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24th Annual Transportation Research Conference
May 22-23, 2013
Saint Paul RiverCentre, Saint Paul, Minnesota
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THE ABCS OF ADA FOR LOCAL AGENCIES

ADA Retrofit and Construction Management: Richfield and Breckenridge, Minnesota
Tim Lamkin, HR Green; Liz Finnegan, City of Richfield
PACE’s Transit Signal Priority Program for Six County Suburban Chicagoland

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Pace, the Suburban Bus Division of RTA, provides fixed route bus service, dial-a-ride paratransit service, vanpool service, and special-event bus service throughout Chicago’s six-county suburban region. Main objective of Pace’s Transit Signal Priority (TSP) Program is to design and implement TSP system to provide transit vehicles with signal priority at signalized intersections to improve schedule adherence and reduce its travel time.

As a part of needs assessment task of TSP program, Pace prioritized its Fixed Route Network for TSP. The task included analyzing approximately 850 miles of roadway along 27 potential TSP corridors to allow the Pace to identify the areas of greatest need for future TSP funding and deployment. The prioritization results provided Pace, a mile-by-mile analysis of where the greatest need exists for TSP deployment along each of the 27 TSP Corridors.

As part of design task of this program, Pace implements Signal Timing Optimization and designs TSP Strategies. The design is completed for Dempster Street and Milwaukee Avenue corridors and is underway for seven additional corridors which include more than 200 Signalized intersections.

Also, Pace demonstrated TSP along several corridors including Cermak Road, US 6/159th Street, Halsted Street in Cook County and recently in Washington Street in Lake County. In February 2010, the Harvey TSP system was successfully deployed TSP along 20 signalized intersections on 159th St, Sibley Blvd, Halsted St and in the vicinity of Harvey Transportation Center, City of Harvey, IL and equipped 55 buses. Additional 10 TSP intersections and 45 buses are planned for deployment as Phase 2 of this project in mid-2013. In June 2012, Pace successfully deployed TSP along 10 intersections of Washington Street and equipped 40 buses. Deployment of TSP along Milwaukee Ave, 159th street and Dempster Street is expected to start by late 2013.

Additionally, Pace plans to continue to design and implementation work along several other identified corridors over the next five years. The presentation will discuss various stages of Pace’s TSP Program including planning, implementation, stakeholder outreach, lessons learned and future planned projects.
Transit signal priority (TSP) is being deployed at numerous locations across the country and is providing significant benefits to transit operations and the public by reducing transit delay and improving schedule adherence. Deployments to date have been performed by selected transit agencies and generally have targeted specific bus route corridors operated by that agency. Unless a region has consistent TSP equipment and traffic signal controllers, TSP operational challenges will exist when the region starts expanding TSP deployments on routes that cross jurisdictional boundaries or where corridors include bus routes operated by multiple transit agencies. To date, no region in the U.S. has developed a completely interoperable TSP system where buses operated by multiple transit agencies can communicate with appropriate traffic signals operated by multiple roadway jurisdictions.

Recognizing this challenge, the Regional Transportation Authority in Chicago, IL is leading a regional TSP implementation program that will develop standards and guidelines for an interoperable TSP system within the Chicago region. Chicago area bus service is provided by the Chicago Transit Authority and Pace Suburban Bus, which operate bus routes on arterials that are managed by the Illinois DOT, the City of Chicago, several counties and multiple suburban municipalities. To date, both transit agencies have deployed TSP demonstration projects utilizing different technologies that are not currently interoperable. In Chicago and other metropolitan areas, regional TSP interoperability is needed to maximize transit operational efficiencies and allow for TSP expansion. The RTA will be supported by a team of consultants led by URS Corporation in development of this interoperable system and will be pushing the technology envelope with this program. The RTA hopes that Chicago’s regional TSP program can serve as a model for future TSP deployment in other metropolitan regions.
Transit signal priority (TSP) has been widely used in reducing bus delays and enhancing bus schedule adherence. The benefits of TSP have also been identified in different ways. This study assessed TSP benefits through traffic simulation modeling. The evaluation methodology was developed to guide field data collection, define measures of effectiveness (MOE’s), develop and calibrate VISSIM modeling, and perform comparative analysis for the evaluation. The challenge for the VISSIM modeling was to implement the TSP algorithm into VISSIM modeling to model how the TSP system operates. Calibration was conducted at both link and node levels to ensure modeling accuracy. Aggregated MOEs were selected and processed from the VISSIM modeling to facilitate the comparisons between before and after TSP deployment conditions. The study provides valuable insight and lessons learned in evaluation of TSP benefits in terms of data collection, simulation modeling, MOE selection and analysis results. The VISSIM 3D video feature provides visual evidence in presenting the TSP benefits for both technical and public meetings.
A Markovian Alternative to Concrete Pavement Condition Monitoring

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Certain concrete pavement distress conditions may be predicted from thermal conditions, diurnal swings, seasonal variations, mix designs, construction methods and traffic level by rigorous regressions. However, while some design processes and performance predictions utilize Monte-Carlo simulation as well as Bayesian statistics, it is believed that initial conditions of jointed concrete pavements provide useful information particularly in to develop a prediction model for propagation of the cracks. The probability of cracking in proximate panels can thus be transformed into a transitional matrix that facilitates subsequent predictions.

This creates a more tenable prediction approach as it accentuates the preponderance of crack progression and distribution in lieu of the total number of cracked panels. It thus facilitates a more intelligent prediction model. This approach was utilized in the analysis and development of prediction model for concrete pavement buckling in areas where this distress form was prevalent. In those sections better maintenance strategies were consequently developed.
Life Cycle Assessment of Reclaimed Asphalt Pavement to Improve Asphalt Pavement Sustainability

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It has become common practice to recycle asphalt pavements in new asphalt roads. The driving force behind this recycling is the economic benefit and cost savings associated with recycling waste materials. For a project to be considered sustainable, it must be socially, economically and environmentally beneficial. Using reclaimed asphalt pavement (RAP) in asphalt pavements satisfies the social aspect of sustainability by recycling and reducing waste. The economic aspect is achieved by costing less than a traditional asphalt road built from virgin materials. However, a pavement constructed with RAP does not address the environmental aspect needed to satisfy the three pillars of sustainability.

To address the environmental impacts of using RAP, a life cycle assessment (LCA) was conducted using SimaPro, a computer program. For the assessment, a functional unit of one lane mile of road with equal thickness was chosen. Two virtual pavements were constructed in SimaPro for comparison, one pavement with no RAP and one with 15% RAP. The model encompasses a cradle to grave approach to analyzing the differences in construction practices and end of life disposal between the two roads. Using the midpoint indicators of cumulative energy demand and equivalent kilograms of CO2 emissions, the environmental impact of the two roads can be compared. With the assumption of equivalent pavement performance and maintenance schedule, the use of RAP generated an increase in total energy and CO2 equivalent emissions.
Concrete pavement thickness data was collected from sections of 2 concrete pavements with a non-destructive testing (NDT) device and by measuring concrete core thickness. The NDT device allowed thickness measurements every 15 ft. compared to 1000 ft. for each core. Comparison of the core and NDT data showed that core thickness data does not capture the extreme peaks and valleys of pavement thickness variation. Further analysis of the core and NDT thickness data with the Minnesota Department of Transportation’s concrete pavement thickness specifications highlighted that contractor pay deductions due to thickness deficiencies were not realized. Autocorrelation analysis of the data showed that concrete pavement thickness variation is not random, but is correlated to thicknesses of lag between 30-270 ft. This correlation lag is a starting point for answering the question, “how often must a thickness measurement be taken to accurately characterize the thickness variation of a concrete pavement.”
MnDOT, along with partners in other state agencies, is working on a number of fronts to promote supply chain optimization as a broad macro-strategy to improve the cost-effectiveness of capital outlays for transportation infrastructure, reduce traffic impacts (on efficiency, safety and repair/replacement requirements) and promote economic development. MnDOT’s “Supply Chain Productivity Initiative” (SCPI) will be a joint effort with the Department of Employment and Economic Development and include an analysis of key industry “clusters” and their specific supply chain needs that might be addressed through targeted transportation investments. This presentation would provide information on the various strategies and mechanisms being applied, and update conference attendees on the progress and remaining challenges of the initiative.
In 2012 and 2013, headlines in Minnesota and Wisconsin have raised questions and alarms about the emergence of new large-scale sand mining in support of petroleum exploration, in particular to make possible the use of the twin technologies of hydraulic fracturing and horizontal drilling in exploiting vast new fields of oil and natural gas from deep shale beds. As controversial as the headlines have been, the underlying story and the resulting effects to the economy and the transportation network of this new energy play is even more compelling and far-reaching. The presentation touches on the purpose, production, and transport of frac sand, the extent of new shale oil & gas plays such as the Bakken, long-term trends driven by this new energy supply, related transportation challenges that affect our system, and the impacts of new transportation fuels across all modes.
The freight system is a dynamic network of private, public and quasi-public entities involving all modes of transportation—trucking, rail, waterways, air, pipelines, and even space. In recent years, the demand for freight transportation service has been increasing, fueled by growth in international trade. Strategic operational and investment decisions by governments at all levels are necessary to maintain freight system performance, and will in turn require sound technical guidance based on multimodal research. Many strategic targeted investments are already being formulated across a wide spectrum of modal interests. For example, the state of Florida recently announced an advance of $24.4 million to help expand the Port of Canaveral to accommodate newer, larger passenger and cargo ships. In March, the state awarded $77 million to deepen the Port of Miami, allowing it to accept bigger ships slated to begin using a wider Panama Canal in 2014. The USDOT TIGER Program provided several targeted freight projects with investment. Dozens of states have also identified targeted freight investments to enhance economic opportunities in their regions.

These targeted investments, especially those directly to railroads, ports, and private businesses, represent a different way of distributing transportation fund dollars to serve freight related needs. To date, there has been limited strategic understanding for such investments in the broader context of statewide transportation funding. Through a comprehensive survey and 12 specific case studies, this project develops a systematic approach to understanding certain types of industries and how transportation investments affect those industries’ expansion and relocation plans. The project also will identify the characteristics of successful freight investments in other states and nations and how they can be appropriately applied in a specific Florida context. This learning is transferable to other state DOTs.

The research team is preparing a decision support framework and necessary guidance for evaluating future investments on their likelihood of success (including projections on job creation and return on investment).

The proposed presentation will include progress updates on the project activities, provide preliminary recommendations and findings, and detail the survey results and case studies completed in the spring of 2013. The project is scheduled to kick off in the early part of 2013 and be completed in twelve months. The May timeframe for the Research Conference provides the audience with enough preliminary information even though the project will not be completed.
Both Ends of the Commute: Research on How to Achieve System-Level, Transit-Oriented Jobs-Housing Balance

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The Twin Cities metro area is in the process of building out an ambitious, regional system of transitways. These major public investments have the potential to be transformative for the lives of Twin Cities residents and the economic fortunes of the region by connecting homes with employment destinations. Fully realizing that potential, however, will depend in large part on the actions of private-sector real estate developers and employers. The Metropolitan Council sees these “Corridors of Opportunity” as central to its efforts to make sustainable regional development the basis of its 2040 Regional Development Framework, Thrive MSP. With support from the Sustainable Communities Regional Planning grant awarded to the Council by HUD, the EPA and USDOT, researchers from the University of Minnesota’s Humphrey School of Public Affairs conducted a series of conversations with Twin Cities developers and business executives aimed at developing strategies for attracting a wide range of affordable housing choices and living-wage jobs to transit station areas.

The research approach centered around a series of in-depth, open-ended interviews with developers and business executives, most ranging from 30-45 minutes in length. Questions focused on primary site selection factors, the role of transportation/transit access in site selection and how that role might change as the regional transitway system matures. In addition, the researchers asked developers specifically about opportunities and challenges regarding transit-oriented and affordable housing development; business executives were asked specifically about specific roles transit might play in workforce recruiting/retention and regional economic competitiveness. Interview transcripts were analyzed through both close readings by the research team and content analysis using the NVivo software package.

Developers interviewed in the study were mostly willing to consider transit-oriented development if they expected an acceptable return on investment, if they saw their key market to be demanding it, and/or if a transitway were implemented in the area of the metro they frequently work in. Most were not, however, willing to take on additional cost, complexity or risk. Many did express a belief that there is a generational shift underway in demand for transit-oriented housing. While businesses varied in their attitudes toward transit, many—including a number with suburban locations—saw a regional transit system as potentially beneficial and attractive. In addition, multiple businesses also identified the placemaking and regional competitiveness benefits of transitways as beneficial. Businesses also had generational changes in mind, with several eyeing improved transit access as increasingly necessary for the future. Potential policy implications include confirmation that developers are receptive to oft-suggested strategies for encouraging TOD, and information on types of employers to target for station-area economic development efforts.
Regional Transit System Return on Investment Assessment

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Business leaders in the Twin Cities wanted to know: can we measure the economic benefits of building out a comprehensive metro transit system? The Itasca Project commissioned a research study by Cambridge Systematics, leading consultants in transportation planning and policy, to determine the "return on investment" that the Twin Cities would experience from a buildout of the Met Council's 2030 plan. The results provide a powerful new understanding of the role of transit in our regional land transportation system, and affirm the economic benefits of such an investment.
Minnesota’s Toward Zero Deaths (TZD) is a multidisciplinary, four “E” collaboration which includes *Enforcement, Education, Engineering, and Emergency Medical and Trauma Services*. TZD includes multiple state and local agencies, academia, the judicial system, traffic safety advocacy groups, and citizen groups. The multifaceted approach to address traffic fatalities is based on international and national models.

