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The State and Local Policy Program (SLPP) of the Humphrey Institute of Public Affairs, University of Minnesota, in partnership with the Minnesota Department of Transportation (Mn/DOT) and the Metropolitan Council, has studied value pricing since 1994. These partners were awarded a grant by the Federal Highway Administration (FHWA) in Fall 1999 to continue this work. This project included major components of both national outreach and continuing efforts to develop political support for value pricing in the Minneapolis-St. Paul region.

This report summarizes the major activities that took place as part of this project, and includes as appendices, the major documents that were produced. These include three papers that were presented at the Transportation Research Board (TRB), a major pilot project proposal, and some other documents that were used locally.

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Lee Munnich and Gary Barnes

State and Local Policy Program
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Contents

Executive Summary

The State and Local Policy Program (SLPP) of the Humphrey Institute of Public Affairs, University of Minnesota, in partnership with the Minnesota Department of Transportation (Mn/DOT) and the Metropolitan Council, has studied value pricing since 1994. These partners were awarded a grant by the Federal Highway Administration in Fall 1999 to continue this work. This project included major components of both national outreach and continuing efforts to develop political support for value pricing in the Minneapolis-St. Paul region.

The part of the project that focused on the Minneapolis-St. Paul region included six major components:

- Cross-case synthesis of U.S. value pricing projects
- Advisory task force
- Crosstown pilot project proposal
- Marketing plan
- Regional traffic modeling
- Equity analysis

The national outreach component of the project included six regional workshops and project partners' meetings, and continued maintenance of the value pricing program web site and listserv.

This report summarizes the major activities that took place as part of this project, and includes as appendices, the major documents that were produced. These include three papers that were presented at TRB, a major pilot project proposal, and some other documents that were used locally.

Project Summary

Introduction

The State and Local Policy Program (SLPP) of the Humphrey Institute of Public Affairs, University of Minnesota, in partnership with the Minnesota Department of Transportation (Mn/DOT) and the Metropolitan Council, has studied value pricing since 1994. These partners were awarded a grant by the Federal Highway Administration in Fall 1999 to continue this work. This project included major components of both national outreach and continuing efforts to develop political support for value pricing in the Minneapolis-St. Paul region.

Unlike most Mn/DOT-sponsored projects, this effort was not organized around a single unifying question leading to a final report. Instead, reports, workshops, and so on, were generated around major individual components of the project as it progressed. Thus the purpose of this "final" report is not to discuss findings or even to present new material; but rather to describe in a general way the major components of this project, and to collect and present as appendices the significant documents that were produced.

Because of the large size and political nature of this project, a steering committee was formed to oversee the activities. This committee consisted of all relevant SLPP staff, the Federal Highway Administration's (FHWA) Value Pricing Pilot Program staff, FHWA regional staff, and Mn/DOT and Metropolitan Council staff. At times, other University of Minnesota staff and faculty participated in meetings. In addition to serving as a sounding board for findings, the committee helped determine project direction. Some of the tasks in the original workplan came to seem politically unwise or otherwise inappropriate to pursue as written; with the approval of the steering committee these tasks were dropped or scaled back and other activities substituted.

Most significantly in this regard, a major focus of the original workplan was to develop value pricing as a component of the long-range regional plan currently under development by the Metropolitan Council. Council staff, however, came to feel that this would be somewhat dangerous politically given the opinions of the newly appointed council chair and other key figures. While a significant amount of computer modeling of regional traffic scenarios was done early in the project in support of this goal, at the advice of the steering committee this activity was curtailed. The committee recommended instead that staff focus on developing a proposal for a pilot project that could be implemented in the near term.

The remainder of the report will give brief overviews of the major components of the project effort. Key documents produced as part of each component are included as appendices to this report. These will give substantially more detail about the various parts of the project.

Minnesota-Based Work

Cross-Case Synthesis

The project team evaluated four operating value pricing projects and a number of significant developing or attempted projects. This study was meant to inform the Minnesota project, especially in relation to the public outreach efforts and consensus building, as well as preliminary definition of market-based alternatives. The report was also a valuable synthesis for other value pricing professionals. A condensed version of the report was presented at the 2001 Transportation Research Board (TRB) meetings in Washington DC.

The cross-case synthesis report is included in this document as Appendix A.

Projects evaluated:

Active projects:

- SR-91 HOT Lane in Orange County, California
- I-15 HOT Lane in San Diego, California
- Katy Freeway JOT Lane in Houston, Texas
- LeeWay, Lee County Florida.

Feasibility studies:

- Boulder, Colorado Congestion Relief Program
- Portland, Oregon Traffic Relief Options Study
- Previous Minnesota work
- Pricing projects in Maryland were also studied as part of the project, but were not included in the final drafts.

The evaluation gathered the lessons learned from the various projects, and addressed such areas as:

- Project Goals and Background
- Alternatives Assessed
- Effectiveness of Public Outreach
- Public Participation and Perception of the Project
- Citizen Approval and Political Support
- Effectiveness of Enforcement
- Travel Studies and Air Quality
- Net Revenues
- Equity
- Impacts on Local Businesses
- Actual versus Perceived Travel Time Savings

This research was intended to help shape the technical review and public outreach work of the Minnesota Project, allowing project managers to avoid the mistakes of earlier projects while employing what worked. This research was helpful in designing the Minnesota project. Most significantly, the Minnesota value pricing advisory task force (discussed below) was modeled in part on the groups employed by the Maryland and Portland projects.

Advisory Task Force

Past attempts at pricing in Minnesota have fallen under a top-down model, with academics and Minnesota Department of Transportation (Mn/DOT) staff pushing for pilot projects and studies that were opposed and apparently misunderstood by the public. Negative public reactions to earlier proposals had engendered a considerable amount of skepticism in area leaders regarding the issue.

Earlier projects had undertaken some market research of the public's attitudes towards pricing, but had not gone beyond this to attempt to educate the public or influence public opinion. When combined with the largely negative publicity that top-down projects generated, this lack of education created a public that was unfamiliar with pricing, but opposed nonetheless.

Given this background, project staff focused early on the problem of developing public and political support for value pricing.

Project staff concluded that a diverse and independent task force would have the most credibility with both the public and government decision makers. Such a group would be able to neutrally evaluate the pros and cons of different forms of pricing in the region, suggest suitable projects, and eventually serve as advocates for pricing in general as well as specific projects. Should this group, and especially its members who had opposed previous projects, emerge as supporters, they would present a strong argument for pricing.

The mission of the task force had three main components

- To discuss the role of pricing and market-based solutions in a regional context,
- To recommend a value pricing pilot project(s), if they considered that pricing strategies had merit,
- To assist in creating a constituency of support for pricing in general and for selected projects.

Active recruitment yielded an initial task force of 37 leaders. By the end of the process 30 individuals remained engaged with the task force. These members fell into a number of broad categories of interest:

- Business groups: 4
- Environmental and social justice groups: 3
- Civic leadership groups: 3
- Local governments: 8
- State Legislators or staff: 3
- County and regional officials or staff: 2
- Transportation interests: 6

The task force met four times; there were also two subcommittee meetings to discuss details of project selection and marketing. All of the meetings consisted of a combination of presentations by value pricing staff and associates, and discussion by task force members. The first two meetings were more strongly weighted toward presentation, as staff introduced the task force members to some of the facts and ideas supporting value pricing. The last two meetings were much more geared to task force discussion, as the group used the information presented in the

first two meetings, along with their own experiences, knowledge, and relationships with stakeholders, to determine which demonstration projects would have the most merit. These meetings focused on defining the technical characteristics of potential pilot projects, and discussing how to market them to politicians and the public.

Project staff initially developed a list of 12 possible projects. A task force subcommittee examining this list decided that it would be more productive to focus attention on three projects that had the most apparent political feasibility. The full task force then discussed these three projects and voted strongly to support one of them as the first choice for a pilot project. This was a project that would have used pricing to manage traffic and fund transit improvements during the reconstruction of a major freeway interchange, the Crosstown Commons.

The proposed Crosstown pricing project was quite visibly promoted by several task force members. Meetings or presentations took place with the state commissioners of transportation and finance, the city council of one of the affected municipalities, the downtown Minneapolis traffic management organization, several state legislators, and others. In addition, there was some radio and newspaper coverage of value pricing that was not directly connected to the Crosstown project.

In almost all these cases the fact that meeting time, or radio time, or newspaper space was devoted to discussing pricing was because of the efforts and reputation of the task force members involved. While value pricing project staff developed ideas for outreach, these ideas were predicated on the willingness of task force members to carry them out; staff working alone would have had little chance to gain access to most of these opportunities.

The task force completed its original mission with the fourth meeting and the release of its final report, just prior to the 2002 legislative session. Project staff asked the group to reconvene after the session to analyze how the legislature dealt with transportation issues, and to discuss where value pricing should go from there. The meeting ended with agreement to shift the focus from the Crosstown project to one with more political promise. The task force asked project staff to study the HOT lane conversion project in particular.

A paper written for TRB describing the work of the task force is included as Appendix B.

The final task force report, written for local distribution, is included as Appendix C.

Crosstown Pilot Project Proposal

The Crosstown Commons is a one-mile common section of two major freeways a few miles south of downtown Minneapolis. The approaches to the Commons are extremely congested and experience long back ups in all directions for up to 7 hours per day, both because of lack of capacity and the large amount of weaving. Due to limited financial resources and right-of-way, the proposed reconstruction plan would have completely shut down travel on one of the two freeways (through the commons area) during a four-year reconstruction period.

As a result of the long period of disruption and the significant loss of capacity during that time, the 2001 Minnesota Legislature placed a one-year moratorium on starting the project, and

required Mn/DOT to evaluate possible design changes to reduce these problems. One of the task force members was a state senator from the affected area, and he amended the legislative directive so as to also require Mn/DOT to evaluate the possibility of using pricing during the construction period.

As a potential pilot project, this was a very large-scale endeavor, and quite original. To the best of our knowledge, no one had ever proposed to use pricing as a way to manage traffic during a large construction project. The only reason this idea was ever floated, and the reason it passed the test of political feasibility, was specifically because of the task force member who was a state senator. He was a major participant in the legislative discussions leading to the moratorium, and this gave him considerable authority in talking about pricing as a possible solution. His willingness to take the lead on the political front was probably the major reason this project was chosen rather than something "safer."

The original pilot project proposal involved reconstructing the Crosstown Commons in a wider right-of-way. This would have allowed traffic from all directions to be maintained during reconstruction, although at a reduced level. Given the high levels of traffic and the generally congested nature of this whole side of the metropolitan area, keeping both highways open would have substantial benefits. Pricing would have been implemented in the corridor to manage traffic demand, with the revenue used in part to improve transit options.

During the study of alternative designs, Mn/DOT developed a new design, using a wider right-of-way, which kept the highway open during construction. This obviously nullified much of the benefit of the value pricing demonstration as originally proposed. As a result, the pricing demonstration evolved to focus on implementing pricing as part of the new Mn/DOT design. The objectives were still to manage traffic flow and improve transit, as before, but with the main selling point being revenue generation, which could help pay for the substantially higher costs of the new design.

While this reconstruction project had been a major focus of the preceding legislative session, the subject never reemerged as an issue in the session after the task force proposed its pilot pricing project. First, the new design, by keeping the highway open, addressed the major concern that had led to the moratorium. Then a major state budget shortfall became almost the sole topic of discussion. While value pricing staff argued that using pricing to pay the higher costs of the new design made even more sense in this fiscal climate, the legislature had far bigger problems to worry about than how to pay for one particular highway project. Finally, various delays necessitated by the new design meant that construction would not start for at least two or three years anyway, leaving almost no reason to spend time talking about this project. Nonetheless, this somewhat radical proposal stayed alive for a surprisingly long time, and was respectfully listened to by a surprisingly large number of major policy makers, largely through the work and influence of task force members.

The proposal that was submitted to FHWA describing the Crosstown pricing project is included as Appendix D.

Marketing Plan

As the task force progressed toward recommending a specific pilot project, staff came to the conclusion that efforts to market and develop public and political support for such a project would benefit from the advice and effort of an outside party with more specific experience in these areas. As a result of this, Joe Loveland was hired as a communications consultant.

His work consisted of two major components. First was advice on how to market the Crosstown project specifically, and pricing more generally, to the various relevant audiences, as well as advice on who these audiences were. As a second major component, he generated documents that staff and task force members could use as support for the conversations and presentations that they took part in, and for newspaper editorials that they authored.

Joe's status as a project "outsider" had the significant advantage that he could help find ways to talk about some of the more difficult technical aspects of pricing in a way that could be more understandable to non-experts. A couple of significant documents that he produced, and a list of the meetings that were held in support of the Crosstown project, are included as Appendix E.

One other significant effort involving public opinion was a survey done in January 2002 by Decision Resources, Ltd. The survey of 1000 Twin Cities adults was done for State Senators Roy Terwilliger and Dave Johnson, to gather information for themselves on the public's understanding of transportation issues. Senator Terwilliger, a task force member, inserted some value pricing questions.

The survey asked respondents their opinion on a variety of new transportation revenue sources. The survey found strong support for "Paying a fee for the use of freeways to keep them open and flowing during major construction projects" at 44% of respondents. A small majority (57%) responded favorably to "Having an option of paying a fee to use an uncongested freeway lane when in a hurry." This support actually outpolled the heavily promoted gas tax increase (52%).

Regional Traffic Modeling

One of the original objectives of the project was the inclusion of value pricing as part of the regional long-range transportation plan. To help in developing a case for this, SRF Consulting were engaged as subcontractors to analyze the impacts on regional traffic patterns of a region-wide peak period freeway tolling system.

The analysis considered three alternatives, all studied based on projections for the year 2025. The first was a "baseline," consisting of the expected highway and transit network with no pricing imposed. The second was a scenario that would impose a per-mile charge on all regional freeways, with the charge highest during peak periods, lower during the peak shoulders, and zero at other times. The final scenario was similar to the second, but examined the impacts on a particular corridor in detail.

In the priced scenario, about 80% trips remain on the freeways (relative to the baseline). Of those that changed, about 15% changed route or destination, and 5% changed time of day or mode. This reduction in freeway trips led to a 53% reduction in daily vehicle hours of delay on the

freeway system. While the shift to other routes led to a 27% increase in delay on other facilities, the overall impact was still a 23% reduction in delay on all facilities taken together. This had the effect of reducing the number of freeway miles with level of service "F" by 59%, and the miles with level of service "D" by 55%.

While political considerations led to this information not being used to influence the regional planning process, it was presented to the value pricing task force to help them understand the impact of pricing compared to other congestion mitigation alternatives.

The final report on the travel demand forecasts is included as Appendix F.

Equity Analysis

Equity and environmental justice (EJ) were intended to be important factors in the development of project alternatives, and the weighing of alternatives. Unfortunately, these considerations proved more difficult than expected. The Cross Case Synthesis found few useful examples of equity and EJ analysis to follow. Project Managers and steering committee members struggled with ways to formally analyze the factors, with little success. Analysis of other projects showed that equity and EJ issues were difficult to avoid altogether, but also that they were not as severe as may have been expected.

Eventually, these issues were addressed in task force discussions. Staff worked hard to recruit members who had expertise or interest in these areas, but had little success. Most organizations that concerned themselves with equity and EJ declined to participate in the task force, usually indicating that the issue was not of great concern to them. Project managers and the task force moved forward with the idea that these issues would always be in the background. These issues were in fact explicitly discussed by the task force, and were a significant factor in the consideration of possible pilot projects. Project managers and task force members—again from an analysis of other projects—also hoped to allay equity and EJ concerns by proper use of project revenues. It was believed that by dedicating revenues to either increased transit or subsidizing pricing participation for low income drivers that equity and EJ concerns would be in part addressed.

University professor David Levinson was also brought onto the project to do some research on equity in value pricing. His work ended up focusing more on equity between drivers, based on the idea that policies that save time for some will tend to impose extra time on others. While this was not the same notion of equity as was motivating the other project activities, the results are interesting nonetheless. The paper resulting from this work was presented at TRB 2002, and is included here as Appendix G.

Regional Strategic Plan

The original primary intent of this project was to develop a long-range regional plan for pricing, and to have that plan included in the "official" regional transportation planning documents produced by Mn/DOT and the Metropolitan Council. This process was to begin with meetings with the commissioner of Mn/DOT and the chair of the Metropolitan Council at the beginning of

the project. As a result of state elections held just after the project started, project managers were uncertain of the reception they would receive, and so they chose to postpone these meetings. Effort was instead directed at modeling the likely effects of pricing on the future regional transportation network (described in the section "Regional Traffic Modeling"), with the idea that it would be necessary to approach these meetings with some formal evidence and arguments in hand.

Project managers and Task Force Chair Carol Flynn did eventually meet with the Mn/DOT commissioner in November, 2001, to discuss the proposed Crosstown project proposal. A meeting with the Met Council chairman was scheduled for January, 2002 but was cancelled by the chairman.

Because of the political uncertainty surrounding this project, the workplan was written so as to allow redirection at key points. In particular, tasks 1.3 and all of task 2 were contingent on the commitments of the commissioner and chairman. As it was not possible to secure these commitments, the project steering committee, with the approval of the project funders, instructed project staff to redirect their efforts away from developing high-level support and influencing the broader regional planning process. The new objectives were to develop lower-level support and a proposal for a specific value pricing project that could be implemented in the near term.

These new objectives were met through the formation of the advisory task force and the subsequent development of the Crosstown pilot project proposal. While some specific component of tasks 1.3 and 2 were kept, such as the creation of a marketing plan and an analysis of policy alternatives, these were refocused so as to be more directly applicable to the new objectives of the project.

National Outreach

As noted above, SLPP has worked on value pricing since 1994, undertaking both research and outreach and education efforts. These outreach and education efforts include convening several workshop/conferences on the subject, maintaining a website and electronic listserv discussion, and developing and distributing a 13-minute educational video. To understand the effectiveness of this previous work, and to inform work under this project grant, SLPP conducted a survey of users of these efforts.

Combining active listserv participants for whom an identity could be confirmed, workshop attendees, and video purchasers, a total of 826 "clients" were identified. The survey was conducted on-line through an interactive website. The total number of respondents was about 150, or just under 20% of the total potential respondents.

The survey asked separately about each of the outreach methods (website, listserv, workshops, and video); respondents were asked to complete sections on methods with which they had personal experience. In addition all respondents were asked to complete a common overall section. Respondents were asked for their agreement with statements on a five-point scale. A number of changes were made to outreach activities based on the results of this survey; these are described below.

Regional Workshops and Project Partners' Meetings

SLPP and FHWA staff hosted three regional workshops under this grant.

- Minneapolis-St. Paul, Minnesota: November 28 and 29, 2000
- Atlanta, Georgia: October 29, 2001
- Seattle, Washington: May 29, 2002

These workshops brought together local transportation leaders and value pricing experts from around the country, providing an opportunity for local leaders to learn about value pricing from nationally recognized experts, and to think about how pricing might fit into their own transportation plans. Workshops were typically attended by 150-200 participants. Proceedings of these workshops are available on the value pricing web site, www.valuepricing.org.

SLPP and FHWA staff also hosted three project partners meetings under this grant:

- San Diego, California, July 2000
- Vail, Colorado, July 2001
- Providence, Rhode Island, July 2002

These meetings were an opportunity for those actively working on value pricing to come together to share ideas among each other, learn the latest research findings and political happenings, and discuss together the desired direction of the field. These meetings were typically attended by 60-100 participants. Proceedings are available on the value pricing web site, www.valuepricing.org.

Web Site and Listserv

SLPP continues to maintain a national value pricing website (www.valuepricing.org). This site is the national clearinghouse for information on value pricing in the United States. The site has introductory material, more advanced material, and links to all active projects in the United States.

The website had been managed at the Institute since 1996 by succeeding generations of students, and had become somewhat disorganized over time. As a result both of feedback from the outreach survey and internal recognition of the problem, SLPP staff initiated a re-organization of the website in 2000, which culminated in a completely new look in spring 2002. This site is open to the general public, and receives moderate traffic. Requests for more information as a result of viewing the website have come from across the world, including Japan, Israel, and New Zealand.

A companion website, www.valuepricingoutreach.org, was also developed in cooperation between SLPP staff, project partners, and FHWA staff. This website is limited access, and is dedicated to assisting project partners with outreach efforts. The site contains sample outreach materials as well as advice on how to develop and run a successful education campaign for a project. This site came on line in the summer of 2002.

As a result of feedback from the outreach survey, significant changes were made to the listserv, which SLPP had maintained since 1995. One complaint that emerged from the survey was that the conversation was at times dominated by a few members and overall was devoted more to ideology than practice. Although this was not mentioned by an overwhelming number of respondents, SLPP staff took the issue seriously. The list was split into three separate lists: the original, public list, a controlled access list, and an announcements only list which is a combination of both memberships. This last list is "read-only;" posts can only be made by SLPP staff, though any member is welcome to submit post requests.

The original public list (con-pric) remains the most active of the three. It has maintained a steady membership of roughly 200 members since 1999 (with fluctuations in members, but fairly steady numbers). The list remains vocal and fairly ideological and theoretical. The project partners' list has about 160 members. Membership is controlled, and open only to those associated with an FHWA funded value pricing project. This listserv has been underused since its inception. While it was intended as a private forum for project partners to hold more technical discussions, questions and comments of this type still tend to be posted on the public listserv.

Buying Time Video

The original workplan included the possible production of a new "Buying Time" video. As noted above, the video was included in the evaluation of previous outreach work. Although the results of the survey indicated satisfaction with the original video and potential demand for an updated version, FHWA staff elected to not produce a new video, and instead directed SLPP staff to use the dedicated money on other outreach products that could be of more immediate practical use by projects. These included the www.valuepricingoutreach.org website, and various materials produced by a local communications consultant, described above in the section "Marketing Plan."

Appendix A

Cross-Case Synthesis Report
Presented at TRB 2001
Jennifer (Ward) DuBord

Value Pricing:
A Synthesis of Lessons Learned

Jennifer L. Ward
Hubert H. Humphrey Institute of Public Affairs
University of Minnesota
130 Humphrey Center
301-19th Avenue South
Minneapolis, MN 55455
(612) 626-9865
jdubord@hhh.umn.edu

ABSTRACT

As regional traffic congestion rises, traffic demand management strategies, such as value pricing, are being evaluated as a way to manage the transportation system more efficiently and effectively. This paper aims to evaluate the operating value pricing projects and feasibility studies to extract the lessons learned that can be applied to future studies and projects, specifically the ongoing efforts in Minnesota.

The four operating projects reviewed include the San Diego I-15 Express Lanes, the SR 91 Express Lanes, the LeeWay in Lee County, Florida, and the Katy Freeway in Houston, Texas. The feasibility studies examined are the Boulder Congestion Relief Study, the Portland Traffic Relief Options Study, and the Minnesota value pricing efforts. The eight criteria used to evaluate these projects and studies include: alternatives assessed, effectiveness of outreach efforts and public perception, effectiveness of enforcement, net revenues, equity, impacts on travel behavior and air quality, travel time savings, and impact on local business.

The lessons learned from this study highlight the benefits and barriers of these value pricing efforts. Operating projects have been effective at maximizing the capacity of a facility, inducing travel mode changes, increasing vehicle occupancy, and shifting the times of travel. Projects have been self-sustaining and generated revenues allocated to transit have mitigated some equity issues. However, equity remains a major in the public eye. Enforcement, gaining public and political support, and modeling constraints have been the largest barriers, but operating projects have effectively countered concerns with outreach and education efforts.

INTRODUCTION

As regional congestion problems continue to grow throughout the country, travel demand management policies have become increasingly more important in managing limited transportation resources. Value pricing adopts a concept often used in other parts of the economy, where price fluctuates based on the demand for a good. Goods and services, such as airlines, phone services, and gas and electric services, charge higher prices during high demand periods as a way to manage limited supply. In the transportation sector, value pricing adopts this theory, charging drivers a relatively higher fee to use limited road capacity during peak congested periods. When applied appropriately, value pricing can be a way to optimize scarce transportation resources while producing benefits for consumers, such as additional transportation choices, more reliable trips, and overall travel time savings.

The Federal Highway Administration began national efforts to evaluate the benefits of value pricing under the ISTEA legislation in 1991. In May 1998, continued funding was approved through Congress, and the Value Pricing Pilot Program was established, authorizing up to 15 projects. Under this program, several operating projects and studies have been funded, while even more project proposals are being submitted and reviewed. Throughout its tenure, the federal program has offered support to assist local governments in studying and implementing value pricing, while the local projects and studies have provided supporting evidence to the benefits of such policies, including the ability to reduce congestion, enhance mobility, decrease highway-related pollution, and increase the overall economic efficiency of highway transportation.

Implementing value pricing projects can be a complex process. Projects can encounter public acceptance barriers and political obstacles, as well as technical and legal enforcement issues. This paper aims to evaluate the benefits and barriers that operating projects and feasibility studies have encountered and extract the lessons learned that could be applied to future studies and projects, specifically the ongoing efforts in Minnesota. The four operating projects reviewed include the San Diego I-15 Express Lanes, the SR 91 Express Lane facility in southern California, the LeeWay in Lee County, Florida, and the Katy Freeway in Houston, Texas. The feasibility studies examined are the Boulder Congestion Relief Study, the Portland Traffic Relief Options Study, and the Minnesota value pricing efforts. The Value Pricing Pilot Program includes other operating projects and feasibility studies approved in 2000, but they have not been included in this assessment as project evaluations are not yet available.

Although each project and study is unique in structure, goals, political environment and need, parallels exist among the operating projects and studies, which can provide insight for future value pricing efforts. The eight primary criteria used to compare projects and extract lessons include:

- *Alternatives Assessed*
- *Effectiveness of Outreach Efforts and Public Perception*
- *Effectiveness of Enforcement*
- *Net Revenues*
- *Equity Implications*
- *Impacts on Travel Behavior and Air Quality Standards*
- *Travel Time Savings*
- *Impacts on Local Business*

METHODOLOGY

The data collection process involved gathering information and existing reports from each of the project managers and the associated research team. Reports from the operating projects included the initial project proposal, pricing feasibility studies, pre-project data collection reports, and project evaluation studies. The studies reported a combination of qualitative data, such as information from focus groups, traveler and telephone surveys, and quantitative data collected from vehicle and occupancy counts, speed demonstrations, and modeling work. The feasibility studies included similar qualitative and quantitative data, but to varying degrees based on the scope and progress of the study to date.

Interviews with project managers and associated research teams complemented the published studies. The interviews often provided more detailed evidence and refined project details. Where necessary, follow-up interviews or correspondence clarified conflicting points. Each of these projects is extremely complex. The information and data provided may not effectively reflect this complexity, but attempts have been made to highlight specific issues. This report aims to compare key points across projects, focusing on the successes and challenges faced when exploring value pricing.

THE OPERATING PROJECTS

The LeeWay in Lee County, Florida (1, 2, 3)

In August 1998, Lee County Florida began a value pricing pilot project on the Cape Coral and Midpoint bridges, two of the four bridges that connect Cape Coral and Fort Meyers. Both bridges carry a large number of commuters during peak periods, although neither suffers from severe congestion. This demonstration was intended to be a proactive measure to examine the affects of pricing on existing congestion, as well as install the technical infrastructure needed for future congestion management projects. Lee County had two primary goals in implementing the Variable Pricing Project: to extensively analyze the impacts of variable pricing in Lee County and to reduce congestion and prevent future congestion during peak periods.

In November 1997, electronic toll collection (ETC) equipment was installed on the bridges, allowing for a variable pricing tolling structure and extensive data collection. By varying the toll structure, the project uses pricing mechanisms to induce patrons who usually travel during peak periods to change their time of travel. The variable toll structure offers a 50% discount during the shoulder periods just before and after the peak traffic period (6:30 to 7:00 a.m., 9:00 to 11:00 a.m., 2:00 to 4:00 p.m., and 6:30 to 7:00 p.m.). This toll discount encourages patrons to change their time of travel without making the peak periods trips more expensive.

Only ETC customers are eligible for variable discounts, requiring patrons to obtain a transponder and an account. Transponders either automatically debit a credit card or draw on prepaid toll accounts as patrons use the facilities. As of March 2000, 66,500 transponders had been issued, with 51.6 percent of them eligible for variable pricing discounts. On average, eligible participants make 25 percent of daily bridge payments. The success of this demonstration has led Lee County to explore other value pricing applications to improve overall traffic management.

Katy Freeway in Houston, Texas (4, 5, 6)

In January 1998, the Texas Department of Transportation (TxDOT), Houston Metro and FHWA funded a feasibility study of a high-occupancy toll (HOT) lane on the Katy Freeway, which resulted in a value pricing demonstration called QuickRide. The Katy HOV lane first opened in 1984 as a 13-mile, reversible lane on the west side of downtown Houston, flowing inbound in the morning and reversing in the afternoon. Initially, only transit and vanpools were permitted, but service was slowly expanded to include HOV-2+ vehicles. High demand from HOV-2+ resulted in degraded service on the lanes during the peak traffic periods. In order to maintain the quality and service of the lanes, the HOV status was upgraded to include only vehicles with three or more passengers during peak periods (6:45-8:00 a.m. and 5:00-6:00 p.m.). During the remainder of the day HOV-2+ vehicles could access the lanes. This strategy effectively countered the excess demand during peak periods, but left the lanes underutilized.

By allowing HOV-2 vehicles to buy-in to the HOV-3+ lane, QuickRide provided a way to utilize the excess capacity during peak periods without degrading the quality of the lanes. The program had several goals: to increase the overall person throughput on the Katy Freeway corridor during peak periods; to increase travel speeds on mixed flow lanes during peak periods by diverting traffic to the HOV lane; and to efficiently manage demand without adverse operating impacts on both the HOV lane and the general-purpose lanes. With a hangtag and a transponder, HOV-2's could enter the lanes during peak periods for a $2.00 charge. The automated vehicle identification (AVI) technology and transponders had been established in previous demonstrations, so participants only needed to set up a $40 debit account to

become eligible users. Initially, a total of 180 users signed up, with a 25% increase in participation after the first couple of months. By June 1998, a total of 468 users were enrolled in the program. The success of the QuickRide program has resulted in additional HOT lane projects on other regional facilities.

Interstate 15 Express Lanes in San Diego, California (7, 8, 9)

The I-15 Express Lanes are two reversible lanes, located in the freeway median, that flow southbound in the morning and reverse in the afternoon. Initially opened as an HOV facility in January 1988, the lanes span eight-miles along the Interstate 15 in San Diego, California. As strictly an HOV facility, the lanes did not fill to capacity. Transit also underserved the corridor in the early 1990's. In effort to overcome these constraints, the San Diego Association of Governments (SANDAG) Board passed a resolution and applied for a grant under the Value Pricing Pilot Program, which allowed pricing to be tested in a demonstration project along the corridor. The main purpose of the grant was to "design alternative congestion-pricing mechanisms to authorize and control the use of excess capacity on the I-15 HOV Expressway by single-occupant vehicle", an act that would allow the conversion of the HOV lane into a HOT lane, or HOV and toll lanes.

The Interstate 15 Value Pricing project began as a three-year demonstration project, implemented in two phases. The Phase 1 ExpressPass program, which allowed single occupancy drivers to buy-in to the HOV lane with a monthly pass, operated from December 2, 1996 to March 30, 1998. Initially, 500 color-coded monthly passes were available for $50 per month, and was later increased to 1,000 at $70 per month. By June 1997, an AVI transponder system was in place. In March 1998, Phase 2 began, instituting the FasTrak program.

The popularity of the project was immediately clear. Within the first week of operations, over 3,200 of the 5,000 available transponders were dispersed. By December 1998, 6,502 transponders were issued, with 4,850 corresponding FasTrak accounts. The facility instituted a dynamic tolling structure, which changed based on the congestion level, with tolls ranging from $.50 to $4, and possibly up to $8 in very unusual circumstances. In August 1998, tolls during the peak shoulders decreased, in an effective effort to encourage drivers to travel in non-peak periods. The demonstration period ended in December 1999, but the project has continued to operate since it has been deemed to be self-sustaining and successful at achieving the prescribed goals.

SR 91 Express Lanes in Orange County, California (10, 11, 12)

The State Route 91 Express Lanes is a unique project in many respects. The four-lane toll facility, opened in December 1995, operates under a public-private partnership between Caltrans, the California Department of Transportation and a private company, California Private Transportation Company (CPTC), allowed under AB 680 legislation. The corridor, the main link between Orange and Riverside counties, represented the most congested section of the freeway at the time of the project's conception. Caltrans initially planned to develop HOV lanes along this corridor, but funding was not available. These constraints made SR 91 a prime candidate for a public-private partnership project. CPTC submitted the proposal to develop the Express Lanes in the median of SR 91, adjacent to the general-purpose lanes and separated only by a painted buffer and pylons. Two continuous lanes flowing in each direction were added, with no exits or entrances along the ten-mile corridor.

CPTC operates the lanes as an independent entity, managing the daily operations, as well as having been responsible for the design and construction of the Express Lanes. CPTC also has the power to set the tolls in order to keep the lanes congestion free and earn a reasonable return on its investment. Since the opening there have been a total of three toll increases. Tolls are collected via Automated Vehicle Identification (AVI) transponders and are variable, based on the time of day of travel and the vehicle occupancy. All automobiles and motorcycles equipped with a transponder and a pre-paid account are eligible to use the lanes. Although the AVI transponder does not require a deposit, a minimum balance of $40 is necessary establish an account. Interoperability agreements are established between all California toll facilities offering electronic/AVI toll payment options under the single brand, "FasTrak".

Despite political tension surrounding the facility, CPTC has built a strong customer base and is looking to possibly expand eastward.

THE FEASIBILITY STUDIES

Traffic Relief Options Study in Portland, Oregon (13, 14, 15)

Beginning in 1996, Portland Metro, in conjunction with the Oregon Department of Transportation (ODOT), embarked on the three-year Traffic Relief Options Study. The goal of the study was to determine the feasibility of value pricing as a congestion relief option for the Portland metropolitan area. Portland Metro wanted to determine whether value pricing was appropriate for the region, if a pilot project should be done and the goals of such a project. They also aimed to increase the public and political understanding of value pricing. The study focused on the costs and benefits of peak period pricing. For the purposes of this study, peak period pricing was defined as a way to better manage traffic congestion by charging drivers a variable fee, which is higher during peak periods, encouraging some drivers to choose alternative routes, use other modes of transportation or travel at other times.

The evaluation of value pricing included the specification of the type of pricing, the location, the type of facility to be priced, a pricing schedule, and details of the application in the specified location. Several types of pricing were considered, including spot pricing applications of a single location, partial facility pricing, pricing of a whole facility, corridor pricing, and area pricing, such as a regional destination center. Technical studies and public outreach were the primary evaluation tools used to narrow the numerous value pricing options. In the end, the appointed Task Force recommended that value pricing be considered on new or significantly upgraded facilities. This was incorporated into the Regional Transportation Plan. However, they voted against advancing the study to the next level at this point in time.

Congestion Relief Program in Boulder, Colorado (16)

The Boulder Congestion Relief Program began with the principal goal of helping facilitate the City's overall transportation goal of a 15% reduction in SOV traffic by 2020. In accordance with the 1989 Transportation Master Plan (TMP-89), the City of Boulder endorsed efforts to minimize the impacts of automobile use in order to promote a high quality of life. The City preferred developing incentives to encourage a shift in mode, but as a contingent, the plan allowed disincentives to be developed to achieve the final goal. Despite an extensive program that yielded a shift in SOV traffic to alternative modes, an increasing concern about congestion and an effort to remain on track with TMP-89 goals led the City to explore the use of congestion pricing.

The Director of Public Works first conceived the concept of congestion pricing in Boulder in the early 1990's. As a joint effort between the Colorado Department of Transportation (CDOT) and the Divisional Office of FHWA, a grant was submitted, leading to the conception of the Congestion Relief Program. Support from within the Boulder City Council at the time of the proposal led to an overmatch of the required local funds to support a pilot project. According to the proposal, the objectives of the project were to develop alternative future scenarios for Boulder with and without the implementation of congestion pricing, to initiate a transferable public process methodology for building community acceptance of market-based demand management techniques, and to design a strategy for congestion pricing techniques that best served the needs of the community. Following the project initiation in May 1995, a series of studies and reports explored the costs and benefits of pricing in Boulder, culminating in the final report issued in December 1998.

