evaporation.

Public Relations

In the literature on traffic evaporation, the need for successful management and public relations is stressed over and over. Essentially the general perception by the public and press is that traffic is always congested and that anything less than a private freeway is unsatisfactory. Call it windshield perspective. Schemes have been undone by unfriendly press accounts, especially those that harp on unsubstantiated reports of traffic chaos. Reporters can always get good quotes about how traffic is terrible and has been made worse. As such, when capacity is reduced, public relations must increase. A 2004 report, *Reclaiming City Streets for People*, describes and illustrates several examples of European cities who have given space back to non-motorized modes.¹¹

⁹ American Association of State Highway and Transportation Officials. *Guide for the Planning, Design, and Operation of Pedestrian Facilities*. 2004. Page 8.

¹⁰ 2001 NHTS, Tables A1-4 and A1-6.

¹¹ European Commission Directorate-General for the Environment. *Reclaiming City Streets for People: Chaos or Quality of Life?* 2004.