Both state and local traffic safety advocates have a long history of tirelessly working to address the needless deaths on Minnesota’s roadways. In 2003, those early advocates have coalesced under TZD; their efforts, commitment, and passion are recognized building blocks for the elevated traffic safety discourse and positively impacted traffic fatalities.

In order to promote the TZD Mission throughout Minnesota, TZD Regions were established to support local traffic safety partners. TZD Regional Coordinators were also hired to serve as liaisons between local entities and centralized state programs, outreach and recruit new local traffic safety partners, and promote the TZD Mission within communities. In 2012, MnDOT conducted the first evaluation of TZD Regional efforts. Data were collected from multiple departments, organizations, and individuals to measure region-level efforts and traffic safety outcomes. Multiple statistical methods were used to measure the impact of TZD Regional involvement with centralized programs and regional maturity on traffic safety outcomes.

The report findings showed that the cumulative effort of TZD Regional Coordinators, partners, and stakeholders is moving Minnesota toward zero traffic fatalities. Local governments and communities are essential partners to TZD Minnesota. This report also includes recommendations for future regional efforts and identifies the most persistent traffic safety issues for each region and for Minnesota.
Evaluating the Effectiveness of State Toward Zero Deaths Programs

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Objective: Since 2001, approximately 30 U.S. states have adopted a mission, vision, or goal to reduce fatal traffic crashes to zero. These efforts, which operate under different titles, such as Vision Zero, Target Zero, or Toward Zero Deaths, are now being promoted as a national strategy by a coalition of transportation and safety groups under the banner of Towards Zero Deaths (TZD). This presentation highlights the characteristics of successful TZD programs and empirically evaluates the effectiveness of these efforts.

Methodology: An initial analysis was conducted on all State Highway Safety Plans, and an evaluation was done to identify the common characteristics of a successful TZD or zero deaths effort.

For the purposes of a broad assessment, fatality rates were used to quantitatively assess the effectiveness of a TZD or zero deaths effort. Traffic fatality data from 1994 to 2009 were obtained from the Fatality Analysis Reporting System (FARS) managed by the National Highway Traffic Safety Administration (NHTSA). Four state programs, Idaho, Minnesota, Utah, and Washington, were the focus of the statistical analysis, because they exhibited the basic characteristics of a successful TZD state as defined by this study and have at least three years of crash data after implementing the program. For each state identified, a two-factor analysis of variance (ANOVA) was used to determine if the fatality rate was significantly reduced after implementing a TZD effort, and an analysis of covariance (ANCOVA) was used to measure the effect of TZD over time.

Results: Statistical tests on these four programs support the conclusion that implementing TZD programs accelerates the reduction of fatality rates. The acceleration rate varies from state to state, taking time for a new program to gain its full effect. Although each state has different degrees of temporal effect of its TZD program, the average effect is more and more apparent over time.

Potential Applications: TZD strategies may be a particularly important approach in reducing rural road fatalities. Rural fatalities are about twice those in urban areas in proportion to population as well as vehicles miles traveled. The TZD approach encourages state agencies to work collaboratively with local police, fire, health, emergency response, courts, schools and private businesses to tackle the behavioral and policy challenges with proven countermeasures such as targeted speed or DUI enforcement and use of information technology to improve crash outcomes in remote rural areas.

Policy Implications: The presentation makes recommendations related to future evaluation of these programs and recommendations to assure the success of TZD programs and the national effort to expand to all states.
This unique MnDOT project has prepared Safety Plans for each of Minnesota’s 87 counties. Highlights of the project include developing a new risk assessment process to identify candidates for safety investment based on the presence of roadway characteristics that are over represented at the handful of locations with crashes. The analytical process has resulted in the development of approximately $240M of safety projects, the application of a specific safety strategy at a specific location on the county system.

The process of analyzing crash and roadway data for the county roadway system has produced a database with over 25,000 of paved roadways, 20,000 horizontal curves and 10,000 intersections. The Update will provide an overview of the process, identification of the risk factors selected for the risk assessment, an overview of the high priority safety strategies and a summary of the suggested safety projects. In addition, compelling crash facts will be shared – i.e., 88% of severe crashes occur on the 56% of the county system that is paved, 50% of severe road departure crashes occur in curves even though curves make up less than 10% of the county system by mileage, the most common type of severe crash in the Metropolitan Area is a right Angle crash at a signalized intersection and almost 40% of all severe pedestrian involved crashes occur at signalized intersections.

To date, MnDOT has provided Highway Safety Improvement Funds for almost $14M of projects along the county highway system and virtually all of these projects were identified in the County Safety Plans using the systemic safety project development.
This paper presents the findings of the second phase study on the development of a new intersection warning system referred to as an Advanced LED Warning System for Rural Intersections (ALERT) and evaluation of the system’s effectiveness. The ALERT system was developed to address the sight restrictions in rural through/stop intersections, and it consists of vehicle detectors that detect approaching or stopped vehicles and LED warning signs that respond according to the received messages from the detectors. The warning signs have LEDs on the perimeter of the sign and a warning message in the middle, which is commonly referred to as a blinker sign. All signs and detectors are powered by solar panels and rechargeable batteries. All message communications between the detectors and warning signs are performed through wireless transceivers. The warning system designed in the first phase of this project is referred to as the ALERT-1 and the second phase as the ALERT-2 system.

In the first phase, we found that the ALERT-1 system was effective at reducing vehicle speeds on the main approach, and increasing the wait time and altogether stopping roll-throughs for vehicles on the minor approaches when a conflict exists at the intersection. However, an increase in roll-throughs when no conflict exists at the intersection was observed. This problem is addressed in the ALERT-2 system by converting the two static STOP signs in the minor approaches to blinker STOP signs and then by adding vehicle detectors equipped with a remote actuator at the paired Stop Ahead signs. With this modification, a vehicle approaching the intersection from the minor approaches first sees a blinker STOP sign activated, as the vehicle passes through the Stop Ahead sign. The activated blinking is turned off as the vehicle arrives to the entrance of the intersection. At that moment, the motorist next sees advanced warning information through the VEHICLE APPROACHING blinker sign which is located on the other side of the intersection and activated by another vehicle that approaches from the major lane (through traffic). This sign activation sequence is designed for the motorists to feel as if the STOP sign and approaching vehicle information is personalized to them by responding to each vehicle. This new design (ALERT-2) is expected to reduce the roll-throughs while keeping the positive effects of the ALERT-1 system. The ALERT-2 system is fully implemented and operational; we report on the design improvements and ongoing evaluation of the ALERT-2 system.
Rural Intersection Conflict Warning Systems

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As part of Minnesota’s Towards Zero Death program, MnDOT has developed the Rural Intersection Conflict Warning System (RICWS) project. The RICWS project will deploy 20 to 50 Intersection Conflict Warning Systems statewide to reduce fatal and serious injury crashes at rural non-signalized intersections beginning in 2013. Intersection Conflict Warning Systems use a combination of static signing, detection, and dynamic elements, to provide drivers with a dynamic warning of other vehicles approaching the intersection.

RICWS is a Design Build project that will utilize a three year on-site warranty and a new contracting method, Indefinite Deployment Indefinite Quantity (IDIQ).

This presentation will discuss Intersection Conflict Warning Systems as well as the innovative contracting process. The lessons learned from this deployment will not only impact the RICWS project, but may be extended to other traffic safety and traffic control applications.
The vast quantity and distribution of culvert pipes across the State of Minnesota is astounding and, while easy to overlook, the culvert infrastructure is a vital component of our water resources and transportation infrastructure. This study examines the current design practices of culverts and storm sewer pipe in our state and seeks to take the next steps toward evaluating the design, installation and performance of culverts with the broad vision of improving culvert service life and lowering life cycle costs through improved pipe materials and advanced design methods. Historically, the predominant material type for culverts in the state has been concrete and metal pipe. Design has not directly incorporated regional variability in soils, water chemistry and other environmental or regional considerations. Over the last decade, alternative pipe materials have emerged such as plastic and coated metal pipe, that expand the design options for culverts. Additionally, the federal government implemented requirements for designers to consider alternative pipe materials in design. This project, which is the first step toward updating design methodology, attempts to evaluate performance of culverts in the state and, through examining large field inspection databases and other environmental databases, identifies common failure mechanisms, determine average effective service life, and assess regional trends that occur throughout the infrastructure. The study identifies performance issues for culverts in Minnesota and, together with the Technical Advisory Panel, provides recommendations for improving performance and advancing culvert design.
Bridge scour is the erosion of bed material around bridge foundations caused by local flow conditions created by the bridge foundations and/or riverine degradation or other channel movement. The erosion can result in the catastrophic failure of the bridge. In the current University of Minnesota’s Center for Transportation Studies (CTS) project, “Scour Monitoring Technology Implementation,” fixed scour monitoring equipment was installed on two Minnesota bridges in November, 2012. The first is over the Minnesota River in Mankato, Minnesota and the second is over the Mississippi River in Winona, Minnesota. MnDOT personnel currently use only portable monitoring devices for the measurement of scour during flooding events that exceed predetermined levels. This manual monitoring method can be difficult, inaccurate and dangerous with the high currents associated with these extreme flood events.

The purpose of the current project is to document the installation and performance of typically used fixed scour monitoring instrumentation in Minnesota for three years. Common issues with fixed scour monitoring instrumentation include debris and ice destroying equipment and lack of monitoring/maintenance in the long term. The current installations were designed with specific bridge and river conditions in mind and the methodology of data collection varies due to these conditions. The equipment installed includes sonar sensors, tilt sensors, float-out devices and stage sensors. Additionally, the data has been logged continuously since installation giving insight into scour monitoring equipment performance, local bed response, and providing data for verification against other datasets. Overall, the installation design/methods and performance of the systems will be reviewed. This will be followed by a review of the scour data collected over an entire annual cycle and the future use of these two deployments in Minnesota.

This project is sponsored by MnDOT through the CTS and in collaboration with ETI Instrument Systems who assembled and programmed the data loggers. This project is the implementation of MnDOT research project “Bridge Scour Monitoring Technologies: Development of Evaluation and Selection Protocols for Application on River Bridges in Minnesota”. This proposal is based on example workplans in that research project.
Economic Benefits of Telework for Employers

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Market research conducted through the Urban Partnership Agreement eWorkplace program found that if telework is to gain widespread support in government and industry, employers need to be presented with strong evidence that telework is good for their bottom line and industry productivity. To begin to address this need, case studies of three employers were conducted to explore their perspectives and experiences in implementing telework policies. Findings from these case studies confirm previous research on the benefits and limitations of these policies and indicate directions for future inquiry. This study contributes to the sustainability of telework initiatives, specifically, and to flexible workplace policies, more broadly.
HOURCAR Program

Public Bike Sharing Program

Cycles for Change Community Bike Shop

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Access to reliable, affordable transportation is critical to a thriving economy – at the macro level and the micro level. Transportation is expensive; often it’s the second highest household expense after housing, consuming 14% of family income for the average family according to the Bureau of Labor Statistics Consumer Expenditure Survey. When low income individuals live far from where they work, transportation consumes over 30% of household income according to Policy Link’s Transportation Prescription. New research by the Center for Neighborhood Technology illustrates the increasingly burden of combined housing/transportation cost even on moderate-income households.

The transportation default for many households is often owning and maintaining a vehicle, an annual cost the American Automobile Association calculates as $8,220. There are options and important ways to connect low income Twin Cities residents with other and more affordable options. Our panel will relate the issues, challenges and on-the-ground successes of reaching low income populations with transportation options.

1. Overview of transportation issues for low income metro residents
2. Enlarging a system of shared cars: HOURCAR
3. Making shared bicycles more available to low income users: Nice Ride
4. Working with social service organizations to address transportation needs of clients
   a. Community Partners Bike Library Program: Cycles for Change
   b. Transportation Options Program: Transit for Livable Communities/Bike Walk Twin Cities

1 “The Struggle of Moderate-Income Households to Afford the Rising Costs of Housing and Transportation”; Center for Housing Policy; October 2012.
Planning and Implementation of Complete Streets at Multiple Scales

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In this presentation the investigators will highlight approaches to complete streets planning and implementation, drawn from a diverse set of local and national case studies. The presentation shifts the focus in advancing complete streets beyond policies and design guidelines, to consideration of institutional change, decision-making, and engagement efforts. The presenters will highlight practical best practices and case examples informed by over 100 interviews with engineers, planners, designers, advocates, and other stakeholders, in 11 cities.