Minnesota Demonstration (17, 18, 19)

Pricing initiatives have a long history in Minnesota. In 1994, legislation was passed directing the Minnesota Department of Transportation (Mn/DOT) and the Metropolitan Council, the regional planning organization, to jointly explore congestion pricing. This initiated the *Minnesota Road Pricing Study* in 1995. The study examined the feasibility of a congestion pricing pilot project and was conducted in three

phases. Phase 1 consisted of a study initiation, phase 2 defined and refined pricing options, performance measures, impact assessment and collateral actions, and phase 3 was the implementation plan and final report. This study intended to fully explore pricing with the intent of proposing a project and implementation plan.

At the same time, a TRANSMART program was being initiated in accordance with a legislative act passed in May 1993. TRANSMART is a public-private initiatives program designed to explore proposals for toll facilities. This program complemented congestion pricing efforts, as a proposed toll road would have the potential of becoming a congestion pricing demonstration. In 1995, after reviewing five public-private partnership proposals, Mn/DOT recommended the Trunk Highway 212 for development as a public-private toll facility. However, in accordance with the process, any of the affected communities could reject the tolling proposition, and one community exercised this veto power, ending this project proposal.

Despite this defeat, the early success of the SR 91 HOT lane in California encouraged Mn/DOT and the Metropolitan Council to examine the concept of a toll lane system in the Twin Cities. The *Toll Lane System: Preliminary Feasibility Study* examined the feasibility of adding high occupancy toll lanes (HOT lanes) to the system. In June 1997 under authorizing legislation, the Metro Division of Mn/DOT initiated the I-394 Congestion Pricing Demonstration Study. The study intended to test whether single-occupancy vehicles would be willing to pay to travel in the HOV lanes and if so, how much. The proposed demonstration consisted of three phases, beginning with a monthly pass system, followed by a ramp-meter bypass stage, and finally moving towards an automated transponder and billing system. However, the proposed demonstration and the concept of pricing did not gain much public support. Four days before the Metropolitan Council was scheduled to approve the demonstration project, the Commissioner of Transportation withdrew it with the intention of improving public education and support for pricing.

LESSONS LEARNED

Based on the experiences of each of these projects and studies, several key benefits and barriers have emerged as lessons to future studies. These lessons have been extracted by using a number of evaluation criteria. Although each project is unique, lessons can be drawn from their similarities as well as their differences.

Alternatives Assessed

An assessment of the alternatives allows projects to test a variety of market-based pricing options in order to determine the feasibility of a project before implementation. By establishing broader transportation goals for the specified project site, the impacts of value pricing were assessed based on the ability to best meet their established goals. In the case of the four operating projects, value pricing emerged as the alternative solution to a specific problem in a corridor, lane, or bridge.

As each of the operating projects had a clearly defined problem, the need to model the impacts of pricing on different regional facilities was minimal. The overarching goal for both the Katy HOV lane project and the I-15 Value Pricing demonstration were to maximize the capacity on the lanes (6,7). The HOT lane concept, allowing a lower occupancy vehicle to buy-in to the lanes, was deemed the most appropriate tool to achieve this purpose. In contrast, the SR 91 corridor experienced high demand with limited capacity. The topography, traffic patterns, and political constraints narrowed the alternatives available on the corridor (12).

Modeling, however, was a critical component to understanding the impacts of potential value pricing projects for the feasibility studies. Studies done in Portland, Boulder and the Twin Cities included extensive modeling work to assess the alternatives. Each study evaluated several pricing scenarios based on a list of criteria. The Boulder study evaluated five road pricing scenarios using a microsimulation model. The analysis found the optimal toll was a demand-based toll, priced at the cost of time delay imposed by a vehicle on the system. Optimal tolls were found to have the most significant impact on reducing auto VMT and drive-alone trips while increasing transit ridership and ride sharing. These

benefits decreased proportionately as tolls were adjusted downward. Accordingly, value pricing was deemed a beneficial tool to manage congestion given viable travel alternatives were in place (16).

The Portland study undertook two levels of evaluation. The first phase used six broad categories of qualitative and quantitative screening criteria to narrow 40 options down to eight based on their net benefits, while the second phase involved a more sophisticated model to conduct a more detailed evaluation (20). Based on the technical analysis, public and political feedback, the Task Force recommended pricing under certain conditions, such as new lane capacity, a new facility, or a major facility reconstruction (21).

A similar alternatives analysis was conducted in the Twin Cities, evaluating the potential impacts of pricing using preliminary criteria, followed by a more detailed modeling analysis, and finally determining an implementation plan to recommend. This analysis yielded similar results to other studies: pricing could influence travel behavior, manage and reduce congestion, raise revenues for transit and other alternatives, and reduce the overall vehicle miles traveled and vehicle emissions (17). Another preliminary study testing the potential of a toll lane system found that HOT lanes provide a way to preserve existing HOV lanes and can reduce congestion in the general-purpose lanes. HOT lanes were also found to be economically feasible, with the potential of guaranteeing toll revenue at levels above the cost of implementation and operation (18).

Effectiveness of Outreach Efforts and Public Perception

One of the primary barriers to value pricing projects can be gaining public acceptance and political support. Public outreach and education have proven effective in gaining support for value pricing projects and creating an understanding of the concept. To effectively gain public support, it is important that the public perceive the need for value pricing. This requires clear communication of the problem, the role value pricing plays in solving the problem, and the benefits of such policies.

Value pricing can prove difficult if the public does not believe the problem warrants the action. In Portland, the public voiced concern about the growing congestion problem, but did not view the problem as critical enough to use value pricing (13). Likewise, in Boulder, public concern over congestion did emerge, but the problem was isolated to a few specific intersections or roadways, and was not perceived as a regional problem. The public perceived value pricing as too extreme a solution for the problem (22). Through marketing research efforts, Minnesota found that value pricing should not be presented as the sole solution to congestion and that HOT lanes were seen as a temporary "band-aid" to the congestion problem. The public felt the need to explore other alternatives to pricing before recommending such a "drastic" solution (19).

Defining the problem was not a concern for most of the operating projects. In Lee County, people never challenged the idea that congestion would occur, even though congestion was not an issue at the time. They felt variable pricing served as a new congestion management tool, a proactive measure against future congestion (23). Value pricing on the Katy Freeway and on the I-15 were, in part, responses to public pressure to find a solution to the congestion problem and underutilized HOV lanes. Value pricing was marketed as an alternative to manage congestion and to utilize the excess capacity. Congestion was a real problem on SR 91, but the Express Lanes were a contentious solution, although more concern was generated over the private ownership issue than variable pricing (12).

In building support for the concept, it is important to engage key stakeholders. Bringing major stakeholders together as an advisory group may help create buy-in from opponents to the project. Advisory committees developed the concepts for some of the projects, including project planning, design, and implementation. The I-15 ExpressPass program engaged community groups, commuters and the media in an educational forum (24). The Lee County Commission appointed three citizen advisory committees to serve in this capacity, consisting of local bridge users and businesses (23). Portland Metro immediately formed a task force committee to oversee the entire process, bringing thirteen community leaders together to act as spokespersons and decision makers for the project. A Technical Advisory Committee and a Project Management Group acted in an advisory capacity for the Task Force (15). In

contrast, Boulder failed to form a key stakeholder group, making it difficult to achieve project buy-in on a grassroots level (16).

Regional stakeholders should also be incorporated into the process, especially when considering any type of regional pricing plan. In Portland, local municipalities were encouraged to participate in the process (13). A lack of regional support further strained the Boulder demonstration, as regional players and municipalities were not incorporated into the process (16). A Project Management Team (PMT) for the I-15 project convened monthly, bringing major governmental stakeholders from federal, state, regional and local agencies together as advisors. These stakeholders viewed it as a successful process, creating inter-agency support for the project (7).

Focus groups can provide insightful input on the formation of a project. They were often used to gauge the public's perception of value pricing as a solution and to inform the overall marketing plan. Although many of the focus groups expressed concerns over equity issues, several distinct public concerns were also voiced.

- Focus groups on the Katy Freeway feared value pricing would lead to additional tolling (4).
- CPTC holds ongoing focus groups. Initially they targeted potential customers to provide feedback on the project but now it allows them to improve their service (12).
- The I-15 ExpressPass program showed that commuters supported the project but HOV drivers and transit users were opposed (25).
- Focus groups held in Portland were firmly opposed to value pricing, although outreach built some support. The public viewed value pricing as only one option in solving the congestion problem, although many were unaware of other options or the inappropriateness of these options for the area (13).
- Residents living in the City of Boulder, often faced with the congestion problem, were supportive of the idea of pricing, while residents living outside the city in Boulder County were opposed (16).
- In Minnesota concerns about equity, the cost of administration, the reliability of technology, and the allocation of revenue from pricing efforts were found (17). A later study emphasized the need to present additional information on HOT lanes, enhance transit with revenues, allow tolled vehicles to bypass ramp meters, and encouraged free access for all HOV-2+ vehicles (18).

Feedback from focus groups, surveys, and advisory committees was instrumental in developing marketing messages. Although each project used similar marketing strategies, individual marketing campaigns were tailored to address local circumstances. The most common marketing tools included direct mailings of project brochures, local media, such as radio and television ads, or billboards, local newspaper ads, attending local speaking and community events, and developing project web sites. Lee County sponsored such events as a "Name-the Transponder" contest where the winner received a year of free tolls, and developed the "Transponder Man", who attended public events (23). The SR 91 Express Lanes conducted a very comprehensive marketing campaign, aimed at building a customer base. In addition to the basic marketing tools, CPTC began loyalty programs, providing discounts at gas stations and recreation centers for customers. However, the most effective marketing tools turned out to be word-of-mouth and road signage (12).

Marketing efforts on the Katy Freeway and I-15 were more contained because of the limited capacity available for sale. In retrospect, a more visible campaign on the Katy Freeway would have been more successful (26). The I-15 Express Lanes expanded marketing efforts in Phase II of the project to include sign-up incentives and educational tapes for prospective and existing customers about the new program (8). Portland Metro leveraged targeted focus groups to create small pockets of support throughout the region (13). Boulder constructed a Congestion Relief kiosk for use at public events as well as engaging local students in discussions on congestion. They planned to sponsor a Household Budget Exercise, intended to personalize the costs of travel, but canceled it due to negative media coverage (22).

The ability for outreach efforts to leverage public support varied by project. Most of the operating projects have experienced overall support. Lee County found that 87 percent of those surveyed had some knowledge of the variable pricing program. People generally liked the program and saw it as a preemptive way to address an impending congestion problem (3). Likewise, the Katy Freeway experienced overwhelming support, with a survey showing a high support among users and non-users. The general public never raised potentially controversial issues, such as double taxation or equity (27). ExpressPass users on I-15 were supportive, but marketing efforts were not as successful with non-users (28). Low awareness and support existed for allocating revenues to transit (7). In Phase II, marketing efforts were deemed effective at raising awareness, but current users felt program changes should be better communicated (8). CPTC was effective at communicating with customers. The initial approval ratings for variable pricing were not high, but support grew as users participated in the program, although non-user support remained low (10). Overall, public support has declined somewhat from 1997 to 1999, perhaps based on political issues (29).

Public support and acceptance was not as high among the feasibility studies. Two attempts to implement value pricing ended in Minnesota because of a lack of public support. The outreach efforts failed to counter the concerns raised during market research and convey the overall concept of pricing to the public. With the exception of the privacy issue, concerns raised in Boulder were not addressed nor incorporated into the project (22). Outreach efforts in Portland had mixed results, with the general public being only passively aware of the concept. Targeted focus groups were more supportive, viewing value pricing as a potential management tool for new or upgraded facilities, but not existing facilities (13).

Politically, the operating projects were more successful at gaining support than the feasibility studies. Having a political champion to promote value pricing, specifically an elected official, can prove invaluable to a project. An effective political champion counters criticism and is vocally supportive of efforts to move the project forward. The former Mayor of the City of Poway, who later became an Assemblyman, acted as the political champion for the I-15 project (9). The Mayor of Houston was considered a passive political champion for the Katy Freeway (26). A County Commissioner in Lee County spearheaded the LeeWay project, and Orange County officials played significant supportive roles in pushing forward the SR 91 Express Lanes (23,11). However, political resistance from Riverside County has raised the awareness of the project with negative publicity, causing public support to falter.

In contrast, the Boulder and Twin Cities studies lacked a main political champion, making it difficult to move forward and implement a final project. The lack of consistent internal political support in the City of Boulder was a weakness in the project. Although a city employee was the champion of the idea, support faltered later in the process, and the project failed to move forward thereafter (16). Pricing remains unpopular on a regional and local level in the Twin Cities. Pricing efforts have been perceived as a governmental solution, but no political champion exists to move the efforts forward. Despite legislative mandates, the political strategy made any kind of tolling effort vulnerable and placed pressure on local governments to support initiatives that were not locally popular. The Portland study lacked a true political champion, but the Task Force consisted of several visible elected politicians, who may emerge as future political champions (13).

Media coverage of value pricing can also become a key component in gaining public acceptance. However, positive media coverage helps outreach efforts and increases public support less than negative media coverage harms them (30). Negative media coverage is often difficult to counter. This stresses the need to develop a relationship and educate the media on value pricing, in order to ensure accurate reporting on value pricing efforts. In Lee County, one person acted as the main contact, ensuring a single, consistent message was communicated to the public (23). On SR 91, public support has fallen due to continued coverage of the political battles between the CPTC and Riverside County (29). Negative media surrounding Boulder's technology demonstration, despite neutral coverage earlier in the project, was the most effective outreach tool, spurring constant debate, but condemning the project (16).

Effectiveness of Enforcement

Enforcement is a strategic component in the design of a value pricing project. An enforcement plan establishes the effectiveness of traffic demand management in the system. The toll structure and overall control over revenues are determined by the ability to effectively enforce priced facilities, especially on dynamically priced facilities. The enforcement system also underscores the safety and reliability of the facility. Violation rates are one measurement of the effectiveness of an enforcement system.

Several legal issues must be considered in establishing an enforcement plan on a priced facility. Enforcement agents must be legally empowered to enforce the law. On the Katy Freeway, Houston Metro had the capacity to charge tolls on the facility, but to implement the project, they were required to establish a toll structure, administrative regulations, rules of participation, participant responsibilities, and a civil enforcement program, which included criminalizing the non-payment of tolls (4). Conversely, SR 91 was required to have legislation passed that decriminalized toll evasion and established toll violation penalties for California toll facilities (12). There is a concern on SR 91 that someone could fight a ticket, as vehicle codes, used to identify violations, can be ambiguous and difficult to enforce. However, to date, there have not been any problems (31). On the I-15, ticketing occupancy violators was legal, but new legislation was required to allow single occupancy vehicles to travel the lane legally with a transponder (7). Although the legal constraints vary by locality, understanding the barriers is essential in designing a feasible project. Projects requiring major changes in legislation can raise public awareness and political barriers.

Technologically, all of the projects have installed AVI technology and transponders. Lee County has not encountered problems with enforcement, as vehicles are required to pass through gates to enter the facility (23). However, SR 91, I-15, and the Katy Freeway all use visual enforcement as the primary means of patrolling the lanes. On the Katy Freeway, Houston Metro officers visually check the windshield of QuickRide participants during peak periods for a transponder and a color-coded hangtag, as well as monitoring for single occupancy vehicles (SOV) violators (27). Likewise, SR 91 and I-15 both contracted with the California Highway Patrol (CHP) to check for transponders as well as checking for occupancy (7,11). SR 91 has supplemented visual enforcement by officers with a video-base monitor that hangs over the lanes, photographing vehicle license plates as they enter. CPTC matches the license plates against a customer database to distinguish customers from violators (12).

Although difficult, enforcement has proven effective for each of these projects. Violation rates are low, estimated between 2-5% on the Katy HOV lane (26). The violation rate on the I-15 decreased significantly after the start of the program, falling from 15 percent in October 1996 to 2 percent in February 2000 (32). The ticket for a violation varies among the projects, $87 on the Katy Freeway, $271 on the I-15 Express Lanes, and $300 on the SR 91 Express Lanes (27,9). Violations on SR 91 are treated like any other offense by CHP, with funds from fines being directed to local jurisdictions. Violations detected via photo enforcement are treated as a marketing opportunity. CPTC assumes a first offense was a mistake and sends a letter, describing the violation, requesting the toll money but no fine, and including information on how to become a customer (31).

Based on the violation rates, the fines in conjunction with the visibility of the patrolling officers have been effective deterrents. However, visual enforcement is considered primitive and has proven difficult in certain respects. It is very difficult for officers to check the occupancy of a vehicle and look for a transponder on a vehicle that is traveling at high speeds. In addition, shoulder space is limited on each facility, requiring officers to monitor vehicles where space is available and making it difficult and dangerous to pull violators over. Some QuickRide participants have taken advantage of this situation by placing the transponder in a non-readable pouch as they pass the AVI reader and then replacing it in the windshield before they pass the patrolling officer (27).

As a result, projects have considered more effective enforcement alternatives. Houston Metro has explored installing electronic monitoring equipment at the exit of the Katy Freeway and having officers monitor at the same location. Houston Metro and SANDAG have also considered changing the

enforcement technology to a more advanced system. However, SANDAG found video cameras and automated enforcement to be ineffective in monitoring vehicle occupancy at this time (9).

Finally, incidences of speeding and safety have been considered a potential enforcement problem. Specifically, policymakers feared changes in speed would occur around discount periods. Despite the perception that drivers travel at higher speeds on toll lanes, researchers have no data showing significant changes in speed on priced facilities. Safety has become an issue on SR 91. It is perceived that Caltrans has compromised the safety of the main lanes by the agreement with CPTC, which prevents Caltrans from improving the SR 91 main lanes. The latest efforts are to condemn the Express Lanes, which would nullify the agreement, opening the Express Lanes to the public. This has generated much legal activity as well as negative press. However, studies monitoring accident rates and the overall safety on priced lanes, including SR 91, have not found any conclusive evidence showing differences from the general-purpose lanes (29).

Net Revenues

Revenue generation provides financial incentives to implementing value pricing. To the extent that value pricing can cover the capital and operating costs, it becomes a viable alternative financing option. Potential revenues can be invested in additional transit options and expansion of the system, or used to mitigate some of the equity concerns. In the Portland study, the Task Force recommended that any revenues earned via pricing efforts be allocated to road improvements and alternative mode uses along any demonstration project corridor (21). Likewise, alternative transportation would have benefited from any revenues generated from a value pricing project in Boulder (16).

HOT lanes can be designed to be self-sustaining, depending on the tolling structure. On the SR 91 and the I-15 Express Lanes, dynamic tolling maximizes revenue while effectively managing traffic at the maximum capacity. On the I-15, there is more revenue potential by pricing on a per trip basis (32). The I-15 Express Lanes project, initiated in part as a means to fund transit, is self-sustaining, with revenues between $1-1.2M and total costs around $500,000, including electronic tolling equipment, administration and maintenance, and enforcement costs (9). Thus, the project produces a small amount of revenue, which has been used to operate the *Inland Breeze*, a new bus service established on the lanes. Houston Metro wanted to ensure that any solution implemented on the Katy Freeway was sustainable, although it was not necessary to generate large amounts of revenue. The initial start-up costs were not very high, as the technology investments were already in place. For the year 2000, the QuickRide program is projected to break even. Any additional revenues are required to be allocated to transit-related activities, although no specific use has been agreed upon between TxDOT and Houston Metro (27).

Operated by a private company, the SR 91 Express Lanes are run with the intent of making a profit. According to the franchise agreement, CPTC has the authority to collect tolls over a 35 year period, after which ownership reverts to Caltrans (10). The variable toll rates are used as a management tool. Accordingly, toll rates increased annually during the first years of operation, but vehicle trips also continued to grow, indicating the cost did not exceed the benefits of traveling on the lanes (11). In August 1998, CPTC achieved a cash flow break-even point, where the company could cover operating, capital and debt expenses from the earned revenue (33). Although the early opening of the Eastern Toll Road threatened the profitability of the SR 91 Express Lanes, a 20 percent decrease in traffic only amounted to 3 percent decrease in revenues (12).

In Lee County, shoulder period tolls were lowered while peak period tolls remained constant, resulting in a loss of toll revenue on the facilities. However, the overall revenue loss was negligible at 1 percent despite an almost 50 percent decrease in toll charges during selected periods (23). Federal funds from the value pricing grant were allocated to offset lost income. The loss was not a concern in light of the benefits accrued from the project. However, after federal funds are exhausted, the project must find another way to supplement these funds (1).

Equity

Equity is a common question associated with value pricing. It is difficult to determine how disproportionate the impacts from a value pricing project will be. However, it is important to assess potential equity issues, so the design of the project can mitigate them to the extent possible. Portland Metro worked with the Urban League to evaluate the equity impacts within their modeling process. The results showed that although net benefits accrued to all vehicle classes, low income groups disproportionately realized costs from certain pricing options (34). The City of Boulder also conducted an extensive equity analysis, yielding two main conclusions. First, work-based trips provide a net benefit for all under the pricing scenarios, with overall increases in transit use and decreases in auto use. Secondly, pricing non-work trips disproportionately impacts minorities and low-income populations, as individuals must either combine or chain trips, or not take the intended trip at all, which adversely affects their mobility (16).

In the operating projects, equity concerns were tempered. The tolling structure in Lee County mitigated some of the potential equity problems as tolls were not increased in peak periods, but decreased in the surrounding shoulders. The average worker who is unable to change their time of travel is not required to pay any additional toll, but may receive the benefit of other drivers shifting out of peak period travel (1). As a controversial project, the press has concentrated on the equity concerns on SR 91, specifically the dispute between Riverside County and CPTC. Although participants in the project seem satisfied, Riverside County residents feel it is inequitable to pay taxes to support a road on which they must pay a toll to drive (31).

Possible negative equity impacts can be mitigated to a certain extent by making concurrent investments in mass transit along the priced corridors. On the I-15 Express Lanes, equity concerns have been partly mitigated by allocating project revenue to new transit, primarily used by low- income lane users, and HOV lane improvements. However, there is a lack of public support for funding transit (7). Boulder suggested four programs, including a new capital investments program, a lifeline tolling program, offering subsidized travel, or targeting transportation programs at those adversely affected by pricing (16).

Examining the demographics of users and non-users and the frequency of use indicates potential equity issues. On the Lee County LeeWay, differences in age, gender, education, and employment type are apparent, as program users can be assumed to have schedules that are more flexible (35). The average Katy Freeway user is a 38-45 year old professional who works downtown, with an income over $100,000, living in a 3-4 person household, and has used the Katy HOV before (5). Likewise, the profile of the I-15 Express Lane user was similar: male, 35-54 years old with a high level of education, annual income over $100,000, two car household, and a solo driver commuting for work-related purposes (8).

In contrast, a study of the demographics on the SR 91 Express Lanes found no apparent differences between users of the Express Lanes and general-purpose lanes. Although the lanes are located in a fairly affluent corridor, low-income users do participate in the program. The study found that low-income groups have a high value of time during specific situations and rely on the lanes during these times. However, the more affluent users demonstrated different usage patterns, using the lanes more frequently. High-income users were more than twice as likely to be frequent user of the toll lanes as low-income users and about half as likely to be non-users. Women and intermediate age groups were also more likely to use the lanes (10). Similar findings were noted on the I-15 Express Lanes, although a larger percentage of women and a broader income distribution emerged as the program progressed (8).

Impacts on Travel Behavior and Air Quality

One of the major potential impacts of a value pricing project is its ability to influence travel behavior. Depending on the design of the project, value pricing can potentially maximize the road capacity while maintaining a high level of service, induce travel mode changes, increase vehicle occupancy rates, and shift the times of travel. According to travel modeling done in Portland, the implementation of pricing could accrue travel time savings to individual commuters, increase the capacity

of a corridor, and result in an exponential decrease in congestion (14). The modeling process in Boulder predicted that overall auto trips would not change significantly. However, total trips for the elderly and poor would decrease, transit and ridesharing would increase, and non-work transit trips would rise dramatically (16).

The operating projects studied the actual effects of value pricing on travel behavior. Where tested, value pricing was able to shift the time of travel on the priced corridor. As one of the main goals in the Lee County demonstration, variable pricing proved effective at influencing the traffic patterns of eligible users. Data showed an estimated 300 trips per day were diverted from peak period travel to discounted shoulder periods (35). On the Katy Freeway, about 8-10 percent of the 2-person trip carpools switched from traveling in the shoulder time period into the peak period (5). SR 91 experienced sharper peak travel around 5 p.m., attributed to commuters readjusting their travel behavior based on the additional capacity on the Express Lanes and the free lanes.

Value pricing projects also experienced induced traffic demand trends and a change in trip frequency. Data from Lee County show that eligible users were making an additional 151 trips per day and that 25.9 percent increased their trip frequency in the first few months of variable pricing (36). Value pricing increased the usage of the Katy Freeway lanes, but only by a small fraction of the available capacity (27). On the SR 91 Express Lanes, it was estimated that 21 percent of the traffic returned from parallel arterials, 20 percent was underlying traffic growth, and the remaining 59 percent of the first year growth was being induced by improved traffic conditions for non-work purposes (10). However, the frequency of use for most participants has been noted to be low, as most do not use the lanes on a regular basis. Many participants consider the lanes an insurance policy, using them only when necessary (12).

The impact of value pricing on travel mode changes and vehicle occupancy rates has been notable. Although no significant change in travel mode or occupancy has occurred on the LeeWay (37), the Katy Freeway found more than half of users are former single-occupancy vehicles formed carpools and moved into the HOV lane, about one quarter of the 2-person carpools moved from the main lanes to the HOV lane during peak hours, and the number of 3+ carpool trips increased by 6.1 percent in the evening. About 18 percent of the morning QuickRide trips diverted from higher occupancy modes, but only 1 percent in the evening. Transit ridership did show a slight decrease after QuickRide was implemented, but the absolute number of riders was miniscule (5). On SR 91, a 40 percent increase in HOV-3+ traffic was evident within the first three months of opening. Although SOV traffic increased significantly, a net movement from SOV to HOV occurred and the HOV count has been stable or growing slowly ever since. A larger jump in SOV caused an initial drop in the average vehicle occupancy, but it has been stable from 1997 to 1999 (29).

Finally, the I-15 experienced a significant movement of carpools from the main lanes to the Express Lanes. In fact, carpool traffic increased by 69 percent from the 1996 pre-project level to June 2000. SOV traffic increased by 28 percent between 1997-1998, but SOV violations decreased from 14.7 percent to 5.3 percent. Overall, transit ridership increased on the corridor, attributed mostly to the start up of the *Inland Breeze,* which began operation in November 1997 (8). Examination of the type of riders indicated that increasing transit options on the corridor benefited those with no other travel alternative the most.

Most of the projects did not analyze the impacts of value pricing on air quality. The I-15 project is the exception, using the California Air Resource Board's EMFAC7G air quality model. Based on data produced from the model, air quality was estimated to worsen as a result of the value pricing project, with increases in emissions of volatile organic compounds, carbon monoxide, nitrogen oxides, and particulate matter. Most of this can be attributed to the increases in speeds and volumes of vehicles traveling along the corridor. An air quality study done in Boulder found the opposite, that pricing decreases the total vehicle miles traveled, proving beneficial to overall air quality. This was specifically true under the optimal fee scenario. However, the study concluded that revenues from any form of pricing allocated to alternative transportation could improve air quality (16). An air quality study is underway for the SR 91 corridor, as the Express Lanes are being considered for an expansion, but data are not available at this point.

Travel Time Savings

Quantifying the actual travel time savings can become a tangible asset for a value pricing project. Travel time savings is estimated to accrue not only to drivers using the lanes, but also to drivers in the general-purpose lanes, which achieve higher speeds as traffic is diverted to the toll lanes. Although some studies have been done, much of the travel time savings data are based on estimates.

The actual impact of the projects on travel time savings was mixed. The San Diego I-15 experienced a small but significant savings accruing in the morning peak, but not in the evening. Lee County hypothesized that variable pricing would decrease the travel time during peak hours, but found no significant changes (38). However, the project was intended to shift peak traffic or the time of travel, not necessarily the length of time it took to travel. In contrast, travelers on both the SR 91 Express Lanes and Katy Freeway experienced significant time savings. Actual time savings on SR 91 showed a maximum of 12-13 minutes saved per trip on normal traffic days. It has been estimated that travel time savings are maximized during peak periods, where commuters realize a value of $13-14 an hour (10). A study done on the Katy Freeway by Hickman, Brown and Miranda calculated a travel time savings by dividing the length of the lane by the average travel speeds recorded by day. The estimate found the average daily time savings to be 20 minutes, valued at $6.00/hr ($2/20 minutes) (5).

Despite the actual time savings, the perception of time saved induces travelers to purchase the benefit on the lanes. A survey in Lee County showed that 43 percent of eligible drivers obtained the account to save time (35). On the Katy Freeway, it is estimated that people generally perceive a 15-minute time savings, lower than the actual estimated savings (27). Commuters on the SR 91 Express Lanes perceived to save in excess of 20 minutes per trip during peak periods (10). Finally, a survey of project participants on the I-15 Express Lanes found that 52 percent reported saving between 13 and 22 minutes while another 18 percent estimated to save between 23 and 32 minutes (8). Although these estimates may factor in time saved on ramp meter bypasses, it reflects the perception that the lanes provide a faster and more reliable trip.

Impact on Local Business

The local business community has not been a major stakeholder in most of the operating projects or feasibility studies. However, studies assessing the impact of value pricing projects on local businesses have been conducted. Integrating the business community into the process could prove beneficial. Efforts to gain business support, as well as coordinate pricing efforts with flextime programs could improve the overall efficiency and effectiveness of any pricing solution.

As alternative work arrangements contribute to the goals associated with value pricing, it is important to incorporate the business community in the planning process. Lee County has actively pursued outreach education to the business community, mostly promoting flextime working options, as well as implementing such policies within the County government (2). Houston Metro has also tried to encourage demand side remedies by working with local employers (26).

Several studies were conducted to gauge the awareness and support of the business community. A survey done of local business along the SR 91 Express Lanes found the majority felt the project would have a positive long-term effect on business, as it improved the reliability of a trip, especially for delivery-based employers (10). A study of business along the I-15 corridor found that although more site-based employers were aware of the program, delivery-based employers found it slightly more important to their business. However, the overall impact of the program on business was perceived as minimal (8).

A study done in Boulder found that many businesses expected to accrue net benefits from pricing, as pricing improves overall travel time. However, pricing may also adversely affect businesses employing low-income workers. In addition, downtown retail firms competing in a regional context may also be adversely affected by pricing, as it would become less expensive for customers to travel outside Boulder (16). This underscores the need to coordinate with business and incorporate alternative transportation plans into pricing efforts.

CONCLUSION

Through the Federal Highway Administration's Value Pricing Pilot Program, operating projects and feasibility studies have been able to evaluate the potential and actual impacts of value pricing on travel behavior, revenue generation, local businesses, and equity implications. Value pricing projects have been able to increase the use of a facility, induce travel mode changes, increase vehicle occupancy rates, and shift the times of travel. Projects have been self-sustaining and generated revenues have been allocated to maintain and improve the facility and increase transit on the priced corridor. Users generally perceive a travel time savings on a priced facility, although only some projects have achieved a significant time savings. This reinforces the value of priced facilities as a reliable commuting option.

Gaining public and political support can be the largest barrier to a project. A clear understanding of the problem and the role of value pricing as a solution are critical in developing a project. Projects engaging key stakeholders and using focus group feedback to inform the general outreach were more successful in generating support. Having a political champion, specifically an elected official, also proved invaluable in moving a project forward. The media can also play a role in gaining support for a project, although negative coverage has been more harmful than positive coverage has been helpful. Equity has also emerged as a key concern in the public eye. Although many of the operating projects did not contend with many complaints about the equity of a project, modeling work showed that low-income households could disproportionately bear the costs in certain pricing scenarios. Although lower income households do participate in programs, as everyone has a high value of time in certain situations, it is important to determine the equity effects of value pricing and mitigate them to the extent possible. Constraints in technology inhibit policymakers from understanding the true costs and benefits of value pricing. Despite technological advances in electronic toll collection, visual enforcement, though difficult, is the most effective means of monitoring for violators. This can compromise the effectiveness of pricing efforts.

Although value pricing has been effective in several situations, key constraints exist that need to be addressed before implementing any project. The lessons from these projects and studies can be used to educate policymakers of the benefits associated with value pricing policies and to inform future value pricing efforts. They should be expanded to broaden the scope of pricing strategies. They should be enhanced as a way to increase the effectiveness of this tool. And above all, they should be built upon as a way to improve traffic demand management and offer choices to policymakers, drivers and the general public when addressing the limits of our transportation system.

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Appendix B

Task Force Report
Presented at TRB 2003
Gary Barnes and Michael Rentz

USING A CITIZEN TASK FORCE TO PROMOTE VALUE PRICING: LESSONS FROM MINNESOTA

Gary Barnes (corresponding author)
State and Local Policy Program
Humphrey Institute, University of Minnesota
301 19th Ave. S., Room 130
Minneapolis, MN 55455
Phone: 612-626-9865
Fax: 612-626-9833
Email: gbarnes@hhh.umn.edu

Michael Rentz
State and Local Policy Program
(use same address info)

(Paper is about 5,400 words.)

ABSTRACT

As part of a feasibility study under the Federal Highway Administration Value Pricing Program, the State and Local Policy Program at the University of Minnesota convened a thirty member task force of civic, legislative, business, transportation, and environmental leaders to explore the feasibility of peak-period road pricing as a congestion management and transportation finance tool in the Twin Cities metropolitan region. The task force held an open dialogue about market-based alternatives, developed a list of criteria for evaluating pricing projects, and approved of three potential pilot projects. This paper describes how the task force was organized and the activities it undertook, and evaluates the strengths and weaknesses of this particular method of public involvement in developing transportation policy.

There were two significant and unique benefits from this approach to public outreach. First, direct discussions and debate with a wide variety of perspectives helped the value pricing project team to a considerably more refined and subtle understanding of the ways in which pricing is both attractive and objectionable to different elements of the public. This had a material impact both on the technical characteristics of potential pilot projects and on the way those projects were sold to other audiences. Second, involving "outsiders" directly in the project development process gave them a strong interest in seeing pricing promoted further. Through the efforts of task force members, pricing was presented in new forums, to high-ranking political figures, and received more favorable media coverage than it had in the past.

INTRODUCTION

Experiences from a number of attempts at implementing peak-period road pricing projects around the country have shown that a concentrated campaign to establish and maintain public and political support seems to be a prerequisite for success. The Minneapolis/St. Paul region of Minnesota is no exception to this pattern. Attempts to implement a pricing project have been stymied by opposition both from the public and from political leaders who in part fear public outcry.

Past attempts at pricing in Minnesota have fallen under a top-down model, with academics and Minnesota Department of Transportation (Mn/DOT) staff pushing for pilot projects and studies that were opposed and apparently misunderstood by the public. In 1996, a proposal to use the revenue from congestion tolling to accelerate construction of a badly needed suburban freeway extension was stopped when one of the affected municipalities refused consent. In 1997, Mn/DOT proposed conducting a study in which one of the region's two large HOV lanes would be converted to HOT lanes. Shortly after the proposal was announced to the public, a gubernatorial candidate took a highly visible stance against the idea, and drummed up substantial, if perhaps unrepresentative public opposition. As a result, Mn/DOT pulled the proposal. These reactions engendered a considerable amount of skepticism in area leaders regarding the issue.

These and other projects had undertaken some market research of the public's attitudes towards pricing, but had not gone beyond this to attempt to educate the public or influence public opinion. When combined with the largely negative publicity that top-down projects generated, this lack of education created a public that was unfamiliar with pricing, but opposed nonetheless.

The State and Local Policy Program, a research group within the University of Minnesota's Humphrey Institute of Public Affairs, working with Mn/DOT's Office of Alternative Finance received a grant in September 1999 from the Federal Highway Administration Value Pricing Program to study the political feasibility of value pricing in the Twin Cities and develop a pilot project. Given earlier results, project staff focused early on the problem of developing public and political support for value pricing. Originally, this was seen as organizing a small group of previous pricing champions who could vocally argue for pricing and persuade higher levels of Mn/DOT, the legislature and administration, and Metropolitan Council (the regional MPO) leaders into agreeing to a pilot project.

One concern was that this plan could repeat the mistakes of past efforts, by using a top-down approach while failing to educate the public or demonstrate public support. Project staff believed that given the increase in congestion, the public would now be more receptive to considering pricing. A committee of champions could prove effective in working with government leaders, but might not be as credible with the general public, and would not be able to demonstrate public support to government decision makers.

