APPENDIX F: STATE OF THE PRACTICE TECH MEMORANDUM

12/23/2009

Technical Memorandum #1: Literature Review & Contemporary Case Studies

Metropolitan Highway System Investment Study

Parsons Brinckerhoff

TECHNICAL MEMORANDUM #1: LITERATURE REVIEW & CONTEMPORARY CASE STUDIES

Metropolitan Highway System Investment Study

GLOSSARY

1.0 INTRODUCTION

This memo documents the results of research undertaken to identify the different types of *Travel Demand Management* (TDM) and *Intelligent Transportation Systems* (ITS) that have been applied on limited access roadways in the U.S. and abroad These treatments are intended to reduce traffic congestion and improve traffic safety, through introduction of lower-cost improvements that could be developed within the existing roadway right-of-way, this avoiding the high right-of-way and construction costs associated with adding lanes on limited access highways to keep pace with traffic growth. This includes identifying successful treatments which have been applied in metropolitan areas with similar-sized limited access facilities to the Twin Cities area. These treatments in the past have been known as *Transportation System Management* (TSM) strategies.

Four basic strategies have been evaluated in this memo. *Active Traffic Management* (ATM) denotes application of advanced electronics to assign traffic priority, lane assignment and speed/queue control, and includes such systems as ramp metering, speed harmonization, queue warning, and dynamic re-routing. *Managed Lanes* include provision of dedicated lanes for use by high-occupancy vehicles, trucks, or any vehicle willing to pay a price to use lanes which operate at a higher speed than adjacent general purpose lanes. *Use of Shoulders* involves either operating buses on roadway shoulders in slower speed application to bypass general purpose lane traffic queuing during peak periods (as on the existing freeway system in the Twin Cities) or using the shoulders for general traffic during peak periods to maintain or provide added capacity, potentially in conjunction with the application of managed lanes on the inside of the roadway. Finally, *Bus Rapid Transit* (BRT) includes the provision of enhanced express bus services and introduction of limited-stop service with on-line stops.

Applicable strategies were assessed by conducting both an extensive literature review, and conducting "case studies" by making contact with agency representatives in seven urban areas in the U.S. on how they have applied different strategies, including the costs, funding, and impacts of system investments. The literature review included an overview of different FHWA documents addressing ATM and managed lanes, as well as documents reviewing applications in Europe. For BRT or bus on shoulder applications, relevant Federal Transit Administration (FTA) and Transit Cooperative Research Program (TCRP) documents were reviewed. The case studies were conducted for Atlanta, Dallas-Ft. Worth, Honolulu, Houston, Miami, San Francisco-Oakland, and Seattle. A template was used with a series of questions asking about the rationale for selection of certain treatments, how agencies are working together to implement such treatments, funding for capital and O&M costs, and the impacts of treatments and overall system investment on traffic congestion and safety.

2.0 LITERATURE REVIEW

A total of 75 documents were reviewed and are listed in the bibliography in Section 5.0. A summary of the content of some of the key documents reviewed follows:

PERFORMANCE EVALUATION FRAMEWORK

Freeway Performance Initiative Traffic Analysis – Performance and Analysis Framework

Cambridge Systematics, October 2007.

This report presents a performance and analysis framework establishing traffic analysis goals and objectives for the San Francisco Bay Area Freeway Performance Initiative (FPI), and identifies corridor study analysis performance measures, analysis framework, expected output, and prioritization framework. The framework is intended to ensure that performance measures and analysis methods are consistent across corridors; are consistent across levels of analysis; are consistent across transportation modes, and address both recurrent and non-recurrent congestion.

The FPI objective is to develop a road map for selection of the best projects and operational strategies for the freeway system in the San Francisco Bay Area. The traffic analysis focuses on corridors, not on specific locations or projects. The analysis framework also addresses improved integration of parallel transit and arterials to enhance overall corridor performance. The regional-level prioritization process developed builds on individual corridor evaluations of projects and strategies that:

1. Provide a consistent assessment across corridors.
2. Normalizes various performance measures by specifying weights to corridor performance measures to account for varying detail of data for individual corridor evaluations, the desire to close HOV-lane gaps in a corridor, and the presence of heavy truck movements.
3. Provides a robust benefit-cost framework
4. Accounts for region wide priorities.

Active Traffic Management

Active Traffic Management: The Next Step in Congestion

FHWA Office of International Programs, July 2007.

This report summarizes a 2006 scanning tour of a FHWA-sponsored delegation to Greece (Athens), Denmark (Copenhagen), England (London, Birmingham), Germany (Bergisch-Gladbach, Cologne, Frankfurt) and the Netherlands (Rotterdam, Utrecht) to meet with transportation agencies on how Europe is addressing active traffic management in operating their major highway facilities in urban areas. The group included Chuck Fuhs, a member of the MHSIS consultant team.

In Europe, the primary active traffic management strategies that have been applied for managing recurrent congestion are speed harmonization and temporary shoulder use. These treatments are also used for addressing non-recurrent congestion, as well as dynamic rerouting.

The speed harmonization systems are configured primarily to automate deployment based on certain travel speed and traffic volume thresholds. In the Netherlands, these systems have reduced collisions by about 16%, and have increased throughput from 3 to 5%. Lane control and speed limit signs in general are spaced about every 1/3 mile.

Temporary shoulder use in Europe is typically deployed with speed harmonization, and has been applied starting in the 1990s in Germany. While typical shoulder use relates to right-hand shoulders, in the Netherlands and Germany, some application of left-hand shoulder use under certain congestion conditions is allowed.

Dynamic rerouting is used in several European countries to provide alternate route information of roadway users during incidents. The dynamic message and guide signs in Germany are adaptable to provide information when even temporary shoulder use is in effect. The spacing of freeway detectors is typically 1/3 to 2/3 mile, and such dense application of detection along with CCTV cameras provides a detailed data backbone from which dynamic rerouting and other active traffic management strategies can b implemented.

Several of the European countries visited also have queue warning systems integrated with their active traffic management systems. Signage for such systems has varied from use of a pictograph in Germany to flashing lights on the variable speed limit signs in the Netherlands.

All of the European countries visited, like the situation in the U.S., recognize that there are insufficient funds to undertake major capacity improvement projects on major urban highways, and thus TSM strategies have become the focus. The use of Public Private Partnerships in Europe to implement TSM strategies has been increasingly popular, with its most extensive application to date in England. The majority of benefits on transportation PPPs have been realized in O&M cost savings over the life of a contract (up to 70% over 30 years). Achieving performance thresholds are a cornerstone to a successful PPP, and contracts in Europe have included measures related to improved operations, reduced delay, and fewer incidents. In most cases, concessionaires have combined private fund with some level of public finances to fund projects.

An Approach to Assessing Freeway Lane Management Hot Spots

Transportation Research Record Vol. 2099, 2009.

This research presents a procedure for capitalizing on the trade-off between urban freeway managed lanes and general purpose lanes that compete for limited road space. The basic goal of the procedure is to provide policy guidance for sharing any excess lane capacity on a timely and efficient basis. Potential operating policy options for these two types of lanes are categorized as "do nothing," "lane management," and "more than lane management." The "lane management" condition recognizes the extent and duration of a "hot spot" as defined by underutilized managed lanes with congested general purpose lanes, or vice versa. Four major and three minor lane management hot spots are deterministically and stochastically captured along a 24-mi freeway stretch in California. The major hot spots account for 8.3% of the total time-space set. The approach, which can also be applied to predict upcoming hot spots, generates satisfying accuracy. Finally, strategies are proposed to prevent the hot spots, and the effects of lane management are estimated. The application of this approach is useful especially for managed lanes with limited access points that prohibit arbitrary lane changing

Investigation of Solutions to Recurring Congestion on Freeways

Virginia Department of Transportation, 2009.

The highway operational strategies implemented to reduce recurring congestion have shown promising results abroad where there is an extensive use of ATM systems. To prove the effectiveness of a better managed freeway in mitigating recurring congestion, this study tested the effectiveness of an active traffic management system on a simulated model of I-66 and I-95 in Northern Virginia. Hard shoulders, variable speed limits, and ramp metering are several active traffic management systems simulated in this study. The simulation model was based on the geometric characteristics, ramp volumes, vehicle flows, and speeds of actual recorded conditions. Compared with the simulated control conditions, the results of the study indicated improvements in average fuel economy, travel delay, delay of the onset of congestion, and reduction of queues. The two ATM systems, i.e., variable speed limits and hard shoulders, showed the highest potential for reducing recurring congestion and should be considered as potential countermeasures in congested corridors.

Road Weather Information Systems, Wisconsin Road Weather Safety Audit Plan and Implementation

University of Wisconsin, 2009.

Specific to Minnesota congestion and safety problems are weather considerations. This series of reports conducted by the University of Wisconsin Traffic Operations and Safety Plan is a comprehensive look at countermeasures which can improve roadway function in adverse weather conditions. Of special note are the literature review and countermeasure documents, which are included as appendices to this report.

Managed Lanes

Managed Lanes Handbook

Texas Transportation Institute, October 2005.

This report, prepared for the Texas Department of Transportation, presents detailed information on planning, funding, designing, and implementing managed lane facilities.

The handbook includes a basic discussion on the definition and classification of different types of managed lanes. Also addressed are public outreach strategies, managed lanes weaving, ramp and design issues, driver information needs and associated traffic control devices for managed lanes, enforcement and incident management strategies, monitoring and evaluating managed lanes facility performance, interim use during construction, special events and emergencies, and staffing and training related to managed lanes development and operations coordination.

The handbook offers guidance based on a number of active managed lanes facilities implementations, along with use of micro-simulation modeling to evaluate more complex operating scenarios, particularly entrance and exit maneuvers to and from managed lanes facilities.

A strategy selection tool is presented to provide a preliminary screening methodology that would help define the types of managed lanes strategies that would be applicable in a particular corridor. Included with this tool is an association of typical project objectives related to different goals and managed lanes strategies. In addition, once planners have selected objectives that are deemed important, a list of 20 general constraints (related to physical conditions, truck characteristics, origin-destination patterns, land use, price elasticity and willingness to pay, and funding) have been identified that must be evaluated before a particular managed lane strategy can be identified.