Practices relate to a wide range of topics, including but not limited to: (1) integrating complete streets into planning and engineering documents, (2) engaging the public in complete streets planning and projects, (3) integrating multiple funding sources to advance innovative roadway design, (4) coordinating multiple transportation modes and land uses at the corridor scale, and (5) advancing intergovernmental and cross-disciplinary coordination in complete streets, lessons learned, best practices, and project methodology in their research of complete streets planning and implementation practices in eleven case studies. This project was funded by the Local Road Research Board and the Minnesota Department of Transportation.

With the recent passage of complete streets legislation in Minnesota, a variety of transportation practitioners are looking to build capacity relative as it relates to the processes associated with complete streets transportation planning and implementation. This project provides a direct response, examining a wide range of approaches to provide a practical guidebook for transportation professionals to use in a variety of roadway and community contexts. Researchers conducted extensive research of eleven case studies across the nation, covering a variety of contexts. Through this research, the investigators identified key practices communities and organizations employed in the policy-making, planning, and implementation processes. The guidebook highlights the key practices and provides practitioners with a valuable resource for future transportation planning. Based on best practices and insights gleaned from engineers, planners, consultants, advocates, elected officials, and designers who have successfully planned for and implemented complete streets, the presentation will highlight: (1) how communities have integrated complete streets concepts into key documents and internal procedures, (2) the use of emerging and innovative complete streets practices, (3) the diversity of planning and design approaches that integrate complete streets with other community priorities, and (4) successful complete streets projects that have been constructed in a variety of contexts. The research effort to be highlighted in this presentation is funded by the Local Road Research Board and the Minnesota Department of Transportation.
Objective: There is a national movement and legislation regarding Complete Streets that may have significant impacts on local agencies. In order to inform local agencies and guide those interested in developing their own policy, the Minnesota Local Road Research Board (LRRB) funded the development of a “Complete Streets Resource for MN Local Agencies.”

Approach/Results: This resource includes an overview on Complete Streets, a brief synthesis of local practices, an understanding of the various terms and activities, guidance on implementation and MN agency experiences in planning and implementation.

Potential Applications & Policy Implications: As addressed, the development and release of this resource will serve to better inform local agencies, and may act as an enabling tool for those interested in developing their own policy.

In addition to the aforementioned impacts, the presentation attendees will gain a deeper understanding of how a local agency can implement a Complete Streets policy/practice within their community. This professionally relevant learning experience will include a discussion of the basics of Complete Streets – what it is and what it isn’t, understanding the terms and activities and most importantly how to implement. In addition, a synthesis of local practices, as well as MN agency experiences in planning and implementation will be presented.
In January of 2013, the Transportation Research Board (TRB) will release the final report of National Cooperative Highway Research Project 25-33 Evaluating Methodologies for Visual Impact Assessment. The project examined the practices that state departments of transportation and selected foreign transportation agencies had for assessing visual impact caused by highway projects. The primary objective of the study was to determine the existing state of the art and to define a set of best practices for conducting a Visual Impact Assessment (VIA). The authors surveyed all 50 states, reviewed the visual impact assessments in approximately 100 environmental documents, and selected five projects in the states of Minnesota, Washington, Colorado, and Vermont and Scotland in the United Kingdom for a thorough analysis.

The resulting set of best practices were defined as 1) a set of six policy and procedural directives to which all visual impact assessments should adhere; 2) a set of four governing concepts that need to guide the development of all visual impacts assessments; and 3) a set of twelve best methodological practices that should be followed, in order to ensure a scientifically valid, administratively practical, and professionally useful assessment of impacts to the affected environment, population, and visual quality.

The Federal Highway Administration (FHWA) has accepted the findings of the report and is currently revising its 1981 guidance on how states are to conduct a visual impact assessment to conform with the findings of the NCHRP report. Understanding the results of the NCHRP report will provide state departments of transportation the opportunity to prepare for the changes that the FHWA is anticipated to promulgate as early as the end of the year.

Environmental compliance officers, professional practitioners who work for federal and state transportation agencies or private practices that are responsible for creating VIAs, and researchers studying the relationship between aesthetics and community impacts would be interested in this presentation.
An Automatic Performance Evaluation and Diagnosis Tool for Arterial Traffic Signal Systems

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Efficient and effective traffic signal operation is greatly beneficial to road users. On the other hand, poorly timed traffic signals could reduce road network capacity significantly and create artificial bottlenecks. Unfortunately due to the labor and cost required, even though traffic signal retiming has a very high benefit/cost ratio, most of the traffic signals in the US are retimed according to a fixed schedule (once every 3-5 years or longer). Such practice may miss the opportunities for operational improvement and could lead to unnecessary delays on signalized arterials. Currently the need to manually collect the data and then calculate performance metrics for an intersection or an arterial has made performance assessment a time-consuming and expensive process for transportation agencies. Therefore, an automatic and low-cost performance evaluation and diagnosis tool for traffic signal system is urgently needed. This paper aims to fill in this gap.

With support from Minnesota Department of Transportation, we have developed a low-cost high-resolution data collection unit (DCU) for existing cabinets to automatically collect and archive event-based traffic data. The DCU collects data from the existing infrastructure, without instrumentation of new sensors. Every “event” occurred at the intersection, such as a vehicle-detector actuation or a signal phase change, is recorded and archived by the DCU, and will be transmitted in real-time to a central server. Using the event-based data, a set of arterial performance measures, especially intersection queue length and arterial travel time, can be estimated. Additional performance measures, such as delay, level of service, and number of stops, etc. can be derived from estimated queue length and travel times. With archived performance measures over a period of time (two weeks in our study), we also developed a performance diagnosis tool that can identify opportunities where a parameter change (such as offset, split and cycle length) may improve the traffic signal operation. The performance evaluation and diagnosis tool are currently implemented on thirteen intersections on TH13 in Burnsville, MN. Field implementation results will be presented in the paper.
A New Approach to Robust Non-Intrusive Traffic Detection at Intersections

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Objective: Non-intrusive detection based on visible band of the electro-magnetic spectrum (i.e. using video camera) offers many advantages for intersection traffic control but it suffers from performance degradation under spectrally-challenging conditions such as shadow and night-time. Non-intrusive detection in a different spectrum, namely microwave radar, has been used extensively on freeways without performance degradation in similar conditions. Objective of the study presented here was to devise and demonstrate an effective way to offer benefits of radar-spectrum detection at intersections.

Methodology: The approach of using a sensor solely based on microwave radar spectrum, somewhat analogous to what is already in use in freeway applications, has been studied elsewhere and will be appropriately referenced in the presentation. The study reported here chose an alternative approach: to explore integration of relevant spectral benefits of radar spectrum with that of visible spectrum to effectively minimize afore-said performance degradations at intersections without giving up benefits of visible spectrum. Video and radar detection accuracies were examined across a wide range of environmental conditions. Data analytics were performed to estimate the percentage of time a particular condition may exist. Effectiveness analyses of the sensing modality, the accuracy of determining environmental or traffic condition, and the likelihood of condition existing were performed to optimize detection accuracy.

Results: The integration approach was tested in laboratory simulation as well as in wide range of diverse field conditions, including different latitudes and seasons that would offer diverse shadow effects, over an extensive period of 18 months. The field results indicate over 98% correct detection under all conditions, benign as well as adverse. Details of the results will be provided in the presentation.

Potential Application: The new approach offers systemically robust non-intrusive detection at intersections sustainable under all weather and day-night conditions, with the benefits of streaming video for traffic surveillance and remote verification of incidents and alert conditions without giving up detection reliability that could compromise intersection safety and mobility.
Kentucky’s First Double Crossover Diamond Interchange: One Year Later

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The Harrodsburg Road (US 68) interchange with New Circle Road (KY 4) was reconfigured and opened to traffic in August 2011 as Kentucky’s first (and the nation’s sixth) Double Crossover Diamond (DCD) / Diverging Diamond Interchange (DDI).

The interchange had for years been a bottleneck with severe peak hour congestion and extremely high crash rates. Harrodsburg Road, a signalized arterial, consisted of two through lanes and a single left turn at the New Circle interchange. Currently, between 35,000 and 40,000 vehicles travel this section of roadway each day. The project corridor included four signalized intersections within a span of less than half a mile, which contributed to that stretch of Harrodsburg Road having the highest crash rate of any major artery in Lexington. Moreover, traffic delay seemed endless each day, and traffic queues on the ramps were backing up on to the fully access controlled New Circle Road.

The feedback from the general public and media has been positive, despite a lot of doubt that surfaced prior to and during construction. The presentation will focus on some of the challenges encountered during both design and construction and will include some of the post-construction findings now that it has been fully open to traffic for more than a year. This will include data regarding improvements to traffic flow and the reduced number of crashes that have been experienced.
Evaluation of Rapid-Hardening Cementitious Mixes for Partial Depth Repair of Rigid Pavements

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At present, a total of 31 pre-packaged dry rapid-hardening cementitious materials are approved by MnDOT for concrete pavement repair. The acceptance criteria for these materials have been based on ASTM C 928 specifications that require a minimum compressive strength, bond strength, resistance to length change, consistency and scaling resistance. While, the ASTM C 928 specifications as well as other sources recommend use of setting time, freeze-thaw resistance, and coefficient of thermal expansion and contraction testing, these are not currently required. The current patch mix approval process does not require the material to be evaluated under the same conditions as repair guidelines established by MnDOT. While there have been several studies that conducted comparative evaluation of commercially available patching mixes, no previous studies evaluated the performance of various patching mixtures in light of allowable construction practices and evaluated effects of chemical admixtures on bagged concrete patching mixtures. Both of these aspects are being evaluated through an ongoing research project. The presentation will focus on laboratory evaluation of 12 patching mixes through a battery of laboratory tests. The presentation will also discuss the work that is currently underway for development of improved guidelines for acceptance of pre-bagged commercial patching mixes.
A broad effort is underway to evaluate current practices, materials, and policies for pavement patching and repair, for both asphalt and concrete pavements, including evaluation of pothole patching practices, basic pavement maintenance, utility repair methods, and rapid repair materials. In support of this effort – and with the support and cooperation of MnDOT and MnDOT District 1 – NRRI is conducting additional refinement, field testing, and performance monitoring of two taconite-related approaches to pavement repair which rely on mixes/techniques that contain (or are enhanced by) taconite mining byproducts and co-products.

The first approach is a pavement/pothole repair compound formulation developed by NRRI that is fast-setting, taconite-based, and contains no petroleum or portland cement. The formulation can be water activated or activated by a chemical solution. For example, testing has shown that the field-mixed compounds can achieve a set time of less than 15 minutes, and be drivable in 30 minutes. Efforts are also underway to impart flexural properties to this compound.

The second approach involves the use of a vehicle-based (truck-mounted) microwave system for in-place pothole/pavement repair/recycling, in which taconite materials can enhance microwave absorption and the system’s performance. For example, field tests have shown that pothole repairs can be completed in less than 10 minutes, with the asphalt pavement and the taconite-enhanced repair mixture (e.g., comprised of RAP and RAS) being heated uniformly to >200° F (~100° C) to a depth of 3 inches in about 6 to 8 minutes.

NRRI is also comparing the performance of both of these methods to more traditional patching and repair approaches (e.g., commercial hot mixes, UPM, etc.) as well as to newer repair technologies such as the Stepp asphalt recycling machine, and the infrared HeatWurx asphalt pavement heating and recycling device.

NRRI’s efforts, to date, are summarized in this presentation.
Innovative Corridor Maintenance: The Trunk Highway 100 Project

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The Minnesota Department of Transportation’s Metro District took an innovative approach to roadway maintenance on Trunk Highway (T.H.) 100 between I-394 and Trunk Highway 62 this past August. In two 48-hour weekend closures maintenance crews were able to conduct numerous functions on the roadway. The type and purpose of closure represented an entirely new way to go about maintenance operations. Northbound TH 100 was closed to traffic August 18-20, while southbound TH 100 was closed the following weekend. These directional weekend closures allowed for a greater number of crews to work in coordination with one another while reducing the number of closures that would have been necessary had the various projects taken place under traffic throughout the season.

Maintenance operations included the following:
- Inspection of all overhead bridges
- Bridge deck repairs on all TH 100 bridges spanning local roadways
- Crack sealing and joint repairs
- Inspecting and repairing of expansion joints
- Milling and patching of roadway segments
- Repairing signage
- Refreshing pavement markings
- Inspecting and repairing electrical systems
- Clearing and repairing drainage structures
- Guardrail repair
- Concrete median barrier repair
- Roadway sweeping and debris removal, including overgrown and dead foliage and weed growth

Construction management: In order to put together the plan for two weekend closures, supervisors from multiple areas (engineering services, traffic, maintenance and public affairs) held two meetings prior to the first closure in order to discuss what maintenance operations were needed, when the project would occur, how to best coordinate numerous activities in close proximity, how to publicize the project and how to work with the local agencies affected. An additional meeting preceding the closure of southbound TH 100 was held to discuss what had gone well on the project and what improvements could be made over the following weekend.

The project took place with relatively few issues or disruptions, thanks to extensive planning during design that was carried out during the work. Particular achievements included the fact that maintenance crews were 60-70 percent more efficient in just two 48-hour periods as opposed to that same amount of time of daily closures scattered throughout the construction season.

Another management achievement was that MnDOT was able to maintain access to one direction of TH 100 at a time rather than fully closing the roadway. This was advantageous because it reduced the number of affected motorists.