Project staff eventually concluded that a diverse and independent task force, such as was used in Portland, Oregon from 1996 to 1999, would have the most credibility with both the public and government decision makers. Such a group would be able to neutrally evaluate the pros and cons of different forms of pricing in the region, suggest suitable projects, and eventually serve as advocates for pricing in general as well as specific projects. Should this group, and especially its members who had opposed previous projects, emerge as supporters, they would present a strong argument for pricing.

The mission of the task force had three main components

- To discuss the role of pricing and market-based solutions in a regional context,
- To recommend a value pricing pilot project(s), if they considered that pricing strategies had merit,
- To assist in creating a constituency of support for pricing in general and for selected projects.

TASK FORCE LOGISTICS

Recruitment

Project staff recruited members of the task force to represent a broad array of interests and positions; aiming at a balance of business, local government, transportation special interests, environmental, and social issues leaders. While including a range of backgrounds and opinions was important to the objective of holding an open discussion of the merit of pricing and its possible role in the regional transportation system, the longer-term goal was that the members could, if they chose, use their positions of authority to advocate for specific projects or for pricing in general. Thus the membership was somewhat biased toward people who were willing to at least consider pricing as a possible solution.

This bias was not problematic for a couple of reasons. First, the intent was not to demonstrate the level of support among the general public, but simply to begin the process of developing and demonstrating high-level support outside of the traditional academic and Mn/DOT champions. Second, while members of the group were open to the idea of pricing, they had very different ideas on how it should and should not be implemented; that is, a number of them in effect became opponents within the context of specific situations. Thus the discussions were far more than simple cheerleading sessions.

Project staff held discussions to determine important stakeholder groups, followed by research to determine key leaders inside those groups. Invitations to join were based on the perceived importance of the stakeholder group and role of the person in the group. An attempt was made to find people inside stakeholder groups who had a demonstrated interest and commitment to transportation issues, and who were well respected inside their community. People with demonstrated knowledge of value pricing or previous exposure to the idea were given special consideration.

City, county, and regional elected officials and staff were recruited through a survey sent to them, about 1,000 in all. 120 responses were returned. (The survey was also used to identify people who might attend a value pricing conference that was held just before the task force was formed; thus the scope was substantially larger than would have been necessary just to find task force members.) Targeted individuals were selected from these respondents based on their answers to the survey questions (including a willingness to serve on a task force to investigate traffic congestion solutions). An effort was made to achieve geographic balance from across the metropolitan area. Preference was given to individuals who expressed familiarity with value pricing.

Finally, all state legislators were invited to join; several did so initially, but by the end of the process only three maintained an active presence.

Known opponents of pricing were also invited to participate, as a way of bringing credibility and integrity to the process, and as a way of gaining a deeper understanding of the nature of their objections. Some of these organizations did in fact participate quite actively in the task force. A few known opponents were invited to join but declined, saying that the issue was not of great enough concern to warrant staff attention. Groups that declined membership included taxpayer advocacy groups and several social justice groups. No organization that requested participation was denied membership.

Membership and Role in Project

Active recruitment yielded an initial task force of 37 leaders. By the end of the process 30 individuals remained engaged with the task force. The other seven, including several legislators, declined to endorse the final report due to a lack of involvement. Of the thirty endorsers, a small number did not attend any meetings, but did follow the work via the mail.

These members fell into a number of broad categories of interest:

- Business groups: 4
- Environmental and social justice groups: 3
- Civic leadership groups: 3

- Local governments: 8
- State Legislators or staff: 3
- County and regional officials or staff: 2
- Transportation interests: 6

The chair of the task force was a former state senator who was also active in a number of other transportation organizations.

This task force was loosely based on the Portland model, especially in that task force members were independent of the project staff and were encouraged to analyze value pricing objectively and suggest project direction. There were also some key differences. While Portland generally chose members based on general leadership and not as representatives of interest groups, Minnesota's task force was explicitly created around these groups. The idea was to craft a solution to regional congestion problems that was sensitive to the needs and concerns of each special interest group, as well as to gain their support or at least reduce their opposition.

Portland's task force also had the express authority to delay or cancel work on value pricing in that region, which did happen when the task force voted for more study rather than immediate action on a pilot project. The Minnesota task force was charged with guiding and advising on research and policy directions, but did not have binding control over project direction. Nonetheless, a negative finding from the task force, especially in the context of a study of political feasibility, would have substantially impacted future work in this area.

TASK FORCE ACTIVITIES

Summary of Activities

The task force met four times; there were also two subcommittee meetings to discuss details of project selection and marketing. All of the meetings consisted of a combination of presentations by value pricing staff and associates, and discussion by task force members. The first two meetings were more strongly weighted toward presentation, as staff introduced the task force members to some of the facts and ideas supporting value pricing. These included the usual arguments about congestion reduction and revenue generation, descriptions of the technology and some applications from around the world, and some simple numerical evaluations comparing pricing to other possible congestion solutions in terms of cost and impact. Because many of the members were politicians, they were quite interested in details about transportation revenues and the possible contribution of pricing. These meetings also included presentation of some of the common objections to pricing. Presenting these objections up front made it possible to talk about them in a more organized way, and kept them from arising as unexpected distractions during subsequent project discussions.

The last two meetings were much more geared to task force discussion, as the group used the information presented in the first two meetings along with their own experiences, knowledge, and relationships with stakeholders to determine which demonstration projects would have the most merit. These meetings focused on defining the technical characteristics of potential pilot projects, and discussing how to market them to politicians and the public.

The meetings took place over a period of about nine months. The first meeting lasted two hours, but subsequent meetings were five to six hours long. Perhaps surprisingly, task force members did not object to the long meetings, and the group that came to the first meeting remained largely intact to the end. Such long meetings seemed necessary to project staff given the complexity of the material and of the objectives, and apparently the task force members felt the same way. Staff mailed minutes of each meeting as well as copies of presentation handouts and other materials that were discussed; this helped to keep people who did not attend up to date on the discussion.

The substantial amount of time that task force members invested in these meetings had two positive effects. First, the members developed a sense of commitment to the objectives of the task force. Even nominal opponents of pricing attended the meetings and were among the most active participants. Second, the members gained familiarity with the materials that were presented, and with each other's perspectives, which made it possible for discussions to proceed relatively quickly to advanced levels.

Project Evaluation Criteria

The task force began its discussion of pricing projects by developing a set of criteria for evaluating the desirability of the various possible projects. The entire task force began developing criteria at the end of the second meeting; a volunteer subcommittee then finished the criteria.

The subcommittee quickly focused on a single primary criterion, which was that the project had to be politically feasible. In general this meant that the project had to address a known, significant transportation problem; and that this problem did not have other solutions with widespread appeal. Given the uncertainty and concern about public opposition to tolls, the task force felt that people would not want to consider pricing except when a problem was severe and more traditional solutions would clearly be inadequate or inapplicable. This "litmus test" was actually suggested by one of the nominal opponents of pricing, whose opposition in large part was based on his belief his group's constituents would not like the idea of pricing. He felt, and other members agreed, that a pricing project in a state with no previous history of tolls, and considerable apparent opposition, would need to offer some very substantial benefits to a very broad audience in order to have a chance of acceptance.

The projects that passed the test of political feasibility were then discussed in more depth within the context of a more detailed set of criteria developed by the task force:

- The project should benefit public health, safety, and the environment.
- The project should provide positive choices for people.
- The project should generate economic benefits (revenues, system efficiency, leverage other funds).
- The project should reduce peak period demand and mitigate an existing transportation problem.
- The project should enhance multi-modal transportation and travel reliability.
- The project should have private sector support.
- The project should represent a public education and/or market research opportunity and it should be transferable to other locations.
- The project should reflect the larger transportation and land use vision.

The number and breadth of these criteria reflects the range of interests that were represented on the task force. Even if staff working alone had been able to think of all these criteria, it would have been hard to know which had real support in public opinion. The fact that task force members represented a range of constituencies, and were willing to invest substantial amounts of their own time in discussing these criteria, made it possible for staff to feel confident that this list was a meaningful reflection of public feeling, rather than an "ivory tower" construct.

The working idea at the beginning of the process was that the task force would develop a set of objective criteria against which different possible pilot projects could be rated quantitatively by project staff. However, it came to seem that any such rating would depend somewhat arbitrarily on the judgment of the raters. Also, the rating would depend on the specific way the project was defined, while not taking advantage of improvements that might be possible.

It was decided to approach the evaluation of the projects by having the task force break into groups, each of which would discuss one project. Each group spent some time defining its project in the most appealing way and discussed how the project might be sold to a broader audience, using the evaluation criteria as objectives. Each group then attempted to "sell" its project to the whole task force. The idea was that the project that was most salable to the task force would also be more popular to others. At the end of these presentations a general discussion took place and a vote was taken.

While the criteria were not formally used to rate projects, the exercise of developing them was still worthwhile. Spending some time thinking about the overall objectives, independent of any particular project, helped to make it possible to see more quickly which projects were likely to have merit. It was also helpful from the standpoint of intellectual clarity to separate the development of objectives from the discussion of projects, in the same way that talking about objections to pricing up front kept them from becoming a distraction during project discussions. Finally, the way the pilot projects were "marketed" was strongly influenced by the criteria that emerged from this process, as they reflected a cross-section of the reasons people might support a pricing project.

Recommended Pilot Projects

The task force's efforts to find a demonstration project for the Twin Cities started out with a discussion of four basic types of projects:

- Spot pricing: imposing a toll at a specific location
- Corridor pricing: tolling a length of highway, with the toll depending on the distance traveled.
- Access-based pricing: making it possible to pay a toll to bypass congestion, such as single-occupant access to carpool lanes, or a ramp-meter bypass
- Vehicle-based pricing: using geographic positioning systems (GPS) to charge tolls to a specific vehicle based on time of day and location. These tolls would be charged in lieu of other fees.

At this time, Minnesota had already received funding from the Value Pricing program to do a vehicle-based pricing demonstration. Because of this, project staff decided to take this kind of project off the table and encourage the task force to look at projects in the other three categories.

Project staff initially developed a list of 12 possible projects in the three remaining categories. A task force subcommittee examining this list decided fairly quickly that it would be more productive to focus attention on three projects, one from each category, which had the most apparent political feasibility. The subcommittee felt, and staff agreed, that a comprehensive discussion of a small number of projects would be more useful than a shallow discussion of all of them. In addition, these three projects clearly had more political promise than the others, in that they addressed well-known problems without viable solutions. The full task force then discussed these three projects and voted strongly to support one of them as the first choice for a pilot project. This was a project that would have used pricing to manage traffic and fund transit improvements during the reconstruction of a major freeway interchange.

The Crosstown Commons is a one-mile common section of two major freeways a few miles south of downtown Minneapolis. The approaches to the Commons are extremely congested and experience long back ups in all directions for up to 7 hours per day, both because of lack of capacity and the large amount of weaving. Due to limited financial resources and right-of-way, the proposed reconstruction plan would have completely shut down travel on one of the two freeways (through the commons area) during a four-year reconstruction period.

As a result of the long period of disruption and the significant loss of capacity during that time, the 2001 Minnesota Legislature placed a one-year moratorium on starting the project, and required Mn/DOT to evaluate possible design changes to reduce these problems. One of the task force members was a state senator from the affected area, and he amended the legislative directive so as to also require Mn/DOT to evaluate the possibility of using pricing during the construction period.

As a potential pilot project, this was a very large-scale endeavor, and quite original. To the best of our knowledge, no one had ever proposed to use pricing as a way to manage traffic during a large construction project. The only reason this idea was ever floated, and the reason it passed the test of political feasibility, was specifically because of the task force member who was a state senator. He was a major participant in the legislative discussions leading to the moratorium, and this gave him considerable authority in talking about pricing as a possible solution. His willingness to take the lead on the political front was probably the major reason this project was chosen rather than something "safer."

The original pilot project proposal involved reconstructing the Crosstown Commons in a wider right-of-way. This would have allowed traffic from all directions to be maintained during reconstruction, although at a reduced level. Given the high levels of traffic and the generally congested nature of this whole side of the metropolitan area, keeping both highways open would have substantial benefits. Pricing would have been implemented in the corridor to manage traffic demand, with the revenue used in part to improve transit options.

While the Crosstown Commons project was the clear first choice of the task force for a pilot project, they also supported two other projects. One would be a revived effort to convert an HOV lane to HOT use. The other project would toll an overcrowded bridge to manage traffic while the (controversial) replacement was being evaluated and built; tolls could then be shifted to manage traffic on the new bridge.

Task Force Approval Process

No formal vote on the findings of the task force was ever taken. All members were given opportunity to voice concerns over the direction of the task force and to question the presentations made. One member in particular did voice disagreement on several points throughout the process, but remained very active. He did not object to the final report or recommendations of the task force, but it was his concern that he not be seen as formally endorsing on behalf of his organization that led the task force to operate under the assumption of consensus rather than a formal vote. This also the led the task force to back off from strongly worded findings.

After the release of the final report, one of the organizations represented on the task force publicly objected to a reporter's characterization of the report's findings as a work of consensus. Representatives from this organization wrote a letter to the reporter—which was published in her column—publicly stating their opposition to the findings of the task force, pointing out that no vote had been held, and arguing that if one had been, they, as well as members representing other freight and business interests, would have opposed it. (Several of these members subsequently denied this assertion, and confirmed that they did in fact support the task force findings.)

A clear vote, while likely yielding two or three "No" votes, may have been preferable to this uncertain situation, which left room for interpretation by opponents. At the same time, given that the membership was not randomly chosen in the first place, it is not clear what a formal vote would have proved. Perhaps what was needed was just for project staff, and the final report, to be clearer that participation in the task force did not imply approval of all of its findings.

Subsequent Activities

The proposed Crosstown pricing project was quite visibly promoted by several task force members. Meetings or presentations took place with the state commissioners of transportation and finance, the city council of one of the affected municipalities, the downtown Minneapolis traffic management organization, several state legislators, and others. Two of the task force members appeared on an hour-long call-in show on Minnesota Public Radio. Two members coauthored an opinion column that appeared in the Minneapolis newspaper, another member authored a column that appeared after the legislative session. In addition, because of their exposure to the task force (they attended one of the meetings), each of the transportation columnists in the two major daily newspapers ran columns that discussed value pricing at some length, and generally favorably.

In almost all these cases the fact that meeting time, or radio time, or newspaper space was devoted to discussing pricing was because of the efforts and reputation of the task force members involved. While value pricing project staff developed ideas for outreach, these ideas were predicated on the willingness of task force members to carry them out; staff working alone would have had little chance to gain access to most of these opportunities. Staff further assisted task force members by attending many of the meetings and presentations (helping out with some of the technical details where needed), and helped with drafting letters and newspaper columns.

During the study of alternative designs, Mn/DOT developed a new design, using a wider right of way, which kept the highway open during construction. This obviously nullified much of the benefit of the value pricing demonstration as originally proposed. As a result, the pricing demonstration evolved to focus on implementing pricing as part of the new Mn/DOT design. The objectives were still to manage traffic flow and improve transit, as before, but with the main selling point being revenue generation, which could help pay for the substantially higher costs of the new design.

While this reconstruction project had been a major focus of the preceding legislative session, the subject never reemerged as an issue in the session after the task force proposed its pilot pricing project. First, the new design, by keeping the highway open, addressed the major concern that had led to the moratorium. Then a major state budget shortfall became almost the sole topic of discussion. While value pricing staff argued that using pricing to pay the higher costs of the new design made even more sense in this fiscal climate, the legislature had far bigger problems to worry about than how to pay for one particular highway project. Finally, various delays necessitated by the new design meant that construction would not start for at least two or three years anyway, leaving almost no reason to spend time talking about this project. Nonetheless, this somewhat radical proposal stayed alive for a

surprisingly long time, and was respectfully listened to by a surprisingly large number of major policy makers, largely through the work and influence of task force members.

The task force completed its original mission with the fourth meeting and the release of its final report, just prior to the 2002 legislative session. Project staff asked the group to reconvene after the session to analyze how the legislature dealt with transportation issues, and to discuss where value pricing should go from there. No members chose to leave the task force formally at this point. At the fifth meeting the task force discussed the status of the projects, where value pricing should go next, how strongly it should be advanced, and what the role of task force members would be in that effort. The meeting ended with agreement to shift the focus from the Crosstown project to one with more political promise. The task force asked project staff to study the HOT lane conversion project in particular. Task force members indicated a continued desire to stay involved and a continued belief in the promise and political feasibility of value pricing.

CONCLUSIONS

The Minnesota model proved a good method of gaining and demonstrating public support, as well as a good tool for learning from the public about how they perceive value pricing. Project staff emerged from this process with a considerably more refined understanding of how to define and sell potential projects, and substantially better connections through which to sell them.

The single most valuable aspect of the task force was the inclusion of members from a wide variety of backgrounds, including known or probable opponents of value pricing. This had two significant advantages that would have been hard to attain through other means.

The first benefit was that participating in detailed discussions with task force members of different backgrounds led project staff to a considerably more refined understanding of how pricing needs to be approached both technically and politically in the Twin Cities. This materially affected the project evaluation criteria as well as the descriptions of the pilot projects; both through objections that were raised and the way supporters on the task force answered them. Different groups and individuals have different preferred solutions for dealing with congestion; and hearing how they view the problem and why they prefer one solution over another helped the project staff to understand how to position pricing to make it more appealing. Listening to the various complaints that were raised, and modifying the task force findings to accommodate them, likely helped to reduce the level of objection that took place in public forums after the findings of the task force were released.

The second advantage was that including people from a wide variety of backgrounds, but all leaders in their areas, gave project staff access to outreach opportunities that would otherwise have been difficult if not impossible to achieve working on their own. Members came as representatives of particular groups, and several of them used their position in these groups to discuss pricing with broader audiences, or invited project staff to do so. The support of task force members led to a number of presentations to local groups, and meetings with important elected and appointed officials, that would have been unlikely to occur from the efforts of project staff alone.

As could be expected, there was not unanimous support for the work of the task force; still, there was significantly greater knowledge of the issue as well as support at the end of the process than at the beginning. This could only be considered a success. Perhaps as importantly, different groups (supporters as well as opponents of pricing) had a chance to establish their common interest in finding solutions to the congestion problem, and a civilized forum in which to discuss the issues. Even those members that did not fully support the final findings could feel that their viewpoint was understood and at least partially accommodated; and perhaps equally significantly, they could see firsthand that there were “real” supporters of value pricing (not just academics and bureaucrats) whose perspectives could influence their own.

ACKNOWLEDGEMENTS

The activities described in this paper took place under a grant from the Federal Highway Administration Value Pricing Program to the Minnesota Department of Transportation. The authors would also like to acknowledge the contributions of other project staff who worked with the task force, especially Lee Munnich of the State and Local Policy Program, University of Minnesota, Ken Buckeye of the Minnesota Department of Transportation, and Ferrol

Robinson of SRF Consulting. The authors also wish to thank the anonymous referees for their very helpful comments.

APPENDIX

Positions and Organizations of Task Force members

State Senators and Representatives
Minneapolis and St. Paul Mayor's Offices
Metropolitan Council Member
Hennepin County Commissioner's Office
Suburban Mayors, Council Members, and other officials
Vice President/General Manager, LDI Fibres
President, Highway Construction Industry Council
Director Office Facilities, SuperValu
Worldwide Account Manager, FedEx Corporate Services
Executive Vice President, The Minnesota Transportation Alliance
Minnesota Trucking Association
Senior Vice President and Senior Counsel, Colle & McVoy Marketing Communications
President and CEO, Minneapolis Downtown Council
President, Bloomington Chamber of Commerce
Director of Outreach and Programming, 1000 Friends of Minnesota
Urban League
Coordinator, Minnesotans for Sustainable Transportation
AAA Minnesota/Iowa
Project Administrator, Downtown Minneapolis TMO
Metro Inter-County Association
Executive Director, Citizens League

Appendix C

Final Report of the Task Force
(for local distribution)

Curbing Congestion

Improving Traffic Flow, Transit, and Transportation Funding Through Value Pricing

Summary of the Work of the Minnesota Value Pricing Advisory Task Force

January 4, 2002

State and Local Policy Program

Hubert H. Humphrey Institute of Public Affairs

University of Minnesota
301 19th Avenue South
Minneapolis, MN 55455

612-625-7357
www.hhh.umn.edu/centers/slp

Executive Summary

The Minnesota value pricing advisory task force is a diverse group of stakeholders that seeks to build political support for implementation of a value pricing demonstration project. Value pricing refers to the use of electronically collected peak-period tolls to manage rush hour traffic flow and to provide revenue for enhanced transit service, limited highway expansion, and other transportation improvements.

> VALUE PRICING REFERS TO THE USE OF ELECTRONICALLY COLLECTED PEAK-PERIOD TOLLS TO MANAGE RUSH HOUR TRAFFIC FLOW AND TO PROVIDE REVENUE FOR ENHANCED TRANSIT SERVICE, LIMITED HIGHWAY EXPANSION, AND OTHER TRANSPORTATION IMPROVEMENTS.

The task force believes that while value pricing cannot solve the congestion problem by itself, that it can, when combined appropriately with other policies, help traffic flow more smoothly while helping to improve the environment and make transportation system financing more equitable.

The task force bases its recommendations on the following findings:

- Growing levels of traffic congestion impose significant costs and threaten the long-term economic prosperity of the region.
- Pricing will not solve this problem alone; it requires increased investment in transit service and highway infrastructure.
- Peak-period tolls could help to reduce congestion and provide the revenue needed to make these investments.
- By helping us avoid or postpone the need for expensive capacity expansions, peak-period tolls could ultimately reduce the total cost that people pay for transportation.

The task force considered the growing congestion problem, problems with current transportation financing, some proposed pilot projects, and the anticipated costs and benefits of value pricing and other congestion management alternatives. The task force created a list of criteria for evaluating projects, recommended three possible pricing concepts, and discussed concerns and potential mitigation strategies.

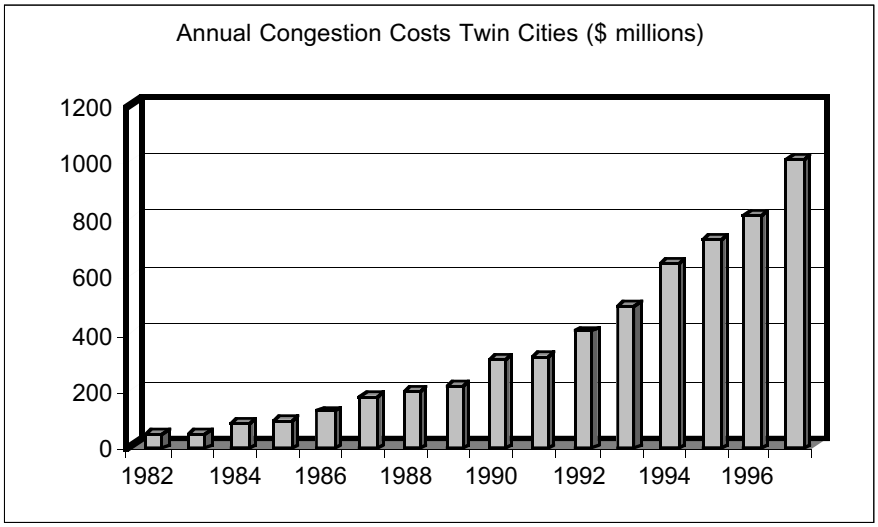
The task force supports an application for funding through the Federal Highway Administration's Value Pricing program to implement the Crosstown Commons reconstruction pricing project described in this report. However, if the Crosstown project does not gain public and political approval, then the task force recommends that other projects, including other reconstruction projects, be pursued.

Contents

Why Pricing?

According to the Texas Transportation Institute's study of congestion in U.S. metropolitan areas, congestion is growing in the Twin Cities area at one of the fastest rates in the United States. The 2001 Civic Confidence Survey of the Twin Cities showed that traffic congestion is the number one concern of residents. Local businesses are also concerned about the impact that congestion has on both their costs of doing business, and on the region's ability to attract and retain skilled workers. There is fear that if nothing is done these problems could eventually lead to a reduction in the economic competitiveness of the region as a whole.

The congestion problem is compounded by budget and environmental constraints, making major expansions of highways or transit difficult in many cases. These constraints underscore the importance of giving serious consideration to all available options, including market-based solutions such as the use of electronically collected peak-period tolls to manage rush hour traffic flow. While no single policy can solve the congestion problem, peak-period road pricing can both improve the effectiveness of more traditional strategies such as highway expansion and transit service improvements, while providing some of the necessary revenue to implement these other options.



> CONGESTION IS GROWING IN THE TWIN CITIES AREA AT ONE OF THE FASTEST RATES THE UNITED STATES.

Congestion and Transportation Finance > > >

Congestion is ultimately a problem of too many people driving at the same time. There are two separate but related issues: how much and when people choose to drive, and how much capacity can be provided with existing transportation revenues. Peak-period road pricing can help to address both these issues.

> FUEL TAXES PAY FOR LESS THAN HALF OF STATE AND LOCAL GOVERNMENT TRANSPORTATION EXPENDITURE. ABOUT 30% IS PAID FOR BY PROPERTY AND SALES TAXES.

When highways are expanded and the new capacity is provided for free, it tends to fill up due to a phenomenon known as the "principle of triple convergence." When congestion is bad, people take action to try to avoid it, by changing their routes, modes, or times of travel. But when congestion is relieved through highway expansion or other means, these "evasive actions" become less necessary, so some people go back to their old way of doing things. Triple convergence means that new capacity tends to be filled by new users from three sources: changing route, changing mode (e.g., bus to car), and changing the time of day of travel. Some also refer to this as "induced demand;" that is, the total amount of traffic will increase when new capacity is made available.

A separate but related issue has to do with how roads are paid for. About 30% of the money that local governments and the state spend on transportation is collected from sources such as the property and sales tax, which have nothing to do with how much people drive. The only transportation-related tax that is based at all on the amount of driving is the fuel tax; which, even counting both the state and federal gas taxes, covers only about 45% of total government transportation expenditures. All of these taxes are regressive; that is, they take a higher percentage of the income of poor people than of people with higher incomes. Overall, revenue is barely adequate to maintain the current system, let alone implement needed improvements; and it is likely to become even more inadequate and detached from driving choices, as vehicles in coming years are likely to use substantially less gas.

Road pricing can help to address both these issues. By creating a more direct link between travel choices and the cost to the driver, drivers have a more compelling reason to make different choices about how and when they travel. Higher charges

during rush hours would lead people to make optional trips at other times of day, to use the bus instead of driving, or to carpool or combine trips to save money. This would reduce rush-hour congestion and thus delay the need for highway expansion. It would also provide the revenue for improving transit service, and for highway expansion when it does become necessary.

Direct road pricing could ultimately reduce the cost of transportation by making it possible for people to choose what roads they use and when they use them in order to save money. Imagine, as an analogy, if restaurant meals were paid for through taxes. Then people would have no reason not to eat every meal at restaurants, since eating at home would not be cheaper. But to pay for the huge increase in restaurant dining, taxes would have to be raised. Ultimately those "free" restaurant meals would cost far more than the current system, where people choose what they consume and pay accordingly.

While such a system might sound absurd as a way of paying for food, it is a fairly accurate description of the way we pay for roads. Peak-period freeway capacity is very expensive to provide, and there is no reason for drivers to refrain from using it. Because there is no way for drivers to save money by making different choices, they end up sitting in congestion, or paying taxes to build capacity that might only be used for an hour or two a day. Because peak-period pricing reduces congestion by rewarding people for making less costly choices, it can ultimately make transportation less expensive for everyone, by avoiding or delaying the need for capacity enhancements. When peak-period tolls are used to replace other taxes they can provide congestion reduction at a small fraction of the cost of highway expansion or transit alternatives.

> DIRECT ROAD PRICING COULD ULTIMATELY REDUCE THE COST OF TRANSPORTATION BY MAKING IT POSSIBLE FOR PEOPLE TO CHOOSE WHAT ROADS THEY USE AND WHEN THEY USE THEM IN ORDER TO SAVE MONEY.

How Pricing Works > > >

> MODERN SYSTEMS COLLECT TOLLS ELECTRONICALLY AT FULL HIGHWAY SPEEDS. THERE ARE NO LINES AT TOLL PLAZAS.

Modern road pricing systems do not use manual toll booths; tolls are collected electronically. While there are different technologies in use, the most common is a small tag (transponder) in the vehicle, which functions as a sort of cash card. Money is credited and programmed into the transponder and tolls are deducted as the vehicle passes at full speed under a gantry. This is the system that is used in California and other states. Alternately, the transponder could be read like a bar code, and an account maintained in a central computer system, avoiding the need for users to "recharge" their transponders.

Victoria, Australia also uses transponders, as well as "day passes" based on automated license plate reading technology. Day passes allow users without a transponder to pay the toll by telephone up to 24 hours after using the system, which is especially advantageous to out-of-town drivers and other infrequent system users. Singapore uses transponders with a cash or credit card inserted. Whoever drives the car inserts his or her own card into the transponder, so the tolls are charged to the driver rather than to the vehicle.

To achieve peak-period traffic reductions, tolls are higher during rush hours and lower or nonexistent at other times. There are two main variations on this theme. One option is a preset schedule of tolls, which may rise and fall over the course of the peak travel period, but which are fixed in advance. This has the advantage of being predictable, but isn't adjustable if there is too much or too little traffic. The other option is dynamic pricing, in which the tolls are changed on the fly to maintain a high but free-flowing level of traffic; the current toll is announced on electronic displays prior to the beginning of the tolled section. This has the advantage of being flexible to maintain the best traffic flow, but the disadvantage is that drivers don't necessarily know what the toll will be before beginning the trip.

Value Pricing in the United States > > >

There are two major types of value pricing projects currently operating in the United States. The first type are projects which allow single-occupant vehicles to pay for access to special lanes that are free for transit and have a reduced price for carpools. On State Road 91 in Orange County, California, new lanes were constructed in the median of an existing (free) expressway; these new lanes are tolled using a fixed-rate schedule. On Interstate 15 in San Diego, existing carpool/transit lanes were underused; a value pricing system was set up to allow single-occupant vehicles to pay a toll to use the excess capacity. The tolls on this highway vary based on the level of traffic. The Katy Freeway in Houston also has a carpool lane; three-person carpools can use it for free, while two-person carpools can use it by paying a toll.

The other major type of project involves higher peak period tolls on facilities that already charge tolls. Lee County, Florida, uses off-peak discounts to avoid congestion on area toll bridges. Recently, the Port Authority of New York and New Jersey began charging slightly higher rush-hour tolls on the bridges and tunnels leading into Manhattan.

> Major U.S. Value Pricing Projects:

- Orange County, CA
- San Diego, CA
- Houston TX
- Lee County, FL
- Port Authority, NY-NJ

The Value Pricing Task Force

Using a grant from the Federal Highway Administration Value Pricing Program, the Humphrey Institute and the Minnesota Department of Transportation convened a task force to explore the feasibility of peak-period road pricing as a congestion management and transportation finance tool in the Twin Cities metropolitan region.

As evidenced by previous value pricing projects and studies, market-based solutions require public and political support from key stakeholders in order to be successful. For this reason, Minnesota value pricing study staff recruited members of the Advisory Task Force to represent a broad array of interests and positions. The task force held an open dialogue about market-based alternatives with the intent of developing a solution that would be effective and feasible for all stakeholders.

The task force brought together 37 key stakeholders from across the Twin Cities; about 25 attended at least one meeting. Members included elected state officials, local government leaders and staff, and leaders in the business, environmental, and civic arenas. Both supporters and opponents of pricing were invited to participate. The mission of the task force was:

- To discuss the role of pricing and market-based solutions in a regional context,
- To recommend a value pricing pilot project(s), if they considered that pricing strategies had merit,
- To assist in creating a constituency of support for pricing in general and for selected project(s).

The task force met four times; there were also two subcommittee meetings to discuss details of project selection and marketing. All of the meetings consisted of a combination of presentations by value pricing staff and associates, and discussion by task force members. The first two meetings were more strongly weighted toward presentation, as staff introduced the task force members to some of the facts and ideas supporting value pricing. The last two meetings were much more geared to task force discussion, as they used the information presented in the first two

meetings along with their own experiences, knowledge, and relationships with stakeholders to determine which demonstration projects would have the most merit.

Agendas of the four meetings are in the appendix to this report.

This report presents the process, findings, concerns, and recommendations of the task force as a group. There was general consensus among the members of the group about the overall findings and recommendations that are documented in this report, with the understanding that many details still have to be worked out. As would be expected in a group with diverse participants there were some disagreements and concerns, which are also documented here.

Project Evaluation Criteria > > >

The task force began its discussion of possible pricing projects by developing a set of criteria for evaluating the desirability of the various possible projects. These criteria then served as general objectives to guide the task force as it narrowed the list of possible projects.

The primary criterion was that the project had to be politically feasible. In general this meant that the project had to address a known, significant transportation problem; and that this problem did not have other solutions with widespread appeal. Given the uncertainty and concern about public opposition to tolls, the task force felt that people would not want to consider pricing except when a problem was severe and more traditional solutions would clearly be inadequate or inapplicable. The projects that passed the test of political feasibility were then discussed in more depth within the context of a more detailed set of criteria developed by the task force:

> THE PRIMARY CRITERION WAS THAT THE PROJECT HAD TO BE POLITICALLY FEASIBLE.

- The project should benefit public health, safety, and the environment.
- The project should provide positive choices for people.
- The project should generate economic benefits (revenues, system efficiency, leverage other funds).
- The project should reduce peak period demand and mitigate an existing transportation problem.
- The project should enhance multi-modal transportation and travel reliability.
- The project should have private sector support.
- The project should represent a public education and/or market research opportunity and it should be transferable to other locations.
- The project should reflect the larger transportation and land use vision.

Concerns > > >

Task force members raised a number of concerns about value pricing and how it would be implemented. These concerns could be generally grouped into two broad categories: lack of options, and equity.

> ROAD PRICING NEEDS TO BE USED IN CONJUNCTION WITH, NOT IN PLACE OF, OTHER OPTIONS SUCH AS TRANSIT IMPROVEMENTS AND LIMITED HIGHWAY EXPANSION.

Concerns about lack of options took a variety of forms. The point of peak-period road pricing is to divert some trips to other times, modes or routes, but by definition this can only work if other times, modes and routes are available. Some task force members noted, for example, that commercial traffic may not have the flexibility that passenger traffic often does.

One concern that was raised was that if all the roads are congested, then there are, in essence, no alternate routes. In some places this is a problem now, and it is likely to become more of a problem as population continues to increase. A related concern was that diverting traffic onto local streets creates its own set of problems that should be considered more explicitly. And some task force members wondered if the relative lack of congestion resulting from successful peak-period pricing would cause needed highway capacity improvements to be delayed too long.

Another aspect of the lack of options had to do with transit, or the absence of transit. While this was felt to be a problem, task force members also felt that pricing roads could provide the revenue to improve transit options, as well as an incentive to use them. The agreed-upon need for better road and transit options highlighted the point that road pricing needs to be used in conjunction with, not in place of, other options.

Equity is a major concern with pricing projects. This can take several forms: that people that use certain roads have to pay extra while people that use other roads don't, that the toll places a greater burden on the poor than on the rich, and even that toll lanes should not be available because wealthier people would gain an unfair advantage by being able to pay to bypass congestion. However, studies in California show that the income distribution of toll-road users is not that different from the general population. People use the lanes when they are in a hurry, not every day. Higher-income drivers use them relatively more, but all incomes use them to some extent.

There are several ways concerns about income equity could be dealt with:

- Most commonly, toll revenues are used to subsidize transit, or improve transit service.
- Very low-income households could be given some free passes.
- More generally, tolls could be based on household income in a progressive way, like the income tax. An individual's rate could be programmed into the transponder.

A final important point to bear in mind with regard to income equity is that, as discussed earlier in the context of transportation finance, the current system of paying for roads places a larger relative burden on lower income people, even though they use the system relatively less. Given the nature of the existing transportation finance system, a well-designed system based on peak-period tolls would very likely improve the lot of most low-income households.

> TOLLED ROADS MUST HAVE ADVANTAGES OVER FREE ROADS, SUCH AS BETTER TRANSIT SERVICE AND FASTER AND SAFER TRAFFIC FLOW.

Perhaps more problematic is "geographic equity." Placing a peak-period toll on a single road or bridge would seem to be unfair to the users of that facility, in the absence of some particular advantage that the toll might create. In a hypothetical region-wide pricing system, peak-period tolls could be offset by reductions in other taxes, keeping overall transportation costs about the same. However, a small demonstration project would collect tolls from the users of the project without providing any offsetting reduction in other taxes. To offset this problem, revenues from pricing projects should be used only for transportation enhancements in the affected corridor. This would give the tolled road advantages that it would not have as a free road, such as better and safer traffic flow, and more transit and other alternatives to driving.