The design section of the handbook presents basic design values related to alignment and operational conditions, representative cross sections, and design considerations for terminal and access treatments. Design configurations for both concurrent-flow and reversible-flow managed lane facilities are provided, including tradeoffs involving lane, shoulder, and buffer width. Guidelines for selecting particular ramp types for managed lanes special access facilities (T-ramp with or without park-n-ride, flyover ramp, at-grade slip ramp with freeway) are also provided.

The handbook also addresses what information needs drivers will have associated with use of managed lanes facilities, translated into traffic signing and pavement marking treatments. The information categories evaluated include: entrance information, exit information, hours of service, incident management information, occupancy requirements, open/closed information, time savings, tolling information, travel time, type of managed lanes, and vehicle restrictions. Information needs related to familiar drivers, semi-familiar drivers, and unfamiliar drivers are provided. The tradeoffs between use of static vs. variable message signing to convey different messages are also addressed.

The handbook also identifies various enforcement strategies which can and should be undertaken to preserve free-flow operations on managed lanes facilities, ranging from continuous enforcement (using automated technology) to the simpler process of self-enforcement. Specific design guidelines related to the placement and layout of enforcement areas under low and high-speed conditions are identified.

There is a recognition in the handbook that managed lanes cause some unique challenges related to incident management. This includes incident responder access to a crash scene, impact of adjacent roadway incidents to managed lane operations, pre-positioned response crews, and mutual assistance agreements between managed lane agencies and general purpose lane agencies where different.

EVALUATION PLAN FRAMEWORK FOR 95 EXPRESS MANAGED LANES
Cambridge Systematics, 2009 and

95 EXPRESS MIDYEAR REPORT
Florida Department of Transportation District 6, October 30, 2009

The evaluation framework report identifies a set of goals and objectives, performance measures, data needs, analysis methodologies, and locations for data collection and analysis segments for use

in assessing the impact of the new 95 Express managed lanes on I-95 in Miami. Four major project objectives were derived around which performance measures were developed:

1. *Measure project impacts on corridor performance* (travel volume, travel speeds, travel time, level of service, peak-period distribution, vehicle classification, vehicle occupancy, vehicle and person throughput, mode split, emissions/noise, fuel consumption, travel behavior)
2. *Measure project utilization* (toll usage, transit ridership, park-n-ride utilization, HOV registrations, hybrid registrations, telecommuting)
3. *Assess project operations and effectiveness (operational efficiency)* (toll revenue, operations and maintenance costs, levels of enforcement, incident frequency and duration, crash frequency and severity, equipment malfunctions/availability)
4. *Measure project acceptance and satisfaction* (user and non-user acceptance and satisfaction, public perception, signage effectiveness, business impacts, media coverage, equity)

These performance measures are consistent with those identified in the October 2008 Urban Partnership Agreement (UPA) and Congestion Reduction Demonstration (CRD): National Evaluation Framework.

A specific set of data needs were identified associated with the different performance measures. Data was stratified into quantifiable traffic, transit and environmental data, and public perceptions. A survey of both users and non-users was conducted to collect mode split, trip making changes, signage effectiveness, business impacts, project perception, acceptance, and satisfaction, and socio-economic data to estimate equity impacts. A separate employer survey was also conducted.

The 95 Express evaluation report presents data and analysis that showed that the initial managed lanes implementation on northbound I-95 through north Miami has been a success. The reporting period is from the first day of tolling in December 2008 through June 30, 2009. Important statistics to note:

- Customers using managed lanes have almost tripled their average travel speed during PM peak periods, from 20 mph to 57 mph.
- Drivers staying in the general purpose lanes have also experienced a significant increase in average travel speed, from 20 mph to 41 mph.
- Average volume along the managed lanes in the PM peak period (4 to 7 PM) was nearly 7,000 vehicles, or 28% of all northbound I-95 traffic. Vehicles traveled at speeds I the managed lanes over 45 mph 95% of the time.
- The managed lanes have remained open to motorists 95.5% of the time.
- The number of vehicle trips served by the managed lanes (4.2 million) was 130% higher than originally projected, with over 46,000registered toll exempt trips by over 7,000 registered vehicles.
- Actual total revenue ($2.8 million) with 89% of projected.
- Charged tolls ranged from $0.25 to $5.00. The average monthly maximum toll charged was $3.64. About 85% of the managed lane customers were charged $1.61 or less.
- 95 Express bus ridership increased by about 30% between the first three months of 2008 vs. the first three months of 2009.

- Operating and maintenance costs for the facility were about $3.25 million over the reporting period.
- Public surveys have shown that 76% of those using the 95 Express lanes feel it is a more reliable trip than if in the general purpose lanes, and 58% of commuters familiar with the express lanes would like to see them developed elsewhere in south Florida.

Use of Shoulders

NCHRP Report 369: Use of Shoulders and Narrow Lanes to Increase Freeway Capacity

JHK Associates, 1995.

This research project developed a methodology to evaluate the feasibility and impact of narrowing travel lanes and using shoulders to increase freeway capacity, and included design guidelines for implementing road improvement projects with these elements. The factors that impact their effectiveness include traffic volume, vehicle mix, capacity, horizontal and vertical alignment, length of application, ability to provide vehicle turnouts, and incident response issues. Eleven limited-access highway corridors around the U.S. (in Atlanta, Boston, Los Angeles, Minneapolis, Northern Virginia, and Seattle), were evaluated with respect to how traffic level of service and accidents changed with respect to implementing narrow lanes and/or use of shoulders.

The research found that when an added lane is developed through just using the shoulder or narrower lanes over an extended distance, the safety performance of the corridor can be negatively impacted. However, more limited applications of these strategies in a corridor – to address lane balance, lane continuity and bottlenecks – have been more successful, with no significant change in accident experience, Also a difference in lane width (from 12 to 11 feet) alone has not had a significant safety impact.

Based on the research findings, it was recommended that narrow lane/use of shoulder strategies be reserved for use only in congested highway corridors, and be for congestion relief, and not applied in general over an extended length. Restriction in travel lane width to 11 feet should be a first modification considered. Reduction of the left shoulder should be considered before reducing the right shoulder.

TCRP Synthesis 64: Bus Use of Shoulders

Wilbur Smith & Associates, 2006.

This research involved a survey of existing applications of bus use of shoulders (BOS) on freeways and arterials in North America. The synthesis involved review of existing bus operational conditions associated with shoulder use, impact on general traffic operations, and use of ITS to designate and monitor shoulder use by buses. Case studies were undertaken for six urban areas with such treatments (Minneapolis-St. Paul; Northern Virginia, Miami, San Diego, Toronto, and Dublin, Ireland), with another eight urban areas (Atlanta, Bethesda, MD; Northern New Jersey; Ottawa, ON; Vancouver, BC; Wilmington, DE; Auckland, NZ) responding to the initial survey.

The minimum desired shoulder width to accommodate bus operations was found to be 10 feet. The extensive application of BOS treatments on the Twin Cities freeway system has resulted in other urban areas following suit to allow operation o buses on shoulders under low speed freeway conditions (25 to 35 MPH), or not faster than (10-15 MPH) than the adjacent general freeway traffic. Actual data on operations and patronage benefits was limited at the time of this research, recognizing that newer projects, particularly those involving FTA funding, would need to provide more rigorous analysis of feasibility and impact for future applications.

To date, most BOS operations have involved using conventional signage to warn both motorists and bus drivers on the use of the shoulders by buses and assignment of right-of-way at interchange on and off-ramps. There is emerging application of ITS technology for BOS operations. In particular, on I-66 in Northern Virginia, overhead message signs advise motorists as to when shoulder lanes are open to general traffic, which could be applied to BOS operations. There is also continuing research on the application of driver assist technology, including lane keeping assistance systems.

Bus Rapid Transit

TCRP Report 90, Planning and Design Guidelines for Bus Rapid Transit

Transit Cooperative Research Program, 2005, and *TCRP Report 118, BRT Practitioner's Guide*, 2007.

These two research reports review the characteristics of bus rapid transit systems, including the costs and impacts of different bus rapid transit components, and how to package different BRT components to provide an overall BRT operation in a corridor that meets estimated ridership demand and physical, operational, community, and funding constraints. Included is a review of the application of express bus and limited stop BRT service, on limited access facilities. Different BRT operating configurations on freeways including High Occupancy Vehicle (HOV) and separate busway applications are reviewed. This includes different roadway cross sections and ingress and egress treatments for bus-only facilities. In TCRP Report 118, a new "bottoms-up" ridership estimation to estimate BRT ridership demand off existing conditions in corridors is presented, including diversion from existing transit, auto drivers diverting transit, and new "induced" transit trips.

Characteristics of Bus Rapid Transit, 2nd Edition

National Bus Rapid Transit Institute, 2009.

This report presents a summary of the characteristics of bus rapid transit, including a comprehensive survey of different running-way and service configurations, including operation on limited-access roadways. The key feature of this document is extensive survey data from numerous cities in the U.S., Canada and around the world related to BRT facility running ways, station treatments, vehicle design, ITS components, and service design.

3.0 Case Studies

Metropolitan Planning Organization (MPO) and transit agency staff from seven urban areas around the U.S. (Atlanta, Dallas-Ft. Worth, Honolulu, Houston, Miami-South Florida, San Francisco-Oakland

Bay Area, and Seattle) were contacted to obtain information on how they are addressing future investments in their major highway systems, including corridor identification, application of new technology, performance measures, and funding for implementation. A template was prepared to guide the PB team in obtaining and documenting information receives. This case study documentation is presented on the following pages.

ATLANTA

OVERVIEW

Agencies: Atlanta Regional Commission, Georgia Department of Transportation (GDOT), Georgia Regional Transportation Authority (GRTA), State Road & Tollway Authority (SRTA), Metropolitan Atlanta Rapid Transit Authority

Years of Experience with Managed Lanes / Active Traffic Management: 2002 - current

Brief History:

- 2009 – Metro Atlanta Managed Lanes System Plan completed
- 2008 –$110 million grant awarded to GDOT to support $147 million pilot project through USDOT Congestion Reduction Demonstration Program. Relates to I-85 HOT lanes project (I-285 to Old Peachtree Road), to be operational by 2011.
- 2007 – Adoption by ARC of Managed Lane Policies for Atlanta Region
- 2005 – Creation of Managed Lane Planning Team by ARC
- 2002 – GDOT adopts first Regional HOV System Plan.