Safety performance measures: MnDOT administered a safety performance and safety program throughout construction. The single direction closure of TH 100 allowed for the protection and safety of workers near the roadway while assuring the safety of the traveling public. A state trooper was present to safeguard the closure area, keeping motorists out of the closed area so that neither they nor the workers would be endangered.
**Environmental awareness:** Maintenance operations took into consideration the physical impacts on water resources; erosion and sedimentation; water quality and surface water runoff; and visual impacts. Improvements to the immediate environment included the reestablishment of deteriorated drainage structures; the removal of dead trees and brush and grooming of overgrown trees and brush alongside the roadway.

**Unusual accomplishments given adverse conditions:** Completing a multitude of maintenance tasks on a busy roadway can be exceptionally demanding, but doing so within a specific timeframe is considerably more arduous. Under these conditions maintenance workers excelled at completing a broad spectrum of activities alongside contractors who also had been inside the work zone conducting work (e.g., lighting and bridge consulting contractors).

Maintenance activities throughout the weekend required help from eight crews, completing more than 12 activities at once on the roadway. A few of the ongoing activities included concrete median barrier repairs, bridge reactive and preventative work, milling and patching deteriorated concrete, tree and brush removal; roadway lighting inspection and repair. Implementing such a variety of tasks required close to 100 workers to be on-site at any given time.

Despite the large task, on-site work was completed efficiently because of effective communication between individual workers, crews and supervisors. Maintenance workers operated in conjunction with a consultant bridge inspection team and a lighting contractor.

**Additional conditions deemed of importance:** The TH 100 maintenance operations project was unusual as it involved the closure of a complex and high volume section of the roadway (a roadway that has an AADT of 113,000). These factors lead to maintenance’s decision to work directly with Metro District Traffic Engineering and Traffic Services in order to put together a highly detailed and complete traffic plan.

The traffic plan was highly extensive compared to those of most highway maintenance projects. Hundreds of barrels were utilized during each weekend closure, in addition to dozens of detour signs, barricades, channelizes and other roadway signage.

The TH 100 traffic plan was deemed successful because of the coordination and involvement of each traffic department. Pooling information resources enabled the use of a large scale traffic detour that took into consideration other roadwork within the area and made sure that no signs or ramp closures were missed. This ensured that all sections of TH 100 were safely closed.

**Community relationships:** Community relationships were maintained by all project partners during construction. Local news organizations were sent information regarding the closures, and a news release was published on the MnDOT web site in order to alert TH 100 motorists and the public. Local businesses and residents were made aware electronically of the upcoming maintenance operations and road closure.

The public relations effort to raise awareness of the project resulted in publication from a variety of news organizations, including the Star Tribune, KSTP, Finance and Commerce, Edina Patch and HometownSource.com.

Local communities were kept up to date about the project through MnDOT’s West Area Program Delivery Engineer and Public Affairs Coordinator. The City of Golden Valley, City of St. Louis Park and City of Edina were notified of the scheduled maintenance work and worked in cooperation with MnDOT to inform the public of the scheduled closures. The City of St. Louis Park, City of Golden Valley and City of Edina published information on the project to their city web site or linked to the MnDOT TH 100 news release. The City of Edina and the City of St. Louis Park each expressed approval of the project:

Email updates were also sent to the 558 persons registered to receive road construction information via e-mail about TH 100 in St. Louis Park. Those registered to receive construction updates on neighboring roadways Hwy 169/I-494 were also notified as they may also be frequent TH 100 users. This included notification to an additional 1,383 e-mail addresses.
Construction activities timeline

- Aug. 18-20: Northbound TH 100 traffic is detoured as maintenance operations begin on the north side of the roadway. Posted detours directed motorists to use westbound TH 62, northbound TH 169 and eastbound I-394 to access northbound TH 100
- Aug. 25-27: Southbound TH 100 traffic is detoured as maintenance operations begin on the south side of the roadway. Posted detours directed motorists to use westbound TH I-394, southbound TH 169 and eastbound TH 62 to access southbound TH 100

Project costs: The short-term closures were a successful way to maintain project costs in comparison to maintenance projects drawn out through an extended period of time. Costs were lower because MnDOT was able to complete the work in-house rather than contracting the work to multiple independent agencies. Costs were also restricted because crews did not need to repeatedly return to the site with equipment nor did they need to repeatedly set up multiple lane closures.

The project also allowed for a longer cure time for the concrete that was placed, which provides a longer lasting and therefore more cost-effective repair.

As the project was created, designed and accomplished by MnDOT Maintenance personnel and made use of MnDOT equipment, the project was of lesser cost than had the work been done by other personnel. The cost of using the equipment, had it not been owned by MnDOT, would total $52,259.71. Since MnDOT maintenance was able to utilize its own equipment, equipment cost was reduced to the price of vehicle fuel (near $3,000). The total cost of the project was estimated to approximately $200,000.

Future value to public and public works: The success of the TH 100 maintenance project was largely a result of the unique philosophy behind the project. As with many construction projects the goal was to “get in and get out.” This project was benefited by the large number of maintenance workers and equipment that were available on-site, leading to a shorter project timeline. Fully closing TH 100 one direction at a time for two consecutive weekends allowed crews to complete work more efficiently without the added concerns that come with busy roadway traffic.

At the completion of the project the value of carrying out a project in such a manner was clear to all those involved. Maintenance leadership have begun scoping metro area corridors with plans to complete two more maintenance operations next spring using the same methodology as that of the TH 100 project. Applying a similar “get in and get out” philosophy with a large task force will help strengthen future projects and provide a greater savings to taxpayers.

Conclusion: Throughout the project MnDOT strived to work efficiently through quality management. In addition, MnDOT worked to secure the safety of the public and constructions crews while performing proficiently. Throughout construction MnDOT aimed to be environmental stewards and to reduce the overall duration of the project. In doing so, MnDOT was able to enhance community relations, which were also strengthened though shared information and interaction with area businesses, residences and the public. The TH 100 maintenance operation was a short-term project but a memorable success.
Freight transportation plays a considerable role in the economic and community life in Minnesota, but in comparison to other business sectors, the elements of freight movement are not well understood. This study explores the means for understanding and enhancing the value of freight transportation to the Minnesota economy, particularly the private freight rail networks. This study will also engage Minnesota’s transportation policy community in understanding how to leverage the dynamics of freight rail to further add value to the state’s economy and transportation planning.

As of the time of submitting this abstract, the study was just starting to get underway. We expect to have an initial snapshot of the community and economic impacts of freight movement in Minnesota by the time of the conference.
Impacts of Biofuel Production and Distribution on Minnesota Agricultural Transportation

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There has been a rapid growth in both corn based ethanol and soybean based biofuels in Minnesota. Biofuel development and growth has been encouraged by a variety of government policies including production subsidies, loan guarantees, and protective tariffs. The goal of early programs was primarily to develop gasoline substitutes and extenders and to reduce our reliance on nonrenewable petroleum products on a voluntary basis. Improving air quality and reducing emissions were secondary considerations. Minnesota was a leader in establishing a viable corn based ethanol industry.

However, this was changed by the Energy Policy Act (EPAct) of 2005 which established the Renewable Fuel Standard (RFS) program. This act established the first renewable fuel volume mandate which required that 7.6 billion gallons of renewable fuel to be blended into gasoline by 2013. (The US produced only 3.9 billion gallons of ethanol in 2005.)

The Energy Independence and Security Act (EISA) of 2007 then expanded the RFS program to include diesel and to require about 15.2 billion gallons of renewable fuels of all types in 2012 (13.2 billion of corn ethanol) and 16.55 billion gallons of renewable fuels of all types in 2013. Eventually there was to be 36 billion gallons of all types of renewable fuels (15 billion gallons of corn ethanol) by 2022. The difference is to be made up by new categories of advanced renewable fuels especially cellulosic fuels (16 billion gallons required in 2022)

These standards (except for cellulosic fuels) were easily met through calendar 2012. However, the 2007 forecasts of gasoline use on which these standards were projected were too high and the assumed increase in ethanol blends from 10% to 15% has not occurred. Consequently, corn ethanol usage has come up against “the blend wall” because 10% of US automobile gasoline usage is less than the 13.8 billion gallons required for corn ethanol in 2013 and 14.4 billion gallons required in 2014. (Furthermore, although the bio based standards for diesel can be met, the standards for cellulosic ethanol have been substantially reduced for 2010-2013 with no realistic expectation of meeting the 2007 standards economically for several years (if ever.) The first part of the paper will present a brief update on how the US motor fuel industry is adjusting to the requirements imposed by the RFS.

Nationally about 40% of the US corn crop has been diverted from the domestic animal feed and international export markets and a new major feed supply (distillers dried grain solubles) that substitutes for both corn and soybean meal has been developed. Major shifts in transportation modes and routes and a reduction in exports, export mix and export destinations have occurred. These include reduced barge movements of grain on the Upper Mississippi River and the addition of major movements of tank barges of ethanol by river and tanker cars by rail. Both ethanol and DDGs require different equipment and storage and handling methods such as containers and rail to container facilities for DDG exports and new water and rail transfer and blending facilities for ethanol.
Similarly as the biofuel industry has developed in Minnesota, there have been significant changes in the patterns of grain transportation flows to through and from Minnesota to end users such as feed lots and exports markets in both product form and product destination. These changes have resulted in increased requirements for truck and rail equipment to transport ethanol, biodiesel, and distiller’s grain feed byproducts while reducing the need for equipment for long distance barge and rail movements on unprocessed grains and oilseeds. (It should be noted that the actual production of corn and soybeans in Minnesota has increased concurrently with the growth of biofuel production.)

This second part of the presentation identifies, examines, and defines the changes in the Minnesota agricultural transportation and logistics system that occurred between 2000 and 2012 due to biofuels. These changes include new equipment types and new and expanded facilities as well causing significant shifts in both the domestic and export disposition of Minnesota’s agricultural commodities.
Minnesota’s river and lake ports, commercially navigable waterways, and related infrastructure are important components of the state’s multimodal freight transportation system. These waterway systems provide modal opportunities beyond reliance on rail and highways for numerous commodities, particularly for the movement of bulk commodities. Access to the Mississippi River system and Great Lakes allows for diverse and economical regional supply chains for industry, supporting economic sectors throughout the State, while connecting Minnesota to the global marketplace.

This first ever statewide plan for Minnesota’s ports and waterways will provide an overview and history of the waterway systems in Minnesota, an inventory of facilities and conditions, and industry profiles of shippers. In addition, a needs assessment and benefits analysis will identify the economic benefits of the waterways systems and will assess the Minnesota Port Development Assistance Program in relation to similar programs of peer states. Recommendations will include the role of private investment, local investment from port authorities, state investment via the port assistance program, and other governmental units. The plan will identify reasonable and reportable performance measures reflective of program effectiveness, system efficiency, cost competitiveness, and capacity. The plan will be completed by July 2013 and will inform multimodal planning activities in Minnesota.
In 2010 and 2011 the Metropolitan Council conducted several major surveys as part of its decennial Travel Behavior Inventory. At the 2011 CTS conference, initial findings from the 2010 Transit On-Board survey were presented. At the 2012 CTS Conference, an overview of the entire survey project was presented, as well as a look ahead at plans for forecast model improvements. In spring 2013, more comprehensive results will be available from the primary survey work:

Home Interview Survey: Between December 2010 and February 2013 over 14,000 households in the 19-county region filled out single-day diaries recording their personal travel. Information was collected on the household level (household structure, vehicle availability, income), person level (age, sex, employment/school status, educational attainment, possession of transit pass or MnPASS transponder), and trip level (location, activity, mode, price, and number of travelers). Survey participants were recruited and data was collected by phone, mail, and web in order to broaden the survey’s reach.

GPS Home Interview Survey: Between May 2011 and November 2011, all members (age 12+) of over 250 households in the 19 county region carried a GPS receiver for seven days, and filled out a single day personal travel diary. The survey collected the same type of data as the home interview survey. It will be used to validate trip rates from the larger diary survey, and as a comparison point for future larger-scale GPS household data collection efforts.

Key findings will be available from these surveys: describing how transportation in the region has changed in the past decade, how new travel modes are being used, and how social and demographic changes are bringing structural changes to transportation demand. Full results will be used in the development of a new transportation forecast model for the region.
The MnDOT Bicycle and Pedestrian Counting Initiative: Progress and Opportunities

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State and local officials in Minnesota need information about use of infrastructure for non-motorized traffic – bicyclists and pedestrians – to support planning and management of transportation systems, assess exposure for safety analyses, prioritize investments, and measure progress towards policy goals. However, the state does not systematically collect bicycle or pedestrian traffic volumes, and few local jurisdictions in Minnesota historically have monitored bicycle or pedestrian traffic. Using the FHWA Traffic Monitoring Guide as a framework, this presentation describes the MnDOT Bicycle and Pedestrian Counting Initiative, a research project to develop systematic procedures for counting bicyclists and pedestrians in Minnesota. Following an overview of advantages and limitations of automated and manual field counts, the presentation summarizes the results of pilot manual counts taken in more than 40 municipalities in Minnesota in 2012. The presentation also summarizes results from automated, continuous counts of bicycle and pedestrian traffic and demonstrates how daily and monthly adjustment factors can be used to estimate average daily bicycle and pedestrian traffic and annual bicycle and pedestrian miles traveled. Technological, financial, and administrative challenges to increasing monitoring are reviewed. The presentation concludes with a summary of strategies for institutionalizing bicycle and pedestrian traffic monitoring in Minnesota, including installation of a number of permanent monitoring sites to demonstrate different technologies.
The I-35W North Managed Lanes Corridor Study was undertaken to identify a viable managed lane alternative for I-35W north of downtown Minneapolis. Overall, the study included a wide variety of analysis disciplines including highway design, transit planning, freeway operations analysis, and travel demand forecasting. The travel demand forecasting performed as part of this study was particularly unique due to the broad scope of managed lane characteristics. These include use by high-occupancy vehicles (HOV), toll-paying single occupant vehicles (SOV), revenue projections, and transit ridership. This presentation will highlight the challenges of assembling the elements associated with each of these components.