Project Summaries

The task force's efforts to find a demonstration project for the Twin Cities started out with a discussion of four basic types of projects:

- Spot pricing: imposing a toll at a specific location
- Corridor pricing: tolling a length of highway, with the toll depending on the distance traveled.
- Access-based pricing: making it possible to pay a toll to bypass congestion, such as single-occupant access to carpool lanes, or a ramp-meter bypass
- Vehicle-based pricing: using geographic positioning systems (GPS) to charge tolls to a specific vehicle based on time of day and location. These tolls would be charged in lieu of other fees.

A task force subcommittee initially considered a list of 12 possible projects in these four categories, but decided that it would be more productive to focus attention on three projects that had the most apparent political feasibility. The full list of potential projects is shown in the appendix to this report. The Crosstown commons reconstruction project had the broadest appeal to the group. It is a highly visible project for which all of the available solutions seem to have serious shortcomings. It was felt that pricing here had the potential to have a visible, long-lasting impact on transportation in the area. Finally, one of the task force members was a state legislator who had been involved in the initial legislative controversy on this project, and was willing to initiate political discussions on this project.

While the other two projects were considered worthwhile as well, they seemed to be much more limited in their ability to impact traffic in a visible way. The Stillwater bridge does not carry much traffic (compared to the Crosstown), while the I-394 HOV lanes did not appear to have enough excess capacity to make much difference to traffic flow on the other lanes.

The I-35W–Crosstown Reconstruction > > >

> THE OBJECTIVES OF PRICING ON THE CROSSTOWN COMMONS ARE TO MANAGE TRAFFIC FLOW AND IMPROVE TRANSIT, AND ALSO TO USE THE REVENUE TO HELP PAY FOR THE HIGHER COSTS OF THE NEW DESIGN.

The Crosstown Commons is a one-mile common section of I-35W and TH 62 bordering Minneapolis and Richfield. The approaches to the Commons are extremely congested and experience long back ups in all directions for up to 7 hours per day, both because of lack of capacity and the large amount of weaving. Mn/DOT has programmed the reconstruction of the Crosstown Commons in conjunction with the expansion of I-35W in that area to reduce the weaving. Due to limited financial resources and right-of-way, the proposed reconstruction plan would have eliminated the TH 62 Crosstown traffic during a four-year reconstruction period. As a result of the long period of disruption and the significant loss of capacity during that time, the 2001 Minnesota Legislature placed a one-year moratorium on starting the project. The legislature also required Mn/DOT to study the possibility of using pricing during the construction period.

The original pilot project proposal involved reconstructing the Crosstown Commons in a wider right-of-way, thus allowing traffic to be maintained during reconstruction. Pricing would be implemented in the corridor to manage traffic demand, with the revenue used in part to improve transit options. Subsequently, Mn/DOT developed a new design which kept the highway open during construction. The pricing demonstration subsequently evolved to focus more on implementing pricing as part of the new design. The objectives of pricing in this case are to manage traffic flow and improve transit, as before, but with more emphasis on using the revenue to help pay for the higher costs of the new design.

I-394 SOV Buy-in > > >

I-394 is a radial freeway linking downtown Minneapolis with its western suburbs. In the peak direction, there are two general-purpose through-lanes and one high-occupancy vehicle (HOV) lane. High mixed-lane demand and capacity bottlenecks cause daily backups in both directions.

A pilot project would involve allowing single-occupant vehicles (SOVs) and possibly commercial vehicles to use the excess HOV lane capacity for a variable mileage-based price (calculated to maintain acceptable levels of service for HOVs). HOVs and buses would continue to use the lanes free of charge.

The desired effect of value pricing would be to fully use the HOV lane capacity, thus increasing the efficiency of the facility. Users who need a fast trip would be able to purchase it.

Stillwater Bridge > > >

Severe traffic congestion in downtown Stillwater, safety problems on approach roadways, and delays caused by the operation of the Stillwater Lift Bridge have spurred the discussion of a new bridge crossing in Stillwater for many years. "Rush hour" delays and weekend backups, especially during the tourist season, frustrate residents and visitors alike. The bridge is currently operating at capacity 3-4 hours per day.

A pilot project at this location would involve a variable or fixed price electronic toll for crossing the bridge. Transponders would be made available to all potential users of the bridge. Gantries would be installed at the approach to each direction of the bridge. A facility for non-regular users (e.g., tourists) to purchase tolls would be provided nearby but off the facility. High-occupancy vehicles (HOVs) and buses would be able to cross the bridge free of charge.

The desired effect of value pricing would be to reduce the number of peak period trips by diverting trips to off-peak periods or to the I-94 crossing.

Conclusion

In addition to choosing the Crosstown Commons reconstruction as a potential pricing demonstration project for the Twin Cities, the task force also developed some other more general statements about the role of pricing in transportation policy.

Statement of Purpose > > >

As a diverse group of stakeholders, we seek to identify and build sufficient political support for implementation of a value pricing demonstration project. We define value pricing as using electronically collected peak-period tolls to manage rush hour traffic flow and to provide revenue for transit, highway expansion, and other complementary policies.

We believe that while value pricing cannot solve the congestion problem by itself, that it can, when combined appropriately with other policies, help traffic flow more smoothly while helping to improve safety and the environment and make transportation system financing more equitable.

Findings > > >

The task force bases its recommendations on the following findings:

- Growing levels of traffic congestion impose significant costs on individuals, businesses, and the quality of life in our communities, and threaten the long-term economic prosperity of the region. Doing nothing will be a costly option in the long term.
- Pricing will not solve this problem alone; it requires:
  - That there is excess capacity somewhere for some trips to divert to; that is, increased investment in highway infrastructure is needed.
  - That there are alternatives to driving on tolled roads; that is, increased investment in transit is needed.
- Peak-period tolls could help to reduce congestion and provide the revenue needed to make these investments.
- By helping us avoid or postpone the need for expensive capacity expansions, peak-period tolls could ultimately *reduce* the total cost that people pay for transportation.

Recommendations > > >

We recommend that Mn/DOT apply for funding through the FHWA Value Pricing program to implement one or more value pricing projects. Our first choice is to use pricing as a travel demand management strategy during reconstruction of the Crosstown Commons. However, we recognize that this project cannot move forward without public and political approval. If the Crosstown project cannot gain this approval, then we recommend that another reconstruction project or one of the other projects in this report be pursued.

> WHILE VALUE PRICING CANNOT SOLVE THE CONGESTION PROBLEM BY ITSELF, IT CAN, WHEN COMBINED APPROPRIATELY WITH OTHER POLICIES, HELP TRAFFIC FLOW MORE SMOOTHLY WHILE HELPING TO IMPROVE SAFETY AND THE ENVIRONMENT AND MAKE TRANSPORTATION SYSTEM FINANCING MORE EQUITABLE.

Appendices

Task Force Members

Carol Flynn, Chair

Senator Roy Terwilliger

Representative Mary Liz Holberg

Kevin McHenry
Office of State Senator Leo Foley

Hubert "Buck" Humphrey IV
Office of Mayor Sharon Sayles-Belton

Deputy Mayor Susan Kimberly
City of St. Paul

Natonia Johnson, Office of Hennepin
County Commissioner Mark Stenglein

Mayor Mary E. Anderson
City of Golden Valley

Mayor Mary Hamann-Roland
City of Apple Valley

Carolyn Rodriguez
Metropolitan Council

Joan Molenaar, Council Member
City of Champlin

Mayor Steve Larson
City of New Brighton

John G. Hoeschler, Planning Commission,
City of Gem Lake

Henry Zweber, Council Member
City of New Market

Ron Lifson , Vice President/General
Manager, LDI Fibres

James Wafler, President
Highway Construction Industry Council

Neil H. Libson, Director Office Facilities
SuperValu

William E. Goins, Worldwide Account
Manager, FedEx Corporate Services

Fred Corrigan, Executive Vice President
The Minnesota Transportation Alliance

Amber Backhaus
Minnesota Trucking Association

Jerry Olson , Sr. Vice President and
Sr. Counsel, Colle & McVoy Marketing
Communications

Frank Brust
Minneapolis Downtown Council

Ron Marien, President
Bloomington Airport Council, Minneapolis
Regional Chamber of Commerce

Bill Droessler
1000 Friends of Minnesota

Richard Rolle
Urban League

Matthew Hollinshead, Coordinator
Minnesotans for Sustainable
Transportation

Daron Van Helden
AAA Minnesota/Iowa

Dave Van Hattum, Project Administrator
Downtown Minneapolis TMO

Bob Vanasek
Metro Inter-County Association

Lyle Wray, Executive Director
Citizens League

Full List of Potential Projects

The task force started with a list of 12 possible value pricing projects, but narrowed the list to three that were thought to be particularly interesting, and more politically feasible. The original list follows.

Spot Locations >

Lowry Tunnel (Minneapolis)

Stillwater Bridge (Stillwater)

Crosstown Commons (Minneapolis/Richfield)

Wakota Bridge (Newport/South St. Paul)

Congested Commuter Corridors >

I-94 (St. Cloud to I-494)

TH 169 (I-494 to CSAH 101)

I-35E (I-94 to I-694)

I-35W (TH 13 to I-94)

Pricing on Expanded Corridors >

I-494 (I-394 to Minnesota River)

I-94 (CSAH 152 to I-494, Brooklyn Park/Maple Grove)

SOV Buy-In >

I-394 HOT Lane

I-35W HOT Lane

The Task Force Process

Recruitment > > >

The Task Force was gathered by active recruitment. Some organizations were selected by the project managers as necessary for the Task Force, and were invited to nominate a member or staff person. All sitting state legislators were invited to join, eight did so. Business leaders were recruited based on recommendations from other groups or individuals familiar with the community. City, county, and regional government representatives were recruited through a postcard survey sent to all 1,000+ government leaders in the metropolitan region.

An attempt was made to find people with previous experience in transportation policy issues—often service on another committee of this type. Although an attempt was made to recruit open minded, neutral parties and previous proponents of pricing, project managers also recruited some opponents of pricing.

Meeting 1: February 9, 2001 > > >

This meeting was mostly focused on the task force members and value pricing staff becoming acquainted, and on presentations covering some of the facts and ideas behind value pricing. The meeting lasted two and a half hours and covered the following agenda:

- Purpose of the Advisory Task Force
- Congestion in the Twin Cities: What is the Problem (Group Discussion)
- Defining the Problem (Three presentations)
- What is Value Pricing? (Presentation)
- Buying Time Video
- Operating Value Pricing Projects and Proposals (Jennifer DuBord)

Meeting 2: June 5, 2001 > > >

The second meeting continued with presentations about various aspects of value pricing, and at the end began the discussion of developing evaluative criteria for choosing a demonstration project. The meeting lasted five and a half hours, and agenda items included:

- Current Value Pricing Projects (Presentation)
- Congestion news videos
- Full Costs of Twin Cities Transportation (Presentation)
- Transportation Finance (Presentation)
- Value Pricing Benefits and Policy Alternatives (Presentation)
- Development of Evaluation Criteria

Meeting 3: July 31, 2001 > > >

The primary focus of this meeting was on discussing potential projects and choosing a project. The original intent had been to use evaluation criteria to rate projects quantitatively. However, it came to seem that any such rating would depend somewhat arbitrarily on the judgment of the raters. Also, the rating would depend on the specific way the project was defined, while not taking advantage of improvements that might be possible.

It was decided to approach the evaluation of the projects by having the task force break into groups, each of which would discuss one project. Each group spent some time defining its project in the most appealing way and discussed how the project might be sold to a broader audience. Each group then attempted to "sell" its project to the whole task force. At the end of these presentations a general discussion took place and a vote was taken.

This meeting lasted five and a half hours, and was mostly discussion with a few short presentations at the beginning. The agenda included:

- International value pricing projects (Presentation)
- Minnesota value pricing market research (Presentation)
- Equity issues in value pricing (Presentation)
- Descriptions of four projects
- Small group discussions of projects
- Presentation of projects by small group representatives
- Large group discussion of projects

Meeting 4: November 30, 2001 > > >

This meeting focused mostly on the Crosstown project and what task force members could do to help move it forward. The meeting lasted five and a half hours, and included the following agenda items:

- Crosstown project update
- Crosstown proposal description
- Discussion of (this) task force report
- Outreach plan and future task force roles

Minnesota Value Pricing Project Staff and Associates

State and Local Policy Program, Humphrey Institute of Public Affairs, University of Minnesota >

- Lee Munnich, Project leader
- Gary Barnes
- Marit Enerson
- Michael Rentz
- Todd Anderson
- Leah Goldstein, strategic planning and evaluation consultant

Minnesota Department of Transportation >

- Adeel Lari
- Kenneth Buckeye

Metropolitan Council >

- Mark Filipi
- Carl Ohrn

SRF Consulting >

- Ferrol Robinson
- Steve Wilson
- Jonathon Erlich

Appendix D

Crosstown Commons Pilot Project Proposal

VALUE PRICING DEMONSTRATION PROJECT PROPOSAL

Crosstown Commons Reconstruction Road Pricing

SUBMITTED TO THE FEDERAL HIGHWAY ADMINISTRATION
BY THE
MINNESOTA DEPARTMENT OF TRANSPORTATION

REVISED DECEMBER 6, 2001

1 INTRODUCTION

1.1 Project summary

The Crosstown Commons is a one-mile common section of Interstate 35W and Minnesota Trunk Highway 62 bordering the cities of Minneapolis and Richfield. The approaches to the Commons are extremely congested and experience long back ups in all directions for up to 7 hours per day, both because of lack of capacity and the large amount of weaving. This section of highway also has one of the highest crash rates in the seven-county metropolitan area. (See attached Figure 1.)

The Minnesota Department of Transportation (Mn/DOT) has programmed the reconstruction of the Crosstown Commons in conjunction with the expansion of I-35W in that area to reduce the weaving. Due to limited financial resources and right-of-way, the proposed reconstruction plan involved eliminating the TH 62 Crosstown traffic and closing several access points during a four-year reconstruction period. As a result of the long period of disruption and the significant loss of capacity during that time, the 2001 Minnesota Legislature placed a one-year moratorium on starting the project, requiring Mn/DOT to study other available options in the meantime. The legislature specifically mentioned pricing as one of the options Mn/DOT must study.

The pilot project would involve reconstructing the Crosstown Commons in a wider right-of-way, thus allowing traffic to be maintained during reconstruction. Pricing would be implemented in the corridor to manage traffic demand. Gantries would be built on all approaches. Transponders would be available for sale to all regular users. Off-site sales would be available for non-regular users (e.g., non-metro area residents) to purchase transponders. HOVs and buses would be able to use the roadway free of charge. The priced facility could also be used during the subsequent expansion of I-494, which runs parallel to that roadway.

The desired effect of value pricing would be to reduce demand and control peak period traffic flow during the period of construction, and to provide user choices through improvements to area or facility transit services.

1.2 Why Pricing?

Pricing in this corridor has to be considered in the context of the available options. The initial plan estimated a four-year reconstruction period during which time the Crosstown would be closed to traffic (approximately 60,000 vehicles per day). More recent estimates place the construction delay at about two years.

Since alternative routes are already at capacity during extended peak periods, it is anticipated that the closure would significantly worsen congestion and delays on arterials and freeways in the area. Preliminary estimates are that the diversion of traffic caused by the closure of the Crosstown would cause an additional $35-40 million in vehicle delay and operating costs per year and cause a substantial diversion of traffic to local street and other already congested principal arterials. Freight destined to the airport and elsewhere would also experience significant disruption. The pricing option would permit a controlled flow of traffic remain in the Crosstown Commons, thus reducing delay and local traffic impacts. Delay costs with pricing would be $20-25 million per year.

Other options being proposed include tunneling and stacking. It is anticipated that these options would be significantly costlier than the current proposal and would also require additional right-of-way. The cost to implement the pricing option would be a fraction of the cost of the above options.

The pricing option would create a temporary condition that would be characterized by the following key elements:

- All traffic movements would be maintained during construction, whether with direct or indirect connections.
- Traffic flow would maintain a level of service that is better than today's by controlling through pricing, how many cars are allowed on the facility.
- The level of diversion to other routes is expected to be, at worst, moderate since the road would remain open to traffic.
- The use of transit will be strongly encouraged and supported. It is expected that some of the revenues collected will go towards adding transit services and facilities serving the Crosstown. This includes bus routes and park-and-ride lots for transit.
- Carpooling will also be strongly promoted, through free or reduced-price access.

1.3 Goals

The goal of the Commons Area Value Pricing Pilot Project is to demonstrate that implementation of pricing during reconstruction of the Commons Area will reduce peak-period demand in the corridor, keep the

Crosstown freeway open during reconstruction and minimize traffic diversion during construction. This will provide reductions in delay, and improvements in safety and air quality in the study area.

Specific goals of this pilot demonstration project include:

- Managing traffic flow and improving safety by reducing the number of cars on the road at any given time, through time-of-day, route, and mode shifts, and trip consolidation and chaining.
- Raising revenue to support improved transit service in affected areas, further reducing the amount of auto traffic and adding options where in many cases they do not currently exist.
- Gaining a better understanding of how road pricing can be used to manage the traffic disruptions that result from major construction projects.

1.4 Outstanding Challenges

Many political and technical challenges must be addressed before this project can move forward. The Twin Cities area has no toll roads, and recent proposals for toll roads have been dropped due to public and political opposition. The use of mandatory tolling on a facility that has always been free will not be an easy idea to sell. This particular project is extremely complex, because of its very large scale, the need for universal electronic tolling, and the fact that the project would take place within the context of a large and independent construction project.

Examples of some specific political challenges that must be met include the following.

- Inclusion and preferably recommendation in the Mn/DOT report to the legislature. Without this it will be difficult to get the legislature to consider a pricing option.
- Legislative approval. This is necessary given the large scope, significant public visibility, and mandatory nature of the project.
- Approval (or at least non-opposition) of affected cities. This would include Minneapolis and Richfield at a minimum, and possibly other nearby cities whose residents and workers use this highway.
- Public support.

1.5 Tasks, time line, project management

Because it is not clear how the above political and technical challenges will be resolved, it is not possible at this time to provide a detailed description of how and when the project will be executed. We would like to propose a two-stage process. The first stage would include roughly the first year of the project, and would consist of the political, engineering, and public outreach efforts necessary to gain support for implementing pricing in this situation. At the end of this stage there would be either a decision to move forward, along with a specific design of

the technical and administrative details of the project, or the project would be rejected. In the first case we would move ahead with implementing the project, in the second case we would forfeit our claim to the remaining project budget.

Tasks under the first phase would include the following:

- Detailed engineering, in cooperation with the Mn/DOT engineers designing the overall reconstruction.
- Ongoing discussions with political leaders to promote understanding of the project and gain support.
- Any necessary public education and outreach.

Major tasks under the second phase could include the following.

- Distribution of transponders, establishing and maintaining long-term transponder distribution network.
- Installation and maintenance of readers and video cameras for toll collection and enforcement.
- Customer account administration.
- Project evaluation.
- General management and oversight.

The time line cannot be determined with much detail at this point. It will depend to a large extent on the time line set by the Minnesota legislature, the construction schedule of Mn/DOT, and any modifications to the project that occur in the course of public debate and discussion.

Likewise, the large scale of this project, and the need to coordinate with the construction project, means that details of how the pricing system will be administered will have to be determined within a broader context.

1.6 The Minnesota Value Pricing Advisory Task Force

In early 2001, the State and Local Policy Program at the Humphrey Institute, University of Minnesota, organized an Advisory Task Force of local leaders to discuss options for including road pricing in Twin Cites transportation planning and policy. As evidenced by previous value pricing projects and studies, market-based solutions require public and political support from key stakeholders in order to be successful.

The task force brings together 37 key stakeholders from across the Twin Cities. Members include elected state officials, local government leaders and staff, and leaders in the business, environmental, and civic arenas. The task force has met three times thus far, in February, early June, and late July of 2001.

The mission of the task force is:

- To discuss the role of pricing and market-based solutions in a regional context.
- To recommend a value pricing pilot project(s).

- To assist in creating a constituency of support for pricing in general and for selected project(s).

The task force has considered the growing congestion problem, problems with current transportation finance, several proposed pilot projects, and the anticipated costs and benefits of value pricing and other congestion management alternatives. The task force has created a list of criteria for evaluating projects and has recommended three possible projects, as well as discussing concerns and potential mitigation strategies. The Crosstown Commons reconstruction project was the most popular of the three major projects considered.

This section discusses the project evaluation criteria that the task force created, and describes the other two projects that were discussed. While the task force generally also felt that these other projects were worthwhile, the Crosstown project generated more interest overall.

1.6.1 Project evaluation criteria

Discussions by the full task force and by a volunteer subcommittee led to a list of eight criteria by which projects were evaluated. Task force members used these criteria informally to judge projects, and perhaps more significantly, to evaluate how the projects could be changed to make them better.

1. The project should benefit public health, safety, and the environment.
2. The project should provide positive choices for people.
3. The project should generate economic benefits (revenues, system efficiency, leverage other funds).
4. The project should reduce peak period demand and mitigate an existing transportation problem.
5. The project should enhance multi-modal transportation and travel reliability.
6. The project should have private sector support.
7. The project should represent a public education and/or market research opportunity and it should be transferable.
8. The project should reflect the larger transportation and land use vision.

1.6.2 I-394 SOV buy-in

I-394 is a radial freeway linking downtown Minneapolis with its western suburbs. In the peak direction, there are two general-purpose through-lanes and one HOV lane. High mixed-lane demand and capacity bottlenecks cause daily backups in both directions.

A pilot project would involve allowing single-occupant vehicles (SOVs) to use the excess HOV lane capacity for a variable mileage-based price (calculated

to maintain acceptable levels of service for HOVs. HOVs and buses would continue to use the lanes free of charge.

The desired effect of value pricing would be to fully use the HOV lane capacity, thus increasing the efficiency of the facility. Users who need a fast trip would be able to purchase it.

1.6.3 Stillwater Bridge

Severe traffic congestion in downtown Stillwater, safety problems on approach roadways, and delays caused by the operation of the Stillwater Lift Bridge have spurred the discussion of a new bridge crossing in Stillwater for many years. “Rush hour” delays and weekend backups, especially during the tourist season, frustrate residents and visitors alike. The bridge is currently operating at capacity 3-4 hours per day.

A pilot project at this location would involve a variable or fixed price electronic toll for crossing the bridge. Transponders would be made available to all potential users of the bridge. Gantries would be installed at the approach to each direction of the bridge. A facility for non-regular users (e.g., tourists) to purchase tolls would be provided nearby but off the facility. High-occupancy vehicles (HOVs) and buses would be able to cross the bridge free of charge.

The desired effect of value pricing would be to divert trips to off-peak periods or to the I-94 crossing and to reduce the number of peak period trips.

1.6.4 Technical and Political Feasibility

If the Crosstown Commons value pricing project proves technically or politically infeasible, the task force recommends moving forward on one of the other two demonstration projects. This approach will allow the Minnesota project team to build upon the emerging support by local champions for value pricing as a long-term congestion management and finance strategy.

2 PROJECT DESCRIPTION

The Commons Value Pricing Pilot Project would involve reconstructing the Crosstown Commons with limited right-of-way expansion to allow all traffic movements to be maintained during reconstruction. To this end, right-of-way would be required south of the Commons Area to construct two temporary lanes (to replace the lanes lost to reconstruction). Other access modifications would also be required within the existing right-of-way. Pricing would be implemented to manage traffic demand and to maintain a high, premium level of service.

The proposed pricing project would be implemented as follows.

2.1 Electronic Toll Collection

Electronic Toll Collection (ETC) would be used exclusively. Electronic tolling zones would be placed at all approaches to the Commons that would also

provide for enforcement of toll payment. No toll plazas or toll booths would be built nor would vehicles have to slow down or stop to make payment. Vehicles would be required to have a tag (transponder) attached to the windshield. This tag identifies the pre-established account of the motorist from which the toll would be electronically deducted.

Tag readers would be placed on existing suitable structures where they exist, or new gantries would be erected for the purpose, at each of the approach points to the Commons section from the Crosstown TH 62, I-35W and any intermediate points (based on ultimate design). The electronic toll collection equipment and video enforcement equipment would be mounted on the gantries. The tolling system would consist of the tolling zones at the approaches to the Commons linked over communication lines to the central computer system plus variable message signs positioned to alert drivers to the existence and condition of the Commons sufficiently in advance of points at which an alternate choice of routing could still be taken.

The locations of the tolling zones, as currently anticipated, are shown in Figure 2 (attached). At the tolling zones all vehicles entering the Commons would be charged a toll, which would be deducted electronically from the pre-funded account identified by the tags. When the account balance reaches a certain minimum level, the balance in the account will need to be replenished. Most accounts would be replenished automatically, by charging the motorist's credit card, debit card or bank account. If accounts without such provision for automatic replenishment are permitted, it would be the responsibility of the accountholder to provide a cash replenishment. The accountholder would be sent a periodic statement showing the previous balance and any deposits added or tolls subtracted.

A general portrayal of a typical tolling zone is shown in Figure 3 (attached). It illustrates the fact that vehicles must be separated and channelized as they approach the tolling zone so that the tolling system can differentiate between HOV vehicles that may be given free passage or preferential rates and non HOV vehicles that are to pay the full toll. In the tolled traffic lanes, checks for correct payment of the toll by the motorist can be made automatically. If a valid tag is read the account is charged. Also the type of vehicle can be determined automatically if tolls vary by vehicle type. If no tag is read, an image of the vehicle's license plate is captured and used to issue violation notices. Unfortunately, in the HOV lanes checks cannot be completely automatic. The check for the required number of occupants can only be effective if made by a human observer. Thus an advantageous spot must be provided from which observations can be made plus a system capability to assist the observer in capturing images of these license plates will be needed. As a supplementary or alternative approach provision could be made for police chase of identified violators.

Normally the number of lanes must be increased within the tolling zone to facilitate the above-mentioned separation and channelization of the traffic. In this instance, however, the overall goal of the project is to reduce traffic flow. Therefore, the existing three lanes in some instances may be then only be

carrying two lanes worth of traffic and the existing three lanes might suffice at least in some of the tolling zones. This is suggested in Figure 3 by the depiction of three traffic lanes prior to and in the tolling zone and two lanes after. However, the design of these tolling zones will need to be coordinated with the redesign of the Commons section.

General views of an existing all-electronic tolling zone installed for the CityLink project in Melbourne, Australia are shown in Figures 4 and 5 (attached). That system, which has all-electronic toll collection, is in successful operation and is illustrative of modern electronic toll collection design.

The central computer system is the "brain" of the toll collection operation. It retains account information for all accountholders, transmits account status information to the tolling locations, receives the toll charge transactions, processes violations, and bills the motorists' accounts. The central computer system will also need to communicate with and control both the variable message signs and any stations set up for the obtaining temporary usage rights by infrequent users.

2.2 Tagged and Untagged Vehicles

Exact details of charging methods and amounts would be the product of further study but tags would likely be made available to users at a highly subsidized rate or for no charge to obtain wide distribution. On the other hand, a minimum annual usage and/or an annual rental could be set so as to discourage frivolous acquisition of tags. Key considerations in tag selection would be compatibility with other toll facilities and the tags currently installed in long haul trucks (if such vehicles are to be users of the road).

Some special provision will need to be made for those in the area who seldom use the road as well as for out-of-towners who are just passing through. There are several possible ways to provide this but some variant of the following is a likely ultimate solution. The approach would allow such motorists to open a special account. Under this concept a motorist without a tag who wants to use or has just used the road obtains the right to use the road without a tag. The process would entail the motorist's registering the license plate of the vehicle with the road operator. This is accomplished at stations set up in the area or over the phone by charging a credit card, thereby opening an account without a tag. When the day's violation images are processed a plate number that produces a match with one of these special accounts would result in an appropriate charge to that account. Transaction processing for these special accounts would be more expensive so such accounts would not be encouraged. The charges for these special accounts could be made relatively high to cover the extra expense and to encourage the use of tags.

2.3 Variable Message Signs

Variable Message signs would be posted along freeway corridors approaching the Crosstown Commons. These signs would be placed to provide advance warning so that alternate arterial routes could be used to avoid the tolled section and would advise motorists of the toll charge level currently in

effect. Potential locations for message signs include, at a minimum, major freeway interchanges that contribute traffic to the Crosstown Commons and that would serve as alternate routes. These freeways include I-35W, TH 100, TH 169, I-494, TH 77, TH 212, TH 100 and I-94.

Also, it is anticipated that variable message signs would be used at selected major traffic generators such as downtown Minneapolis and the MSP International Airport. Signs should also be posted on local access interchanges near the Commons.

2.4 Right-of-Way Issues

A cursory analysis of right-of-way requirements indicates that 13 homes and one business may be affected to an extent that full taking would be required. Right-of-way expansion may also trigger an Environmental Impact Statement (EIS) amendment or supplement.

2.5 Duration of Pilot Project

As proposed, the Pilot Project would only be in place during the Crosstown reconstruction period. However, once the Commons area is reconstructed, the priced facility could be useful during the reconstruction of I-494, which is expected to occur after the Crosstown project is completed. If the Pricing Pilot Project is successful, and the public decides that it is worth maintaining, decision-makers could make it a permanent priced facility.

2.6 Type of Pricing

The pricing method will be one of the following two methods.

2.6.1 Variable Tolls by Time of Day and Vehicle Type

A toll that varies by time of day and/or by type of vehicle would work as follows: A high toll level would be in effect during peak periods; an intermediate toll would be charged during the shoulders of peak periods; and a minimum toll would be charges during off-peak periods.

In addition, tolls could be charged based type of vehicle: a base toll for passenger cars and progressively higher tolls for light trucks and heavy trucks.

Multiple fixed tolls have the advantage of being simple to communicate and implement. Their disadvantages are that if they were set either too low or too high, adjustments would have to be made periodically. In addition this approach would fail to provide any mechanism to make control adjustments for atypical traffic conditions.

2.6.2 Dynamic Tolls

Toll levels could be made to vary to reflect demand on the tolled facility combined with, possibly, the level of congestion on I-494 (due to trip diversion from the Commons). Dynamic tolls would also vary (as with variable tolls) by time of day and/or vehicle type.

The advantage of dynamic tolls is that the level of tolls charged could vary periodically to maintain the optimal level of traffic flow on the tolled facility. If demand levels threaten to degrade the level of service in the Commons section, the toll rate could be increased to reduce demand. A disadvantage of dynamic tolls is that the current toll level has to be communicated to drivers well in advance to give them the opportunity to opt not to use the tolled facility. This requires additional variable signs and communications infrastructure, and introduces another decision-making point for drivers.

2.7 Level of Service

The toll charge will allow the facility to be operated at a high level of service. This will be achieved by limiting the number of peak period users such that 50-55 miles per hour speeds are generally maintained, compared with stop-and-go conditions experienced at present. (It is estimated that 1,800 cars per lane per hour could be achieved at this level of service (compared to 2,200 or more cars per lane per hour on other freeways with lower levels of service).

Maintaining traffic flowing at a steady flow (50-55 mph) is likely to result in fewer accidents on this high-accident segment of highway. Thus, the benefits of the project are likely to extend to a lowering of property loss, injuries and, potentially, fatalities.

2.8 Anticipated Demand

The I-35W/TH 62 Crosstown Commons section currently carries approximately 150,000 vehicles per day on three lanes per direction. However, due to the substantial weaving movements as well as high volumes in both directions, the roadway operates under congested conditions approximately 8 to 10 hours per day.

The pricing proposal would enable approximately 128,000 vehicles per day to remain on the facility, or 85 percent of the demand (see attached Figure 6). It is estimated that pricing would be required to reduce demand approximately 16 hours per day. During this time, the demand for 22,000 vehicles would not be accommodated, and this traffic would switch time periods (peak shifting), switch to transit or HOV, or select alternate routes or destinations. Preliminary estimates are that 113,000 vehicles per day would use the Commons during time periods when it is priced.

Final estimates of demand will be determined in cooperation with Mn/DOT based on the design and construction staging for the Crosstown Commons construction project.

2.9 Anticipated Revenue

A preliminary estimate of revenues indicated that annual tolling revenues of approximately $36 million per year can be achieved. This analysis assumes seven hours per day of peak period pricing at $2.00 per vehicle, and peak nine hours per day priced at $1.00 per vehicle (including midday and evening hours). While this estimate assumes that two-person HOVs would receive a 50 percent

discount, this detail would need to be finalized during the implementation and design of the system. Similarly, treatment of commercial vehicles and trucks would need to be agreed upon as a result of system implementation.

It is assumed that the system would operate 255 weekdays per year, with no pricing on weekends or major holidays.

3 RESEARCH, EDUCATION AND TECHNICAL SUPPORT

The University of Minnesota's Humphrey Institute of Public Affairs and K.T. Analytics have provided ongoing research, education and technical support to Minnesota in its development of a value pricing project as well as to other states and regions. This support has proven critical in addressing the complex political, institutional and technical issues local leaders face in pursuing value pricing as a congestion management strategy. Past activities such as a citizens jury, *Buying Time* video, regional and project partners workshops, the Value Pricing web site and list serves, and technical support to project partners as needed, have significantly increased interest and participation in the Value Pricing Pilot Program from all parts of the country.

It has become clear based on experience with successful projects that it is impossible for value pricing demonstration projects to move forward without local champions and support from elected officials. Furthermore, an effective communication strategy is required to convince various stakeholder audiences – businesses, environmental groups, transit advocates, road users – why they should support value pricing. The task force and communications strategy developed by the Humphrey Institute is a model that can be applied in other areas. In fact, Atlanta has adopted this approach with the assistance of the Humphrey Institute.

This project will build upon the experience and knowledge of the Humphrey Institute and K.T. Analytics by carrying out the following activites:

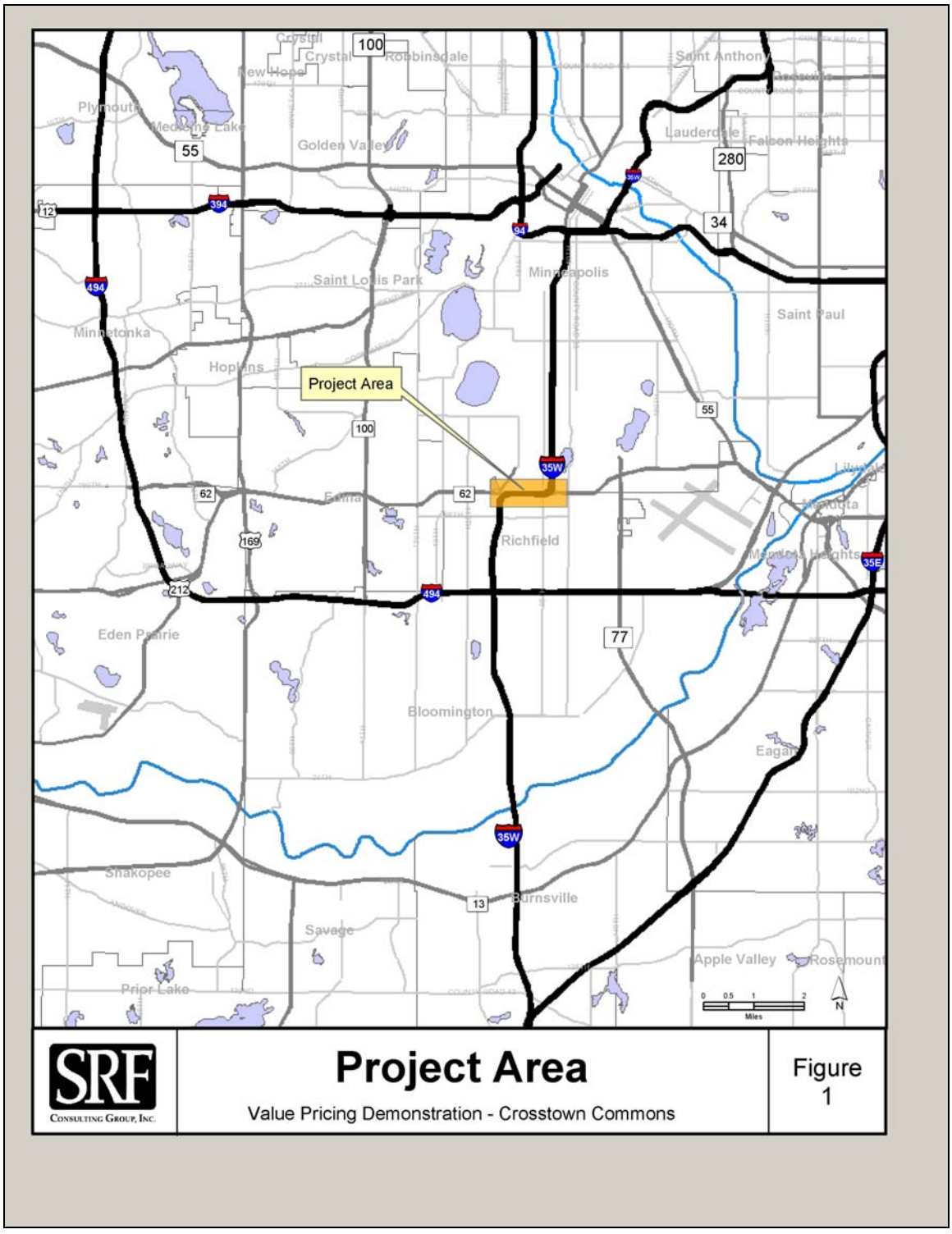
- Task force organization, management and leadership support for Minnesota and other states or regions;
- Technical and research support for value pricing pilot projects and those interested in developing pilot projects;
- Education and communications support for value pricing project partners;
- Evaluation and assessment of value pricing projects and strategies;
- Convening of project partners to discuss successful strategies and innovative approaches to value pricing;
- Web site and list serve management and other outreach activities to promote and provide information about value pricing.