Population: 4,440,000 (2007)

Congestion: 75% of peak VMT congested, 58% of lane miles congested, 57 annual person hours of delay per peak traveler (2007)

MANAGEMENT PROGRAM DESCRIPTION

THE REGION

From 1982 to 2007, population in the Atlanta urbanized area doubled, from 2.25 million to about 5 million. The size of the urban area also almost doubled over this 25-year period, from 1,700 to 3,050 miles. Given these trends of population to urban area size, the population density within the region only slightly increased from 1982 to 2007. However, traffic growth, tripled in this 25-year period, going from 30 million vehicle miles per weekday in 1982 to over 90 million in 2007.

MANAGEMENT STRATEGIES DEPLOYED / STUDIED

The Atlanta region has been very active over the past ten years in the development of TSM strategies to provide a more efficient regional highway system. Since 2002, there has been a focus on the development and implementation of a HOV System Plan, which in recent years has been focused on the development of managed lane development strategies. This has culminated this year in the adoption of a Managed Lanes System Plan for the Atlanta region.

A five-tiered implementation program has been identified for the Metro Atlanta Managed Lanes system, totaling $16.2 billion (with $7 billion estimated funding gap, assuming PPP delivery). The projects to be included in the different tiers based on five criteria:

1) Traffic Congestion
2) Connectivity
3) Ease of Implementation
4) Design and Environmental Activities Underway
5) Level of Public Financial Contribution

A specific set of 12 managed lane corridors for the Atlanta region were derived from GDOT's 2002 HOV System Plan, with 25 evaluation criteria applied. Once the managed lane corridors were identified, specific lane operation, number of lanes, and facility location options were evaluated. Lane operations considered included both reversible lanes and bi-directional lanes. The use of one vs. two lanes in each direction was also assessed. Facility location options considered included elevated, at-grade, inside median and outside median. The assessment also identified locations where direct ramp connections between managed lane corridors should be developed.

I-85 High Occupancy Toll (HOT) Lanes is the first project in the Managed Lanes Plan to be implemented. Project will convert about 15 miles of existing HOV lanes to HOT lanes from I-285 in DeKalb county to Old Peachtree Road in Gwinnett County. The transit component will be provided by GRTA, with 36 new commuter coach buses to serve seven routes in the corridor. GRTA also will construct two new park-n-ride lots, totaling 1,900 new parking spaces. Transit will use the HOT lane toll-free.

Selection Criteria

In the development of the Metro Atlanta Managed Lanes System Plan, GDOT applied 25 evaluation criteria to screen the corridors identified in GDOT's 2002 HOV System Plan to identify an initial Managed Lanes network. These criteria include:

- Functional Classification
- Presence of Existing Managed Lanes
- Trip Lengths: >10 miles
- % of Vehicles with 2+ Occupants
- Total Vehicles
- Total Trucks
- Total HOVs
- Volume to Capacity (V/C) Ratio
- Duration of Congestion (# of hours)
- Travel Time Index
- Percent of Persons Residing Within 5 Miles (2005)
- Percent of Persons Residing Within 5 miles (2030)
- Percent of Jobs Located Within 5 miles (2005)
- Percent of Jobs Located Within 5 miles (2030)

- Environmental Justice Populations Located along Corridor
- Interchanges per Mile
- Number of System Connections
- Number of Freight Connections
- Presence of Existing Express Bus
- Presence of Planned Express Bus, BRT
- Presence of Existing Park-n-Ride Lots
- Presence of Planned Park-n-Ride Lots
- Candidate for Truck Only Lanes
- Design Activity Already Underway
- PPI Proposed Along Corridor

Responding to Strategic Planning Challenges

Long Range Transportation Plan

As an input to the 2030 Environ6 Regional Transportation Plan for the Atlanta Region, the ARC Board in 2007 adopted a set of Managed Lane Policies to guide the identification of management and operations strategies on the regional expressway system and provide a framework for a Regional Managed Lanes System Plan. Policies were identified for five key areas: 1) Efficiency 2) Revenue 3) Regional Goals 4) Transit and 5) Accessibility. Congestion management was identified as the primary objective in designing future managed lane systems.

Multimodal Corridors

In the development of the Metro Atlanta Managed Lanes system Plan, three key decisions were made with respect to the use of lanes and designed design and operating characteristics. It was assumed that ideally two managed lanes would be provided in each direction, as warranted:

- Decision #1 – Occupancy: HOT 3+ operation
- Decision #2 – Maximum revenue or maximum efficiency: Managed lanes "value priced" to maintain a minimum 45 mph travel speed
- Decision #3 – Who is allowed to access lanes? Accommodate cars, transit, and light-duty trucks
- Decision #4 – Convert Existing GP Lane to a Managed Lane? Only on most constrained corridors/option of last resort.

Dallas – Fort Worth Area

Overview

Agencies: North Central Texas Council of Governments / Regional Transportation Commission (MPO), Texas Department of Transportation (TxDOT), Dallas Area Rapid Transit (DART), North Texas Turnpike Authority (NTTA)

Years of Experience with Managed Lanes / Active Traffic Management: 1991 - current

Brief History:

- 1991: Opened first HOV lane on I-30 in 1991, a contra-flow HOV facility with moveable barrier.
- 1996 – 1997: Opened various-type (concurrent flow, reversible flow) HOV lanes on I-35E and I-635
- 2000 - 2002: Opened concurrent flow HOV lanes on US 67 and I-35E
- 2000 - 2004: Conducted EIS recommending construction of priced managed lanes on I-635
- 2005 – current: Construction activities commence on I-635 priced managed lanes
- 2005 – 2008: Completed construction of I-30 Managed HOV Lanes facility; tolling anticipated on the lanes starting in 2010.

Population: 4,445,000 (2007)

Congestion: 66% of peak VMT congested, 43% of lane miles congested, 53 annual person hours of delay per peak traveler (2007)

Management Program Description

Management Strategies Deployed / Studied

The North Central Texas (Dallas – Fort Worth) region has operated under a non-traditional planning regimen for over a decade. In 1993, the regional transportation commission (RTC) adopted a policy which stipulated that any new highway capacity using federal aid funds must first be reviewed for toll road viability. As a result of this policy, all long range transportation plans adopted by the MPO have been examined for viability. The region has evolved the policy to not only include traditional concepts of toll roads, but also toll lanes and managed lanes.

An additional limitation has been Dallas – Fort Worth's non-attainment status, which has affected the region's deployment of managed lanes. Whereas initial construction of HOV lanes occurred to satisfy air quality requirements, changes over time have led the region to conclude it will soon no longer remain constrained due to emissions improvements. In time, the region anticipates a change from HOV lanes to managed lanes where HOV users are provided benefits only in the off-peak periods.

Managed lanes are currently treated the same as HOV lanes in selection process from an air quality perspective. However, the RTC created a regional managed lanes / value pricing policy in 2007 that identified 1) managed lanes as the preferred capacity expansion process for the Dallas – Fort Worth region, and, 2) HOV discounts would not be assumed into the future. The next iteration of the long range plan will provide a process for adapting existing HOV lanes to managed lanes, and, altering capacity expansion plans to a managed lanes pursuit.

FIGURE 1: HISTORY OF REGIONAL MANAGED LANE POLICIES, NCTCOG, 2009.

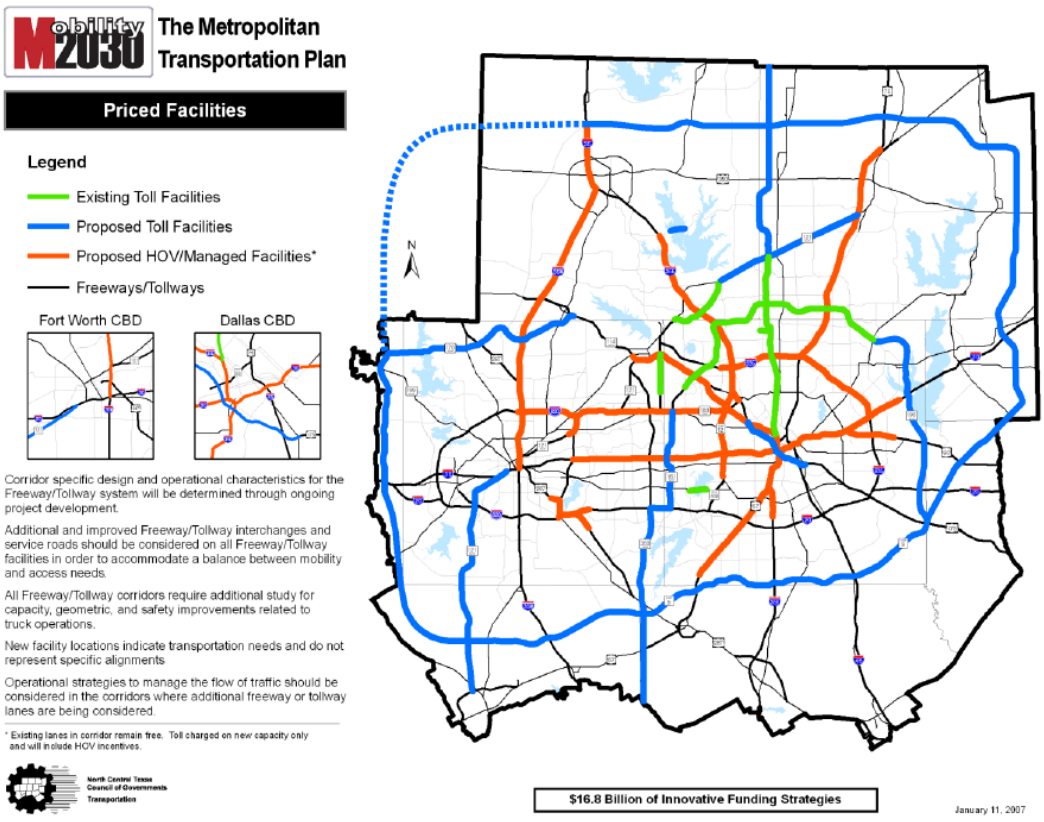

FIGURE 2: PLANNED REGIONAL MANAGED LANES / FACILITIES, NCTCOG, 2007.