The managed lane alternatives along the I-35W north corridor assumed operating parameters consistent with existing MnPASS facilities in the Twin Cities region. Specifically, HOV and transit buses would be allowed to access the lanes for free. Any unused capacity could be sold to SOVs willing to pay a toll. The Twin Cities Regional Travel Demand Model was used to estimate the peak usage of the managed lanes and the proportion of SOV and HOV users. This effort included extensive calibration procedures along existing MnPASS lanes on I-394 and I-35W south to ensure realistic model performance.

Another study outcome requiring forecasting tasks included revenue projections for SOV toll-payers using the managed lanes. It is expected that tolls would be collected through in-vehicle transponders that would communicate with readers mounted on overhead signs. The toll rates would update dynamically based on downstream conditions in the managed lane. As the lane approaches capacity, the toll rates increase, thereby discouraging some SOVs from using the lane and guaranteeing a congestion-free trip for transit, HOVs, and SOVs willing to pay the higher toll. Results of the traffic analysis were used to predict the managed lane utilization, the resulting traffic densities and associated toll rates. Finally, revenue was calculated by multiplying the toll rates across SOV users in the lane.

Increasing transit ridership was a key goal identified early on in the study. Recognizing that the addition of managed lanes in this corridor would be expected to improve travel times for express bus service, existing and future ridership patterns were evaluated. The analysis showed that improved travel times would, in fact, increase transit ridership, by up to 13 percent on select express routes. In addition, a high-level analysis was performed to gauge the potential for highway bus rapid transit (BRT) offering all-day, high frequency service through the corridor. The results provided insights to trade-offs between express vs. all-day service, travel time vs. frequency, and the influence of transit station design.
Leveraging YouTube as an LRRB Communication Tool

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Recently, the Minnesota Local Road Research Board (LRRB) funded the development of a series of YouTube videos for social media distribution. The video topics of the three recently completed videos include two videos on the effectiveness of stop signs and speed limit reductions as a strategy to reduce vehicle speeds on local roadways, respectively, and one on potholes. Future videos topics include Stormwater Best Management Practices and Rural Work Zone Safety. The objective for collecting the research and presenting the information as brief videos on a social media platform (i.e. YouTube) is to provide a compelling communication and educational tool for local agency staff and citizens.

The proposed session will highlight this public communication strategy by airing all or a portion of each video. It will also discuss the research and video development process, as well as the plans to implement these tools on local agency websites and at other public events to increase public education about the purpose of stop signs and speed limits. Furthermore, it will address the goal of equipping local agencies with an efficient and clear educational tool in order to decrease the time demands on local engineering and administrative staff and costs.
Lessons from Tweets and Likes: Metro Transit and Social Media

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As one of the largest transit agencies in the country, Metro Transit serves many stakeholders – customers, employees, businesses, community organizations, the news media and others. This session will cover how Metro Transit communications staff use social media channels (with an emphasis on Facebook and Twitter) to engage and converse with these various stakeholders. Presentation content will include guidelines and philosophy, content, audiences and the mechanics of efficiently managing social media accounts. A case study will feature Metro Transit’s use of social media during winter storms. Visit us in advance on Twitter at @MetroTransitMN or Facebook.com/MetroTransitMN.
CrashHelp in Minnesota: An Innovation to Improve Traffic Crash Emergency Medical Response

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Objectives: Rural areas create a number of significant safety problems. Extended travel times and limited visibility on accidents make the “golden hour” – the window in which trauma patients’ chances of survival are the greatest if they receive definitive care – difficult to achieve. Therefore, CrashHelp, a mobile multimedia EMS application, was developed in order to enable emergency responders to collect data about crash victims on-scene and send it directly to the emergency department (ED). This communication provides hospitals with advance notification of crash severity and related information that can be used to best prepare for the patient’s arrival. This presentation will examine the results of two pilot implementations of CrashHelp in rural Minnesota.

Methodology: A multiyear case study was conducted with the Mayo Clinic in southeastern Minnesota and San Mateo County, CA in order to explore EMS best practices and to validate the CrashHelp model. Through this work, researchers analyzed EMS response data, interviews, and focus group discussions with EMS practitioners to identify several critical gaps and consequent opportunities to improve medical responses to rural crashes. The findings were then used to develop the CrashHelp system.

A live beta test was conducted from July through October 2011 in Boise, Idaho and enhancements made based on feedback from field operators. Comparative pilot studies were implemented in July 2012 in Crosby, MN (Cuyuna Regional Medical Center) and November 2012 in Wadena, MN (Tri-County Hospital), both rural trauma facilities in greater Minnesota.

Results: Technical beta testing has been completed in Crosby, MN, and a full-fledged demonstration is underway in Wadena, MN. The researchers have found that CrashHelp is technically feasible in rural regions and can be used for a variety of emergency responses, including but not limited to crash responses. Results suggest CrashHelp can enhance communication between pre-hospital transport and hospital organizations (ED/Trauma). Use cases on crash response and treatment are being investigated to better understand its impact on care decision-making and resource utilization by hospital personnel.

Potential Applications: This will provide conference attendees from rural areas a variety of strategies to address EMS incidents that are more severe in nature and/or present long transport times.

Policy Implications: CrashHelp provides a real-time interface between on-scene medical providers and providers of definitive care. For regions adopting CrashHelp, the tool will potentially provide increased efficiencies in the delivery of definitive care, hospital billing, and EMS medical treatment.

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Red light running is a significant safety concern that leads to numerous fatal and injury crashes. Even though issuing citations onsite is one of the effective methods to minimize the red light running violations, it can be contested and overturned, taking up valuable court and law enforcement time and resources. Providing visual evidence to violators has been effective in reducing contested and overturned citations. This project develops an enhanced red light enforcement system that monitors and records the red light violation events, and provides onsite law enforcement personnel with alert signals and video evidence to help them effectively issue citations. This leads to a more efficient use of both enforcement and judicial staff resources and a safer driving environment at signalized intersections. The uniqueness of the system is that it provides a flexible platform that can be easily deployed at any location of interest. Traffic safety department and law enforcement personnel can then monitor the violations, conduct onsite law enforcement, and collect violation profiles to ultimately prevent or minimize the violations. URS Corporation is supporting MnDOT and the State Patrol in conducting a field test at a selected location in St. Cloud to assess how accurate and effective the system would be in terms of system installation, violation detection, alert signal transmission, and violation reduction.
Continuous Flow Intersections (CFIs) have been in the innovative intersection tool kit for over 10 years. While there has been significant research performed on CFIs from an academic perspective, little has been reported on actual operations. Over our ten year history in designing CFIs, two topics are frequently of interest from designers, owners and users: safety and pedestrian accommodation. Stantec has results on both safety data and pedestrian movement accommodation from two separate projects. We will provide the audience with a brief review of the CFI concept and report on the impact on safety and pedestrian movements.
Pedestrian involved crashes account for approximately 8% of severe crashes in Minnesota, 11% of severe crashes in the Metropolitan Area and were selected as one of the target crash types in the Safety Plans for the urban counties. However, city and county engineers indicated that there was a lack of readily accessible information about basic mitigation strategies, expected crash reductions and a description of candidate locations for deployment. In order to assist local engineers deal with pedestrian safety issues, staff from CH2M HILL along with the Director of the Pedestrian and Bicycle Information Center at the University of North Carolina Safety Research Center assembled a Best Practices Handbook documenting the characteristics associated with 15 pedestrian and bicycle safety strategies.

The presentation will provide an overview of the safety characteristics associated with strategies including; sidewalks, crosswalk enhancements, medians, pedestrian signals, crossing guards, road diets, bike lanes, bicycle boulevards, shared spaces and speed reduction measures.

The final Handbook was published in January, 2013 and electronic versions can be found on the MnDOT and L/TAP websites.
Investigation and Repair of the Diefenbaker Bridge Fracture

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The Diefenbaker Bridge is a 7-span, 304m (1000 ft.) long, fracture critical steel structure crossing the North Saskatchewan River in Prince Albert, Saskatchewan, Canada. The bridge is an important regional crossing and was constructed in 1959. On August 29th, 2011 a major fracture was found in one of the two steel girders of the southbound bridge.

The crack extended from the bottom flange through the web of the girder, nearly full height of the girder and is one of the largest in-service bridge fractures to occur in Canada. The structure was immediately closed and traffic was diverted to the parallel northbound structure. Full collapse was averted and there were no reported injuries.

This paper describes the resulting fracture investigation and major structural repair implemented on the structure. Based on this investigation, the structure is believed to be susceptible to constraint-induced fracture (CIF), a phenomenon reported to have occurred on the Hoan Bridge failure (Milwaukee, Wis., December 13, 2000) and in the US 422 Bridge failure, (Schuylkill R., Pottstown, PA, May 20, 2003).

To repair the structure, the fractured bridge was supported on steel towers constructed on a river berm and raised to its original position. A section of the girder was then cut out and replaced with new steel and connected to the temporarily supported horizontal and vertical bracing. This intricate procedure required innovative engineering and construction procedures.

The presentation will be of interest to bridge owners, designers, and anyone involved in inspecting and maintaining bridge infrastructure.
Monitoring and Modeling of the I-35W St. Anthony Falls Bridge

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Long-term monitoring of post-tensioned concrete structures is complicated by the fact that the behavior of these structures is strongly dependent on temperature and time-dependent effects. The monitoring system installed within the I-35W St. Anthony Falls Bridge provides a case study for investigating how these behaviors might manifest in sensor data collected over a number of years. This talk focuses primarily on how temperature affects the structural behavior. First, the bridge monitoring systems which measure structural deformation, elongation, temperature, and vibration are presented. Changes in strain readings due to temperature and time-dependent effects are found to be much larger than those imposed by 200 tons of static loading. Thermal gradients in the bridge cross section are shown to have a significant impact on the behavior of the structure, and are furthermore found to cause higher stresses than those expected by the AASHTO LRFD design gradient. Modal frequencies, a common measure of global structural mass and stiffness properties, are shown to depend strongly on seasonal temperature changes. Finally, ongoing investigations into the temperature dependence of concrete creep and shrinkage are presented.
The literature contains conflicting findings regarding whether or not current American Association of State Highway and Transportation Officials (AASHTO) shear live load distribution factors over- or under-predict the amount of shear carried by individual girders in a bridge system and how secondary bridge elements affect the distribution of forces. Furthermore, there is a dearth of experimental data to evaluate these findings. A better understanding of the distribution of shear in prestressed girder bridges as a system is needed to more accurately assess shear load rating capacity.

Parameters including, but not limited to, girder spacing and size, end conditions, skew, barrier stiffness, and type and location of diaphragms and their effect on shear live load distribution factors are being investigated in this project. The accuracy of the live load distribution factors for shear will be assessed by conducting numerical analyses, field testing, and a laboratory study. The studies will be used to resolve the conflicting results found in the literature and will provide shear distribution information at both service load levels and near ultimate capacity levels. The final outcome of the project will be the development of recommendations for shear distribution factors that can be used to more accurately rate prestressed concrete girder bridges for shear.
In cooperation with the Minnesota Department of Transportation, the Minnesota County Engineers Association, the Minnesota Local Road Research Board, and the FHWA Minnesota Division Office, a number of counties in the state have built accelerated and innovative bridge construction projects on their local roads in the past few years. These projects have included side-by-side precast box beams on sheet pile abutments, mechanically-stabilized earth (MSE) walls with single-line pile abutments, precast inverted tee slab span bridges, large precast box culverts, and three-sided structures. The first two county precast inverted tee beam bridges have been recently constructed based on the groundbreaking work of the Minnesota DOT for this bridge type, and the first Minnesota county bridge with geosynthetic-reinforced soil (GRS) abutments is scheduled to be built this construction season. Through many domestic local bridge scanning tours with federal, state, and local partners, the featured presentation describes the reasons that Minnesota counties have implemented ABC and innovative bridge construction techniques. The bridge elements, details, and costs related to these exciting local bridge projects will also be highlighted.
The “A” Minor Arterial System is unique to the Twin Cities. It was created to supplement the region’s Principal Arterial system in response to findings in the 1988 Transportation Policy Plan concluding the necessary resources were not available to greatly expand the region’s Principal Arterial system. With the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, the region directed a portion of the Surface Transportation Program (STP) Urban Area funds to be used to implement improvements to the “A” Minor system.