4 ESTIMATED PROJECT COSTS

A preliminary estimate of $5.7 million per year operating cost has been assumed, based on an average of $0.20 per transaction. This conservative cost is based on an assumed use of the “temporary pass” and the potential short-term duration of the program (which increases the effect of “start-up” costs).

A preliminary cost range of $15 million to $20 million has been identified, which would include civil work, gantries, telecommunications equipment, video and transponder detection equipment, transponders, fixed and variable message signing and other elements. A major cost is transponders, which are assumed to cost $25 each, and of which as many as 300,000 could be needed. Capital costs cannot be determined more precisely until the design of the Crosstown Commons section is complete and further investigation of available infrastructure can be made.

The research, education and technical assistance activities of the Humphrey Institute and K.T. Analytics are estimated to be $1.5 million over the course of this project. Mn/DOT will provide $375 thousand in soft match to this effort.


Project Area
100
55
394
494
35W
62
169
212
77
13
280
34
94
Crystal
New Hope
Robbinsdale
Saint Anthony
Plymouth
Medicine Lake
Golden Valley
Lauderdale
Falcon Heights
Saint Louis Park
Minneapolis
Saint Paul
Minnetonka
Hopkins
Edina
Richfield
Mendota
Mendota Heights
Eden Prairie
Bloomington
Eagan
Shakopee
Burnsville
Savage
Apple Valley
Rosemount
Prior Lake
0 0.5 1 2
Miles
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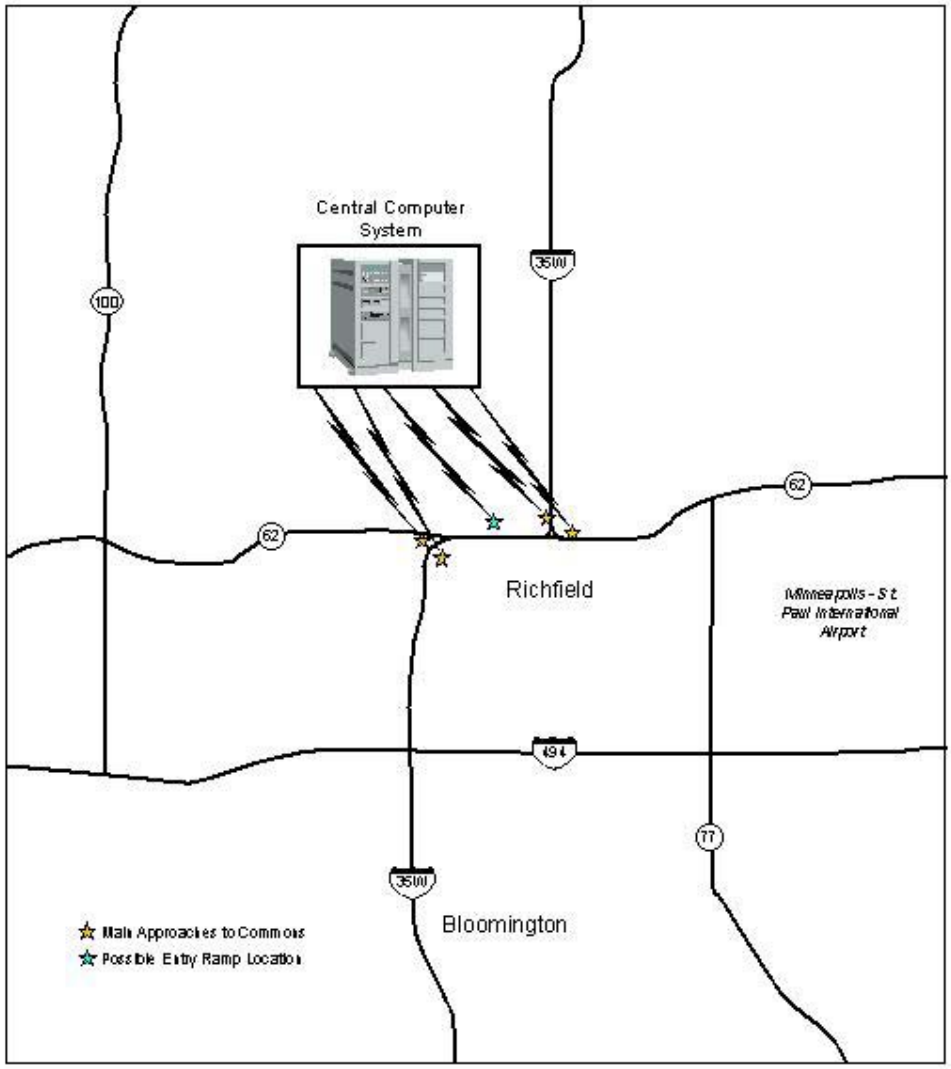
SRF
Consulting Group, Inc.
Project Area
Value Pricing Demonstration - Crosstown Commons
Figure 1

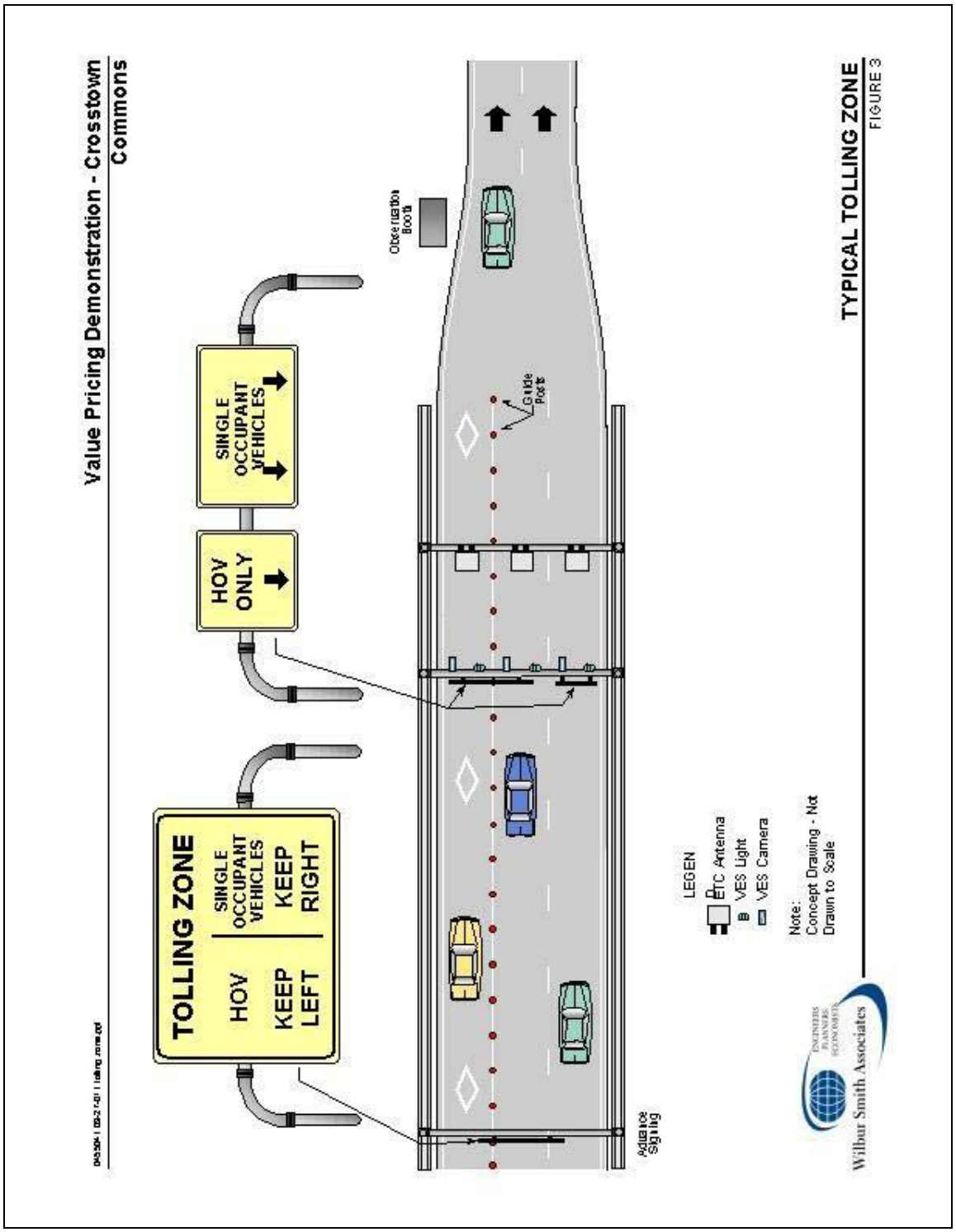
Value Pricing Demonstration - Crosstown Commons

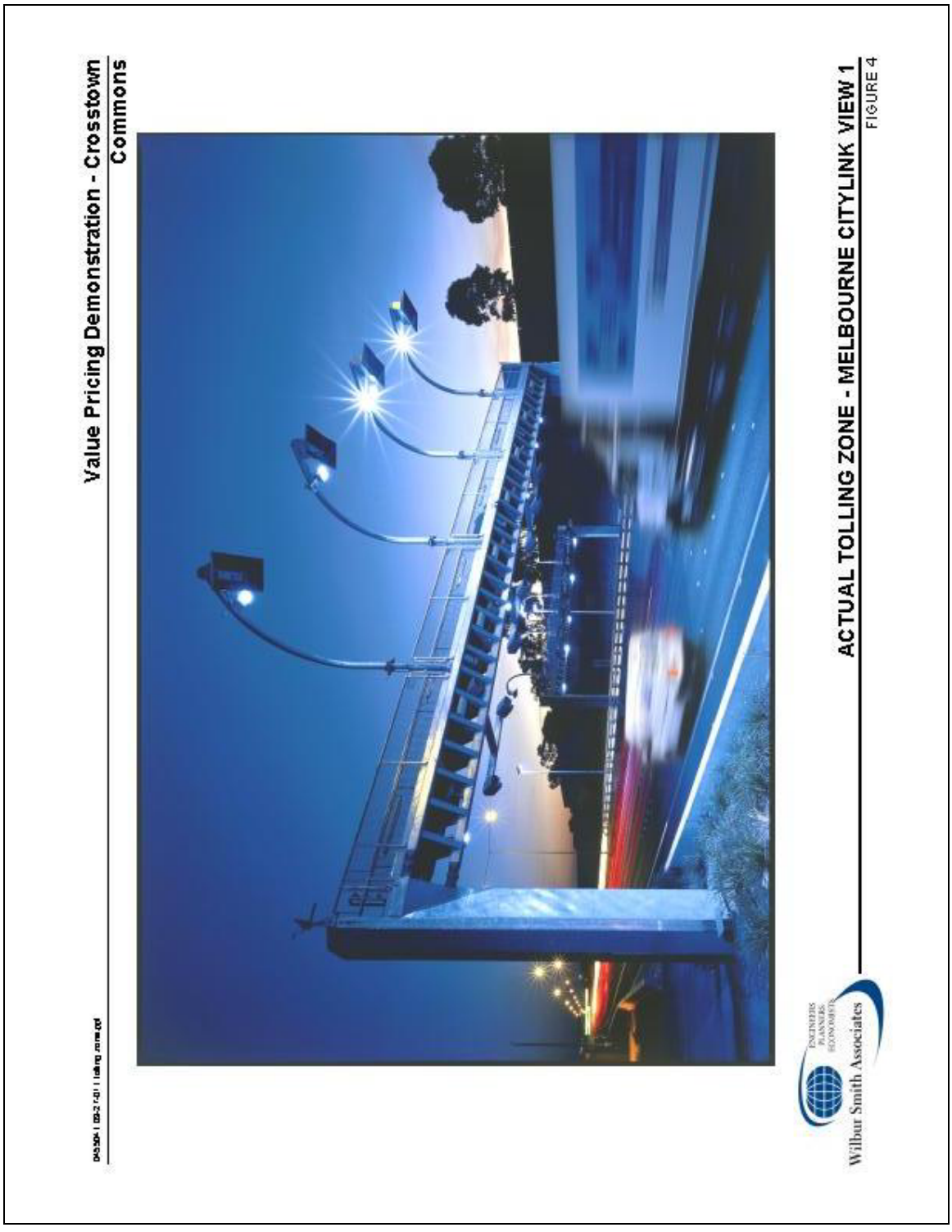


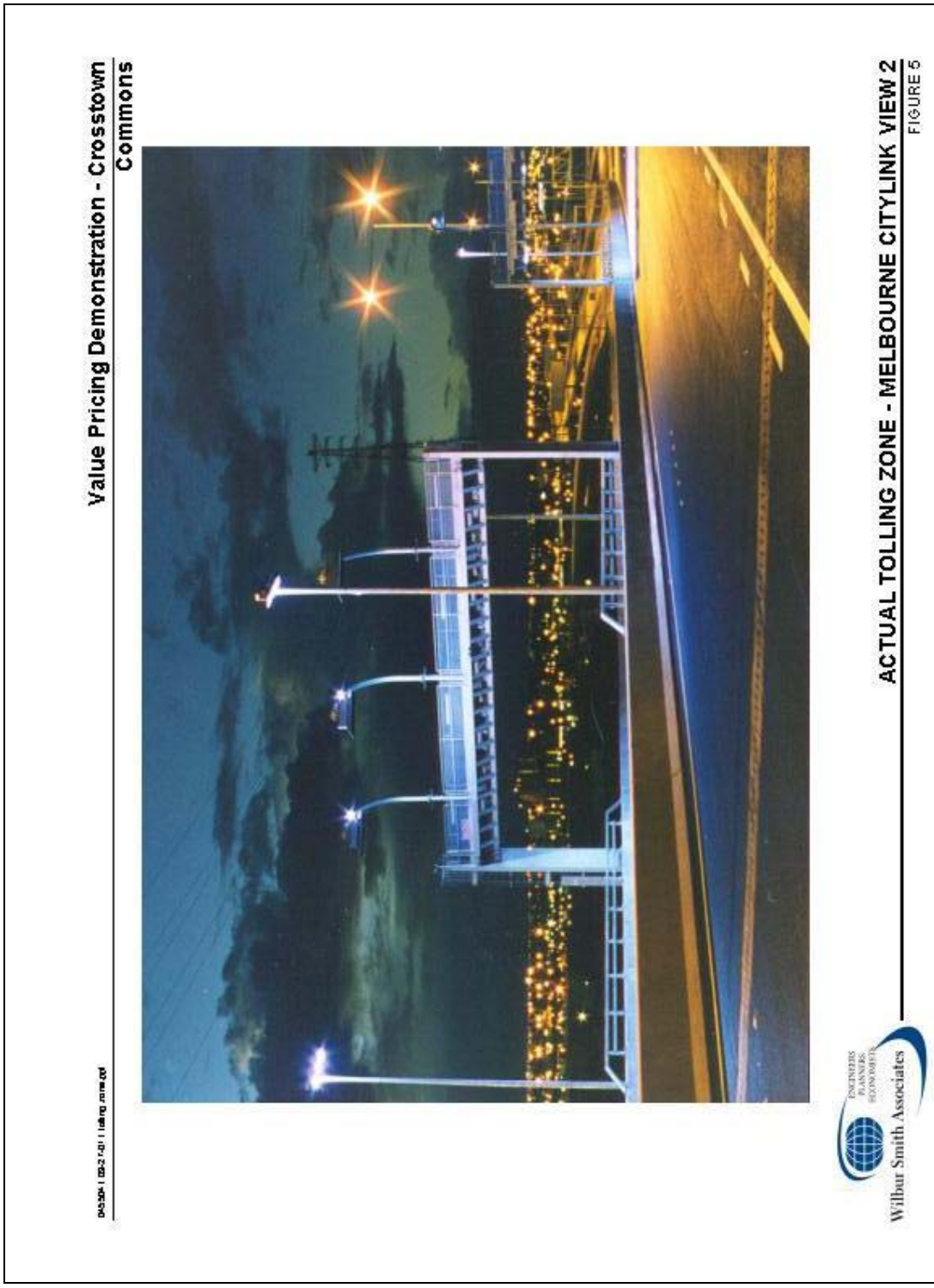
Wilbur Smith Associates

FIGURE 2

POTENTIAL TOLLING SYSTEMS LOCATION


Value Pricing Demonstration - Crosstown Commons
TOLLING ZONE
HOV
KEEP LEFT
SINGLE OCCUPANT VEHICLES
KEEP RIGHT
HOV ONLY
SINGLE OCCUPANT VEHICLES
Observation Booth
Gantry Posts
Advance Signing
LEGEN
ETC Antenna
VES Light
VES Camera
Note:
Concept Drawing - Not Drawn to Scale
Wilbur Smith Associates
TYPICAL TOLLING ZONE
FIGURE 3


Value Pricing Demonstration - Crosstown Commons
ACTUAL TOLLING ZONE - MELBOURNE CITYLINK VIEW 1
FIGURE 4
Wilbur Smith Associates


Value Pricing Demonstration - Crosstown Commons
ACTUAL TOLLING ZONE - MELBOURNE CITYLINK VIEW 2
FIGURE 5
Wilbur Smith Associates

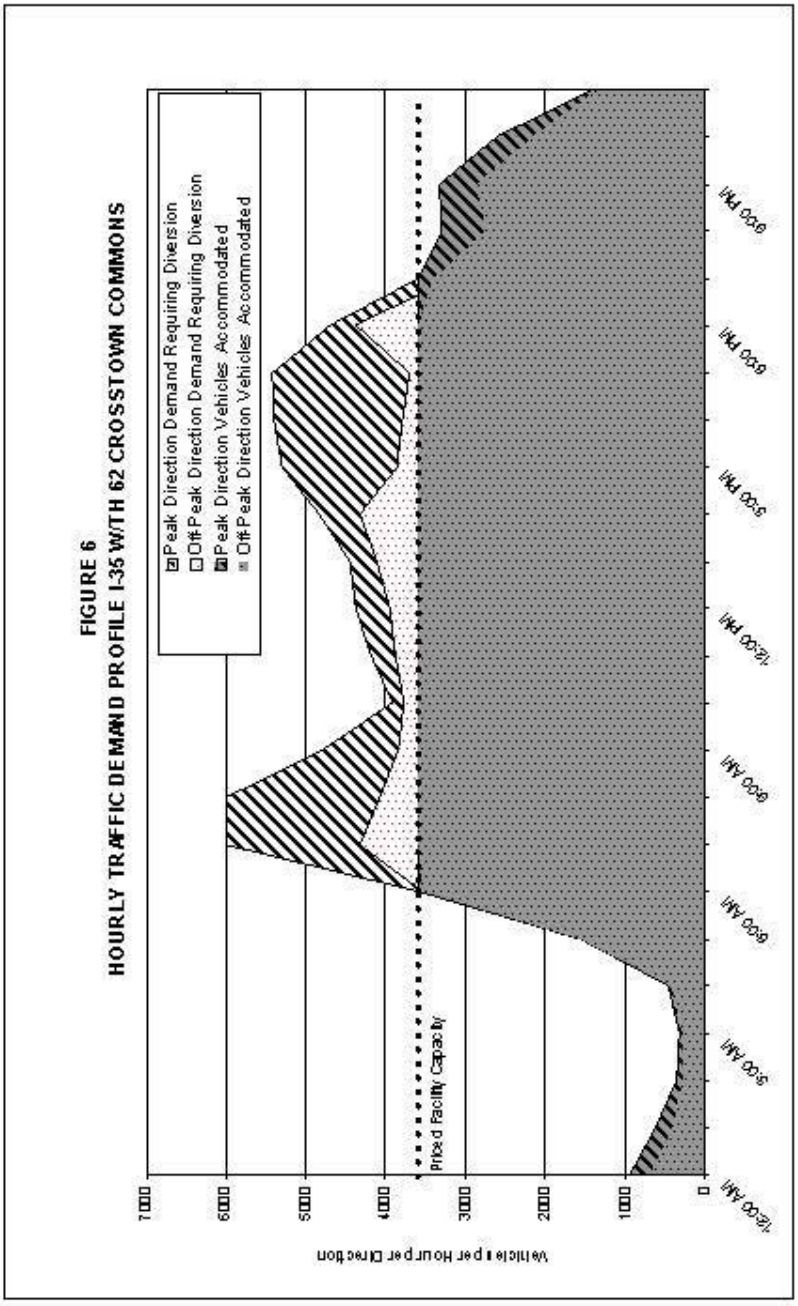


FIGURE 6
HOURLY TRAFFIC DEMAND PROFILE I-35 W/TH 62 CROSSTOWN COMMONS
Peak Direction Demand Requiring Diversion
Off Peak Direction Demand Requiring Diversion
Peak Direction Vehicles Accommodated
Off Peak Direction Vehicles Accommodated
Priced Facility Capacity
Vehicles per Hour per Direction
7000
6000
5000
4000
3000
2000
1000
0
12:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
3:00 PM
4:00 PM
5:00 PM
6:00 PM

Appendix E

Outreach Materials
Joe Loveland

Lessons Learned

Minnesota's Value Pricing Community Outreach Initiative

Background

Value Pricing Task Force. In the Winter of 2001, the University of Minnesota's Humphrey Institute of Public Affairs convened a Value Pricing Task Force to study the issue of value pricing and identify potential pilot projects to test the concept in Minnesota. In the Winter of 2002, the Task Force issued its findings and recommended that one of three value pricing projects be piloted.

Task Force Community Outreach Initiative. Several Task Force members volunteered to initiate a dialogue with the community about the Task Force's findings and recommendations. To guide this community outreach initiative, the Humphrey School retained a communications consultant with a background in public affairs. A communications plan was written by the consultant and executed by members of the Task Force. Pursuant to the plan, the consultant prepared summary materials, and dozens of meetings with key community leaders were held. A Communications Steering Committee met weekly for a period of four months to continually evaluate progress and make adjustments to the plan.

Due to political developments, the outreach plan had two distinct phases.

- **Crosstown Outreach**. The community outreach plan initially focused on the Task Force's top recommendation, a plan to charge value pricing on all lanes of a Twin Cities freeway intersection known as the Crosstown Commons. The recommendation was for value pricing to be used on the Commons during a major four-year reconstruction project. The purpose was to manage peak period traffic during the chaotic construction period, as well as finance the cost of keeping the Commons open during construction and transit improvements in the area. However, longstanding controversy associated with the overall Crosstown project ultimately made state transportation leaders hesitant to add value pricing into the mix.

- **HOT Lane Outreach**. At the same time as the Crosstown proposal was being discussed, a study commissioned by the Minnesota Department of Transportation (Mn/DOT) was released concluding a) Twin Cities HOV lanes are underutilized; b) opening HOV lanes to SOVs had more quantifiable benefits than costs; c) HOV lanes will nevertheless remain closed to SOVs because HOV lanes are central to the region's long-term multi-modal transportation strategy and because of federal penalties associated with opening HOV lanes to SOV traffic; and d) converting HOV lanes to HOT lanes is one potential way to get more out of underutilized HOV lanes without incurring federal penalties. As a result of this highly visible HOV lane report, there was heightened community interest in HOT lanes. Therefore, the Task Force's subsequent community outreach efforts increasingly focused on the task force's second recommendation, conversion of an I-394 HOV lane into an HOT lane.

Learnings and Achievements. The community outreach project achieved several things. First, a credible legislative champion and community champions were identified and mobilized. Second, the value pricing message was introduced to key decisionmakers. Finally, several lessons were learned about how to present value pricing to decisionmakers and the general public.

Those lessons are discussed below. They represent the observations and opinions of the project's communications consultant, rather than the findings of a formal analysis.

LESSONS LEARNED
Persuading *Decisionmakers*

Committed High-Level Champions Are Necessary

Low- and mid-level decisionmakers do not have enough clout to lead the public to accept something as new and potentially controversial as value pricing. It requires a top leader from the executive or legislative branch who has public credibility and a "bully pulpit" with which to sell value pricing. Cultivating such a champion and his or her influencers should be a top priority.

Critical Mass of Thought-Leaders is A Prerequisite for Enlisting High-Level Champions.

Governors, mayors, transportation agency appointees and legislative leaders all have people they look to for transportation advice. Unless these "influencers" are enlisted as value pricing supporters, it is difficult to access, much less persuade, high-level champions. The support of thought-leaders and low- and mid-level decisionmakers is necessary, though not sufficient, to gain the support of high-level champions.

The Perception of Public Opposition Must Be Countered With Hard Evidence.

Whether stated or unstated, elected officials' biggest concern about value pricing is usually related to public acceptance. Most are predisposed to believe that the public strongly opposes any type of tolling. Generalized assurances and anecdotal evidence are not sufficient to convince them that supporting value pricing is politically safe. Local public opinion data from a credible source is needed to counteract this predisposition. If at all possible, the survey should be local and recent. If that is not possible, highlighting public surveys from other value pricing projects, such as the I-15 project in San Diego, can show that the public supports value pricing where it is used.

Messages Must Be Customized For Each Decisionmaker.

Value pricing can be sold as an environmental, traffic management, financing, or transit tool. It can be sold as a conservative program or a liberal program. Message-wise, value pricing is a bit of Rorschach test; people see in it what they want to see. Value pricing advocates spend a lot of time arguing over which solitary theme should be used to the exclusion of others. However, because a broad coalition is necessary, messages should be customized for each potential coalition member. It is important to study each decisionmakers' background, constituency and personality, and tailor the messengers and message accordingly, rather than adopting a one-size-fits-all approach.

The exception to this rule would be a jurisdiction dominated by one political philosophy. For instance, a political jurisdiction in which the Governor, Legislature, public, and media were all predominantly liberals singularly dedicated to financing better transit, it would make sense to more narrowly present value pricing as a tool to achieve that goal. However, most jurisdictions have a power base with diverse viewpoints. In those

environments, a more customized messaging approach is necessary to form a winning coalition.

A Non-traditional Coalition Requires Constant Diplomacy.

A concept as new and different as value pricing requires a broad community coalition. Value Pricing is an issue that potentially can garner business groups and environmental groups, transit advocates and road advocates, suburban leaders and urban leaders. However, because of years of mutual distrust between these traditional opponents, building and maintaining such a "strange bedfellows" coalition takes extra time and effort. But it is worth the effort, because decisionmakers are more likely to embrace issues that bridge gaps between traditional policy opponents.

Technical Homework Must Be Done.

Executing value pricing is a technical matter, and for many potential supporters "the devil is in the detail." Questions about a variety of technical issues abound, particularly issues related to collection technology, costs, revenues, out-of-area users and enforcement. Responding that "we'll figure that out when we get to the design phase" is a sure way to communicate that the concept is not yet feasible. Seemingly small issues, such as the rules for one-time, out-of-area users, often sway the decisions of key decisionmakers. It is important have a technical expert who has done enough preliminary technical work to inspire confidence that the proposal is well thought-out and ready to be implemented. The technical expert must be fully integrated into all communications efforts.

Frame the Question Correctly: The Alternative is Not "Free Roads"

As decisionmakers make calculations about public acceptance, they often immediately conclude that changing "free" lanes into tolled lanes will be unpopular with their constituents. They are undoubtedly correct, if the question is framed that way. Therefore, the choice has to be framed differently. The choice must be presented as being between out-of-control congestion or less congestion. It's a choice between scarce transit and road funding or a steady stream of ongoing funding. It's a choice between an extra lane or no extra lane. It's between a choice to bypass gridlock or remain in a stalled lane. The issue needs to be framed up for decisionmakers in these ways, so that they can begin to see how they can successfully frame it for their constituents.

The Effort Must Be Staffed and Sustained

Value Pricing is not the kind of issue that people embrace overnight. They have to question it, research it, absorb it and refine it before they will be ready to take a position on it. They have to see how bad the alternatives look in comparison. Some have to see other peers take the lead before they will commit. This process can take years and has to be nurtured by a staffed effort. If the community outreach support system for value pricing is dropped after a short period of time, it is unlikely that an idea this new, technical and initially controversial will grow organically.

LESSONS LEARNED
Persuading the *General Public*

Public Must Understand There Are No 'Free Roads'

Free roads will always be more attractive than tolled roads. It will be difficult to generate public support until the public understands that there is no such thing as a free road. For instance, it is important to preface remarks about value pricing by stressing the large gap between future road and transit needs and currently available funding. Doing so forces the listener to confront the fact that roads are not free. It also forces them focus on *which* particular revenue source to choose, rather than *whether* an additional revenue source is needed.

Identify the Problem: The High Cost of Inaction Must be Understood.

Bold policy moves are generally only embraced by the public in response to crises. Because value pricing is viewed as a bold policy, citizens must understand that they face a crisis if no action is taken to address gridlock and related problems. Value pricing cannot be a solution in search of a problem. The community outreach initiative must stress the dire consequences of inaction. Citizens need to have a sense of the looming transportation crisis before they will accept something as new and different as value pricing.

"Choice' Is An Easier Sell Than "Mandatory."

Citizens in a free society are conditioned to resent restriction of choice. Even if they never exercise a particular option, citizens like the idea of having options. Therefore, the less restrictive the tolling rules, the more marketable the project. On one end of the spectrum is an opt-in HOT lane that only tolls a currently restricted lane a few hours per day, and adds a lane choice that didn't exist before. On the more restrictive end of the spectrum is a project with all lanes tolled most hours of the day. Where a project falls on this "choice continuum" will have a significant impact on project marketability. The more choices drivers have, the easier the project will be to sell. Designers of the pricing proposals should be mindful of that fact.

Tangible Benefits Must Be Directly Tied to Costs.

Citizens voluntarily part ways with their money every day, when they get something of value in return. Similarly, with value pricing will be more likely to be embraced if the tolls are purchasing a direct benefit that citizens want, such as better roads and bridges, improved transit service, less gridlock, an opportunity to bypass gridlock in a crunch and/or a way to keep a freeway open that otherwise would have been closed during construction. For example, a Twin Cities survey that asked whether citizens supported tolling showed modest support. But another survey taken about the same time showed substantial support for "*having an option of paying a fee to use an uncongested freeway lane when in a hurry."* The difference is that the wording of the former question only mentioned the cost and the latter question connected cost and benefit. As in

commerce, citizens will support transactions that deliver something they want, and resist those that do not. Therefore, selling the "value proposition" of each pricing proposal is a top priority.

Show It Works and Is Accepted Elsewhere

Value pricing looks like a risky experiment to those unfamiliar with it. Experiments often lead to annoying glitches or outright failure. For this reason, it is very important to stress the many places where value pricing has worked well and been embraced by the public. Bringing in experts from successful projects might be a way to effectively make this point. However, take great care to find an "apples to apples" comparison. For example, in the minds of many, it is not credible to compare Singapore and Minnesota, or toll bridges and HOT lanes.

The Supportive Case and Coalition Must Be Solid Before Seeking Mass Media Coverage.

It's not difficult to get the mainstream news media to cover value pricing, but it should not be done until you are well prepared to make your case. A single press release will likely prompt uninformed news reporters to ask uninformed citizens if they support paying a toll for their currently "free" road. With the issue presented this way, the public response to such framing is likely to be highly negative and have a long-lasting chilling effect on political support. Value pricing supporters should have credible champions ready to frame up a credible case for value pricing before they rush to proactively seek news media coverage. This is especially true of short-format news media, such as television news and commercial radio news, where there is not sufficient time to lay out the entire case and respond to concerns.

The Effort Must Be Staffed and Sustained

As with decisionmakers, support for value pricing comes as a result of a lengthy public learning process, not an instantaneous epiphany. If there is not a team in place to quickly and effectively react to questions and concerns raised by the public or news media, the public will quickly become hostile to the concept.

Joseph D. Loveland is an independent communications consultant. He can be reached at 651-224-8534 or lovelandcommunications@attbi.com.

Community Outreach Activities
Since Task Force Report Issued in January

Task Force members have begun to explain the work of the Value Pricing Task Force to key community decisionmakers and their influencers.

Briefings/Testimony/Discussions

- Transportation Commissioner Elwyn Tinklenberg and senior staff
- Finance Commissioner Pam Wheelock and senior staff
- I/35W-Crosstown Advisory Committee members
- I/35W-Crosstown Advisory Committee Chair Phil Riveness
- Richfield State Representative Mark Gleason
- Major Projects Commission Chair Dave Jennings
- Senator Jane Ranum (member I-35W/Crosstown Advisory Committee)
- Rep. Jean Wagenius (member I-35W/Crosstown Advisory Committee)
- Met Council Director of Transportation Planning Natalio Diaz
- Senate Transportation Committee member Dave Johnson
- Richfield City Council members
- Minnesota Center for Environmental Advocacy Land Use and Transportation Director Jim Erkel and colleagues
- Senator Steve Kelley
- Senate Transportation Committee member Julie Sabo
- Senate Transportation Committee Budget Division Chair Dean Johnson
- Senate Capitol Investment Chair Keith Langseth
- I494 Advisory Task Force
- Minneapolis TMO members

Requested Meetings That Have Not Yet Occurred:

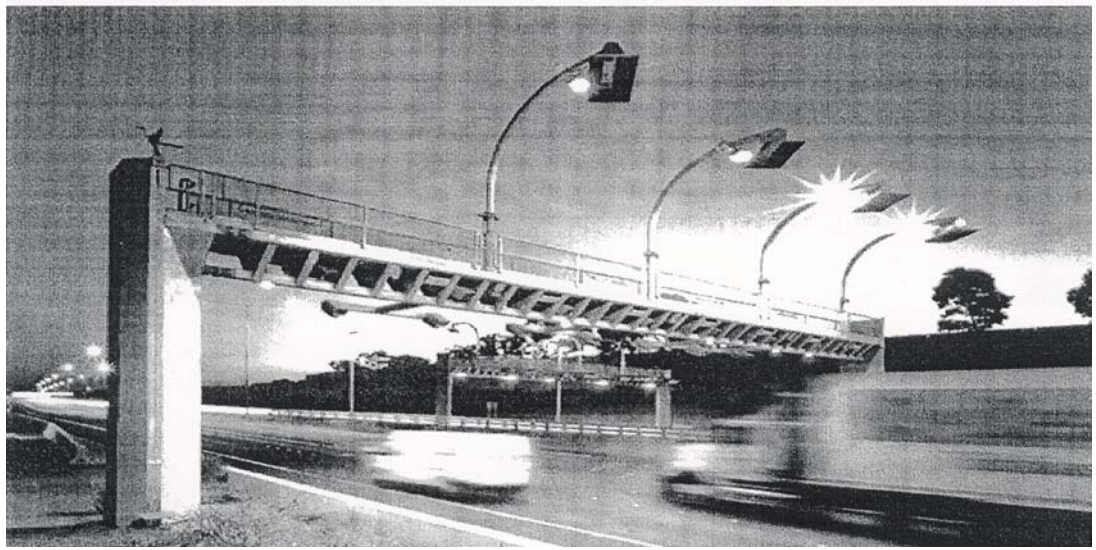
- Governor Jesse Ventura
- Governor's transportation aide Joe Bagnoli
- Metropolitan Council Chair Ted Mondale

Media

- Terwilliger-Flynn Crosstown commentary piece published in the Star Tribune
- Star Tribune editorial board members Tom Berg and Laurie Sturdevant
- Star Tribune Laurie Blake column (2)
- Pioneer Press transportation Toni Coleman article
- Mary Anderson commentary on Crosstown published in Golden Valley paper (circulated to area legislators)
- Munnich-Barnes Star Tribune commentary on I-394 HOT lane option submitted but not published

Community outreach efforts are on-going, and any Task Force members interested in becoming more active in explaining the Task Force's recommendations to the community are strongly encouraged to advise the Task Force Chair or staff.