The regional managed lane policy provides a phasing for tolls on the facilities. The policies are summarized:

- Fixed-fee toll schedule will be used for the first six months of operation; dynamic pricing thereafter in order to "smooth" curves prior to adoption of dynamic pricing
    - The fixed-fee schedule will be adopted per-mile, up to $.75/mi.
    - Rates will be updated monthly
- Transit vehicles will not be charged a toll
- SOV's will pay the full rate, with trucks paying a higher rate
- HOV-2+ will pay the full rate in the off-peak period; 50% discount during the peak periods
    - As the air quality attainment maintenance period is phased out, the discount will be discontinued

Selection Criteria

The most recent long range transportation plan emerged from a large gap between available funding and needed transportation projects. In order to do more with less funding, the region adopted a screening process which first allocated revenues to low cost / highly cost effective, and/or, most air quality beneficial projects and programs. This included congestion management, transit, and HOV systems. More traditional capital intensive projects where then included only if they could be afforded (including an examination of toll viability) and did not exacerbate the air quality of the region.

Responding to Strategic Planning Challenges

Long Range Transportation Plan

The Dallas – Fort Worth Metropolitan Transportation Plan (MTP), the long-range transportation plan for the region, incorporates an emphasis upon preservation of the existing transportation system. Regionally, over $21 billion in the plan has been designated towards system operations, maintenance, rehabilitation, and safety. Of this, more than $2 billion is dedicated towards congestion management and operations, including system and demand management. Managed lanes are not considered a part of congestion management strategies; rather, they constitute their own category of capacity projects.

As mentioned above, the MTP adopted a process for selecting projects for the long range plan. The prioritization is as follows:

1) Enhance efficiency of the existing system, through the elimination of trips through demand management and more productive use of highways through system management
2) For those trips that cannot be eliminated, encourage a mode shift to bus and rail
3) Increase auto occupancy for those trips that cannot be persuaded to use transit, through the development of HOV and managed lanes
4) Single-occupant vehicle capacity considered only for those congested corridors where previous efforts as outlined above have not been successful.

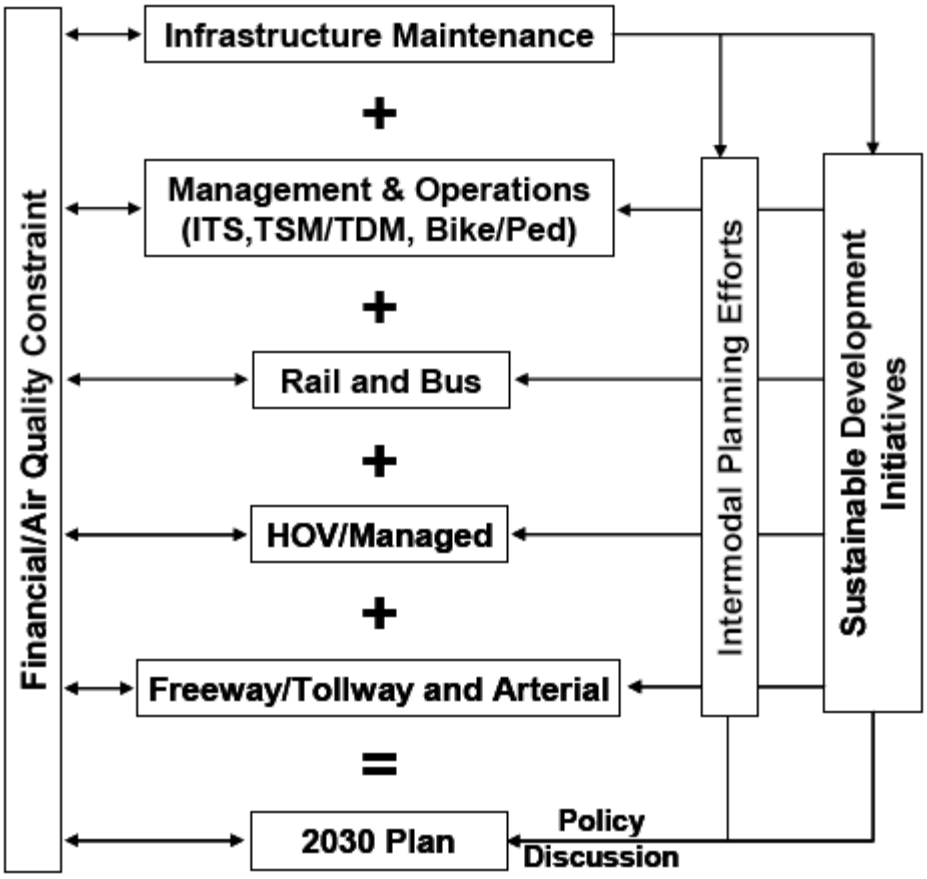

FIGURE 3: PLANNING PROCESS FOR DALLAS-FT. WORTH REGION, MOBILITY 2030, NORTH CENTRAL TEXAS COG, 2009.

Funding Issues

Funding limitations have forced the change in both capacity preference and HOV policy to managed lanes. The region cannot afford the revenue leakage that comes with preferential treatment of HOV's in their managed lanes. In addition, the region has pursued an "aggressive" financial plan (as stated in the MTP). This plan provides overly optimistic scenarios for funding, so that if funding does arrive, how it is spent is addressed directly in the plan. These assumptions state that 25% of managed lanes costs will be covered by toll revenue, and, 100% of toll roads will be covered by toll revenue.

Interchanges

Interchanges are only prioritized for freeway-to-freeway connections. All other interchanges are subject to case-by-case analysis.

Performance Measures

The principal performance objectives from the region's development of toll and managed lane facilities are to:

- Provide additional capacity in congested corridors
- Provide trip reliability for HOV and transit
- Improve air quality and increase vehicle occupancy, and enhance person movement
- Generate revenue to construct facility
- Generate revenue to operate and maintain facility
- Increase corridor efficiency
- Provide for operational flexibility in response to changing corridor needs

Multimodal Corridors

The region's long range plan adopts an established hierarchy in uses of funds, and, preference for multimodal transportation. Bus and rail transit are preferred directly in plan expenditures to HOV travelers, who are in turn preferred to SOV users. This hierarchy illustrates the delineation of managed lane corridors from rail corridors, for example.

Honolulu (Oahu)

Overview

Agencies: Oahu Metropolitan Planning Organization

Years of Experience with Managed Lanes / Active Traffic Management:

- Managed Lanes: HOV (time of day based, 2+), zipper lane (contra-flow AM peak only – planning underway for an afternoon option at some point), shoulder use (peak period, but thinks that people use them during off-peak as well – enforcement is difficult and lane looks like a standard lane all the time, shoulder mount static sign only).
- Traffic Management/ITS: Traffic Management Center (City & County of Honolulu and Hawaii DOT), VMS (about 12 or so, all on interstate system), no ramp metering, there is a long-term plan/desire to merge the State's and City & County's TMC's and integrate it with the State's and City & County's Department of Civil Defense and Department of Emergency Management, respectively.

Population: 705,000 (2007)

Congestion: 57% of peak VMT congested, 51% of lane miles congested, 26 annual person hours of delay per peak traveler (2007)

Management Program Description

Management Strategies Deployed / Studied

The Honolulu area has a rich history with deploying operational and management strategies

- HOV lanes on H-1 between the Waiawa and Keehi interchanges, on Moanalua Freeway from Halawa to Puuloa Road, and on Kalanianaole Highway from West Halemaumau Street to H-1, and on H-2 from the Mililani interchange to the Waiawa interchange.
- Reversible (Zipper) Lanes (contra-flow) on the H-1 freeway and two primary arterials during peak periods.
- Tolling is being evaluated for the Regional Transportation Plan as a scenario (making the afternoon zipper lane a toll facility with variable pricing). There is debate in the Legislature regarding tolling authority. City and County of Honolulu does have the ability to institute cordon pricing, and the Oahu MPO will be looking at cordon pricing as a scenario in the 2035 Plan (it is a preliminary look to see if it is something they should study in more detail).

In addition, the region is exploring highway modernization activities including expansion/standard upgrades, shoulder lanes, and active management strategies.

Selection Criteria

Thus far, there has been no single approach to screening or selection of management and operational strategy type projects other than "is there existing congestion?" At this time, H-1 is the major benefactor for management and operational strategies, and consequently is the only real focus. In addition, they have limited analytical tools to assess management and operational strategies.

Responding to Strategic Planning Challenges

Long Range Transportation Plan

Whereas the Hawaii MPO / DOT is deferring maintenance through-out Oahu due to financial constraints, operations and management strategies are preferred for their low cost value. HDOT does not have the money to maintain the roadways on a regular basis, let alone try to expand the system. It has been said that "unless it is an absolutely required capital improvement, all available funding is going to operations and maintenance."

Funding Issues

The region projects stagnant revenues, and certainly not enough to address the present shortage let alone future issues. At most, the MPO projects constant funding levels (2% annual increase in Federal and 1% increase in State and City & County funding), which is not keeping up with inflation.

They need to start focusing more on the right kind of public information and outreach. For example, answering the public question of "how is it that we can afford to spend X billion on a rail system, when we can't even keep the roadways properly surfaced." All three entities need to do a better job of informing the public on appropriate investments and how much money it takes to build roads. They are finding the need to debunk a lot of misinformation about the cost to build infrastructure facilities.

Performance Measures

The Honolulu area does not currently have a performance measure for travel time reliability. In addition, the tools they have available do not have the capacity to measure reliability. Observationally, taking the zipper lanes will yield better travel times and better reliability, but whether the model can predict it with any certainty is doubtful / challenging (using TransCAD).