To mark the 20-year anniversary of the “A” Minor Arterial system, the region evaluated if the nearly 2,000 mile “A” Minor Arterial system has been successful in supplementing mobility on the roughly 700-mile Principal Arterial system. The study also analyzed how this original purpose fits with current regional policies. Finally, the study examined the system’s funding (federal, state, and local) to identify the role of federal funding, including those funds awarded through the Regional Solicitation Process.

The study effort was managed by Metropolitan Council staff. The planning sub-committee for the region’s Transportation Advisory Board (TAB), the Technical Advisory Committee (TAC), helped shape the study’s scope of work. Ongoing technical support for the study was provided by a 14-person Technical Steering Committee consisting of representatives from the TAB’s TAC, MnDOT Metro District, the seven counties (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott & Washington), and from five of the ten cities on the TAC (Maplewood, Minneapolis, Plymouth, Rosemount, and St. Paul). The study’s consultant team was led by SRF Consulting Group and included Cambridge Systematics.

Building on the 2012 CTS presentation which introduced this study, the proposed 2013 presentation will summarize study findings, focusing on “A” Minor Arterial system funding. It will also discuss the challenges encountered with collecting and analyzing comprehensive “A” Minor Arterial funding data for the first time in the region. The nearly 2,000 miles of “A” Minor Arterials travel through every part of the region and greatly affect passenger vehicle, freight, transit, bicycle, and pedestrian travel. Attendees will leave the session with a better understanding of this important system and how it is funded.
Rural Highway Expansion and Economic Development: Impacts on Private Earnings and Employment

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With the interstate system substantially complete, the majority of new investment in highways is likely to take the form of selective capacity expansion projects in urban areas, along with incremental expansions and upgrades to expressway or freeway standards of existing intercity highway corridors. This study focuses specifically on the latter type of project, rural highway expansions designed to connect smaller outstate cities and towns, and examines their effects on industry-level private earnings and local employment. We examine three case study projects in rural Minnesota and use panel data on local earnings and employment to estimate the impacts of the improvements. Our results indicate that none of the projects studied generated statistically significant increases in earnings or employment, a finding we attribute to the relatively small time savings associated with the projects and the maturity of the highway network. We suggest that for rural highway expansion projects, as with other types of transportation projects, user benefits should be a primary evaluation criterion rather than employment impacts.
The Minnesota Department of Transportation (MnDOT) has nearly completed a pilot test studying user acceptance of mileage-based road user fees (MBUF). The test involved 500 participants recruited from the Twin Cities Metro Area, specifically Wright County, each of whom participated in the test for a period of 6 months. During the test, participants drove their vehicles as they normally would while carrying an Android smartphone equipped with custom software to monitor their mileage and calculate their corresponding road user fees. The pilot study smartphone devices also provided drivers with safety alerts at key locations as a test in support of the United States Department of Transportation’s (USDOT) research in connected vehicle technologies. Participants received visual and auditory alerts while driving through designated signage zones (i.e., speed zones, work zones, school zones, and curves). The test also demonstrated a capability for in-vehicle technology to determine travel times for key corridors based on second-by-second data from the participants’ vehicles.

The study team divided the 500 drivers into three groups to control for seasonal variations in driving behavior. The first group began the test in September 2011 and the final group completed the test in October 2012. Each driver’s 6 months in the test included a 2-month Baseline Period and a 4-month Test Period. During the Baseline Period, only the standard navigation features of the smartphone were present. The mileage-based user fee and safety signage functionality was activated during the Test Period and the participants paid invoices for their accumulated user fees. The test combined both congestion pricing and cordon pricing as the fee was structured such that drivers were charged a higher fee for any miles driven in the predefined Twin Cities “Metro Zone” during peak hours.

Science Applications International Corporation (SAIC) is leading the independent evaluation of the Minnesota Road Fee Test which is focused on studying driver acceptance of mileage-based user fees as a supplement to declining fuel tax revenues. For drivers who do not favor the MBUF concept and/or the technology used to test the MnDOT model, the team is investigating the reasoning behind these misgivings and seeking to understand what it might take to overcome these perceptions. The study team is looking at a variety of measures including: driver comprehension of the system; perceived utility of the system; driver confidence in the system; perceived system quality and overall usability; perceived impacts of the system on behavior; and system value and overall driver acceptance. To evaluate these measures the team conducted three rounds of surveys with all participants, generating a total of 1,411 completed surveys; six focus group meetings, resulting in a total of 63 drivers participating in a focus group; and one-on-one telephone interviews with 423 participants. The study team is also reviewing participants’ help desk inquiries, service reports, and invoicing records to better understand drivers’ experiences and perceptions.
The study team is also analyzing data collected from the smartphones issued to the study participants. Over the course of the pilot study, these devices’ GPS locators generated over 600 million second-by-second data points across over 3 million vehicle miles. Each data point provides a variety of information including speed, heading, latitude, longitude, timestamp, and GPS accuracy during participants’ travels throughout the course of the study. This data is being used for the safety zone analysis where the team is analyzing how drivers reacted to and used the in-vehicle signage. The team is comparing detailed speed data through safety zones with and without the alerts at the individual user level. The team is also looking at whether the alerts improved overall speed limit compliance through the zones.

The report will be completed in early 2013 and all final results will be available for presentation at the time of the 2013 CTS Conference.
MnDOT is finalizing its draft 20-year State Highway Investment Plan which establishes capital investment priorities on Minnesota’s 12,000 mile state highway system. It accounts for many factors including state and federal law, MnDOT Vision and Multimodal Transportation Plan, technical analysis of conditions, and stakeholder input. Recurring—an aging system and widening gap between revenue and costs—and new—MAP 21—challenges necessitated a fresh approach, integrating performance-based planning and risk assessment to establish and analyze outcomes of alternative investment approaches.
Air pollution concentrations exhibit significant within-city variability. Spatial patterns of air pollution concentrations in an urban area may impact cyclists’ and pedestrians’ exposure. We measured particulate air pollution during morning (7-9am; n=12 days) and afternoon (4-6pm; n=30 days) rush hours on weekdays (8/14/2012 – 10/16/2012). Measurements were performed using a mobile platform; we used a modified bicycle trailer to measure: (1) particle number concentration, (2) fine-particle mass concentration, (3) black carbon mass concentration, and (4) particle size distributions. Three sampling routes (~20 miles each) were cycled repeatedly (10 [4] times per route in the afternoon [morning]) to estimate ‘typical’ rush hour concentrations in various urban environments in Minneapolis, MN. Our goal is to use these measurements to (1) estimate concentrations of air pollution during rush hour for every street segment in Minneapolis, using a land-use regression approach; and, (2) estimate population exposures from walking and bicycling, by comparing our air pollution estimates with non-motorized traffic volumes. Our research may be of interest to transportation planners working on non-motorized transportation.
Bike share systems are being rolled out in several cities across the United States. These systems are touted for providing opportunities to engage in active travel and reduce auto dependency. In the Twin Cities, the Nice Ride Minnesota bike share system has more than doubled in size since its inception. Does this system growth translate to health and physical activity benefits? This study examines physical activity associated with bike sharing programs through a longitudinal investigation of the NiceRide Minnesota bicycle sharing network. Specifically, we model trip frequency, duration, and propensity to meet physical activity recommendations among subscribers as a function of bike share network size and density, controlling for demographic factors and seasonal/weather effects. The findings from this study will have implications for planners and public agencies considering implementing their own bike share systems to estimate potential health impacts of system configuration and expansion.
Bike-Friendly Cities: Built Environment, Transportation Infrastructure, and Travel Attitude Impacts on Propensity and Frequency of Utilitarian Bicycling

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This research evaluates the role of self selection, bicycle infrastructure, and the built environment in bike commuting in the Twin Cities. Federal and local governments have made substantial investments in developing bicycle facilities and promoting bicycling. But to what extent does infrastructure and the built environment influence bicycling behavior? This study addresses this question by developing a two-step selection model. Using 2011 survey data from 1308 residents in five neighborhoods in the Twin Cities, we will explore propensity to bicycle and frequency of commuting and making non work trips by bike. In particular, we will disentangle travel attitudes and self selection from built environment characteristics to quantify the contribution of bicycle facilities and neighborhood design. This research will offer important policy implications on the benefits of bicycle-friendly design.
Steps for Improving Vehicle Sharing Among Transportation Providers in Minnesota

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Increased vehicle sharing among transportation-service providers in Minnesota has long been identified as an opportunity to reduce costs and increase efficiency, particularly for those organizations providing transportation services to older adults, people with disabilities, and individuals with lower incomes. However, this opportunity remains largely unrealized in Minnesota due to several obstacles. This research project looks at two of the principal obstacles: (i) the vehicle insurance market; and (ii) compliance with motor carrier regulations. The research examines the nature of these obstacles in Minnesota, and how these same obstacles have been overcome in other states that have successful vehicle-sharing systems. Particular attention is given to the policy and legal frameworks that other states have adopted to facilitate and encourage vehicle sharing. The research also examines several case studies in Minnesota where vehicle sharing does occur to inform this analysis. The objective of the research is to identify concrete steps that policy makers in Minnesota can take to increase vehicle-sharing and make it a more integral part of the larger transportation system.
Capital “T” Stands for “Trust”: Collaborative Community Outreach in Central Corridor Transit Planning

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Metro Transit has been working on efforts to welcome stakeholders to the planning process much earlier in the planning process for bus and rail initiatives in the Region:

- Early Public Outreach for Service Adjustments. Under current Metro Transit policy, minor service adjustments, those that do not rise to the level of requiring a public hearing, do not require any public outreach before the change is finalized and new schedules are prepared. This includes changes that might have a negative impact on riders such as eliminating a trip, shortening the span of service or reducing service frequency. Ideally these changes should be brought before the public for information and feedback before a final decision is made. Metro Transit has used rider alerts, bus stop postings and targeted mailings to inform stakeholders of service changes under consideration early in the process, before plans are finalized. This has resulted in more transparency, better plans and less opposition to changes.

- Pre-Concept Plan outreach. Prior to implementation of Green Line LRT service, Metro Transit is conducted a study of bus service in the Central Corridor to plan for expansion and integration of the current bus service network with Green Line service to maximize the overall effectiveness and efficiency of transit service in the area and ensure that overall transit service is maintained or improved for neighborhoods along the line. In previous sector studies planners generally have not conducted significant outreach before a concept plan is drafted. Recognizing there would be significant public interest in the eventual service plan, Metro Transit started the outreach process sooner, with thorough public engagement before the concept plan is drafted. For the CCTSS, planners reached out to more than 30 community groups, along with existing riders and other stakeholders such as elected officials, educational institutions and business groups to seek input into the service restructuring plan. This allowed planners to craft a plan that meets the community’s needs and on which they have had an opportunity to express before any work is complete. It also made it easier to solicit
feedback on a specific service restructuring plan since the community was aware of the project and had an opportunity to voice their desires and concerns in advance.

- Trusted Advocates. There are a significant number of people living or working in the service area covered by the CCTSS that usually do not participate in “traditional” outreach processes such as open houses, surveys, etc. Many of these people are highly transit literate, rely on transit and may be significantly affected by changes to transit, but are underrepresented in the planning process due to lack of participation and language or cultural barriers. Metro Transit partnered with the District Council Collaborative of Saint Paul and Minneapolis (DCC) on a demonstration project (Transit, More Than A Ride) using “trusted advocates” to deepen community engagement. Proven community organizers, advocates and leaders were contracted by the DCC for their expertise in developing tailor-made engagement strategies, to bring information from the community to transit planners, and to share study results with the communities.

The proposed session will focus primarily on the Central Corridor Transit Service Study and planning outreach as a case study for how building trust early in any planning process richens the outcome and opens real opportunities for collaboration with community organizations and project stakeholders.
Communicating Among Expert and Public Perceptions of Local Road Systems Resilience in Minnesota

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Minnesota’s local road systems face resilience and sustainability challenges. Persistent resource shortfalls and historic changes in usage of local road systems are testing the ability of local communities to sustain their local road systems. Perhaps the prevalence of this problem offers some comfort to the Minnesotan communities struggling with these choices right now.

A November 2012 New York Times opinion piece entitled “Learning to Bounce Back,” issued days after Hurricane Sandy’s devastating landfall in the city, endorsed a “new dialogue… around a new idea, resilience” and joined what it characterized as a growing “challenge” to the old “sustainability regime.” This is a particularly high profile, though not necessarily new, evocation of resilience as the preferred framework for understanding and adaptively managing disruptions to natural and institutional systems. Such references are popping up not only in popular writing (Edwards and McKibben 2010), but also in environmental studies (Berkes and Folke 1998; Walker and Salt 2006) and planning scholarship (Innes and Booher 2010, Toonen 2010, Goldstein 2012). Yet resilience remains an admittedly ambiguous term (Walker et al. 2004), and its generally positive valence may mask the complex, political, and resource-constrained contexts in which public managers are trying to sustain key infrastructure and other public services.