Curbing Congestion:
Minnesota Value Pricing Task Force

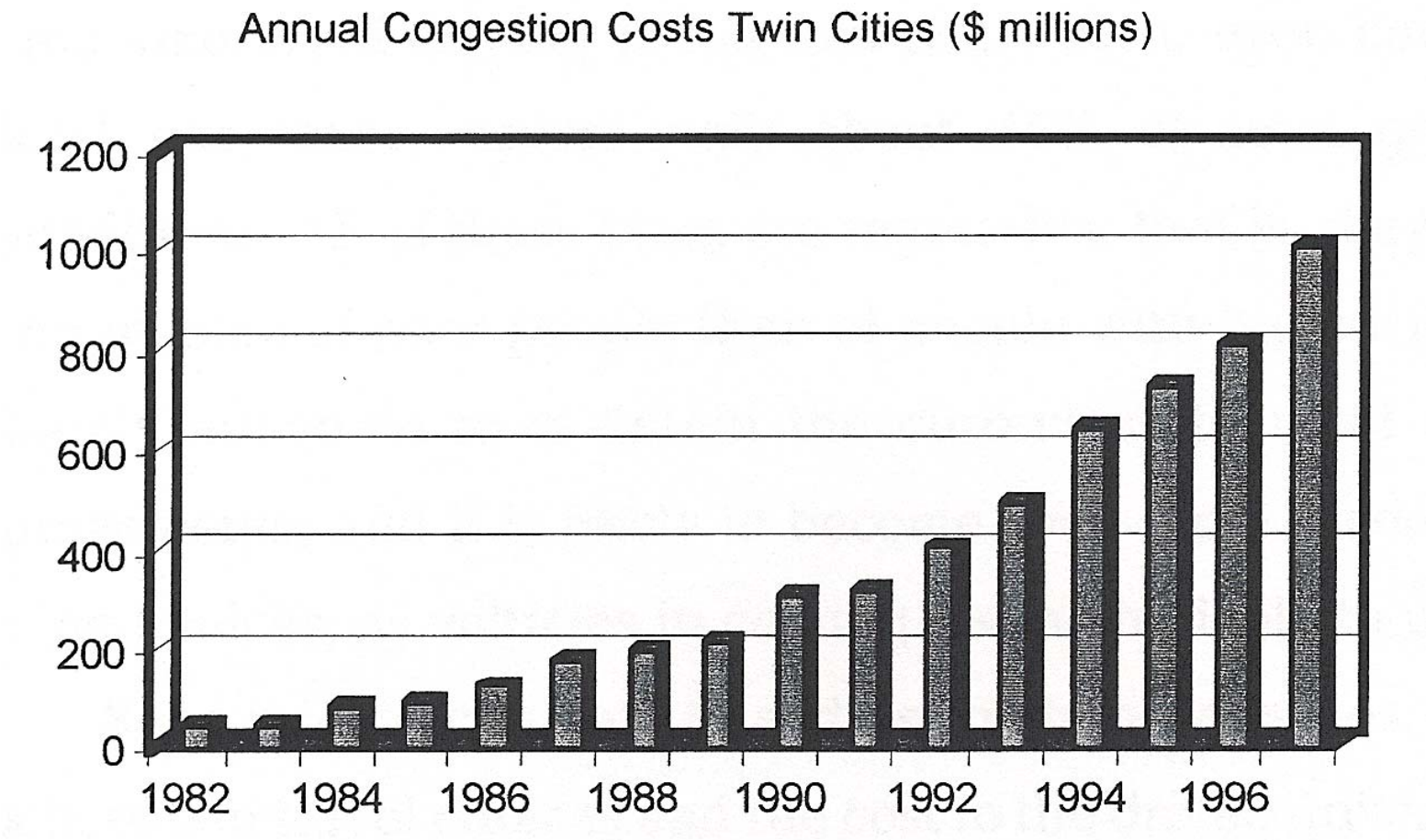


Developing public and political support for complex and controversial transportation projects through honest conversation with area leaders.

Background: Congestion Crisis Looming

- Twin Cities congestion growing at the 2nd fastest rate of any metro are in the U.S. (TX Transp. Institute)
- Twin Cities population expected to grow 38% by 2025.
- Several surveys of residents now name congestion as #1 public concern.
- Budget constraints make financing expensive transit and road improvements difficult. The Minnesota gas tax has not been increased since 1988, and may not be a a long-term stable source of funding as gas mileage increases.
- Value pricing, a potential solution that has proven effective elsewhere, has been rebuffed in Minnesota, in part because of a lack of wide-spread understanding of the extent of the problem or the benefits of pricing.

Congestion A Growing Economic Burden



What is “Value Pricing?”

- Electronically collected tolls designed to give drivers a price signal to mirror the costs drivers impose on others by being on the road.
- Used effectively elsewhere to:
  - Manage rush hour traffic flow
  - Provide revenue for gridlock-reducing transit and highway improvements
- Successful projects in: California, Florida, Texas, New York, Australia, Norway, Sinapore, Canada

Pricing  Less Congestion

Currently	With Pricing
Little incentive to avoid driving alone during rush hour	Provides financial incentives …to make optional trips during off-peak periods; …to take alternative routes or combine trips; or …to use carpooling or transit.
Transit and road funds scarce	Millions of dollars for congestion-reducing transit and transportation improvements.
Congestion getting worse	Has reduced congestion where used elsewhere.

Pricing  Responsibility

Currently	With Pricing
People who don't use freeways during peak times pay same amount as those who don't.	Those who use more, pay more. Those who find ways to use less, pay less.
30% of transportation improvements funded by property, sales or other taxes, which have nothing to do with how much you use roads.	Driving costs are more directly tied to how often you use scarce road space during rush hour.

Pricing  Transit Improvement

Currently	With Pricing
Transit perceived to be more expensive than driving.	People have much greater direct financial incentive to use buses and carpools.
Additional funds for transit scarce.	Millions in pricing revenue could be used to improve transit in the area.

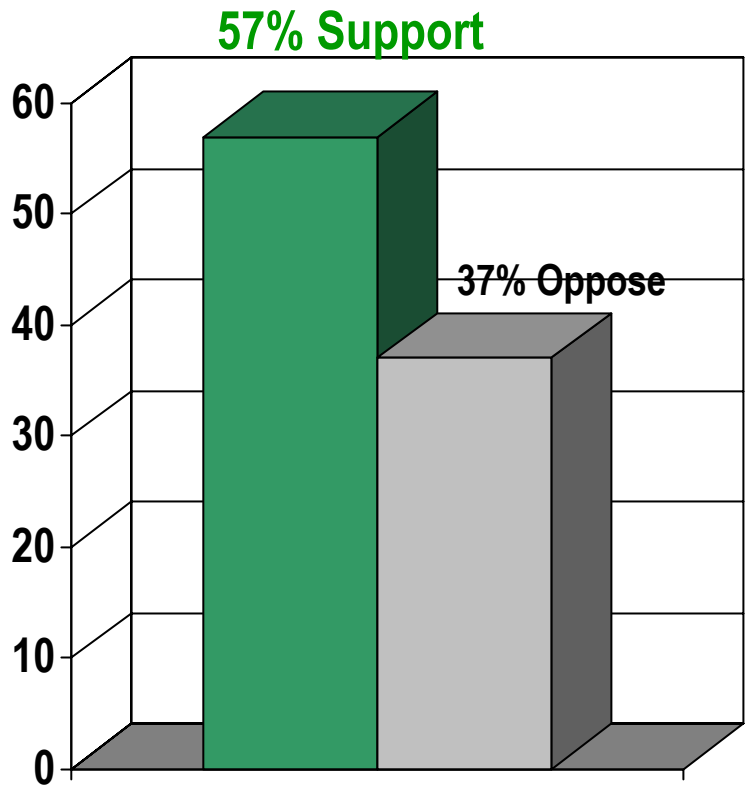
Value Pricing Task Force

- Legislature said value pricing should be considered as a long-term transportation funding source
- Humphrey Institute convened a group of 30 private, public and non-profit leaders
- Objective: Evaluate value pricing concept and identify demonstration projects that could test the concept

Pilot Projects recommended by the Task Force

Crosstown Commons	I-394 Express Lane	Stillwater Bridge
Use pricing on I-35W/Crosstown Commons during difficult 4-year reconstruction period. •Rush hour tolling for drivers going solo during peak periods •Helps manage rush hour traffic during construction chaos •Revenue pays for congestion-reducing transit and/or road improvements	Convert existing I-394 HOV lane to an tolled Express Lane •Winter 2002 study shows HOV lane currently underused •Solo drivers would have the option of buying into the lane •Revenue pays for congestion-reducing transit and/or road improvements	Use pricing to manage rush hour traffic on the bridge. •Rush hour tolling for drivers going solo during peak periods •Helps manage rush hour traffic •Revenue pays for congestion-reducing transit and/or road improvements

Will Minnesotans Support Value Pricing?



Decision Resources Ltd., Jan. 2002

- In a January 2002 survey, 57% of Twin Cities citizens supported “having an option of paying a fee to use an uncongested freeway lane when in a hurry.”
- Value pricing had more support that a gas tax increase (51% support)

Is the Time Right for Value Pricing?

"…(T)he scene has changed. Congestion has grown worse; a consultant's study has documented the under use of the carpool lanes on I-394 and Interstate Hwy. 35W, and – interestingly – a public opinion survey has found that there are a sizable number of people in the metro area who would be willing to pay a toll for the privilege of driving in a lane free of congestion."

3-28-02

PAGE B2 • STAR TRIBUNE *

METRO/STATE

Laurie Blake

Getting There

Would tolls solve congestion crisis?

Idea gaining to let motorists pay fee to use carpool lanes

Making better use of the open space in the carpool-bus lanes by allowing solo drivers to use them for a fee is an idea that is ripening slowly in Minnesota.

Intrigued by the prospects, legislators authorized a congestion-toll experiment on Interstate Hwy. 394 in 1997. But Jim Denn, then the transportation commissioner, canceled it in the face of public opposition.

He said at the time: "Solving the congestion crisis is of vital importance to the region's long-term economic success, and I do not want to eliminate any potential congestion-relief strategy from future consideration by pushing it forward prematurely. Unfortunately, despite the support of the Legislature, the Federal Highway Administration and the Minnesota Department of Transportation, I do not believe the proposed I-394 demonstration project enjoys the level of public understanding that is necessary for it to receive the objective analysis and fair consideration we seek."

Since then, the scene has changed. Congestion has grown worse; a consultant's study has documented the underuse of the carpool lanes on I-394 and Interstate Hwy. 35W, and — interestingly — a public-opinion survey has found that there are a sizable number of people in the metro area who would be willing to pay a toll for the privilege of driving in a lane free of congestion.

An independent poll taken by Decision Resources of Minneapolis in January and February in the Twin Cities metro area found that 57 percent of area residents would support having the option to pay a fee to use an uncongested freeway lane when they are in a hurry.

It's not hard to imagine commuters willingly paying a fee to get to a morning meeting on time or to make it home in time for a child's concert or basketball game. Many solo drivers already use the lanes illegally for similar reasons.

Limiting such traffic to maintain a fast trip for carpools and buses, there still would be room for another 500 to 1,000 solo drivers per hour on each of the express lanes during the morning and evening peak hours, MnDOT estimates. The Decision Resources poll suggested that it would not be difficult to fill that space.

Experience elsewhere suggests that making such a lane a success here would require the use of electronic toll collection. That process charges drivers as they pass under an electronic gateway.

The best example of this kind of operation is on Interstate Hwy. 15 in San Diego where an 8-mile transit lane was opened to toll payers in 1996. On that highway, carpoolers and bus riders use the lanes for free, while solo drivers pay a toll that goes up and down with congestion levels. Electronic signs flash the going rate before it's necessary to commit to the lanes. Tolls typically range from 50 cents during off-peak hours to $4 during the highest peak hour.

Because the tolls are collected electronically, those who want to use the lane must have an account and an electronic identification device in their windshield. More than 13,000 motorists have set up such an account.

Toll revenues are spent on bus service, and since 1996, bus ridership in the lane has increased by 9 percent.

A 2001 telephone survey of 800 I-15 motorists found that the toll lane is popular among those who use it as well as among those who use the regular lanes. The same poll found that the lane isn't a so-called "Lexus lane," having strong support from low- and high-income users alike.

The Decision Resources survey suggests that residents here are ready to try a pay-as-needed toll lane like the one in San Diego, said Lee Munnich, a public policy analyst at the University of Minnesota's Humphrey Institute of Public Affairs.

Although legislators have shown no interest in the topic this session in the wake of the report on the half-empty carpool and bus lanes, Munnich said the Humphrey Institute will continue to push for a toll-lane trial. A task force on road pricing will meet again in May to discuss prospects for pilot projects, he said.

Reader Mail

Look in the mirror: *I think we should all look in the mirror and ask: "Am I helping to alleviate or am I contributing to the enormous traffic problems that face our town today because of the sheer numbers of people who now live here and drive vehicles? Is three to five minutes at a ramp light too much for me to bear so that we can all share the freeway? Am I part of the problem or am I part of the solution?" . . . Come on. It won't hurt. What benefits all, in the end, benefits the individual. Come on. You can do it. You will still be free. I served my time in combat for the U.S. Army so that we would stay free. There are people today in combat with the armed services to ensure your freedom. Least you can do is ask yourself, "Am I part of the problem or am I part of the solution?" I promise. It won't hurt.* — **T.J. Skinner, St. Louis Park**

— Comments are welcome and must include your full name, community, and day and evening phone numbers. E-mail: Gettingthere@startribune.com; or mail: Getting There, Star Tribune, 425 Portland Av. S., Minneapolis, MN 55488; call: 612-673-9016. Join the discussion online at http://www.startribune.com/gettingthere

Community Outreach

Star Tribune Editorial

Star Tribune photo by David Brewster

The Interstate Hwy. 35 and Crosstown Hwy. 62 bottleneck: "Congestion pricing" could manage traffic and bring in revenue without toll booths.

A smart way to keep the Crosstown open during construction

For years, Minnesota's transportation leaders have struggled to find the best way to fix the bottleneck at Interstate Hwy. 35W and Crosstown Hwy. 62, one of the most congested and dangerous bottlenecks in America. What we have discovered has been difficult to swallow — all options bring significant inconvenience and costs to commuters and adjacent neighborhoods.

These facts were not lost on the 2001 Legislature. Because of concerns about the design as well as the impact of a potential closure of up to four years, the Legislature placed a one-year moratorium on construction so we could review a variety of design and construction options. That review continues.

The consultants retained by the Minnesota Department of Transportation have among their goals to avoid closing the Crosstown Hwy. 62 during construction, or to at least minimize the shutdown time. That is a tall order which requires thinking "outside the box."

We know that keeping Crosstown open during construction will raise its cost. Estimates indicated that the costs will go from the current $115 million to between $160 million and $170 million — not an insignificant change considering how difficult transportation dollars are to come by.

One possible alternative to deal with this huge cost increase comes from a task force of 37

- Vale Pricing Task Force members currently engaging community, legislative and executive branch leaders.

NEW HOPE • GOLDEN VALLEY SunPost

January 16, 2002

OPINION

Value pricing is a potential tool for addressing gridlock

By Mary Anderson
Guest Columnist

Traffic congestion and gridlock are becoming an increasing concern to the residents of Golden Valley and others in this metro area. In Golden Valley, we have Interstate 394, Highway 169 and Highway 100 touching our city and creating an increasing burden on our residents. It is critical that the governor and state Legislature start now to develop a variety of actions to deal with the problem.

Surveys conducted this year by Metropolitan State University and the Metropolitan Council rate congestion and transportation issues as the top concern of Twin Cities residents. The prediction is that 25 years from now we will have almost 40 percent more traffic on our already jammed roads. We need to get serious about the problem and be creative about solutions.

One interesting option that should be considered is called value pricing or congestion pricing. As with toll roads, value pricing charges freeway users on a per use basis, but the approach is very different from traditional toll roads in several important ways.

Unlike traditional toll roads, drivers aren't required to stop or even slow down in order to pay. Instead, they simply put a tag in their car and the tag is read at full speed by equipment hanging over the freeway. This technology has been proven over and over in places such as Canada, California, Florida, Australia and Norway.

Also unlike traditional toll roads, drivers are not charged if they use the road during off-peak periods of the day, or during nights and weekends. Citizens also aren't charged for the use of the road if they use public transit. They pay greatly reduced charges if they car pool. This gives drivers more choices than they have with toll roads.

When value pricing causes some drivers to choose to travel at other times, to use public transit or to car pool, fewer cars are on the road and congestion is less severe. Also, when the revenues raised through value pricing are invested in additional transit and adding freeway capacity, congestion is further reduced.

Recently I served on a task force, which studied value pricing. There were 37 leaders from the public, private and non-profit sectors. We looked at how value pricing works in other places around the nation and the world. We considered several options for doing a pilot project in this metropolitan region. Ultimately, we recommended that value pricing be tested during the reconstruction of the Crosstown Commons.

Last year, the Minnesota Department of Transportation (MnDOT) proposed to completely close the Commons to all traffic during the four-year reconstruction. The Legislature rejected this plan and has asked for alternatives. Value pricing can finance the cost of keeping the Crosstown Commons open and flowing during this lengthy construction period.

Keeping the Crosstown open will cost another $50 million to $60 million, according to MnDOT. That additional cost could draw funding from other road projects in this metro area. If value pricing is used on the Crosstown during construction, the $90 million to $130 million in net revenues paid by those Crosstown drivers who benefit most from keeping the Commons open could finance that additional cost. The pricing revenues could also finance significant transit improvements in the area to further reduce congestion.

This would be a demonstration project. Once the construction period is over, the charge would be terminated. A review of the experience by an independent authority would then help us better understand the costs and benefits of this approach.

Driving on freeways and on our other roads and streets is not free. We pay for these transportation options through local property taxes, state and federal income taxes, or state and federal gas taxes. Transportation improvements are critical to the viability and livability of this region. Value pricing provides a revenue option that also can reduce gridlock.

I suggest that you ask your legislators and the governor to consider value pricing as one of the creative ways to both fund transit and roadways as well as reduce congestion. This will be a topic in this next legislative session. Now is the time to act.

Mary Anderson is the former mayor of Golden Valley.

For More Information

www.valuepricing.org

Appendix F

Traffic Simulation Study Summary
SRF Consulting

HUMPHREY INSTITUTE VALUE PRICING PROJECT

PHASE I

TRAVEL DEMAND FORECAST RESULTS

Prepared by SRF Consulting Group, Inc.
May 11, 2001
SRF No. 003894

SRF
CONSULTING GROUP, INC.

BACKGROUND AND PURPOSE

The Hubert H. Humphrey Institute State and Local and Policy Program is participating with the Federal Highway Administration and the Minnesota Department of Transportation in the evaluation of value pricing in the Twin Cities Metropolitan Area. Specifically, the effort is aimed at identifying a pilot value pricing project for short-term implementation and later expansion into regional value pricing programs. As part of that process, travel demand modeling and analysis have been conducted to quantify and understand the effects of value pricing on the regional transportation system and on travel behavior in the Twin Cities.

This report includes analysis of impacts at the regional level and at a corridor level, and includes an assessment of the benefit-cost ratio.

DEFINITION OF PRICING ALTERNATIVES

Three alternatives are considered in this analysis:

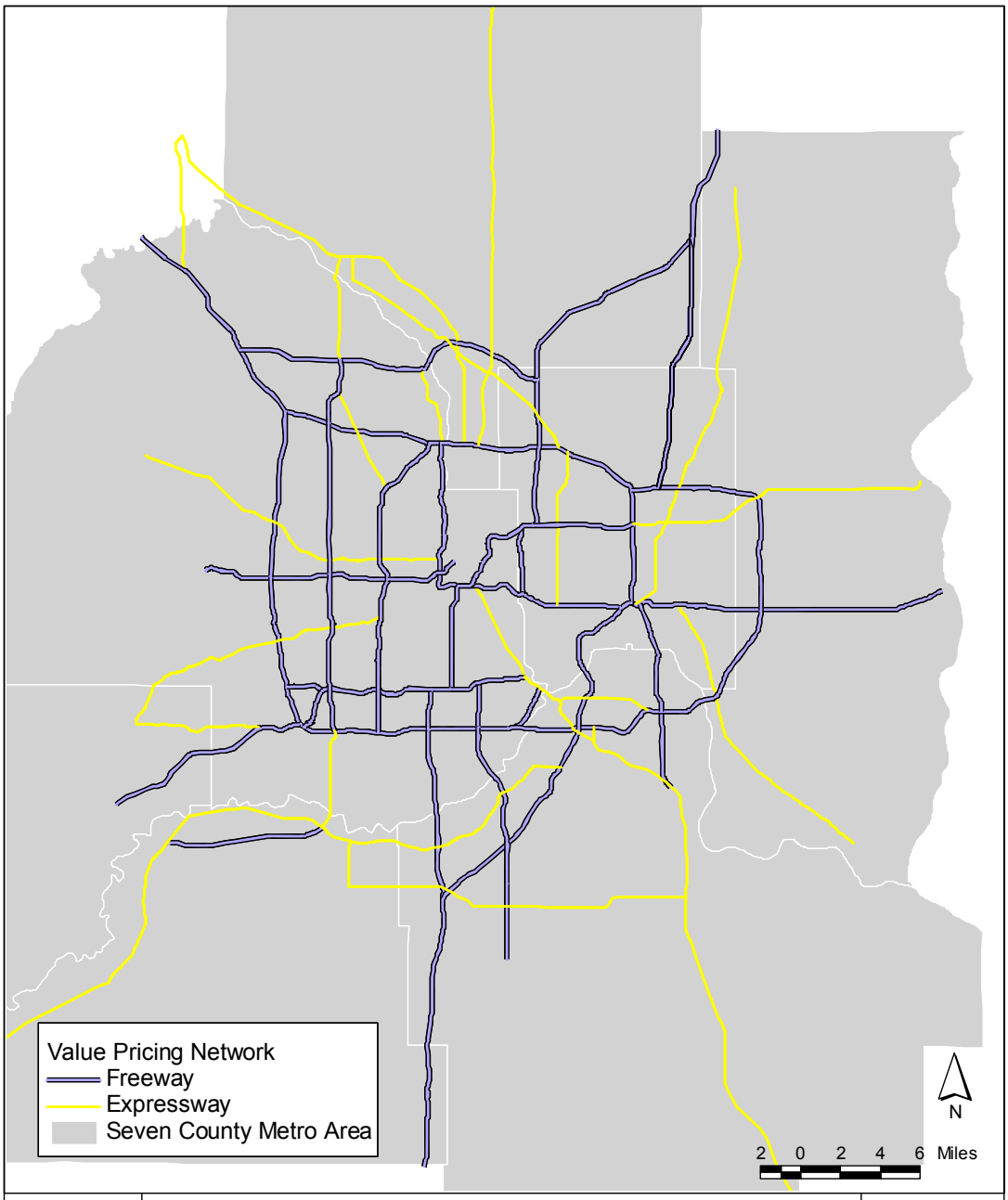
- **Baseline**: Assumes the year 2025 Metropolitan Council policy plan system, with adjustments to the location of HOV lane assumed on I-494. The policy plan network assumes the HOV lane from I-394 to TH 212 and from TH 100 to 34th Avenue South; whereas this study assumes the HOV lane to run continuously from I-394 to TH 100, with no HOV lane from TH 100 to 34th Avenue South. The final environmental impact statement being prepared for I-494 includes these segments as a "managed corridor" system with no designated HOV lanes.

- **Priced Scenario:** Assumes the baseline network but adds a distance-based price during peak times. All freeways and expressways are priced at a rate of 12 cents per mile in the peak periods, and 6 cents per mile in the shoulders of the peak. High occupancy vehicles (HOVs) are exempt from the charge on freeways, but pay it on expressways due to the impossibility of identifying HOVs on an expressway. The time periods and defined prices for the scenario are shown in Table 1. Figure 1 shows the location of the assumed priced facilities.

- **Subarea Corridor (Priced):** The effects of the system pricing scenario are reviewed in detail for the I-35W corridor between downtown Minneapolis and Burnsville, including nearby minor arterials. It should be noted that the results of this analysis would be different for a scenario where only the I-35W corridor was assumed to be priced. Figure 2 shows the location of the I-35W corridor.

Table 1
Time Periods for Pricing

Time Period	Time	Duration	Price
AM Peak Shoulders	6:30 - 7:00 a.m. 8:00-8:30 a.m.	1 hour	6 cents/mile
AM Peak Hour(s)	7:00 - 8:00 a.m.	1 hour	12 cents/mile
Midday	8:30 a.m. - 2:00 p.m.	5.5 hours	--
PM Peak Shoulders	2:00 –3:00 p.m. 6:00-7:00 p.m	2 hours	6 cents/mile
PM Peak Hours	3:00 - 6:00 p.m.	3 hours	12 cents/mile
Evening/Night	7:00 p.m. – 6:30 a.m.	11.5 hours	--

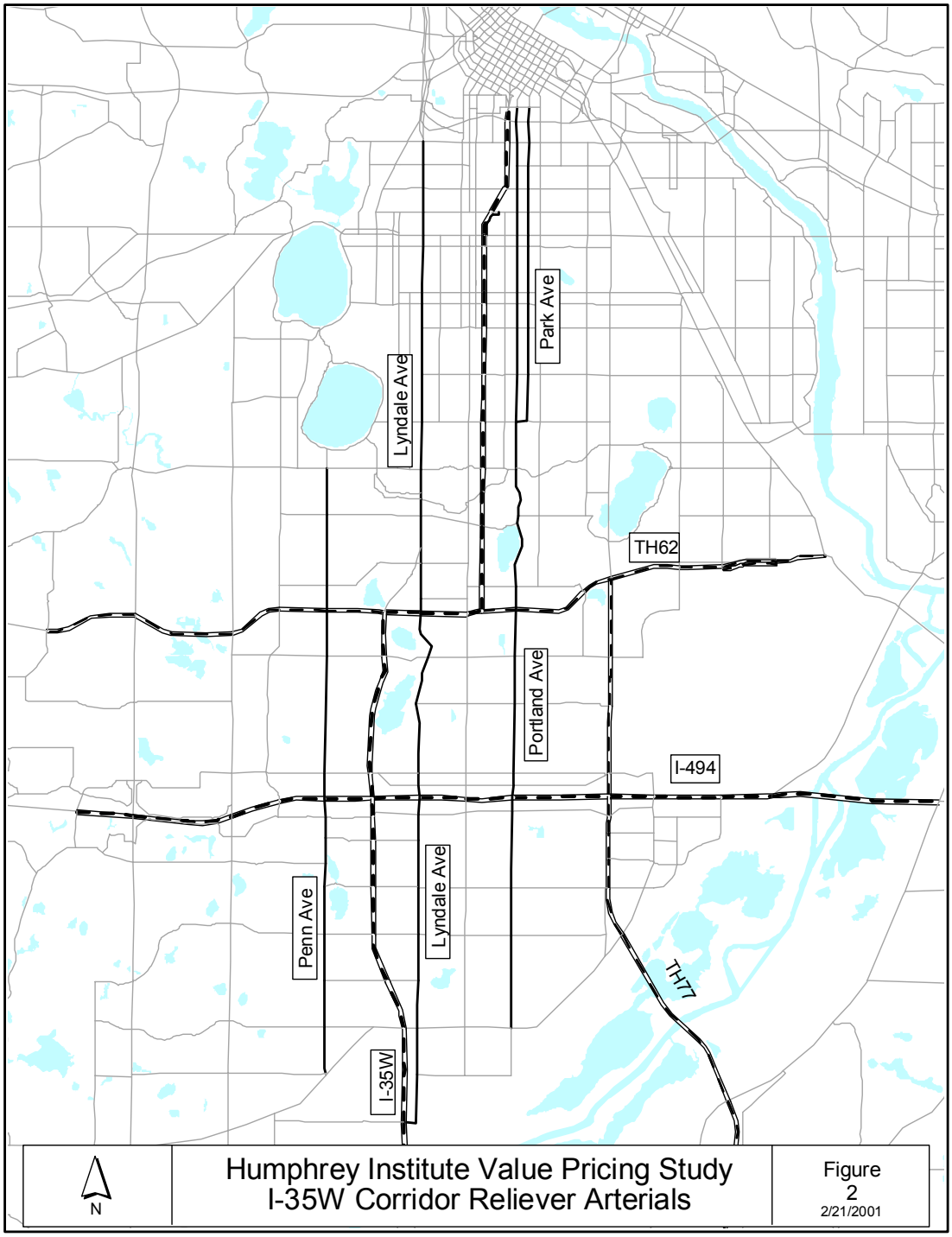


SRF Consulting Group, Inc.

Twin Cities Freeways and Expressways

Value Pricing Study Phase 1

Figure 1



Humphrey Institute Value Pricing Study
I-35W Corridor Reliever Arterials

Figure 2
2/21/2001

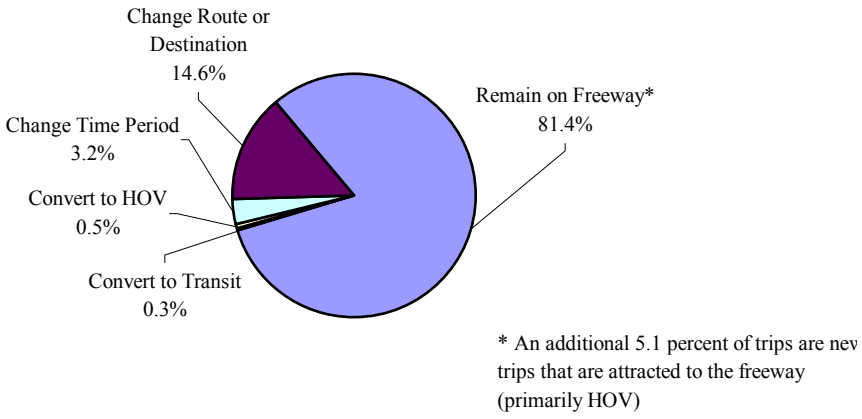
REGIONAL SCENARIO RESULTS

The regional pricing scenario achieves varying degrees of travel behavior change, including changes in mode, changes in time of travel and changes in the destination and/or route of travel used.

Trips Using the Freeway System

Figure 3 summarizes the overall effect on peak hour trips using the freeway and expressway system. In general, pricing appears to show a small effect on mode shift (less than one percent of the trips), and a small effect on peak spreading at 3.2 percent. However, a significant diversion of traffic from the freeway system occurs, with an 18.1 percent of "baseline" traffic either diverting to non-freeway routes or altering the choice of destination. The reduction in traffic due to the pricing is somewhat offset by new freeway users; these new trips are almost exclusively pre-existing HOVs that were not previously using the freeway, but would divert to the freeway because they can travel for free on the less-congested roadway. The increase represents 5.1 percent of the trips using the freeway under the priced scenario. The 81.4 percent remaining on the freeway system may include those shifting routes within the system.

Figure 3
Effect of Pricing on Peak Hour Freeway Travel



Vehicle Miles of Travel (VMT)

Under the regional pricing scenario, daily regional VMT decreases by six percent (see Table 1). Freeway VMT decreased significantly in all time periods, up to a maximum of 35 percent in the p.m. peak hour. Arterial and collector VMT decreases slightly during the night and midday and increases during the peak periods and peak shoulders. Decreases exhibited during non-priced times reflect the overall effect of trip redistribution or mode shifting across the day.

Table 2
Daily Vehicle Miles of Travel

	2025 Baseline	2025 Priced	Change
All Roadways			
Nights/Evenings	14,426,000	13,678,000	-5%
AM Peak Shoulders	5,444,000	5,131,000	-6%
AM Peak Hour	*7,995,000*	*7,376,000*	*-8%*
Midday Offpeak	21,506,000	20,195,000	-6%
Midday Peak Shoulder	4,639,000	4,422,000	-5%
PM Peak Hours	*20,352,000*	*18,788,000*	*-8%*
Evening Peak Shoulder	5,089,000	4,910,000	-4%
Total	79,451,000	74,502,000	-6%
Freeways and Expressways			
Nights/Evenings	8,471,000	7,810,000	-8%
AM Peak Shoulders	2,998,000	2,280,000	-24%
AM Peak Hour	*4,030,000*	*2,909,000*	*-28%*
Midday Offpeak	12,086,000	11,018,000	-9%
Midday Peak Shoulder	2,596,000	1,926,000	-26%
PM Peak Hours	*10,589,000*	*6,867,000*	*-35%*
Evening Peak Shoulder	2,760,000	2,136,000	-23%
Total	43,530,000	34,947,000	-20%
Other Facilities			
Nights/Evenings	5,955,000	5,868,000	-1%
AM Peak Shoulders	2,446,000	2,852,000	17%
AM Peak Hour	*3,965,000*	*4,467,000*	*13%*
Midday Offpeak	9,420,000	9,177,000	-3%
Midday Peak Shoulder	2,043,000	2,496,000	22%
PM Peak Hours	*9,763,000*	*11,921,000*	*22%*
Evening Peak Shoulder	2,329,000	2,774,000	19%
Total	35,921,000	39,555,000	10%

Vehicle Hours of Travel (VHT)

Daily VHT decreases by six percent. Freeway VHT decreases in all time periods. The decrease is largest in the morning and afternoon peak periods. Arterial and Collector VHT decreases slightly during the night and midday and increases during the peak periods and peak shoulders.

Table 3
Daily Vehicle Hours Travel

	2025 Baseline	2025 Priced	Change
All Roadways			
Nights/Evenings	323,000	309,000	-4%
AM Peak Shoulders	148,000	141,000	-5%
AM Peak Hour	*297,000*	*262,000*	*-12%*
Midday Offpeak	520,000	487,000	-6%
Midday Peak Shoulder	115,000	112,000	-3%
PM Peak Hours	*594,000*	*556,000*	*-6%*
Evening Peak Shoulder	128,000	125,000	-2%
Total	2,124,000	1,992,000	-6%
Freeways and Expressways			
Nights/Evenings	149,000	138,000	-7%
AM Peak Shoulders	69,000	50,000	-28%
AM Peak Hour	*137,000*	*87,000*	*-36%*
Midday Offpeak	230,000	206,000	-10%
Midday Peak Shoulder	52,000	36,000	-31%
PM Peak Hours	*266,000*	*147,000*	*-45%*
Evening Peak Shoulder	56,000	41,000	-27%
Total	958,000	705,000	-26%
Other Facilities			
Nights/Evenings	174,000	171,000	-2%
AM Peak Shoulders	78,000	91,000	17%
AM Peak Hour	*160,000*	*175,000*	*9%*
Midday Offpeak	290,000	281,000	-3%
Midday Peak Shoulder	64,000	76,000	19%
PM Peak Hours	*329,000*	*408,000*	*24%*
Evening Peak Shoulder	72,000	84,000	17%
Total	1,165,000	1,286,000	10%

Mode Split

Under pricing, a small mode shift occurs from single occupancy vehicles to high occupancy vehicles and transit across all purposes (see Table 4). Additionally, HOV occupancy increased from 2.39 persons per vehicle to 2.41 persons per vehicle under the priced scenario.

Transit mode share increases appear to be limited because the longer-distance and dispersed travel market served by the freeway system is a difficult market to serve by transit. Furthermore, the baseline transit network assumes a high level of transit service – thus capturing a significant portion of the likely market potential. However, the benefit of the transit increases is still significant because the increase occurs during congested time periods.

Table 4
Effect of Pricing on Mode

	Mode	Baseline	Priced
Work Person-Trips	SOV	1,498,000	1,483,000
	HOV	279,000	288,000
	Transit	176,000	180,000
Non-Work Person-Trips	SOV	4,926,000	4,922,000
	HOV	4,278,000	4,280,000
	Transit	133,000	135,000

Average Speeds

Freeway average speeds increase by two to six percent in the peak shoulders and by fifteen percent in the morning and afternoon peak hours. There is no significant change in regional arterial and collector speeds (Table 5).