Multimodal Corridors

Like many metropolitan areas, Honolulu's two initiatives for premium transit service have come to a halt due to financial constraints. The service was from Central Oahu to downtown that was non-stop and provided by a private vendor. This service was terminated at the end of last year for reasons unknown.

A ferry service pilot project from the far end of Pearl Harbor to downtown Honolulu was put into service, but the cost per ride was not a sustainable subsidy the City & County could afford.

Regarding freight service, they are so confined geographically that about the only thing they can do is to work with the Port of Honolulu or the airport to facilitate egress/ingress from their facilities. The situation is very much on FHWA's radar and they'd like to find some way for Oahu MPO and its participating agencies to do things better. Hawaii is the last state to adopt the CVISN and are at least a decade behind in terms of handling commercial vehicle management. When Waikiki was being developed there was no provision for loading docks at the hotels, so trucks take the center lane or the side streets to off-load and cause considerable congestion in the process. They have been considering off-hours loading, but the tourist focus of Waikiki essentially limits what is really realistic in terms of off-hour freight operations.

Model Results

The Honolulu MPO is examining cost/benefit of various scenarios under study for the 2035 RTP Update efforts. They are looking at four capacity expansion scenarios (3 facility-specific scenarios based on Central Oahu, Ewa and Waianae transportation needs), one overall lane mile expansion to arrive at LOS D service on an island-wide basis and two scenarios that deal with HOT lane/tolling and cordon pricing into Honolulu.

They are looking at these varied scenarios to provide a higher level of education to the public on transportation facility options and the true cost of transportation infrastructure.

Houston

Overview

Agencies: Texas Department of Transportation (TxDOT), Metropolitan Transit Authority of Harris County (Metro), Harris County Tollroad Authority (HCTRA), Houston-Galveston Area Council (H-GAC), City of Houston

Years of Experience with Managed Lanes / Active Traffic Management: 1979 - current

Brief History:

- 1979: First HOV lane opens a 9.6-mile contraflow lane for buses and vanpools on I-45N (North Freeway), funded by a $2 million UMTA services and methods demonstration grant. This project and subsequent HOV lanes are operated by the regional transit authority in a partnering agreement with TxDOT.
- 1984: First reversible HOV lane opens on I-10, Katy Freeway, initially to buses and vanpools, and later to 2+ HOVs before raising occupancies back to 3+ (1986) and then demonstrating QuickRide pricing starting in the late 1990s
- 1986-2002: Reversible HOV lanes open on six other freeway corridors, replacing the contra-flow lane 2009: The Katy Freeway is reconstructed and the reversible HOV lane is replaced with four managed lanes operated by HCTRA. The managed lanes are separated by plastic pylons, have multiple ingress/egress locations, two direct access with transit facilities to service express bus BRT, include three toll zones and employ variable pricing on a 24/7 basis. The managed lane implementation included a financial contribution from HCTRA toward the total $2.6 billion rebuild of the freeway.

Population: 3,815,000 (2007)

Congestion: 73% of peak VMT congested, 49% of lane miles congested, 56 annual person hours of delay per peak traveler (2007)

Management Program Description

The Region

The greater Houston metropolitan area contains a population of approximately 5.9 million covering a very expansive region. Traffic growth has historically averaged about three percent annually, with vehicle miles of travel averaging four to five percent. In the past decade, population growth has occurred both within the inner city as both densification and infilling has occurred, as well as in more distant communities that comprise the greater metropolitan region. Urban densities extend from 35 to 50 miles from the inner city on the north, northwest, west, southwest and southeast corridors of the region.

Although Houston was founded as a confluence of railroads in the late 1800s and became a major port city in the early 20th century, it has largely grown up around the automobile wit h a majority of its growth occurring since the 1920s. Houston's first controlled access roadway, the Gulf Freeway connecting Houston to Galveston, opened in 1958 on a previously abandoned interurban right-of-way. By 1970 Houston had a well developed system of freeways radiating from its downtown along with plans for three circumferential loops immediately circumscribing the downtown area, approximately 5 to 8 miles from downtown and 15-20 miles from downtown. Houston's freeway system became the largest in Texas early in its development. HOV lanes began to be added to congested freeway corridors starting in 1979, with 126 lane-miles in operation by 2002. Express bus transit was inaugurated along with HOV lanes, and today express buses and ridesharing accommodate over 135,000 passengers daily. All HOV lanes are currently in the process of being converted to HOT.

In 2009 the eight-county Houston area comprises 12,500 square miles and a population of 5.9 million. Population is forecast to grow by more than 1 million within the next decade and 3.5 million by 2035. The 2008 TIP includes almost $11 billion in transportation investment, of which 52% comes from locally generated taxes and tolls. The region has just started building fixed transit guideways, with an LRT starter line opening in 2002 and four more planned to open within the next five years.

The region's reliance on toll roads represents a growing component of the transportation system looking forward. The Harris County Toll Road Authority (HCTRA) came into existence in September 1983 when Harris County voters approved a referendum by a 7-3 margin to release up to $900 million in bonds to create two toll roads - the Hardy Toll Road and the Sam Houston Tollway, to improve the regional mobility and reduce traffic congestion in the Greater Houston area, an area known for rapid population growth. The need for a county-run toll road system came from TxDOT's budget shortfall and its inability to authorize funding to upgrade the second loop around the city, Beltway 8, which had been on planning maps since the 1950s. The Texas Turnpike Authority turned down the opportunity to improve the road as well, leaving the county to upgrade the road to freeway standards. However, Harris County could not afford to build and maintain a freeway from its general fund. Shortly after the referendum, the Commissioners Court created the Toll Road Authority to administer the construction and operation of the new road system. Then-County Judge Jon Lindsay is generally credited with shepherding the referendum from its infancy to its passage, along with the implementation of the plan for the roadway. HCTRA is a part of Harris County's Public Infrastructure Department and is subdivided into a Services and an Operations Division. While for many years, the Hardy Toll Road never had the traffic that the HCTRA envisioned it would need to turn a profit, the Sam Houston Tollway has more than made up for the lost revenue. The high profit margins on the Sam Houston Tollway allowed the authority to construct its third and fourth toll roads, the Westpark Tollway and Fort Bend Toll Road, both of which opened in 2004. Both of these toll roads have termini in Fort Bend County and are run in conjunction with the Fort Bend County Toll Road Authority. The most recent project of HCTRA is contributions toward TxDOT's construction of managed lanes that run along the median of I-10/Katy Freeway between SH 6 and I-610. HCTRA currently operates 103 miles of toll roads in Harris County and contracts to operate toll roads in adjoining counties. HCTRA and surrounding counties plan on building another 120 route-miles of toll roads over the next 15 years.

Management Strategies Deployed / Studied

The Houston region has embraced a variety of management strategies, most notably HOV lanes for the past 30 years. Early in the region's development, growth and demand outstripped the ability to add sufficient freeway capacity. HOV lanes and mass transit, along with commensurate investments in transit stations and very large suburban park-and-ride lots and ridesharing outreach, helped provide alternatives to congestion. The Houston area still reflects the largest commitment in express bus and park –and-ride investment of any US city. The region's barrier-separated lanes offer a truly reliable alternative, commensurate to a rubber tired commuter rail system that traverses virtually every radial freeway in the region. In parallel to HOV lane development which generally took place through 2002, an aggressive freeway rebuilding and

expansion program also occurred. For a number of years between 1985 and 1995, Houston's roadway expansion kept pace with demand and congestion was noticeably reduced.

Traffic management is another TDM component that the Houston area embraced at an early stage. The I-45S Gulf Freeway became one of the first in the nation to test ramp metering and freeway surveillance in the late 1960s and early 1970s. As freeways were expanded and upgraded, reliance on these strategies waned and few ramp meters exist today. A more aggressive "quick clear" incident management agreement was reached in 2005 that had the effect of more efficiently handling minor incidents and coordinating towing services among a wide range of agencies and providers.

Looking forward, all HOV lanes will be instrumented with pricing representing a $70 million investment over the next five years. Future plans are to focus new capacity primarily on new toll roads and managed lanes. Remaining funding will be focused on preservation and rehabilitation projects. While a major investment was made over a decade ago in a regional traffic management center, no active traffic management programs are currently envisioned to augment traditional surveillance and incident management practices. No bus on shoulder or active traffic management studies or other projects similar to Minnesota are underway.

Selection Criteria

There is no formal screening or corridor selection process for management projects. In the past, opportunities for partnering occurred between agencies based on interest, need and resources each could bring to a project. This ad-hoc approach has created some interesting dynamics between agency roles. For example, TxDOT has never operated any of the region's HOV lanes, preferring to formalize an agreement with one of the local agencies (either Metro or HCTRA) based on who was a willing partner to sponsor and implement a managed lane facility. And while the state has a legislatively empowered turnpike authority, all local toll roads have been implemented and operated by local agencies. Capacity expansion is still the primary means the region looks to satisfy growing mobility needs, and there is not comparable screening applied to examine trade-offs between a management strategy and a capacity improvement. Some corridors, like I-10 Katy Freeway in its major investment study and environmental review, included both general purpose expansion alongside the implementation of managed lanes, growing the total cross section from 6 general purpose lanes to an average of 14. This approach was taken because the long-range forecast suggested that even 14 lanes will become congested shortly after the re-built route was opened, hence the desire to preserve some capacity for a higher level of management.

Responding to Strategic Planning Challenges

Long Range Transportation Plan

The TIP includes a wide range of investments in all modes, including fixed guideway transit, general purpose expansion, toll road expansion, conversion of HOV to HOT lanes (from one corridor to all six) and bike/pedestrian improvements along with access management and livable communities land use planning for new development. Absent is a larger focus on operations management or active traffic management, and arterial connectivity. The driving forces in the long range transportation plan reflect agency and market driven needs—completing the regional toll road and

transit plan. Barriers being experienced are consistent with other regions: lack of sufficient funding, environmental hurdles, inability to stem increases in delay time, and inability in most corridors to add any more capacity. However, more creative ways to operate the system are still not being focused on.