This paper provides evidence and practical suggestions for negotiating the complex terrain of public involvement in policy-making pertaining to the resilience of local road systems in Minnesota. Our research project studies the perceptions of local public works leaders, elected officials, and other community stakeholders in Minnesota regarding the nature of this problem, key challenges to system sustainability, and desired futures. The paper will analyze data currently being gathered through a LRRB-sponsored research project. Data are being collected through 15 interviews, media content analysis, 3-4 focus groups, and ethnographic observations. We will identify convergences and divergences in expert and lay understandings of fiscal and other challenges, opportunities, and desired outcomes for local roads systems. In addition, the presentation will include practical information and suggested remedies for addressing key areas of misunderstanding and conflict through public communication and engagement.
Public Art and Urban Trails: A Case Study of Minneapolis

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Planners are increasingly recognizing the benefits of public art and are incorporating art and artists in all stages of planning and building public and private infrastructure, including trails for non-motorized traffic. I will use Minneapolis as a case study to examine public art on its fifty miles of bike trails. Specifically, I will study the presence of public art within neighborhood contexts and explore the roles of stakeholders, such as the City of Minneapolis, Hennepin County, neighborhood associations and other nonprofit organizations, and private sector businesses, that are involved in planning, creating, and maintaining public art pieces. Understanding the ownership structure of the trails in the City and the involved organizations’ attitudes towards public art on trails will aid in assessing the accessibility of public art on trails in Minneapolis. Finally, using the model created by Wang, Lindsey, Hankey, and Hoff that estimates trail traffic in Minneapolis, I will determine if art pieces are located in traffic-heavy portions of trail and analyze the socioeconomic demographics of neighborhoods in close proximity to art on trails.
A Comparative Review of Stakeholders and LRT Development Planning

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With three light rail transit (LRT) lines, Hiawatha LRT (Blue Line-2004), Central LRT (Green Line slated to open in 2014) and Southwest LRT (Green Line Extension slated to open in 2018), the Twin Cities is rebuilding its rail transit network. With three LRT lines either operating or in project development, the region is also learning that no two lines are exactly the same. Like the communities they serve, each line has its own unique characteristics, opportunities and challenges.

This presentation provides an overview of rail transit history as well as an update on recent LRT project development efforts in the Twin Cities. A detailed look at each line’s unique features will also be provided including demographics, commuter sheds, stations, guideway, costs and funding mechanisms. In addition, a review of lessons learned so far regarding LRT development from a planning point of view will be provided. This session will provide insight on how each line is connected to the greater metropolitan region but also how each line possesses its own unique attributes and qualities. This session promises to be an informative, fun and creative session on the region’s three LRT lines.
Impacts of Minnesota’s Primary Seatbelt Law

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Objective: In the spring of 2009, the Minnesota Legislature changed the state’s seat belt law. Until June of that year, not wearing a seat belt was a “secondary” offense, which allowed law enforcement officers to ticket for failure to wear seat belts, but only when there was another citable moving violation. On June 9, 2009, not wearing a seat belt became a “primary” offense, where officers can ticket drivers for not wearing a seat belt without any other law being broken. Currently, 32 states have primary seat belt laws. The University of Minnesota’s Center for Excellence in Rural Safety (CERS), housed at the Humphrey School of Public Affairs, conducted an analysis of the impacts of the new law, examining the changes in roadway crash fatalities, seat belt use, and support for the law.

Methodology: Using data from the Minnesota Crash Records Database provided by the Department of Public Safety, the study utilized two methods of analysis, first comparing actual crash data from July 2009 – June 2011 to expected data based upon trends from July 2004 - June 2009, and second, comparing the expected post law change injury types estimated from the July 2006 – June 2009 crash data to the actual post primary crash data from July 2009 through June 2011. Results of seat belt use and public opinion surveys were also reviewed.

Results: This study estimates that there have been 68 - 92 fewer fatalities from motor vehicle crashes, and 320 - 550 fewer serious injuries since the primary seat belt law went into effect. This improved safety record translates into at least $45 million in avoided hospital charges, including a direct savings of nearly $10 million or more tax dollars that would have paid for expenses charged to government insurers. The primary seat belt law has enjoyed the support of over 70% of all Minnesotans and observed use of seat belts statewide has risen from 86.7% in 2008 to an all-time high of 92.7% in 2011.

Potential Applications: Ideally, this material would be presented in conjunction with Hal Campbell in order to consolidate current research by the Center for Excellence in Rural Safety (CERS) at the University of Minnesota’s State and Local Policy Program and the Minnesota Department of Public Safety. This will provide conference state officials several strategies to increase traffic safety.

Policy Implications: Currently, 32 states have primary seat belt laws. Using Minnesota as a case study, the research provides empirical evidence supporting the effectiveness and viability of primary seat belt laws.
Background: State statutes incorporating graduated driver licensing (GDL) are designed to provide new teenage drivers with behind-the-wheel experience and skills, gradually acquired over time in low-risk environments. Drivers begin by acquiring a learner’s permit, progress to a provisional license, followed by receipt of a full driver's license. GDL restricts driving in adolescents by limiting unsupervised, nighttime, and driving with peers; the restrictions are gradually lifted, concluding with the individual attaining a full driver's license.

At least two multi-state analyses of GDL have shown that it is effective in reducing motor vehicle crash and injury. However, GDL laws are different and disparate by state, so that while it is clear that GDL has been effective nationally and across the states, it is less clear if GDL has been specifically effective in Minnesota.

Methods: We conducted a single state analysis of the impact of Minnesota GDL statutes on hospital-treated injury resulting from motor vehicle traffic crashes (MVC). We used Minnesota hospital data that identifies the cause of injuries; this data begins in 1998 and was examined through 2011. Analysis included both in-patient cases and those treated in the emergency department and released.

Results: Secular trends across most, if not all, age groups have shown a significant and meaningful reduction in MVC injury; the rate of injury among those 16-19 declined along with other age groups. Various analyses were used to evaluate the effect of GDL on the targeted age group. The decrease in injury for those 16-19, concomitant with implementation of various GDL statutes, was greater than that for other age groups; specifically, after 2008 when several additional GDL measures were added, there was an important drop in MVC injury.

Conclusion: There is substantial evidence that GDL has worked in Minnesota. Future efforts for strengthening GDL should be considered. Future analyses with additional, related data sets (e.g., CRASH, CODES) should be conducted.
Impact of Liability Rules on Rear Ending Crashes

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Rear-ending crashes on freeways contribute significantly to non-recurring congestion. Reducing these events would then significantly improve freeway capacity, particularly during peak hours. However, analyzing rear-ending crashes requires understanding of driver behaviors in a braking event. A driver utility based model is proposed to analyze driver's action in such events. And then the impact of liability rules to reduce overall frequency of rear-ending crashes is demonstrated.
Automated speed enforcement (ASE) can be an effective strategy for reducing speeding and improving roadway safety. ASE has been deployed widely internationally and is used in a number of U.S. jurisdictions. However, ASE is currently not used in Minnesota. Building upon previous research at the Humphrey School on the potential for ASE in Minnesota, this study investigates the design of an ASE pilot project for work and school speed zones in Minnesota. The research investigates: (i) the technical, legal and administrative challenges for an ASE pilot project in work and school zones; (ii) the preferred scenarios and key parameters for pilot deployment; (iii) the use of automated warnings in addition to automated citations; (iv) the necessary legal framework and administrative arrangements; and (iv) the methodology for measuring the effectiveness of a pilot project, not only with respect to improving roadway safety but also with respect to stakeholder support for ASE. The project will employ qualitative and quantitative approaches for identifying pilot locations and conditions. In addition, it will solicit input from key stakeholders at the state and local level. The objective is to prepare a report that contains a set of recommendations for how to design and structure an ASE pilot project for school and work zones in Minnesota.
Statewide Evaluation of Soils for Improving Construction Site Discharge Through Site-Specific Chemical Treatment

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Construction site runoff carries sediment, suspended solids and colloidal particles. In many Minnesota locations with fine-grained soils, traditional stormwater best management practices (silt fences, diversion ditches, temporary seeding, check dams and sediment ponds) have been observed to be ineffective in removing many fine particles, frustrating construction personnel and leaving construction sites unable to meet stormwater regulations. Flocculation, a chemical treatment to enhance fine particle sedimentation and filtration, is a common technique in the controlled world of water treatment. Work done by the Federal Highway Administration and several states has shown great promise in the application of flocculation to construction site stormwater management, removing fine particles with predictable and flexible approaches robust enough to meet a wide range of runoff conditions.

However, the variety of soil morphologies within Minnesota has frustrated attempts to create a unified approach to flocculation. The unique characteristics of soils originating from sources ranging from unglaciated karst (The Driftless Region) to high strength igneous rock (The Arrowhead), from glacial lake shale-based clays to quartzite outwash sands and organic peat soils, necessitates substantial pre-treatment evaluation before flocculation can be used. Pre-treatment evaluation can save substantial costs and greatly improve performance, but it requires much more planning not typically associated with contractors who are used to simply buying more silt fence.

In this paper, results are presented of a statewide pre-treatment evaluation done on twenty-four soils selected by soil morphology and geographic characteristics. Fifteen different flocculent chemicals are evaluated in a factorial analysis to assess the performance of a range of chemical treatments. Temperature effects on flocculation rate and dose are assessed to consider variations in performance under likely construction field conditions. Recommendations for design of construction site sediment control systems are provided that anticipate site-specific soil conditions for improved surface water protection related to construction water discharges.
Effluent and Material Management from Barge Work Surfaces for Large Bridge Construction: Implications for Research

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This presentation will provide as a case study of two metro bridge projects with a focus on understanding research and implementation gaps in the design and program delivery of bridges as it relates to pollution prevention, storm water management and resource protection. The primary case study will show means and methods, and application of environmental constructability knowledge used for the St. Croix River bridge crossing preliminary test piling and shaft load studies and the other project of the new Hastings bridge construction movement over the Mississippi River. Gaps presented include minimizing wetland impacts and best methods for crossing soft soils for river access, discovered archeological cultural resources, concrete batching and handling over water, cleaning, staining and texturizing concrete surfaces, barge surface best practices for prevention of loss of drilled core sediments, decontamination protocols of aquatic invasives, prevention and recovery of petroleum and other chemical spills, and pollution prevention planning for all chemicals and products used to build large infrastructures over waters.
Maximizing Goals for Stormwater and Forestry - An Urban Street Reconstruction Case Study

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The value of blending stormwater management and trees is becoming better understood. This is particularly relevant with the emergence and management of Emerald Ash Borer (EAB) as a significant forest pest in the Twin Cities. This presentation will illustrate how stormwater and forestry needs were integrated on a Saint Paul Public Works street project to maximize City resource goals.

The City of Saint Paul annually reconstructs residential roadways in various neighborhoods as part of its long-term Residential Street Vitality Program (RSVP). Stormwater management for the 2012 RSVP in the Prior-Goodrich neighborhood was constrained by poorly draining soils as well as existing utility lines. In response, Saint Paul expanded its design toolbox to better align cross-discipline goals for tree canopy cover and sustainable stormwater management. Areas of the neighborhood will be improved to include new deciduous trees receiving stormwater in depressed boulevards featuring structural (Cornell University, or “CU”) soil.

The presentation will give the audience a strong visual understanding of how the stormwater features were constructed. Technical information about stormwater sizing and costs for CU soil installation will be shared. The audience will learn about Saint Paul’s citywide tree canopy inventory and canopy cover goals; the City’s approach to controlling and responding to Emerald Ash Borer infestations; and discover the delicate balance between resource management goals and property owner perspectives on a linear project in an urban neighborhood.
This presentation summarizes the key results from the national evaluation of the Minnesota Urban Partnership Agreement (UPA) projects under the U.S. Department of Transportation (U.S. DOT) UPA program. It highlights information from the pre-deployment period and one full year of operation of all the Minnesota UPA projects. The national evaluation is sponsored by the U.S. DOT. The Research and Innovative Technology Administration’s (RITA’s) Intelligent Transportation Systems Joint Program Office (ITS JPO) is responsible for the overall conduct of the national evaluation. The Battelle team, including the Texas A&M Transportation Institute (TTI), was selected by the U.S. DOT to conduct the national evaluation through a competitive procurement process.

The Minnesota projects focus on reducing traffic congestion in the I-35W corridor and in downtown Minneapolis. I-35W South is the section south of downtown Minneapolis and I-35W North is the section north of downtown Minneapolis. Intelligent transportation systems (ITS) technologies underlie many of the Minnesota UPA projects, including those dealing with tolling, real-time traffic and transit information, and a driver assist system (DAS) for shoulder-running buses. Minnesota UPA projects include high-occupancy toll (HOT) lanes and a priced dynamic shoulder lane (PDSL) on I-35W South, six new or expanded park-and-ride facilities, 27 new buses, double contraflow bus lanes on Marquette and 2nd Avenues (MARQ2) in downtown Minneapolis, and a “Transit Advantage” bus bypass lane/ramp at the Highway 77/Highway 62 intersection. Other projects include the DAS for shoulder-running buses, real-time transit and next bus arrival information, and eWorkPlace, a telework program.