Table 5
Average Speed

	2025 Baseline	2025 Priced	Change
All Roadways			
Nights/Evenings	44.7	44.3	-1%
AM Peak Shoulders	36.8	36.4	-1%
AM Peak Hour	*27.0*	*28.2*	*5%*
Midday Offpeak	41.4	41.5	0%
Midday Peak Shoulder	40.3	39.4	-2%
PM Peak Hours	*34.3*	*33.8*	*-1%*
Evening Peak Shoulder	39.9	39.2	-2%
Total	37.4	37.4	0%
Freeways and Expressways			
Nights/Evenings	56.7	56.8	0%
AM Peak Shoulders	43.2	45.3	5%
AM Peak Hour	*29.5*	*33.5*	*14%*
Midday Offpeak	52.6	53.5	2%
Midday Peak Shoulder	50.3	53.3	6%
PM Peak Hours	*39.9*	*46.6*	*17%*
Evening Peak Shoulder	49.2	52.3	6%
Total	45.4	49.6	9%
Other Facilities			
Nights/Evenings	34.3	34.3	0%
AM Peak Shoulders	31.2	31.4	1%
AM Peak Hour	*24.8*	*25.5*	*3%*
Midday Offpeak	32.5	32.7	0%
Midday Peak Shoulder	32.2	32.8	2%
PM Peak Hours	*29.7*	*29.2*	*-2%*
Evening Peak Shoulder	32.6	32.9	1%
Total	30.8	30.8	0%

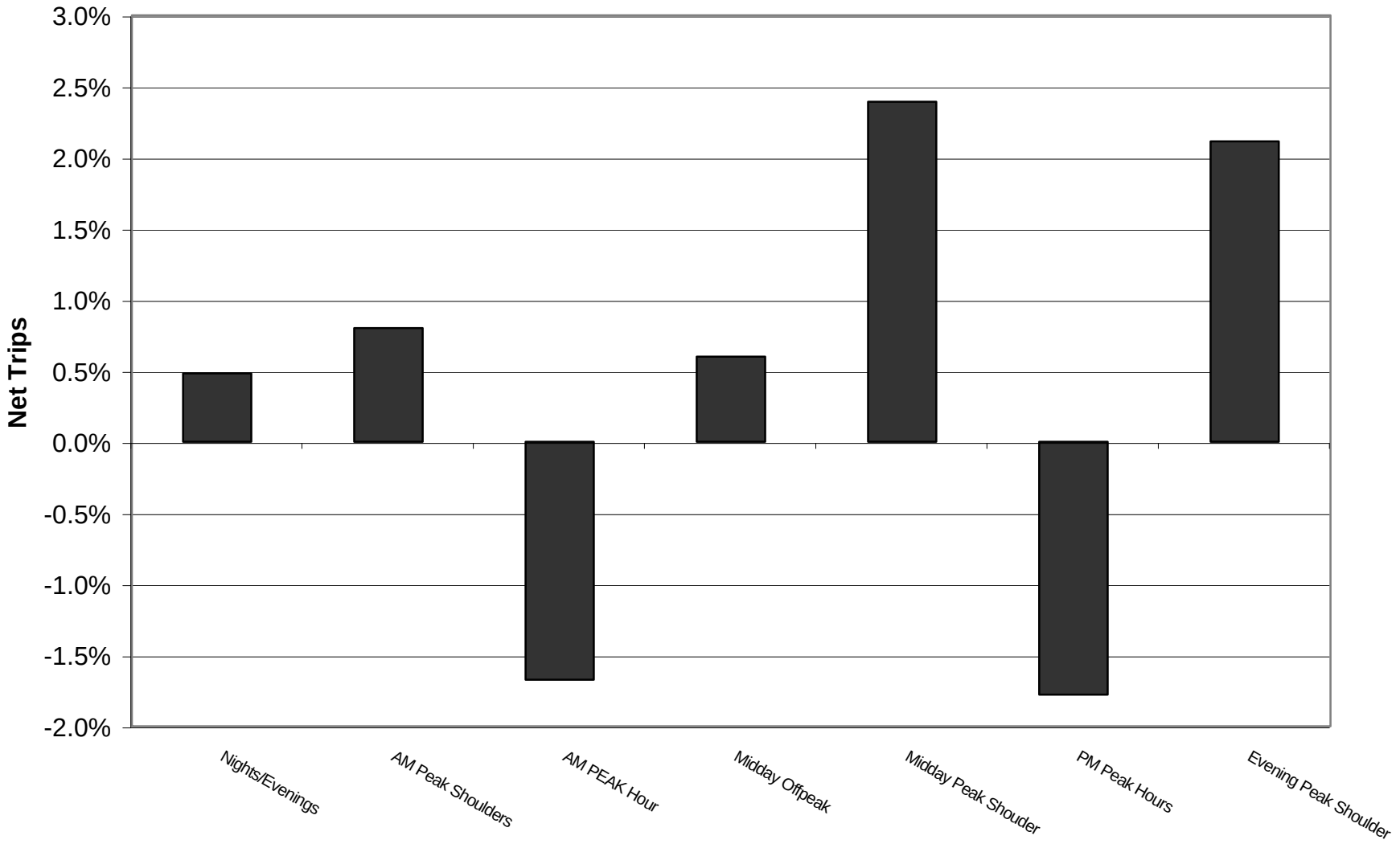
Peak Spreading

Under the priced scenario, a total 56,200 trips shift from the morning and afternoon peak hours to the peak shoulders. In addition, 24,900 trips shift from the shoulders of the peak to offpeak time periods (see Table 6 and Figure 4). Peak spreading is limited by the presence of congestion in the peak shoulders, which reduces the time-advantage to shifting.

Table 6
Peak Spreading Model Results

	2025 Baseline	2025 Priced	Change
Pre-Spread Trips			
Nights/Evenings	1,673,600	1,671,300	-0.1%
AM Peak Shoulders	544,200	542,500	-0.3%
AM Peak Hour	*803,000*	*800,400*	*-0.3%*
Midday Offpeak	2,813,800	2,811,300	-0.1%
Midday Peak Shouder	563,600	562,900	-0.1%
PM Peak Hours	*2,412,000*	*2,408,000*	*-0.2%*
Evening Peak Shoulder	636,700	636,100	-0.1%
Post-Spread Trips			
Nights/Evenings	1,681,100	1,686,800	0.3%
AM Peak Shoulders	551,300	554,000	0.5%
AM Peak Hour	*792,200*	*776,200*	*-2.0%*
Midday Offpeak	2,820,800	2,835,200	0.5%
Midday Peak Shouder	580,600	593,300	2.2%
PM Peak Hours	*2,375,500*	*2,328,700*	*-2.0%*
Evening Peak Shoulder	645,500	658,400	2.0%
Changes			
Nights/Evenings	7,500	15,500	107%
AM Peak Shoulders	7,100	11,500	62%
AM Peak Hour	*-10,800*	*-24,200*	*124%*
Midday Offpeak	7,000	23,900	241%
Midday Peak Shoulder	17,000	30,400	79%
PM Peak Hours	*-36,500*	*-79,300*	*117%*
Evening Peak Shoulder	8,800	22,300	153%

Figure 4: Peak Spreading Due to Pricing



Congestion and Delay

Congestion on the freeway and expressway system is reduced significantly under the priced scenario. Of 1,334 miles of freeways and expressways in the region, 966 operate at or below LOS D and 459 of them are at LOS F in the baseline scenario (see Table 6 and Figure 5). In the priced scenario, only 438 miles operate at or below LOS D and 187 of them are at LOS F.

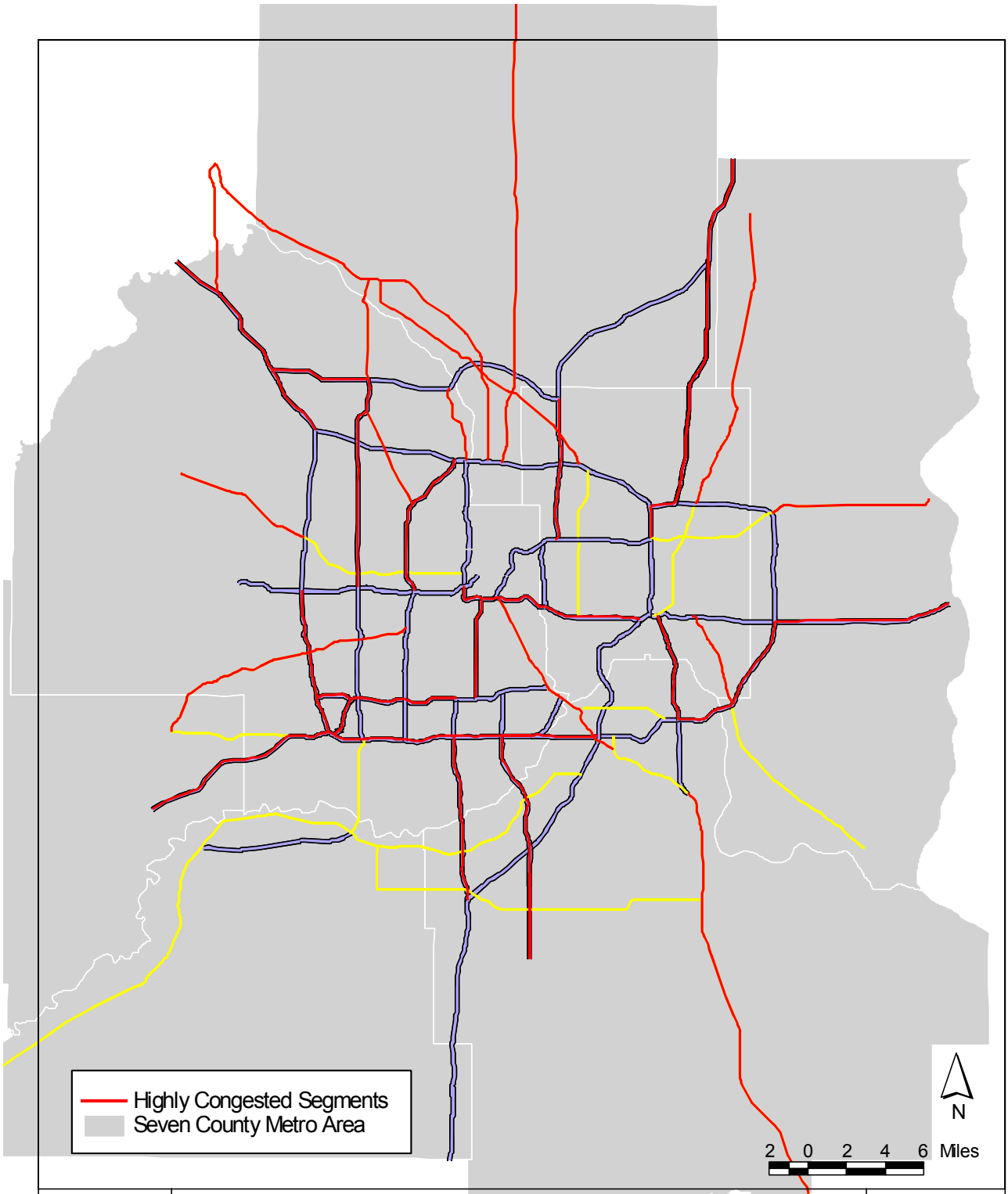
The following corridors are projected to operate at LOS F in the baseline scenario, and operate at LOS C or better in the priced scenario:

1. I-35E between I-694 and TH-36
2. I-35W between TH-62 and I-94
3. I-494 between TH-77 to I-394
4. I-94 between I-394 to TH-280
5. US-61 north of I-694
6. TH-7 west of I-494
7. TH-36 east of I-694
8. TH-55 between TH-62 and I-94
9. TH-62 between I-494 and I-35W
10. TH-47 south of US-10
11. TH-610 west of US-169

In addition to the number of miles that experience congestion, the amount of delay experienced is a key indicator of the efficiency of the transportation system. As shown in Table 7, the total amount of delay decreases overall by 23 percent from the baseline to the priced scenario. Peak hour delay on the freeways and expressways decreases by 46 percent (a.m.) to 66 percent (p.m.), but his decrease is partially offset by increases in delays on other roadways due to traffic diversion.

Table 7
Miles of Congestion

	2025 Baseline	2025 Priced	Change
Freeway/Expressway Miles	1334	1334	
LOS "D" Miles	966	438	-55%
Percent LOS "D"	*72%*	*33%*	
LOS "F" Miles	459	187	-59%
Percent LOS F	*34%*	*14%*	

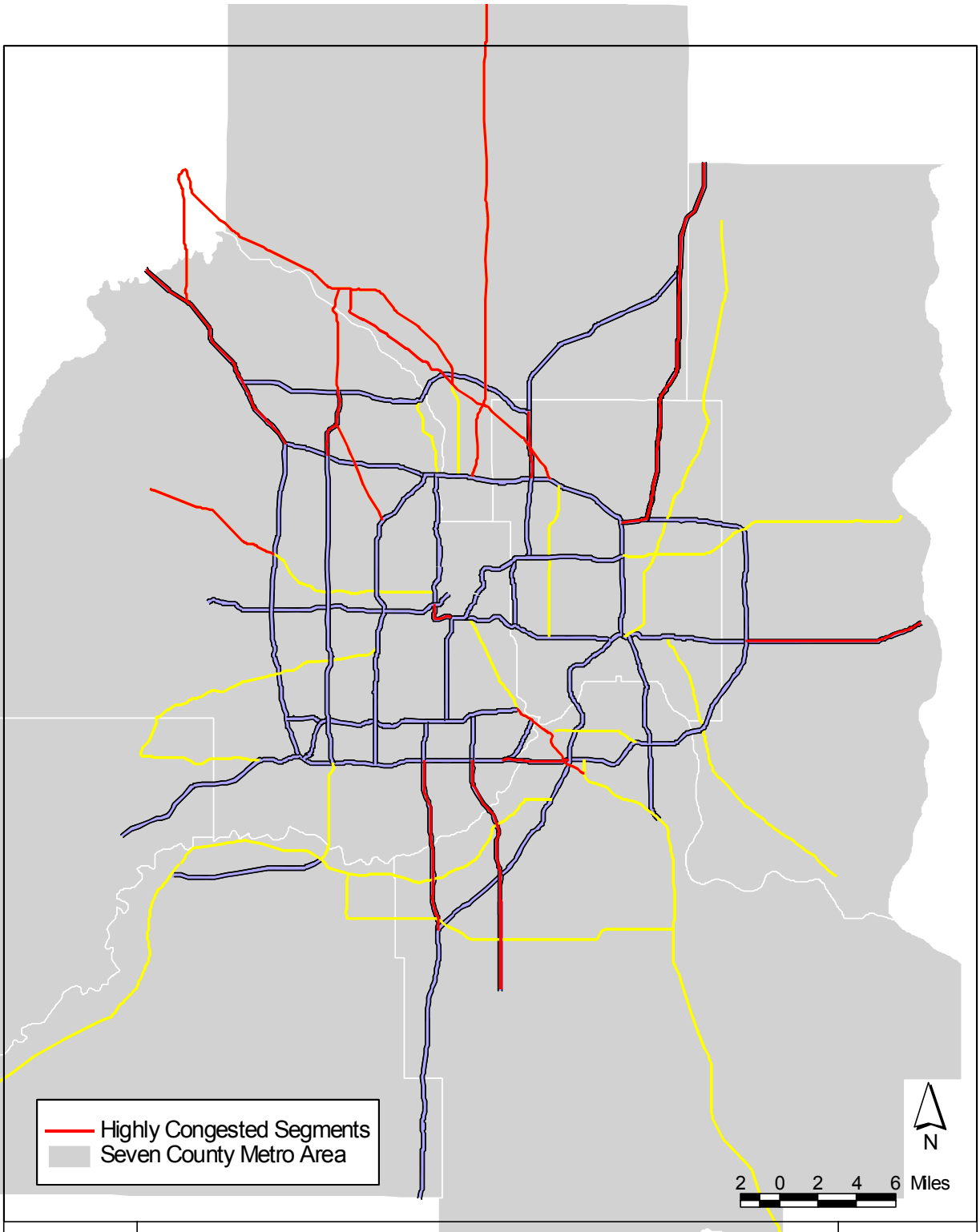


SRF Consulting Group, Inc.

Baseline Congested Segments

Value Pricing Study Phase 1

Figure 5



SRF Consulting Group Inc.

Priced Scenario Congested Segments

Value Pricing Study Phase 1

Figure 6

Table 8
Daily Vehicle Hours of Delay

	2025 Baseline	2025 Priced	Change
All Roadways			
Nights/Evenings	570	430	-25%
AM Peak Shoulders	24,240	20,310	-16%
AM Peak Hour	*109,910*	*82,750*	*-25%*
Midday Offpeak	23,410	16,990	-27%
Midday Peak Shoulder	8,230	6,130	-26%
PM Peak Hours	*122,110*	*95,690*	*-22%*
Evening Peak Shoulder	10,670	8,430	-21%
Total	299,140	230,730	-23%
Freeways and Expressways			
Nights/Evenings	380	280	-26%
AM Peak Shoulders	16,180	10,090	-38%
AM Peak Hour	65,140	35,400	-46%
Midday Offpeak	14,920	10,230	-31%
Midday Peak Shoulder	5,450	2,200	-60%
PM Peak Hours	*77,320*	*26,400*	*-66%*
Evening Peak Shoulder	7,160	3,380	-53%
Total	186,550	87,980	-53%
Other Facilities			
Nights/Evenings	190	150	-21%
AM Peak Shoulders	8,060	10,220	27%
AM Peak Hour	*44,770*	*47,350*	*6%*
Midday Offpeak	8,490	6,760	-20%
Midday Peak Shoulder	2,780	3,930	41%
PM Peak Hours	*44,790*	*69,290*	*55%*
Evening Peak Shoulder	3,510	5,050	44%
Total	112,590	142,750	27%

Revenue

The revenue generated by the region in the priced scenario is $1,539,000 daily. Of this, $1,161,000 is generated during the peak hours, and $378,000 is generated during the peak shoulders.

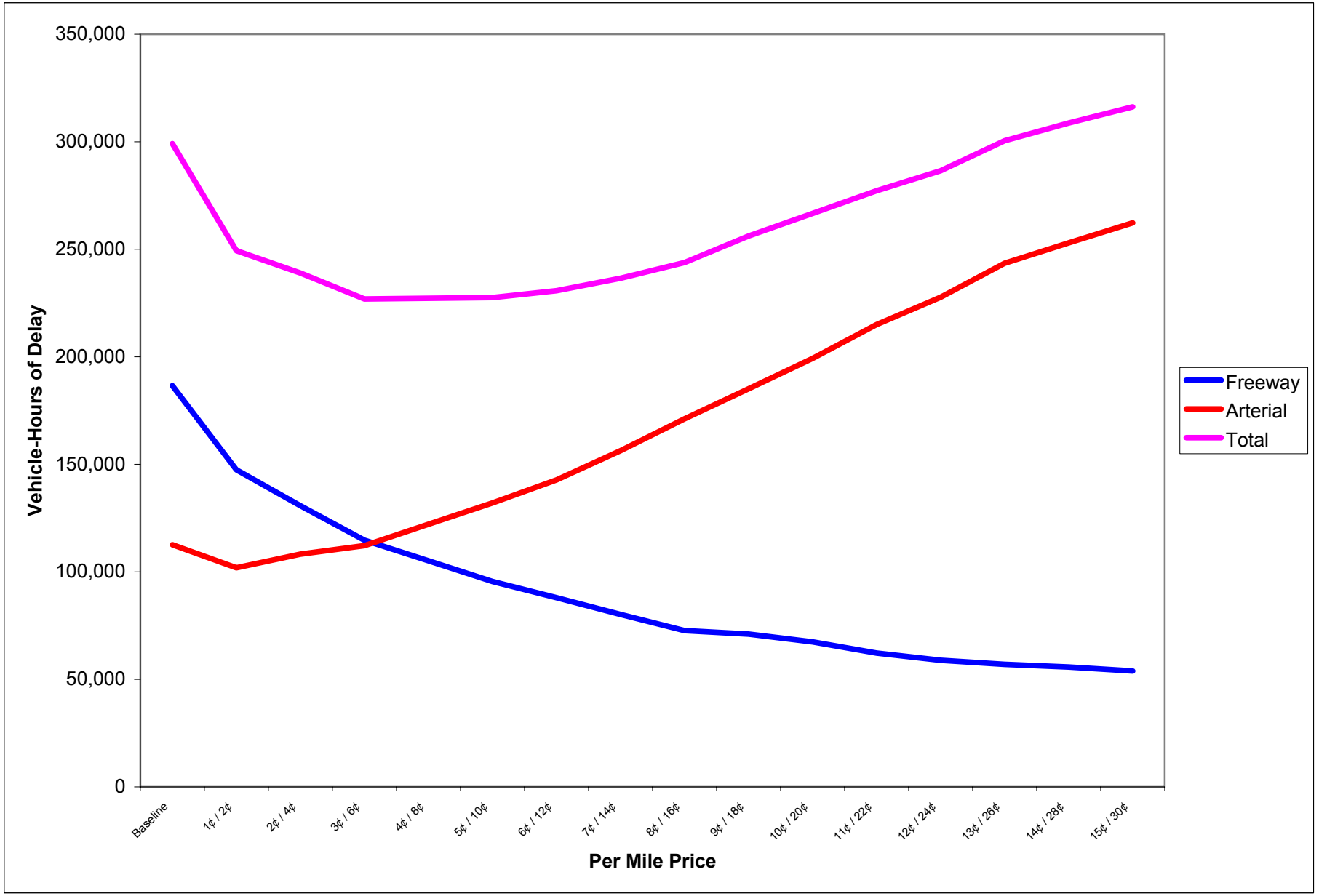
Pricing Sensitivity Tests

Multiple peak and off-peak pricing combinations were tested, ranging from no pricing (the baseline alternative) to thirty cents per mile in the peak hour. Peak shoulder prices were assumed at one-half of those for the peak hour.

For the purpose of analyzing the effectiveness of each pricing scenario, vehicle hours of delay was selected as a single measure of effectiveness; delay is a major indicator of congestion and user travel time dis-benefit. The total delay under the baseline scenario is 299,000 vehicle-hours. The minimum delay (approximately 228,000 vehicle-hours) occurs with a peak period price of ten cents per mile (Figure 7).

Total delay rises with pricing levels that are higher and lower than ten cents per mile. The baseline delay is exceeded when the price approaches 28 cents per mile.

Under the scenarios studied, the revenue collected continues to increase from $1,174,000 under a peak period price of eight cents to $2,424,000 under a price of twenty-eight cents per mile. The marginal price increase, measured as the change in delay per dollar of revenue, reaches a minimum at fourteen cents per mile. Based on these data, twelve cents per mile is close to the optimum peak period price.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Vehicle-Hours of Delay
Baseline
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12¢ / 24¢
13¢ / 26¢
14¢ / 28¢
15¢ / 30¢
Per Mile Price
Freeway
Arterial
Total

I-35W CORRIDOR SCENARIO RESULTS

Vehicle Miles of Travel

Vehicle-miles of travel (VMT) drops by twenty-four percent in the peak hours on the freeway, and by seventeen percent on a daily basis. However, there is an increase in VMT of nine percent on nearbyarterial and collector streets within the corridor. While it is likely that the majority of these trips were previously users of I-35W, such a conclusion can not be made with certainty; the number of model iterations performed, the effects of trip redistribution and the pricing assumed in other corridors limits the ability to trace the changes in trip behavior among trips on specific roadways from one scenario to the next.

Table 9
Daily Vehicle Miles Of Travel (I-35W Corridor)

	2025 Baseline	2025 Priced	Change
All Roadways			
Nights/Evenings	667,000	594,000	-11%
AM Peak Shoulders	246,000	222,000	-10%
AM Peak Hour	371,000	335,000	-10%
Midday Offpeak	1,102,000	980,000	-11%
Midday Peak Shoulder	231,000	211,000	-9%
PM Peak Hours	959,000	869,000	-9%
Evening Peak Shoulder	248,000	228,000	-8%
Total	3,823,000	3,439,000	-10%
Freeways and Expressways			
Nights/Evenings	425,000	368,000	-13%
AM Peak Shoulders	147,000	118,000	-20%
AM Peak Hour	188,000	153,000	-19%
Midday Offpeak	673,000	588,000	-13%
Midday Peak Shoulder	135,000	109,000	-19%
PM Peak Hours	516,000	384,000	-26%
Evening Peak Shoulder	138,000	114,000	-17%
Total	2,221,000	1,834,000	-17%
Other Facilities			
Nights/Evenings	241,000	226,000	-6%
AM Peak Shoulders	100,000	104,000	4%
AM Peak Hour	183,000	182,000	-1%
Midday Offpeak	429,000	392,000	-9%
Midday Peak Shoulder	96,000	103,000	7%
PM Peak Hours	443,000	485,000	9%
Evening Peak Shoulder	110,000	115,000	5%
Total	1,602,000	1,605,000	0%

Vehicle Hours of Travel

Table 9 shows the estimated vehicle hours of travel for roadways in the I-35W corridor. The freeway system, as expected, shows the greatest reduction in VHT, with a 47-51 percent reduction in the peak hours. The roadway system shows a lower overall VHT, a function of trip redistribution and diversion to other corridors or roadways as well as mode choice. However, VHT does increase on the arterial roadways in the peak hours, particularly in the p.m. peak hours at a 15 percent increase.

Table 10
Daily Vehicle Hours of Travel (I-35W Corridor)

	2025 Baseline	2025 Priced	Change
All Roadways			
Nights/Evenings	881,000	742,000	-16%
AM Peak Shoulders	318,000	272,000	-14%
AM Peak Hour	*716,000*	*531,000*	*-26%*
Midday Offpeak	1,452,000	1,221,000	-16%
Midday Peak Shoulder	300,000	261,000	-13%
PM Peak Hours	*1,872,000*	*1,373,000*	*-27%*
Evening Peak Shoulder	318,000	281,000	-12%
Total	5,858,000	4,682,000	-20%
Freeways and Expressways			
Nights/Evenings	523,000	402,000	-23%
AM Peak Shoulders	178,000	126,000	-29%
AM Peak Hour	*420,000*	*221,000*	*-47%*
Midday Offpeak	826,000	638,000	-23%
Midday Peak Shoulder	165,000	118,000	-28%
PM Peak Hours	*1,169,000*	*567,000*	*-51%*
Evening Peak Shoulder	167,000	122,000	-27%
Total	3,449,000	2,193,000	-36%
Other Facilities			
Nights/Evenings	358,000	340,000	-5%
AM Peak Shoulders	140,000	146,000	4%
AM Peak Hour	*296,000*	*310,000*	*5%*
Midday Offpeak	626,000	584,000	-7%
Midday Peak Shoulder	136,000	144,000	6%
PM Peak Hours	*703,000*	*806,000*	*15%*
Evening Peak Shoulder	151,000	159,000	5%
Total	2,409,000	2,488,000	3%

Trip Redistribution

The primary factor influencing this shift appears to be trip redistribution of trips to destinations out of the corridor. On a daily basis, the amount of travel on corridor roadways decreases in the corridor by nearly 400,000 VMT. However, the amount of travel on the arterial system increases by only 3,000 VMT. It is unlikely that a significant amount of diversion is occurring to other freeway corridors, since they are equally priced. However, the relative volume reduction on I-35W does increase further from Downtown Minneapolis (from eighteen percent to twenty-one percent), and then decreases to ten percent at the Minnesota River crossing. This indicates that more trips are redistributed to other areas as the destination choice increases further from downtown. There are fewer options available to crossing the river at the I-35W bridge, therefore the volume reduction is lower.

Modal Shift and Peak Spreading

Certain conclusions and measurements cannot be made within the I-35W corridor for a variety of reasons. The ability to trace changes in mode and time of travel is lost through the process of trip redistribution, since the number of person trips traversing the corridor changes. The identity of I-35W users in the baseline scenario can be determined from the zone-to-zone interchanges that use I-35W. However, the pattern of interchanges varies from time period to time period and alternative. Furthermore, the trip redistribution process may take a corridor trip an redistribute it to an area outside of the corridor. These issues affect the validity of measuring corridor-level changes in mode choice.

This issue is not a problem in the regional analysis because all trips are contained within the region, whereas trips shift in or out of a corridor (particularly one such as I-35W with parallel or adjacent freeway corridors.

Level of Service

Conditions on I-35W between Downtown Minneapolis and Burnsville (see Figure 2) improve significantly in the priced scenario. Volumes on the freeway decline by ten to twenty-one percent depending on the location. Of the twelve freeway segments in the corridor, eight operate at a LOS D or E and four at a LOS F in the baseline 2025 scenario. In the priced scenario, only two segments operate at a LOS D or E and only one at LOS F. These results are shown in Table 10.

Table 11
I-35W Freeway Volumes and Level of Service

Segment	Average Daily Traffic 2025 Baseline	Average Daily Traffic 2025 Priced	Peak Level of Service [1] 2025 Baseline	Peak Level of Service [1] 2025 Priced
Lake Street to TH 62	204,000	165,000	F	F
TH 62 to I-494	128,000	106,000	D	C
106th Street to TH 13	144,000	117,000	F	D

[1] Measured as exceeding capacity (1950 vehicles per lane per hour) for more than 25 percent of the segment in either the a.m. or p.m. peak hour (by direction)

Table 12 shows the estimated effect of pricing on north-south arterials near I-35W. It can be seen that , at a planning level of analysis, only small changes in daily traffic volumes occur (generally less than 2,000 vehicles per day. Several of the segments would operate at level of service E/F under either the baseline or priced alternatives. Only one segment (Penn avenue form TH 62 to 66th Street) would fall from an acceptable level of service to an unacceptable level of service.

As a point of caution, however, it should be noted that assessing arterial capacity on a link-based analysis may give erroneous results. Arterial system capacity is largely affected by intersection capacity, specific geometrics and the degree of access management. A better reflection of delay and levels of service can be achieved by analyzing specific intersections, which is a degree of detail beyond the scale of this study.

TABLE 12
ARTERIAL SYSTEM LEVEL OF SERVICE

	Park/Portland Avenues (combined one-way pair north of 50th St.)			Nicollet Avenue			Lyndale Avenue			Penn Avenue		
	Number of Lanes per Direction (1)	Average Daily Traffic	Approximate Level of Service (2)	Number of Lanes per Direction	Average Daily Traffic	Approximate Level of Service	Number of Lanes per Direction	Average Daily Traffic	Approximate Level of Service	Number of Lanes per Direction	Average Daily Traffic	Approximate Level of Service
Existing												
Franklin Avenue to Lake Street	4	15,600	C or Better	3	12,400	C or Better	2	15,900	C or Better			
Lake Street to 50th Street South	3	17,800	C or Better	1	11,200	E/F	2	12,100	C or Better			
50th Street South to TH 62	2	17,000	D	1	15,300	E/F	2	15,800	C or Better	1	8,300	D
TH 62 to 66th Street South	2	17,900	C or Better	2	13,300	C or Better	1	17,500	E/F	2	15,500	C or Better
66th Street South to I-494	1	13,500	E/F	2	11,900	C or Better	1	13,500	E/F	2	13,500	C or Better
I-494 to Old Shakopee Road	2	11,200	C or Better	2	9,650	C or Better	1	17,000	E/F	2	15,100	C or Better
Old Shakopee Road to 106th Street South							1	9100	C or Better	2	6650	C or Better
2025 Baseline												
Franklin Avenue to Lake Street	4	20,400	C or Better	3	16,200	C or Better	2	20,800	D			
Lake Street to 50th Street South	3	23,300	C or Better	1	14,700	E/F	2	15,800	C or Better			
50th Street South to TH 62	2	22,200	E/F	1	20,000	E/F	2	20,700	D	1	10,900	E/F
TH 62 to 66th Street South	2	26,800	C or Better	2	19,900	C or Better	1	26,200	E/F	2	23,200	C or Better
66th Street South to I-494	1	16,500	E/F	2	14,600	C or Better	1	16,500	E/F	2	16,500	C or Better
I-494 to Old Shakopee Road	2	19,100	C or Better	2	16,500	C or Better	1	29,000	E/F	2	25,800	E/F
Old Shakopee Road to 106th Street South							1	15500	E/F	2	11400	C or Better
2025 Priced												
Franklin Avenue to Lake Street	4	22,000	C or Better	3	17,400	C or Better	2	21,400	D			
Lake Street to 50th Street South	3	25,400	D	1	14,800	E/F	2	17,200	D			
50th Street South to TH 62	2	22,300	E/F	1	20,100	E/F	2	21,200	D	1	11,000	E/F
TH 62 to 66th Street South	2	30,100	C or Better	2	20,600	C or Better	1	26,700	E/F	2	24,500	E/F
66th Street South to I-494	1	17,900	E/F	2	15,300	C or Better	1	16,700	E/F	2	16,800	C or Better
I-494 to Old Shakopee Road	2	19,800	D	2	17,000	C or Better	1	29,400	E/F	2	27,000	E/F
Old Shakopee Road to 106th Street South							1	16,200	E/F	2	12,000	C or Better

1- Per-lane capacity varies by area type.
2- Level of Service is based on volume-capacity ratio thresholds

Table 13 shows the change in delay on I-35W corridor roadways. The I-35W freeway itself would have reductions in delay of 72 to 75 percent in the peak hours. A slight reduction in arterial delay in the a.m. (four percent) would appear to be a result of trip redistributions and mode changes, which are calculated on a daily-level by the forecast models. The p.m. peak hour increase of 32 percent on the arterial system is more consistent with the expected diversion of traffic from the freeway to the arterials.

Table 13
Daily Vehicle Hours Of Delay (I-35W Corridor)

	2025 Baseline	2025 Priced	Change
All Roadways			
Nights/Evenings	40	20	-50%
AM Peak Shoulders	970	470	-52%
AM Peak Hour	3,330	1,470	-56%
Midday Offpeak	2,080	1,290	-38%
Midday Peak Shoulder	700	370	-47%
PM Peak Hours	5,330	2,330	-56%
Evening Peak Shoulder	720	420	-42%
Total	13,170	6,370	-52%
Freeways and Expressways			
Nights/Evenings	30	20	-33%
AM Peak Shoulders	840	360	-57%
AM Peak Hour	2,550	720	-72%
Midday Offpeak	1,790	1,040	-42%
Midday Peak Shoulder	610	280	-54%
PM Peak Hours	4,390	1,090	-75%
Evening Peak Shoulder	600	300	-50%
Total	10,810	3,810	-65%
Other Facilities			
Nights/Evenings	10	0	-100%
AM Peak Shoulders	130	110	-15%
AM Peak Hour	780	750	-4%
Midday Offpeak	290	250	-14%
Midday Peak Shoulder	90	90	0%
PM Peak Hours	940	1,240	32%
Evening Peak Shoulder	120	120	0%
Total	2,360	2,560	8%

Revenue

The revenue generated by the I-35W corridor is $79,000 daily. Of this, $59,000 of this revenue is generated during the peak hours, and $20,000 is generated during the peak shoulders.

BENEFIT-COST ANALYSIS

A benefit-cost analysis was conducted comparing the baseline scenario with the priced scenario using the FWHA Surface Transportation Efficiency Analysis Model (STEAM).

STEAM was run with eighteen market sectors, one for each SOV and HOV time period, and peak and off-peak periods for walk-to-transit, drive-to-transit, and commuter rail. For each market sector, matrix and network analyses were conducted within STEAM to determine benefits based on travel demand, emissions, energy, accidents, external costs, user benefits, and revenue transfers.

Annual Pollution Savings

Emission rates were calculated using the Minnesota Pollution Control Agency (MPCA) approved factors and coefficients in the EPA Mobile 5A emissions model. These factors account for fleet composition and local pollution control regulations. Emission rates are based on vehicle mix, vehicle speed, and percent cold-start assumptions. The STEAM model applies a zero percent cold start factor to the network analysis, and then adds in cold-starts on a per-trip basis. Carbon dioxide and fuel savings were estimated using STEAM default values.

The priced regional scenario would result in a reduction of all pollutant classes due to the reduced travel and delay:

Hydrocarbons :	853 tons/year
Carbon Monoxide:	15,403 tons/year
Volatile Organic Compounds:	1,055 tons/year
Particulate Matter (PM10):	41 tons/year
Carbon Dioxide:	316,700 tons/year

In addition to emissions, STEAM estimates the changes in fuel consumption. The priced scenario results in an estimated reduction of 32,476,200 gallons of fuel consumed per year.

Vehicle Crashes

STEAM applies per vehicle-mile crash rates for each facility type. These crash rates were taken from the 1999 MnDOT Office of Investment Management-recommended values. The estimated reduction in vehicular crashes is:

Fatality	14	per year
Injury	2291	per year
Property Damage Only	3333	per year

Benefit Summary

User benefits are considered to be the sum of benefits deriving from travel time savings, operating cost savings, out-of-pocket cost savings, and user-perceived accident costs. The out-of-pocket effects of toll and tax changes (significant in a pricing study such as this) are separated from user benefits as revenue transfers. Even though they are costs incurred to system users, they are not lost from society, and they are collected by the tolling agencies.