Funding Issues

The region has increasing funding due to the investment being made in toll roads regionally. This is partially offset in a loss of funding (in real terms) from the state and federal levels. This reality is why so much focus is being placed on toll lanes and toll roads, along with a profusion of new toll road authorities—one for almost every one of the six surrounding counties.

Interchanges

Up until now, new interchanges have been added or reconstructed by TxDOT as the needs arose. I-10 Katy completely rebuilt four major system level interchanges, partially funded by an infusion of toll revenue HCTRA fronted in a cooperative agreement with TxDOT. However, looking forward, it is apparent in the TIP that only toll facilities with system interface with other routes will likely see interchange ramps built/rebuilt. Most of these examples relate to greenfield toll roads, not managed lanes.

Performance Measures

Regional performance measures relate to average vehicle occupancies, demand/capacity, delay time, average travel speeds and speed contours for selected employment centers, population/density to lane-miles of roads, person and vehicle hours of delay. These measures are monitored, but not significant in the allocation of resources or determination of the most appropriate investment insofar as traffic management strategies are concerned. In general, these measures are positive for areas of growth were demand can be met with capacity expansion. There are no regional tools applied to measure the reliability of managed lane facilities.

Multimodal Corridors

The region has a rich history of addressing multimodal planning at various levels, both regionally and more appropriately, at the corridor level. Defined solutions attempt to address, or leave space for, both current investments and potential ones. For example, most freeway reconstruction and expansion has left space for at least one reversible managed lane even if there is no apparent agency to implement and operate such a treatment in the exurban areas. Space is being left for future LRT and commuter rail within ROW takes, and transit agency plans include addressing local, circulator and express bus needs along with ridesharing. Investments in transit stations and P&R lots similarly address both multi-modal needs and land use (TOD) opportunities. There are few formal policies supporting these considerations, but instead, close agency relationships in which all attempt to service the future and potential needs of others.

Model Results

Cost-benefit studies have been undertaken for selected investments and for specific modes. In particular, there is a rich library of studies and evaluations supporting the first 25 years of HOV lane performance and investment, largely housed within the Texas Transportation Institute (TTI).

MIAMI – FT. LAUDERDALE

OVERVIEW

Agencies: Miami-Dade MPO, Miami-Dade Expressway Authority, Broward County MPO, FDOT Districts 4&6, South Florida Commuter Services, Miami-Dade Transit, Broward County Transit

Years of Experience with Managed Lanes / Active Traffic Management: 14

Brief History:

- 1995 - HOV lanes implemented on I-95
- 1994: Initial partner in FHWA Value Pricing Program
- 1995 – 1999: Conducted feasibility studies of HOT lanes for Metropolis region
- 2000 – 2002: Implemented region's first HOT lane pilot program on I-22
- 2006: Implemented bus use on shoulder treatment along SR 836
- 2007: Submitted proposal and receive approval of Urban Partnership grant
- 2008 : Opening of initial 95 Xpress Lanes on NB I-95 to Golden Glades Interchange
- 2009: Completion of Managed Lanes Study and Plan for FDOT District 6
- 2009: Application submitted to FHWA Tolling and Pricing Opportunities program to obtain funds to develop Managed Lane Network Concept of Operations

Population: 5,420,000 (2007)

Congestion: 82% of peak VMT congested, 71% of lane miles congested, 47 annual person hours of delay per peak traveler (2007)

MANAGEMENT PROGRAM DESCRIPTION

MANAGEMENT STRATEGIES DEPLOYED / STUDIED

- 95 Express Lanes – Phase 1A (Miami CBD to Golden Glades Interchange), deployed and operational in December 2008. Phase 1B expansion (Golden Glades to I-595) scheduled for completion in January 2010. Phase 2 (north of I-595 through Broward County) scheduled to start construction in 2010. The 95 Express is a combined BT/managed lane project, and incorporate a variable toll/congestion pricing strategy
- Express Toll Lanes for I-595 – After I-95 Express, the next corridor for the deployment of managed lanes is I595, involving reversible managed lanes extending from I-75 to east of US 441/SR 7, with direct connections to/from Florida's Turnpike, and connect with the 95 Express at the Golden Glades park-n-ride facility The facility will include new BRT service.
- Variable Tolling on MDX and FTE Facilities - Both MDX and FTE are planning to replace cash tolling with an all electronic toll collection system using a combination of transponder and video tolling. This will allow to introducing peak vs. off-peak differentials in tolls. Open Road Tolling (ORT) will apply to SR 869/Sawgrass Expressway in Broward County, the Turnpike mainline in Broward and Miami-Dade Counties, the Homestead Extension of Florida's Turnpike (SR 821/HEFT), and four MDX toll roads (SR 836/Dolphin Expressway,

SR 112/Airport Expressway, SR 916/Gratigny Expressway, and SR 874/Don Shula Expressway. These ORT roadways may become variably priced roadways in the future.

- Express Toll Lanes on Selected Toll Roads - Both MDX and FTE have carried out feasibility studies on the addition of value-priced express toll lanes on SR 836 and SR 821. These studies have included that managed lanes would be the most cost-effective way to add capacity to these corridors, though portion of these lanes would need to be elevated. Because of the high traffic connection between SR 836 and 821, the plan is to implement express toll lanes on these facilities at the same time. This would occur after the conversion to Open Road Tolling and peak/off-peak pricing scheme has been instituted.
- Addition of Managed/Express Toll Lanes on Other Regional Roadways – Reversible express lanes are being studied on I-75 between I-595 and SR 826/palmetto Expressway, as well as adding HOV lanes to the Palmetto Expressway. Miami-Dade County is also studying a managed lane project on US1 South utilizing the existing South Miami-Dade Busway Corridor.
- Toll Truck Lanes - A study was conducted to assess the feasibility and configuration of a truck toll lane system in Miami-Dade County. Two major connections were identified on the County expressway system, to get trucks from the Port of Miami to the Golden Glades Interchange area and Miami International Airport: 1) I-395 and I-95 from the new Port Tunnel to Golden Glades, and 2) SR 112/Airport Expressway from I-95 to Ludlum Road.

These management strategies have been reflected in the latest (year 2035) regional transportation plans for Miami-Dade and Broward Counties. The broader managed lane network is referred to as the South Florida Express. The intent in both MPO plans is to address added capacity and improved level of service through a combination of managed lanes and new BRT service in all of the freeway/tollway facilities in these two counties. The South Florida region sees an integrated strategy, with active traffic management and enhanced transit service (in particular, BRT) applied in the different corridors.

Selection Criteria

For FDOT District 6, a Managed Lanes Visioning Study was conducted for Miami-Dade and Broward Counties., completed in 2009. This study addressed managed lanes and premium transit service integration to both expressway and major arterial corridors within the two counties, for the South Florida Express system. This is being followed up by the development of a Network Concept of Operations for the South Florida Express. This will identify and involve regional stakeholders, determine common goals, objectives, vision, system approaches, concepts, and operational strategies for facilitating the subsequent design and deployment of the managed lanes system. Key topics to be addressed in the Network Concept of Operations will include:

- Refined relationships among the various FDOT districts, other transportation agencies, and the local/regional Traffic management Centers.
- System requirements for a regional network, such as developing consistent messages and familiar signage throughout the network to avoid traveler confusion.

- How to integrate already developed concept of operations, public agency programs, multi-agency tolling initiatives, traffic operations initiatives, law enforcement, and incident and emergency management operations and interfaces
- How should a multi-agency regional network be administered, operated, and maintained – tolls and traffic/transit operations.
- Develop a refined set of performance measures and monitoring for a region system.

Responding to Strategic Planning Challenges

Interchanges

The 95 Express project has involved some interchange modifications to provide direct access in and out of the managed lanes. With the South Florida region being built out, interchange improvements in future will focus on modifications to freeway to freeway interchanges to accommodate a seamless transition of managed lanes between facilities, and rebuilding certain interchanges to provide for greater safety and limited capacity improvements.

Performance Measures

A detailed set of performance measures (over 40) was developed for use in the evaluation of the 95 Express project. Measures were developed addressing 1) System Impacts/Utilization 2) Operations and 3) Acceptance/Satisfaction. Impacts on both managed and general purpose lanes were identified, as well as transit operations. This measurement system as applied to other corridors and the South Florida Express system as a whole will be refined in the development of the Concept of Operations for the regional system.

San Francisco / Oakland Bay Area

Overview

Agencies: Metropolitan Transportation Commission (MPO), California Department of Transportation (Caltrans), Congestion Management Authorities (CMA) – county-based entities who aggregate municipal activities for regional congestion reduction and mobility enhancement

Years of Experience with Managed Lanes / Active Traffic Management: 1970 - current

Brief History:

- 1970: HOV Express Lanes opened on the Bay Bridge Toll Plaza, establishing concurrent flow design of HOV facilities
- 1974 - current: Concurrent flow, peak-hour only HOV lanes are opened on 51 distinct segments throughout the Bay Area.
- 1994 - 1997: Initial partner in the Federal Congestion Pricing Pilot Program, examining application of value pricing to the Bay Bridge for congestion management
- 1996 - current: Various endeavors / studies by Alameda County for the development of HOT Lanes in the County; I-680 HOT lanes currently under construction (first Bay Area HOT lane to open in 2010)

- 1999 - current: Study of HOT lanes for US 101 in Marin / Sonoma Counties; still examining HOT lane / toll viability for the corridor
- 2001 - current: Santa Clara County pursuit of HOT lanes throughout the San Jose area. Initial HOT lanes under development for SR-237 / I-880.
- 2004 – 2007: MTC conducts Freeway Performance Initiative study to address phasing of operational / management strategies for the region
- 2006 – current: MTC conducts a regional HOT lane assessment project
- 2007 – current: San Francisco County signs an Urban Partnership Agreement with the US DOT for pursuit of congestion pricing, bus rapid transit, and other strategies for San Francisco. Pricing on Doyle Drive is dropped in favor of a parking pricing program in San Francisco.