The Minnesota UPA partners include the Minnesota Department of Transportation (MnDOT), the Twin Cities Metropolitan Council, Metro Transit, the City of Minneapolis, Minnesota Valley Transit Authority (MVTA), and Anoka, Dakota, Ramsey, and Hennepin counties. The Center for Transportation Studies (CTS) and the Hubert H. Humphrey School of Public Affairs at the University of Minnesota are also partners in the UPA, as are the four transportation management organizations (TMOs) in the area.
Transportation agencies are increasingly considering “return-on-investment” (ROI) when evaluating projects for inclusion in plans and programs. Projects are commonly evaluated on the basis of costs and monetized benefits. Costs typically include construction, less typically full life-cycle costs. Benefits typically include safety (reductions in fatalities, injuries and property damage) and delay savings. Many benefits are not easily monetized; economic value to development, construction job creation, trip reliability, ADA accessibility, multi-modal enhancement, environmental benefits (and dis-benefits) to name a few.

Opportunity costs need to be considered as well. A dollar spent for a low or future ROI on one project is a dollar not spent for a higher or present value on another project.

ROI is a part of MnDOT’s performance-based solutions approach. MnDOT has considered ROI in a number of ways. One way is in considering when an investment is made vs. when the benefits are realized. Our congestion management safety program is prioritized based on ROI. In rescoping major projects we are considering what returns can be garnered with lower cost approaches. We are considering maintenance or life cycle costs. With several specific infrastructure strategies we are getting like-new performance out of less than reconstruction.

The nationwide vision for ROI approaches to investment decisions requires more study to assess the monetized value of a fuller range of both costs and benefits. Even without that study consideration of the presently non-monetized costs and benefits is time well spent.
Conversion of the Twin Cities Transportation Policy Plan to a Performance Based Planning Methodology

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MAP-21, the Moving Ahead for Progress in the 21st Century Act was signed into law by President Obama on July 6th, 2012. Within 18 months of the date of enactment (October 1, 2012), the Secretary of the US Dept. of Transportation will establish performance measures. Within 1 year of the final rule on national performance measures, the states will establish targets for those measures. Within 180 days of that date, Metropolitan Planning Organizations (MPOs), such as the Metropolitan Council, are required to set performance targets. These targets are then required to be included in the regional long range transportation plan (the Metropolitan Council Transportation Policy Plan or TPP) and Transportation Improvement Program (TIP).

In 2012, the Metropolitan Council (through the services of a consultant – Cambridge Systematics, Inc.) began reviewing the current Transportation Policy Plan adopted in 2010 to identify the revisions necessary to include performance based planning and performance targets in the planning process and ultimately in the next plan to meet the federal requirement. The use of performance measures by other regions in their respective planning processes and documents will be researched to learn both what has worked well for other regions and what has not worked well. Key stakeholder input to identify appropriate performance measures and targets, where appropriate, is to be gathered in February, 2013.

The basic principle behind the identification and use of performance measures can be expressed as follows:

S – Specific
M – Measurable
A – Agreed
R – Realistic
T – Time-Bound

The presentation will discuss the potential performance measures that have been identified through the study process, along with the anticipated restructuring of the TPP to incorporate performance based planning. The process by which benchmarks or targets are to be established for the region will also be discussed.
Performance Measures Related to Access Gaps – ROCOG’s Experience

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ROCOG staff is exploring an approach to analyzing environmental justice analogous to the approach to education taken by the No Child Left Behind programs. The approach would set local standards for adequate access and identify individuals, households, and neighborhoods lacking adequate access. Where inadequate access is disproportionately associated with low income or minority groups, we have access gaps, analogous to achievement gaps. Neighborhoods with high numbers of persons with inadequate access would be “failing neighborhoods.” The analysis reflects the vertical equity concepts explored in “Evaluating Transport Equity” (Todd Litmann, March 12, 2013, Victoria Transport Policy Institute. See http://www.vtpi.org/equity.pdf). The concept is also related to studies of access deprivation related to health disparities. One such study (see http://www.graham-center.org/online/etc/medialib/graham/documents/publications/presentations/2007/bphilps-adi.Par.0001.File.tmp/bphilps-adi.pdf for a summary) derived an “access deprivation index,” defined as “a neighborhood-level measure of risk for experiencing barriers to accessing healthcare ...” Other analogous efforts at the neighborhood and community levels include the literature on food deserts (see for example, Mari Gallagher, 2006, Examining the Impact of Food Deserts on Public Health in Chicago, at http://www.marigallagher.com/site_media/dynamic/project_files/FoodDesert2011.pdf).

The presentation reviews our efforts to measure the neighborhood prevalence of access deprivation through a combination of Census and local data related to infrastructure and the location and proximity of residential areas to essential services.

For our purposes, we define access deprivation as follows:

The inability to obtain needed goods and services in a timely fashion due to combinations of circumstances related to
- the individual (age, disability),
- household (income, vehicle ownership),
- neighborhood (distance from needed goods and services), and
- infrastructure (absence of infrastructure, level of service, or condition of transportation modes).

For purposes of defining standards, the terms “needed goods and services” and “timely fashion” require quantification and refinement. We consider it important to identify standards locally, reflecting for example the fact that we have an average commuting to work time of 17 minutes.

Good neighborhood design can overcome household or individual mobility limitations, providing good access even in the absence of high levels of mobility. For example, a neighborhood that has good infrastructure and that incorporates grocery stores, parks, jobs and schools addresses the access needs of its residents even if they are young or disabled and even if they live in households that do not own vehicles. Similarly, household characteristics such as income can overcome neighborhood and individual limitations: a disabled person with enough financial resources can live in a rural setting lacking sidewalks and isolated from goods and services and still have good access, perhaps compensating by paying for a chauffeur and a limousine. Because income has a significant influence on access deprivation, enhancing household assets by providing affordable housing or affordable child care, for examples, would be indirect ways of ameliorating access problems; direct ways would include assistance with carpools or investments in transit or bikeways.
Relating this effort to transportation-related environmental justice, we should organize our plan and program so as to ensure that neighborhoods with missing or inadequate infrastructure and/or with high numbers of persons or households at risk of access deprivation should receive interventions in the form of improvements in infrastructure, where relevant. Relating this effort to the overall community planning program, we should ensure that such neighborhoods receive interventions in the form of improvements in neighborhood design or household assets, where relevant.
Sustainable Transportation Analysis and Rating System (STARS): Creating High-Performance Transportation Plans and Projects

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STARS is an emerging transportation project development and rating tool designed to improve the economic, environmental and community/equity outcomes of transportation plans and projects. STARS, the Sustainable Transportation Analysis & Rating System, is a performance-based process for developing, analyzing, rating and comparing outcome-based transportation plans and projects.

STARS was developed by the Portland (OR) Bureau of Transportation, the North American Sustainable Transportation Council (STC), and the Santa Cruz County Regional Transportation Commission. STARS is a voluntary, national system for use by public agencies and private consultants to simplify alternatives analysis and decision making. STARS intends to improve transportation outcomes by certifying and rewarding performance, much in the way LEED and the Living Building Challenge are improving building performance.

STARS is designed to improve the triple bottom line performance of transportation plans and projects, specifically to:

- Improve safe, affordable, healthy and equitable access to jobs, school, housing and goods
- Cut petroleum use and greenhouse gas emissions
- Provide local and regional economic benefit while reducing transportation capital and operating costs

STARS is being developed for use nationwide and is currently being piloted in a wide range of plans and projects in California, Oregon, and Washington. The presentation will describe the STARS tool and provide preliminary information from pilot projects. More information is available at www.transportationcouncil.org.
Risk Assessment in Travel Forecasts

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Funding-constrained public agencies are increasingly focusing resources on projects that meet near-term needs, rather than those designed to solve future problems that may not materialize. Some of this is a consequence of resource allocation, while some can be attributed to a lack of certainty about future conditions resulting from economic downturns and the real or perceived changes in travel behavior. Agencies are turning to forms or risk assessment in their project planning to help address the consequences of their decisions in these times of uncertainty.

Travel forecasts are often at the forefront of project planning in terms of identifying and questioning assumptions relating to the future use of facilities. Consequently, they are a logical place in the planning process to explore risk assessment. But each project may have a different set of issues of concerns needing to be evaluated, so there is no single best practice to incorporate risk assessment into travel forecasts for projects. This presentation will review how forms of risk assessment have been reflected in travel forecasts for different projects in Minnesota and in other places.

A key project to be reviewed in this presentation is the extension of Trunk Highway 610 and its connection to I-94 in suburban Maple Grove. Certain of the movements were perceived as redundant or potentially not cost-effective. Furthermore, the area in question is in an area where most of the development is expected to occur between now and the year 2030 and is uncertain given current economic conditions.

In addition, forms of risk assessment have been used in local transit projects and studies, including the Bottineau Corridor Transitway, and the Arterial Transitway Corridor Study. Indeed, the Federal Transit Administration has been key in re-evaluating the role of long-range forecasts in its project decisions.

Finally, there other project types where risk assessment plays a similar role. This presentation will explore how risk assessment has or could be incorporated.
ADA Retrofit and Construction Management: Richfield and Breckenridge, Minnesota

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Objective: The City of Richfield was reconstructing nine blocks of 76th Street including all new private utilities, pavement, and landscaping through the corridor. The typical section included a 5.5’ concrete sidewalk on the south side of the road and an 8.5’ bituminous multi-use path on the north side of the road for which all pedestrian curb ramps needed to be ADA compliant. The City of Richfield did not have the staff availability to provide a full time construction inspector and needed to hire these services.

The City of Breckenridge needed to analyze the existing sidewalk system and identify and reconstruct any sidewalks and pedestrian curb ramps that are not compliant with current ADA Standards. The project scope included all pedestrian curb ramps at 12 intersections on Highway 75 through the city.

Methodology/Approach: The 76th Street project employed a unique collaboration which included the City of Richfield, and Three Rivers Park District, with HR Green, Inc. as a project consultant. The project team successfully coordinated all three aspects of the project (utilities replacement, regional trail construction, and roadway redesign) using a Context Sensitive Solutions (CSS) approach which engaged stakeholders in the design of 76th Street.

Throughout the design of the roadway, which included a complete street section, the idea of reflecting the needs of all stakeholders groups was prevalent. Additionally, the multi-use trail portions of the project addressed the long-term plan of Three Rivers Park District. These aspects of design were important to understand as the construction of the project began. The idea of the design team also providing the inspection, observation, and field engineering aspects of the project seemed to be a natural fit. Another example of collaboration between design and inspection was the idea to forego intersection details and to field design the ADA aspects of the pedestrian routes. Doing this saved money during design and provided a level of detail in the field that cannot be achieved on paper for the accuracy of the pedestrian curb ramp construction.

This unique process of less design detail and more field design was utilized in Breckenridge for a mill and overlay project that had a project scope that extended to the retrofit of the sidewalks and pedestrian curb ramps. At predesign the idea was to provide intersection details for each intersection showing pedestrian ramp locations, grade breaks, and truncated domes. However, as the design moved forward, it became evident that the level of detail provided by intersection details was not necessary because of the new MnDOT standard plans for pedestrian curb ramps. The plans were reduced from ten intersection details to one tabulation that provided the quadrant, the pedestrian ramp type, and the quantities for construction.
**Findings/Results:** By eliminating plan sheets during design, the cost of design was reduced with no real addition to the construction observation costs later on. Also, HR Green and the City of Richfield were able to work together during contracting to combine aspects of the design and construction observation contracts to save addition costs.

In addition to cost reduction, the quality of the project and the ADA compliance reached a very successful synergy. Through construction of the sidewalks and the multi-use trail in Richfield, the inspector worked with the concrete contractor to build ADA compliant ramps and pedestrian routes. This worked exceptionally well, because through the construction process, there had been changes to some pedestrian curb ramps, catch basins, trail and sidewalk locations and material thickness, and residential properties that affected the design of the pedestrian curb ramps. Furthermore, having a member of the design on-site, provided for a level of design expertise and understanding with the project that could not be provided by simply hiring a construction inspection company. HR Green, the City of Richfield, Three Rivers Trial District, and most importantly the residents and users of the system and roadway, had reached a level of understanding of how the project was supposed to be built and what the end result should look like. This allowed the inspector to make a large amount of quick decisions in the field that saved both time and money for the contractor and vis-a-vis the City.

More time and money was saved because as a designer, the inspector understood how the trail and the sidewalk needed to function with the roadway and with the residential properties. Therefore, staging could be discussed with the contractor and the best practices could be implemented.

**Potential Applications:** The 76th Street reconstruction project is a great example of the advantages of having a construction inspector who was involved in the design elements of the project. In particular, it has proven to work well in regards to ADA compliance for both retro fit and full reconstruct projects. These projects show the application of design flexibility by HR Green to save both time and money during design.

**Policy Implications:** Moving forward Richfield will follow a similar process for future projects. This change in approach illustrates the profoundly positive impact of this collaborative project. The design and observation aspect provides a very high satisfaction because the precise needs of all stakeholder groups are reflected in the final design. One example from this project was the recognition that the pedestrian curb ramps needed to be designed and constructed differently at the multi-use trial and the sidewalks.