The overall reduction in VMT is realized through the scope of this analysis, driving down emissions and accident rates, and reducing total vehicle-mile and trip-related user costs. Thus the overall benefits of the priced scenario compared to the baseline are quite high.

User Benefits	**$191,085,000**
Travel Time	$166,826,000
Fuel Costs	$4,901,000
Non-Fuel Operating Costs	($50,508,000)
Out-of-Pocket Costs	($2,648,000)
Accident Costs	$72,514,000
Reduction in External Costs	**$67,968,000**
Emissions	$65,726,000
Global Warming	$1,146,000
Noise	$1,096,000
Revenue Transfers	**($9,801,000)**
Total Benefits	**$249,252,000**

Costs

Costs were estimated based upon the prices detailed in the 1995 MnDOT Congestion Pricing study, adjusted to 2000 dollars. The resulting estimated total capital cost, for the purposes of this analysis, is $521,956,000, an average annual capital cost of $34 million. The annual operating cost is estimated at of $46,095,000. The costs are summarized below.

Capital Costs	
Freeway Entry Ramp Gantries (505)	$106,712,000
Freeway Exit Ramp Gantries (498)	$78,783,000
Freeway Mainline Gantries (20)	$9,989,000
Expressway Mainline Gantries (1 per mile)	$150,516,000
Transponders (1.9 million at $11)	$21,470,000
Communications Plant	$19,220,000
Central Computer	$9,040,000
Courtesy Stations (48)	$58,145,000
Contingency	15%

Operating Costs	
Enforcement ($0.002 per transaction)	$2,737,000
Billing ($0.02 per transaction)	$27,374,000
Staff (150)	$6,356,000
Maintenance	$3,616,000
Contingency	15%

The overall benefit of the priced scenario is estimated at 3.07.

Appendix G

Equity Analysis Report
Presented at TRB 2002
David Levinson

Road Pricing and Compensation for Delay

By David Levinson
Assistant Professor
Department of Civil Engineering
University of Minnesota
500 Pillsbury Drive SE
Minneapolis, MN 55455 USA

levin031@tc.umn.edu
Work: 612-625-6354
Fax: 510-626-7750

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ABSTRACT

The equity issues facing congestion pricing are an impediment to its adoption. A criticism that gets very little attention is that not only does a toll road enable some to buy their way out of congestion, under certain circumstances such as a queue jumper, they do so at the expense of others - that is, they may make others wait longer so that they can avoid delay, in both cases of take-away capacity and additional capacity. They, along with the toll road authority, are in a sense stealing time from those who don't pay. What to do with the revenue from congestion pricing is a critical question that needs to be answered before toll roads will become widely adopted. This paper investigates the issue of compensation and several possible alternatives. The equity and efficiency problem of conventional (uncompensated) congestion pricing is outlined. Then several of the previous alternatives are discussed and developed. A new compensation mechanism is suggested, called the "delayer pays" principle. This principle ensures that those who are undelayed but delay others pay a toll to compensate those who are delayed. Issues of imperfect information and gaming the system are addressed. Such a system can potentially eliminate some of the disadvantages of congestion pricing while ensuring that the money stays within the transportation sector, and is returned to those delayed.

KEY WORDS: Value Pricing, Road Pricing, Compensation, Transportation Equity,

INTRODUCTION

The equity issues facing congestion pricing are an impediment to its adoption. In part there is resistance due to people's dated perceptions of how toll roads operate, people still envision stopping at toll booths and paying the toll, a situation where the toll road causes more delay than it relieves. Electronic toll collection will obviate these concerns. There is additional resistance to the idea of paying twice for the same thing. If gas taxes already paid for the road, why should tolls now be put in place? A third criticism is the idea of so-called "Lexus Lanes", the idea that toll roads (in parallel with free roads) are only for the wealthy, so that they can bypass congestion while the poor and middle class sit stuck in traffic. Research on the operations of SR91 in Southern California suggests that income effects are not very strong (Sullivan 2000). While logic argues that the rich do have a higher value of time than the poor, and so would in general be more willing to pay a toll, working class individuals may have a greater penalty for being late to work or pick up a child from day care. A related criticism, and one that gets very little attention, is that not only does a toll road enable some to buy their way out of congestion, they may do so at the expense of others if the toll lanes function as queue jumpers - that is, some toll road users may make others wait longer so that they can avoid delay. They, along with the toll road authority, are in a sense stealing time from those who don't pay.

What to do with the revenue is a critical question that needs to be answered before toll roads will become more widely adopted. This paper investigates the issue of compensation and several possible alternatives. First, the equity and efficiency problem of conventional (uncompensated) congestion pricing is outlined. Then several of the previous alternatives are discussed and developed. These include HOT Lanes, Fair Lanes, and Combined Toll/Rationing schemes. Finally, a new compensation mechanism is suggested, called the "delayer pays" principle. These alternatives are in contrast with the efficiency arguments put forward about marginal cost pricing presented in most research on the subject.

STEALING TIME

At least as early as 1975, a number of environmentalists have called for imposing *The Polluter Pays Principle.* The Polluter Pays Principle argues that the parties who impose environmental costs should either pay to avoid it or compensate those who suffer because of it.

Any social cost takes at least two parties, for instance the polluter and the polluted upon. In the absence of either one, no economic externality would take place. The party responsible for mitigating the externality depends on the circumstances. Two examples illustrate the point:

- If a new (previously unplanned) airport is built in an existing community, can the airport make as much noise as it wants to?
- If an airport has long been located in the middle-of-nowhere, and then a new subdivision moves in, should the new neighbors be able to require the airport to become quieter?

The "common sense" answer to these two questions is "no" as we have an existing status quo that is disrupted by a change. It is the disrupter who creates the externality. In

contrast to the Polluter Pays Principle, we could establish a *Disrupter Pays Principle* to deal with externalities.

What happens on a highway? Congestion, like air pollution, noise, and other externalities results from a lack of well-defined property rights. In the absence of property rights, we have a first-come, first-serve priority system. First-come, first-serve (FCFS) is an arrangement brought about by the technology and the social norms applied to it. Vehicles line up in narrow lanes. Vehicles arriving at the back of the queue rarely drive to the front while other cars are still ahead of them. One occasionally sees cheaters (people driving on shoulders) who violate this norm. Roads with clearly striped lanes thus differ from the mob behavior seen in other bottleneck environments (e.g. a crowded elevator). Transit passengers have different customs in different locations, for instance, everyone is in a well defined queue boarding San Francisco's BART but not on Washington DC's Metro.[i]

On a roadway with a queue, the vehicle in front delays the vehicle in the back. By the "polluter pays principle", the front vehicle should compensate the back vehicle for their delay. On the other hand, the vehicle in front was there first (that is why they are in the front), and the vehicle in the back disrupted the status quo. So by the common sense "disrupter pays principle", it is the person in the back who causes the delay on themselves by arriving later - and of course they already bear the costs in terms of congestion and time lost.

Most congestion pricing proposals argue that because vehicle A delays vehicle B, a government authority should be able to impose tolls on vehicle A (or on both vehicles A and B). It is as if person A robs person B and the police captures person A and keep the loot themselves. This robbery example is socially unacceptable because we have a well-defined system of property rights and clearly the stolen property originally belonged to B. Who does stolen time belong to? Is vehicle B complicit in its delay, or is it solely the responsibility of A? In the case of the crime, is it possible that person B was "asking for it", by walking around and flashing money in a well-known crime-infested area? If the government authority gets the money, what does it do with it? These are issues that should be addressed in an equitable congestion pricing system.

The Coase Theorem famously argues two points, assuming rational behavior, no transaction costs, and bargaining (Coase 1992). First, the efficiency hypothesis posits that, regardless of how rights are initially assigned, the resulting allocation of resources will be efficient. Second, the invariance hypothesis suggests that the final allocation of resources will be invariant to how rights are assigned (Medema and Zerbe 1998). Coase shows how it takes two to have positive or negative externalities, and depending on one's view of the property rights, the prices, taxes, costs, or negotiations will differ. Traffic manifests high transaction costs, no property rights, and little bargaining, perhaps explaining the lack of efficient outcomes.

If property rights are to be assigned, and a low transaction cost exchange mechanism to be established (for instance electronic toll collection), perhaps a more efficient and equitable outcome could be achieved. An efficient outcome suggests maximizing net social benefit, which will consider the weighted sum of delay, schedule delay, and out-of-pocket costs for users, the costs of providing the infrastructure, and the social costs of externalities. Any analysis must assess the appropriate weights -- different individuals have different values of time and different types of delay are perceived

differently. An equitable outcome is less clear, perhaps equalizing the weighted sum of delay, schedule delay, and out-of-pocket costs for all members of some group (say, people who want to use the facility at a given time).

In the absence of private roads, we can consider at least two extreme alternatives regarding the initial distribution of rights:

- Everyone has the right to free (unpriced) travel.
- Everyone has the right to freeflow (undelayed) travel.

If everyone has the right to free (no monetary cost) travel, then the mechanism for more efficient travel requires the delayed to pay the delayers not to delay (a congestion prevention mechanism), or the delayed will continue to suffer congestion. Alternatively, if everyone has the right to freeflow (undelayed) travel, then the burden is on the delayers to compensate the delayed (a congestion damages mechanism). These comport with the *disrupter pays* and *polluter pays* principles respectively. Whether drivers impose costs on those behind them depends on one's point of view vis-a-vis property rights.

A major difficulty is that traffic and congestion externalities are time sensitive. By the time the delayed vehicle arrives, it is too late to pay the delaying vehicle not to be there. Furthermore, the delayer delays multiple vehicles, and so if the delayed tried to pay the delayers not to be there, he may pay significantly more than his own benefit would warrant. These dynamics suggest that conventional economic arguments concerning externalities cannot be simply applied. If the delayer pays scheme were in effect, then those behind would be imposing a cost (the price or the tax or the fine or whatever you want to call it) on those in front, in contrast with the traditional first-come, first-serve approach we have now.

There is also the issue of behavioral response of the paid driver. If I am compensated not to do something, I won't do it. But what if I weren't going to do it initially? For instance, as a non-smoker, I will gladly take any compensation you want to give me for not smoking. Under a compensation regime, I may threaten to smoke just to extort money from you. Similarly, as a driver, I may make the threat to drive on a congested route just to be paid not to. Table 1 categorizes alternative payment and compensation schemes.

These difficulties with internalizing the delay externality are, in part, associated with treating the road as a commons, and trying to give rights to drivers, rather than having the road owner have the right to charge for use. However private ownership does not guarantee an absence of delay. This paper does not consider private roads.

BUYING TIME: HOT LANES

In 1998 the Congestion Pricing Policy Project at the Humphrey Institute released a short video entitled *Buying Time*. It argued that individuals with a high value of time, because of a business meeting, doctor's appointment, departing late for the airport, or picking up a child at day care should be able to buy into a toll lane that moves faster than the freeway it parallels. It is well established that HOV lanes are often underutilized (Dahlgren 1998). While Dahlgren argues that most HOV lanes should be reverted back to general purpose lanes, an alternative has emerged in recent years. High Occupancy/Toll Lanes (HOT) are an innovative solution, suggested by Fielding and Klein (1993) to implement what is now called "value pricing" by selling the available

High Occupancy Vehicle (HOV) lane capacity to those willing to pay extra. Those who pay to use the HOT lanes save time. Other HOV travelers don't noticeably lose time because the additional flow is managed to keep it sufficiently below capacity. What happens to traffic in the general purpose lanes (serving low occupancy vehicles or LOV), however, depends on the geometric configuration of the roads, as well as weather, travel demand, etc.

Figure 1 illustrates two cases of special (diamond) lanes which are used for HOV traffic and might be used as HOT Lanes. In the first case, the bottleneck jumpers, the diamond lane traffic does not interfere with the regular LOV traffic, and avoids the queue entirely. The presence of the additional lane provides a net benefit to regular traffic, by taking cars out of the stream and thus reducing total delay, ignoring any induced demand effects.

In the second case, queue jumpers, the diamond lane traffic simply moves to the head of the queue, displacing the regular LOV traffic (making regular cars wait longer). The total delay in the second case is the same as the baseline, and regular traffic views it as a net loss unless they are compensated. These two outcomes have very different equity implications.

Assume the diamond lanes allow toll users to buy-in. Like a corrupt maître d'hôtel at an expensive restaurant, the toll authority receives payment for allowing the bribers to pass the honest.[ii]

Compensation is required to make the situation fair. Assume the toll-payers have a higher value of time than the no-toll traffic, otherwise they wouldn't pay the toll. The maximum payment that should or could be made to the no-toll traffic is the price of the toll. If the payment were too high however (congested no-toll travelers were paid more than their extra delay would warrant), travelers would be induced by the compensation payment to travel more. But we again run the risk that people with very low values of time would drive to generate income. To avoid this kind of scheming, a two tier pricing system must be established. Part 1 would be a fixed cost assessed to all travelers to pay for maintenance and operation of the roads, as well as other non-delay externalities. Part 2 would be a premium for avoided congestion. The part 2 revenue collected from toll-payers could offset the congested travelers part 1 charge, but should not exceed it.

BORROWED TIME: FAIR LANES

Patrick DeCorla Souza has put forward an idea he has called *Fair Lanes*. Noting that congested facilities often have lower throughput than uncongested facilities, he would separate currently free, but congested, freeway lanes into two sections: toll lanes (our diamond lanes) and "Credit" lanes, but not add any lanes. Electronically tolled express lanes would bear tolls dynamically set to maximize throughput. Electronic credits, funded from tolls, would be given to travelers in the Credit Lanes where congestion continues. The credits could be spent on the toll lanes or for other priced transportation goods (e.g. transit fares or parking), or could be taken as cash. DeCorla Souza claims credit lane travelers would benefit two ways. By better traffic management, the toll lanes now have a higher vehicle throughput than they did previously. Since more vehicles per hour (and fewer vehicles per mile) are on the toll road, fewer vehicles per hour are attempting to use the other lanes. Second, credit lane

travelers receive credits to compensate them for their frustration and for seeing free lanes converted to tolls. While this might again induce travelers with low values of time to drive just to receive credits, perhaps some control could be placed on that. Second, the claim of higher throughput needs to be established empirically.

SHARING TIME

A Pareto-efficient outcome is one where some people are better off while no one is made worse off. Unless revenues are returned to drivers, conventional congestion pricing or marginal cost pricing is not Pareto-efficient. Hau (1991) speaks of the tolled or tolled-on and the tolled-off. The wealthy minority with a very high value of time clearly benefit from congestion pricing, but others lose. Losers are those who either pay a toll but would prefer the congestion to the toll, or those who are tolled-off and don't pay the toll. Further, some people will switch routes to avoid the toll, making the individuals onto whose route they switch worse off. To overcome such difficulties, Daganzo and Garcia (1999) suggest drivers should take turns. By combining rationing (some fraction of users get a free pass every day) with tolling (the remaining fraction of users pay a daily toll that depends on the length of the queue), a Pareto-efficient outcome results, even if revenues are not returned to the original drivers. Their analysis considers commuters driving through a single bottleneck during the morning commute, who each have a desired arrival time, and early and late penalties if they miss that time. Each commuter selects an arrival time at the bottleneck to minimize the weighted sum of tolls, queuing time and deviation from the desired passage time. This system is Pareto-efficient where others aren't because everyone alternates paying the toll and receiving the benefits of others paying the toll. Unless the benefits of traveling faster are shared among the entire population, congestion pricing benefits some (those with a high value of time) at the cost of others, who either pay the toll and save time, but not enough to make it worth while, or who defer the trip altogether.

REIMBURSING TIME: DELAYER PAYS

The system we will introduce and explore in this paper is a variation on the polluter pays scheme applied to congestion. Imagine a cumulative arrival and departure pattern as in Figure 2. This is represented numerically in Table 2, where the numbers 1 - 9 indicate the 1st through 9th vehicle. Each row is a time increment (or turn) for instance a two second headway, reflecting the capacity of the roadway of 1800 vehicles per hour.[iii] Vehicle 1 delays nobody. However after that first vehicle, the arrival rate exceeds the departure rate (say 3600 vehicles per hour for several seconds). As a consequence, Vehicle 2 delays Vehicle 3 by one turn. Vehicle 3 delays vehicles 4 and 5 by 1 turn. Vehicle 4 delays vehicles 5, 6, and 7 by 1 turn and so on. We can tabulate the direct payments and income from such a system, shown the right hand columns of Table 2.

We define this *short-run* marginal cost as the change in the *short-run* total cost, because we only know information about the present (the number of vehicles in the queue at the time a vehicle leaves), not the full consequences of delay on vehicles yet to join the queue. The short-run marginal cost scheme above would then charge 1 unit of toll to

vehicles 2, 3 and 6. It would charge 2 units of charge to vehicles 4, and 5. Vehicles 7, 8, and 9 would get refunds of 1, 2, and 4 units of toll respectively. If everyone has the same value of time, which can be monetized in units of tolls, this seems fair.

However, the short-run marginal costs imposed by a vehicle are not its only costs. Rather a vehicle's presence has a reverberation much longer in time. For instance, in the absence of vehicle 2, the queue looks like the cumulative arrival and departures given in Figure 3, shown numerically in Table 3. Note that the total difference in costs with and without vehicle 2 is now 16 – 9 = 7, implying a true long-run marginal cost of vehicle 2 of 7 units, rather than the 1 unit shown above.

In the absence of vehicle 3, the total costs are again only 9 units. In the absence of vehicle 4, the total costs are 10 units. But those savings are not additive, that is, initially there were 16 units of cost, the savings from vehicle 2 is 7 units, from vehicle 3 is also 7 units and vehicle 4 is 6 units. Yet, we cannot add 7 + 7 + 6 = 20, which exceeds the total delay. Rather, the total cost is 4 units and only 16 - 4 = 12 units are saved. So even eliminating vehicles 2, 3, and 4 does not completely eliminate congestion. Thus we can identify two complications, the long-run marginal cost of a vehicle depends on how many other vehicles there are and when each vehicle arrives.

Charging the long-run marginal cost (rather than the short-run marginal cost) and paying people the amount of their delay, would produce the result shown in Figure 4. The figure shows that more money is paid in than paid out. This discrepancy is because eliminating a vehicle will sharply reduce delay, but to the delayed vehicle, it matters not which vehicle ahead is eliminated, any one of them will reduce delay significantly. So using long-run marginal cost accounting will generate surpluses. This can be described mathematically with the equations and description given in Table 4.

If people vary in their values of time, people with a high value of time may not be fully compensated, while those with a low value of time would get more dollars back than the value of the time they wasted. This may induce more travel by clever people with low values of time trying to scam the system; however clever people rarely have low values of time for long.

Moreover, the system would send price signals back to drivers, who would then change their departure times in some fashion, probably smoothing out their behavior. A new, less peaked, arrival pattern would come about. So after equilibration between price and demand, the system would have a lower price and lower net turnover than suggested by Table 2.

One can imagine problems with this scheme, getting on queue becomes a gamble that there is not a large platoon of vehicles behind you. Can the technical "gamble" problem be solved? I believe we can come very close with the technology available, but it will require implementing a detailed traffic monitoring system, as illustrated in Figure 5.

Strictly speaking the correct charge (either short-run or long-run marginal cost) is unknown until some time after the driver exits (the front) of the queue, but some approximations could be made. The charge depends not only on how many vehicles were behind the driver at the time the driver exits, but how many vehicles are behind those vehicles -- that is on how much delay that vehicle actually caused. Figure 5 represents a freeway with an on and off ramp just before a bottleneck. If we know the mainline traffic flow, on-ramp flow and off-ramp flow, we can post the expected price at

the Variable Message Sign (VMS) just before the bottleneck. This will not be strictly accurate, as the mainline flow may suddenly spike upward, or the off-ramp may suddenly get more traffic. But with experience, the forecasting system would get more and more accurate.

This leads to a modified strategy that distributes the revenue back to the delayed, but would only charge drivers based on what they were promised at the VMS. In this case the Toll Authority would assume the risk of under/over forecasting, and someone would monitor it to ensure it behaved well.

The delayer pays scheme, using short-run marginal cost enables a straight-forward solution to "what to do with congestion pricing revenue" -- return it directly to those who were delayed almost instantly. The system can be perfectly revenue neutral, stay within the roadway sector, and be economically efficient. Overall, the amount of revenue collected equals the amount distributed. But those who delay others the most pay the most, while those who are delayed more than they imposed delay on others are compensated for their delay. Again to avoid scheming, a two-tier pricing system could be established.

CONCLUSIONS

Equity and efficiency form the two pillars on which transportation decisions should be made. However, determining what is efficient, much less what is equitable, is far from simple.

When considering whether and how to compensate for congestion pricing, we have a number of alternatives:

- continue with First Come, First Serve, using delay as the cost of travel - the "no-toll" option.
- Marginal cost pricing in peak times, without compensation.
- implement a delayer pays scheme to charge based on the actual congestion caused.
- split the difference between delayer and delayed.
- convert HOV lanes to HOT lanes,
- convert general purpose lanes to "Fair" lanes, or
- construct a toll and rationing system.

Who owns the right to travel on the roadway? Currently the system is first-come first-serve. Unfortunately the conventional marginal cost pricing approach often ignores traffic dynamics and tends to treat time in large discrete blocks rather than continuously. How significant a problem this is depends on the conditions of the case. The delayer pays scheme outlined in this paper implies everyone has a right to free-flow, and the individuals who deny that right to others are the ones who should pay. So is delayer pays a good idea? This depends on answers to two questions:

- Empirical question - What will the magnitude of cheating/gaming the system be?
- Technical question - What is the cost of the added data collection and toll redistribution?

There are also several key philosophical questions that need to be addressed. These very much parallel the fundamental question of whether people should be guaranteed equality

of opportunity or equality of outcome. Congestion externalities required two actors, the delayer and the delayed. If both parties have equal opportunity to arrive, than one should not compensate the other. But if we want to guarantee an equal outcome in terms of a combination of time and money, those who save time should pay more money and those who spend more time should be paid by those causing their delay.

Congestion pricing generates revenue that can substitute for conventional transportation financing (such as the gas tax). Few argue against substitution, as it makes sense as a demand management measure. However, what to do with excess congestion pricing revenue has been a hurdle for its adoption. In the absence of private roads, this is a political problem. Suggestions range from the government keeping the money, to building more roads, to providing transit, to compensating the poor (redistributing the money by income class). There is a clear alternative however that is fair, returning the excess congestion pricing revenue to those who are congested, in the form of cash or credits, in such a way to avoid encouraging gaming the system or driving for dollars.

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Table 1: Alternative monetary payment and compensation schemes

Delayer	Delayed	Road	Label
0	0	0	First-Come First Serve (unpriced)
Paid	Pays	0	Disrupter Pays
Pays	Paid	0	Polluter Pays
Pays	0	Paid	\
0	Pays	Paid	- "Marginal Cost Pricing"
Pays	Pays	Paid	/

Table 2: Short-run marginal cost payment scheme with all vehicles.

Time	Queue	Veh	Payment	Income	Net Income
0:00	1	1	0	0	0
0:02	23	2	1	0	-1
0:04	345	3	2	1	-1
0:06	4567	4	3	1	-2
0:08	56789	5	4	2	-2
0:10	6789	6	3	2	-1
0:12	789	7	2	3	1
0:14	89	8	1	3	2
0:16	9	9	0	4	4
	Total		16	16	0

Note: Vehicle 1 arrives and departs before vehicle 2 arrives.

Table 3 Payment scheme in the absence of vehicle 2.

Time	Queue	Veh	Payment	Income	Net Income
0:00	1	1	0	0	0
0:02	3	3	0	0	0
0:04	45	4	1	0	-1
0:06	567	5	2	1	-1
0:08	6789	6	3	1	-2
0:10	789	7	2	2	0
0:12	89	8	1	2	1
0:14	9	9	0	3	3
			9	9	0

Table 4 Mathematical model of delayer pays compensation schemes

Cost and Income Variables	Expression
S_v = Own cost	$S_v = A_v - D_v$
$T_{[\ ]}$ = Total cost [for arrival pattern containing vehicles in bracket]	$T_{[\ ]} = \sum_{[\ ]} S_v$
J_v = Short-run marginal cost	$J_v = Q(D_v) - 1$
M_v = Long-run marginal cost	$M_v = T_{[1\text{--}V]} - T_{[1\ \text{--}\ v\text{-}1, v+1\ \text{--}\ V]} - S_v$
R_v = Reimbursement income	$R_v = S_v / \mu$
N_v = Net income	Short-run marginal cost $N_v = J_v - R_v$ Long-run marginal cost $N_v = M_v - R_v$

Notes: Subscript $_v$ denotes vehicle v. A_v = Arrival time (at back of queue). D_v = Departure time (from front of queue). $Q(t)$ = Number of vehicles in queue at time 't'. μ = Service time (headway between vehicles departing queue).

Figure 1 Baseline and two types of diamond lanes

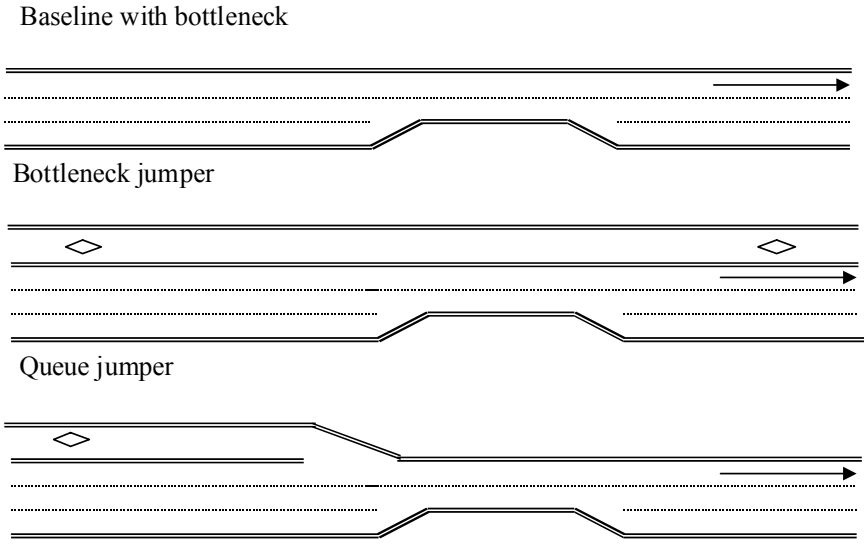


Figure 2 Cumulative arrival and departures, base case

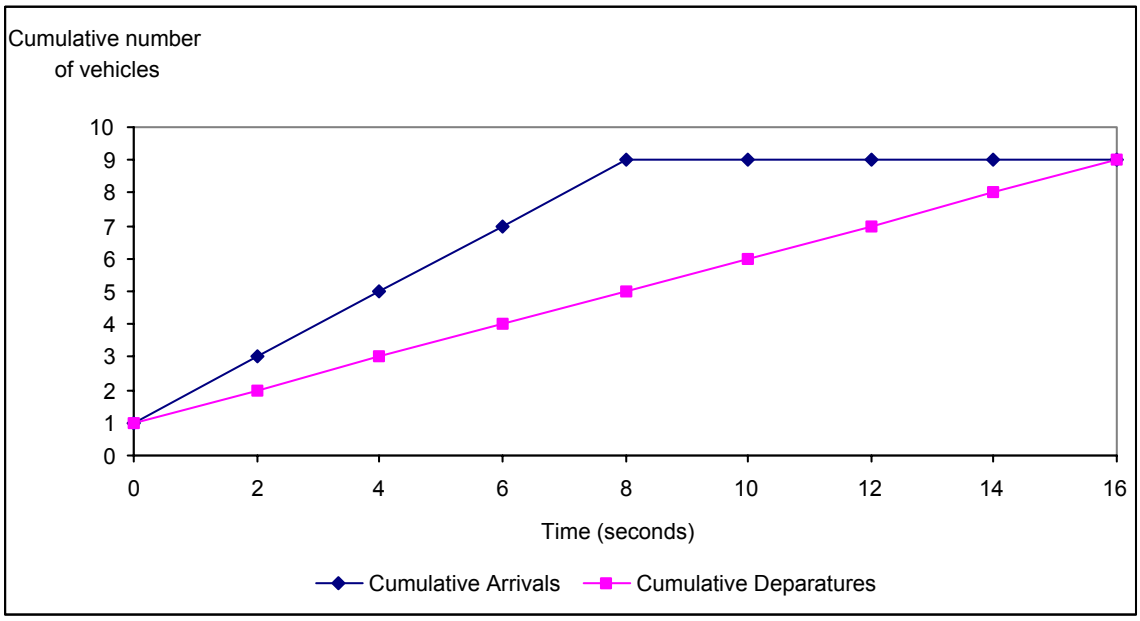


Figure 3 Cumulative arrival and departures, in the absence of vehicle 2

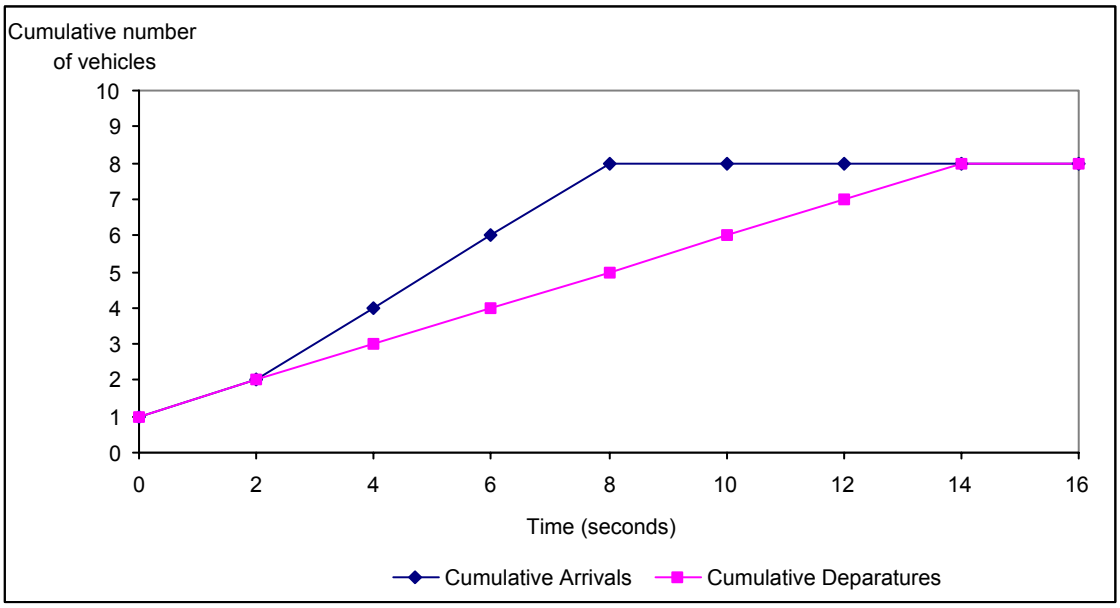


Figure 4 Average and marginal effects of delayer pays principle

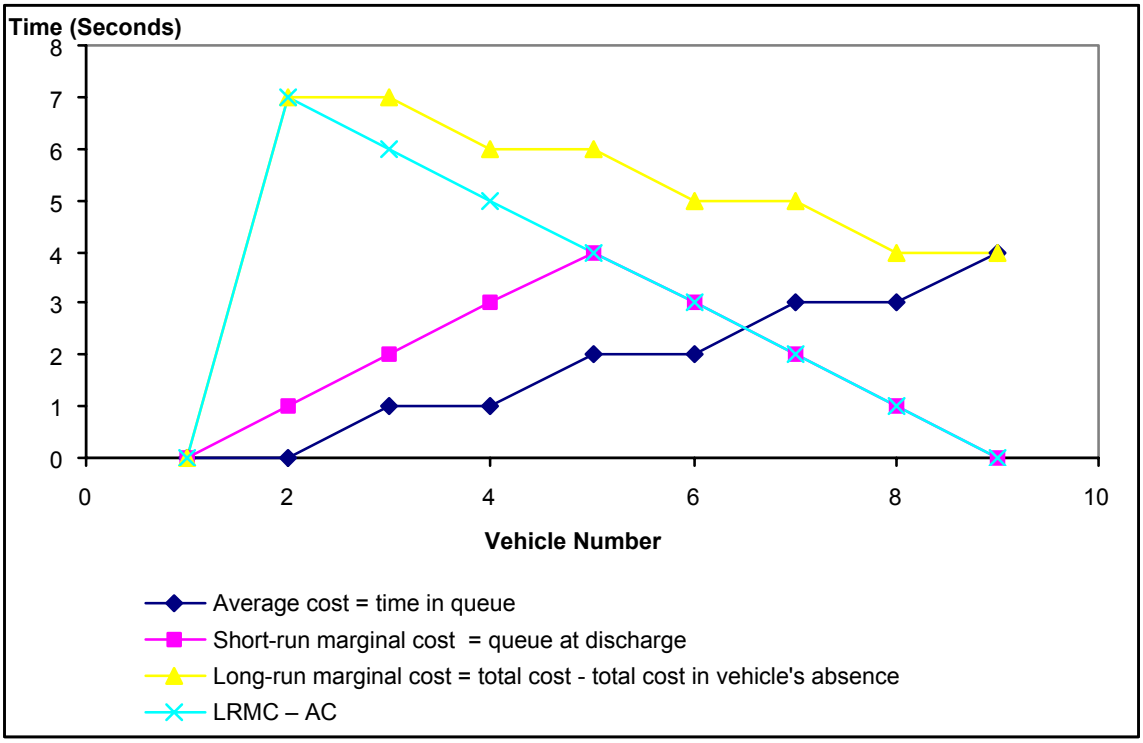
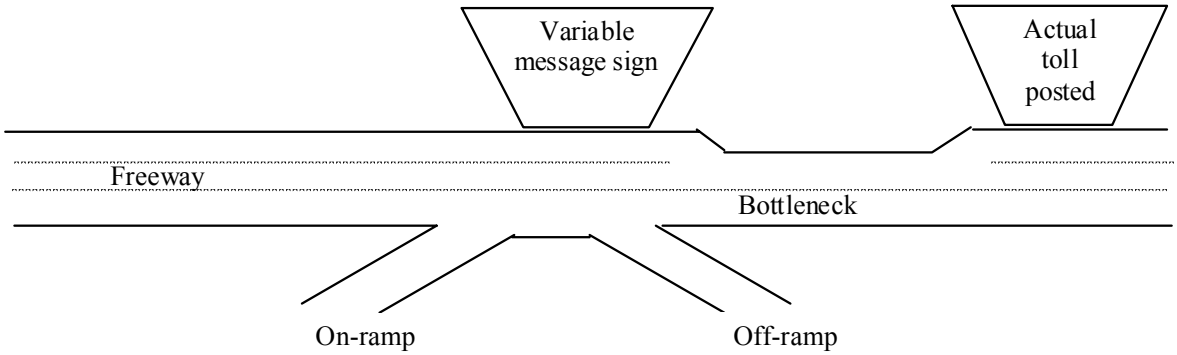


Figure 5 Detailed Monitoring System



[i] On San Francisco's BART the transit agency has put black pads on the station platforms adjacent to where the train doors open, but on Washington DC's Metro the train doors open at seemingly random locations along the platform.

[ii] The mention of expensive restaurants suggests the theoretical ideal known as *reservation pricing.* If only n vehicles can depart in a given time slot, why should more than n vehicles arrive during that same period? Logically, all other arrivals involve wasted time. If properly implemented, reservation pricing would ensure no delay. Just like restaurant reservations, bottleneck reservations would be made.

Obviously guaranteeing arrival in a 2-second time window is impossible, but with a larger time block and multiple vehicles, the total amount of queueing will be short and random.

The driver would arrange to arrive at a bottleneck at a given point in time (say a time window such between 5:00 and 5:05 p.m.). The system managers would ensure there was sufficient capacity to handle the assigned reservations during that period. If drivers were able to accurately predict when they could show up, such a system could ensure no or minimal delay.

A bottleneck management system would be required that took reservations and ensured that only reserved vehicles would be allowed to enter the bottleneck. Reservations could be auctioned off, or priced in any other efficient manner. At peak times the price to travelers for a reservation would be highest, trailing off to the shoulders of the peak. To make such a system revenue neutral, you would need negative prices in the off-peak, or some other way to compensate travelers.

[iii] The idea of delayer pays scales up to a much longer time period than the 18 seconds represented by 9 vehicles, it's just unwieldy to draw in detail