Population:

- San Francisco/ Oakland: 4,480,000 (2007)
- San Jose: 1,705,000 (2007)

Congestion:

- San Francisco/ Oakland: 82% of peak VMT congested, 60% of lane miles congested, 55 annual person hours of delay per peak traveler (2007)
- San Jose: 81% of peak VMT congested, 68% of lane miles congested, 53 annual person hours of delay per peak traveler (2007)

Management Program Description

Management Strategies Deployed / Studied

The Metropolitan Transportation Commission (MTC), California Department of Transportation (Caltrans), and respective county-based Congestion Management Agencies (CMA) have worked over the past twenty years towards reorienting highway investments towards sustainability. The principal tool for evaluating the effectiveness of operational and management treatments for planning purposes has been the Environmental Impact Record (EIR), where any given project must be evaluated against a variety of discrete operational, highway capacity, and transit alternatives. Typically, the system management alternative invariably performed the best.

Recently, in attempting to move the bar forward, the MTC (in partnership with Caltrans and the CMAs) attempted a comprehensive review of operational / management strategies on a corridor-by-corridor basis, called the Freeway Performance Initiative (FPI). The FPI created prioritized list of system management and capital investments for each corridor. From this list, a comprehensive benefit / cost analysis was conducted and prioritization / phasing. For example, for a corridor with a long-term projected need for managed lanes, an auxiliary lane might have been recommended as an interim measure to "buy some time" until the managed lane implementation was warranted and funding was available. By comparison, other corridors may have overwhelming need. The FPI study created prioritized lists that were incorporated by the MTC (the MPO for the region) and agreed upon by the CMA's (the implementing agencies).

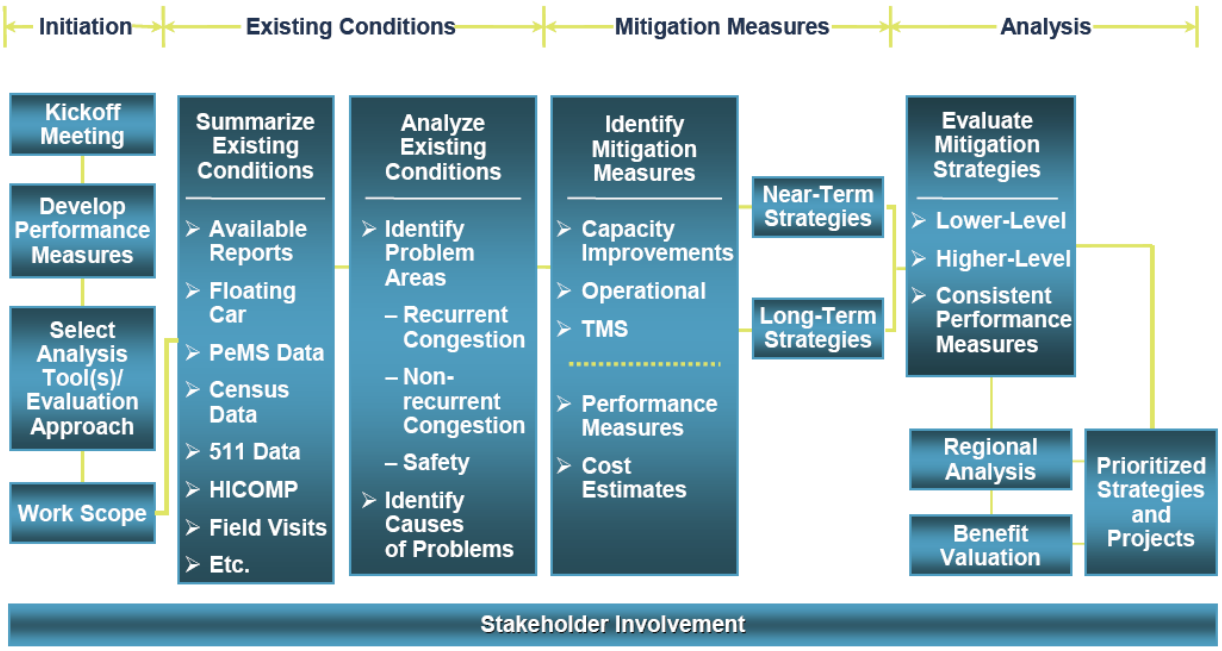

FIGURE 4: OVERVIEW OF FPI CORRIDOR ANALYSIS APPROACH, METROPOLITAN TRANSPORTATION COMMISSION, 2007.

In addition to the FPI study, the MTC also conducted a regional managed lane network plan, building upon existing efforts towards implementation in Alameda and Santa Clara Counties. MTC, working with its regional partners, has developed a detailed cost-effectiveness analysis on a corridor-by-corridor basis. Although this managed lane network has moved forward for implementation, it regrettably has not yet been incorporated within the framework of the FPI. Subsequent efforts by MTC will concentrate upon integrating the managed lane concept into the detailed phasing of FPI strategies.

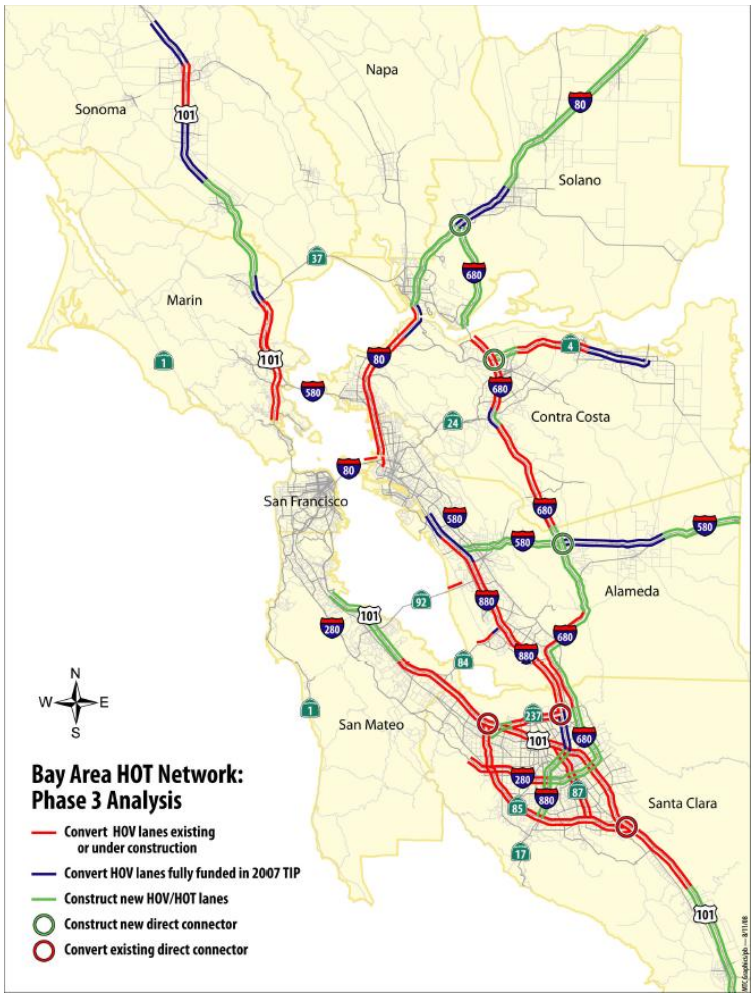

FIGURE 5: REGIONAL MANAGED LANE SYSTEM, METROPOLITAN TRANSPORTATION COMMISSION, 2009.

Selection Criteria

The FPI Study completed a quantitative screening of corridors, projects, and strategies. The Metropolitan Transportation Plan (MTP) then rolled up the measures of effectiveness for regional impacts to vehicle miles traveled, travel time delay, air quality / greenhouse gas emissions, etc. as evaluated in the travel model. The regional managed lanes study also examined traffic and air quality benefits when developing the regional system. Commons measures included vehicle hours traveled reduction, peak hour average speed increase, reactive organic gasses reduction, nitrogen oxide reduction, PM10 reduction, and CO2 reduction.

Responding to Strategic Planning Challenges

Long Range Transportation Plan

The FPI Study (and following process) has fundamentally changed the way that MTC deals with the MTP, the long range transportation plan for the region. The FPI provided a recommended list of priorities, from which the CMA's submitted their project priorities to the regional plan. This was compared back to the FPI recommendations, in order to ensure consistency between the short-

term phasing of the FPI and the long-range vision of the MTP. The FPI, in essence, creates a phasing mechanism in the MTP, showing iterative steps in the long-range plan. This prevents big-capacity projects from "grabbing the limelight" in the MTP, and instead shows the operational and management treatments that must occur first before capacity expansion would be considered. MTC had some occasional differences from the CMA's in terms of priorities, but the long-range timeframe of the MTP allowed those differences to dissipate.

In the development of the MTP, the FPI process recommendations reflected a consistent assessment of management and operational treatments across corridors, normalized performance criteria to account for differences in detail of data, the desire to close managed lane gaps in the corridor, and the presence of heavy freight, developed a robust benefit-cost framework for planning analysis, and developed a phasing plan through the life of the MTP.

Funding Issues

Although the region does project declining transportation revenue from known sources, historic evaluation indicated that California had a history of providing unanticipated "bumps" in revenue over time. These bumps typically came from voter action, state investments, etc. that are unspecified and certainly cannot be relied upon for the future. However, the MTC did make an effort towards identifying how future unspecified funds would best be applied in the region. Although no policy has yet been determined, one possibility is to view managed lane revenue from tolls much in this context, even though the money is designated to managed lane projects. In turn, funding for other efforts will be guided from this process.

There are some big projects in the region, but most of the large capacity projects are already funded through tolls (primarily bridges). Two big exceptions are the Marin Narrows and Doyle Drive, both of which the region has aggressively pursued federal and other funding for assistance. The region, unofficially then, has internalized the costs for big projects by generating separate revenue through tolls to accommodate those big projects.

Interchanges

An interchange is examined within the context of the FPI, and is subject to the same analysis.

Performance Measures

The principal performance measures concentrate upon three areas: mobility (movement of people and freight), reliability (predictability of travel time), and safety. Mobility measures in the FPI are travel time and travel delay, with separated analyses for managed lanes and general purpose lanes. Reliability is measured by a "buffer index", which defines the extra time cushion that travelers add to their average travel time when planning trips at the 95th percentile. MTC applied the FHWA guidance on buffer indexes for the FPI. Safety measures comprise crash reduction rates, with delineation between fatality, injury, and property damage crashes.

Multimodal Corridors

Neither the FPI study nor the managed lanes study explicitly addresses transit use on the corridors. However, the region's extensive history of HOV lanes has been a component in the development of managed lanes. Already, some corridors are sufficiently congested so as to require HOV-3+

operations (I-80 primary among those). Additional HOV lanes will soon reach their design capacity with HOV-2+ operations. As a result of the anticipated needs, the MTC has adopted a policy of transitioning to HOV-3+ operations on the managed lanes system as situations warrant and/or as necessary to meet targets for O&M and revenue recovery for new facilities.

Model Results

The region has adopted a life-cycle benefit-cost analysis to assess the effectiveness of the region's FPI and managed lane recommendations. The benefit-cost analysis reflected changes from current (2007) conditions for short-term improvements (2015) and long-term improvements (2030). For comparability, the analysis assumed all projects were begun in 2007, which is unreasonable for a variety of factors. The lifecycle analysis reflects upfront costs (capital, support, ROW) and ongoing O&M costs. Prioritization of projects within corridors and for the plan's phase increments are dependent upon value-added strategies that consistently yield a beneficial relationship in the B-C analysis.

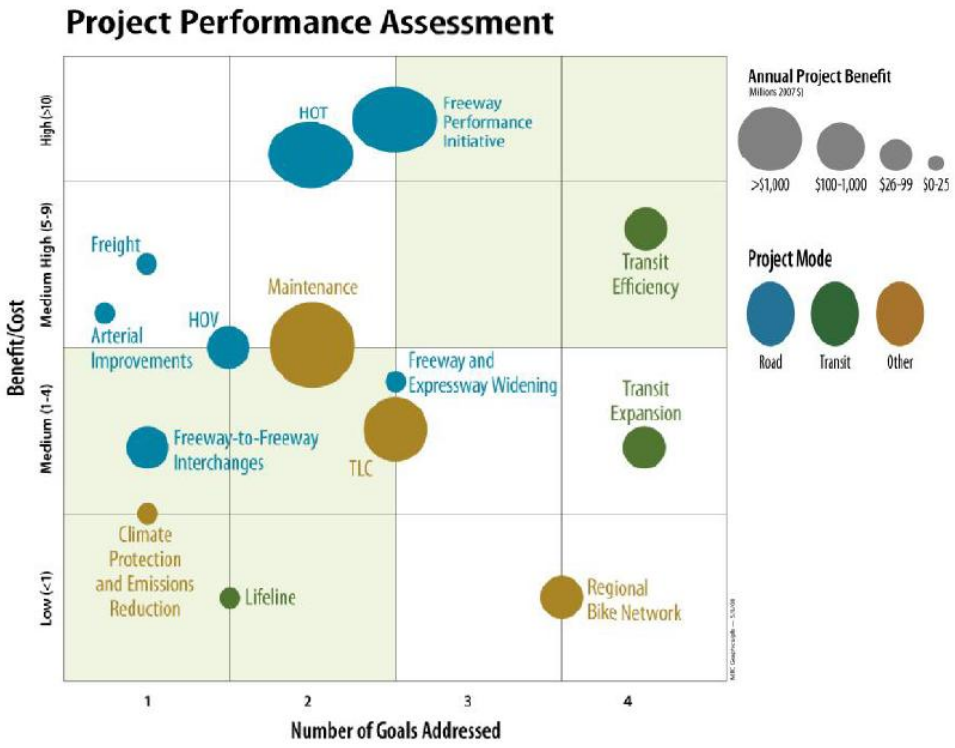

FIGURE 6: MODELED COST-EFFECTIVENESS FOR 2035 PLAN, METROPOLITAN TRANSPORTATION COMMISSION, 2008.

Seattle

Overview

Agencies: Puget Sound Regional Council and Washington State Department of Transportation

Years of Experience with Managed Lanes / Active Traffic Management:

- Managed Lanes: mid-70's to current
- Traffic Management/ITS: mid-70's to current
- Active Traffic Management: feasibility studies (2007 – 2009), 2010 speed harmonization & queue warning system on-line

Brief History:

- 1970s – 1980s: Inclusion of HOV lanes, park-and-ride lots, and ramp meters in the interstate definition.
- Early 1990's: WSDOT Core HOV System Plan
- 1992 WSDOT Freeway HOV System Policy
- 1997: WSDOT Puget Sound HOV Pre-Design Studies
- 2001-2005: Vancouver HOV Lanes Pilot Project
- 2004: I-405 Managed Lanes White Paper
- 2006: Hours of Operation Demonstration Project
- 2006: Comprehensive Tolling Study Part 1
- 2007: I-405 Managed Lanes White Paper Update
- 2008: Comprehensive Tolling Study, Part 2
- 2008: SR 167 HOT Lanes Pilot Project Opens
- 2007 – current: Pursuing active traffic management system of speed harmonization and queue warning system and inclusion of ATM measures in the Highway System Plan.
- 2008 – current: Seattle (Lake Washington) Urban Partnership Agreement (congestion pricing, ATM elements, transit improvements and TDM measures)
- 2009 – current: Value Pricing Pilot Program, Acceptance and Awareness of Pricing Study

Population: 3,100,000 (2007)

Congestion: 66% of peak VMT congested, 51% of lane miles congested, 43 annual person hours of delay per peak traveler (2007)

Management Program Description

Management Strategies Deployed / Studied

The Seattle region has deployed an extensive variety of management and operational strategies:

- HOV Lanes – Extensive HOV system through-out the greater Puget Sound Region (totaling approximately 250 lane miles as of 2009). WSDOT developed the Core HOV System Plan in the early 90's that identified 310 HOV lane miles on I-5, I-405, I-90, SR 520, SR 509, SR-167, and SR 16. Direct Access Ramps and Freeway to Freeway connectors were identified as part of the HOV Pre-Design Study in 1995/1996.

- Reversible Express Lanes – I-5 between Northgate and the south end of the Seattle CBD (approximately 7.5 miles in length). I-90 between downtown Seattle and just east of I-405 (approximately 6 miles in length).
- HOT Lanes – Implemented first HOT lane facility on SR 167 in May 2008. Looking to implement additional HOT lanes on re-built SR 520 Bridge and I-90, as well as the length of I-405 (30 miles).
- Tolling – Originally used to finance bridges (I-90, SR 520 and Tacoma Narrows). New Tacoma Narrows Bridge is currently tolled. Urban Partnership Agreement for SR 520 will include variable tolling. The Puget Sound Regional Council (PSRC) recently completed a demonstration on GPS-based regional tolling.
- Traffic Management Centers, extensive use of ITS, incident management, ramp metering.
- Limited use of transit only lanes.

In addition to the deployed strategies, activities in the region have emphasized the role of operational and management strategies for addressing mobility needs:

- The Washington State Department of Transportation (WSDOT) has the Moving Washington Program. This congestion reduction program has identified 3 key strategies: operating the existing system efficiently, adding strategic road capacity and managing demand by providing choices. In addition to the over-arching strategies – the plan includes integrated corridor specific plans to address location specific situations.
- Washington State Transportation Commission conducted a statewide tolling study – recommending 7 potential tolling corridors (Cross Lake Washington, I-5 Central Puget Sound, I-405/SR 167, I-5 Lewis County, SR 395 N Spokane, Columbia River Crossing and Snoqualmie Pass).
- PSRC convened a Pricing Task Force to engage business and policy leaders on tolling
- Generally, PSRC's RTP is more towards balancing management of existing system and strategic investments in expansion.
- WSDOT recently received funding to develop implementation plans to convert their HOV system into tolled express lanes.
- The HOV system is largely completed and Surveillance, Control and Driver Information (SC&DI) elements were included in HOV lane construction projects.
- Large-scale freeway expansion hasn't really been seriously looked at in a very long time. However, there is still political interest in extending SR 167, widening I-405 and the construction of the Cross-Base corridor/freeway. But there is also a lot of political interest in limited to no freeway expansion either. In certain instances, local jurisdictions are interested in expanding their arterial systems leading to the freeway/highway corridors, but have been somewhat resistant to the creation of a network of parallel facilities to provide redundancy to the freeways.
- Destination 2030 had more roadway projects in the fiscally constrained version than is being considered for Transportation 2040, partly due to climate change initiatives.
- Major capacity expansion projects are being looked at for tolling (tolled (SR 509, SR 99, CrossBase) and in other instances transformed to BAT and managed lane concepts.

- The current direction seems to be an incremental approach starting with tolling project level facilities and then moving to full system tolling on the freeways and eventually VMT charges (2040). Will incrementally move to VMT charges.
- Upcoming tolling studies by WSDOT include: Express Toll Lanes (2) on I-405 in Central Puget Sound, SR 99 Alaskan Way Viaduct Replacement Project, I-5 Columbia River Bridge Replacement in Vancouver Washington and toll feasibility studies for freeway extensions on SR 167 and SR 509 (south Puget Sound).
- In the past 10 years or so WSDOT has been more focused on mega projects, but WSDOT also continues to layer on additional management systems one at a time (see brief history) to create a more manageable and safer traffic flow.
- PSRC has an extensive benefit-cost analysis tool for use with their model. An econometrics model that builds off of their land-use and transportation model. Have been using this to explain the benefits of a more localize project to the greater region….gets at the sub-area equity issues.

Selection Criteria

The HOV program was screened and selected as noted previously in the early/mid 90's. Generally the screening criteria related to whether there was transit service, how bad the congestion was, the expected benefits, but implementation and construction was a bit more opportunity based. Managed lanes implementation has been opportunity based thus far (SR 167), however, a system plan is being developed and future projects will flow out of that process.

WSDOT recently completed a feasibility study for ATM and have a general implementation plan for a proposed speed harmonization and queue warning system for the Central Puget Sound Region.

PSRC is reporting out on managed lane travel-times for certain facilities (O/D pairs) in order to do roadway travel time as well as transit travel times. The agency has reviewed different scenarios – some heavy on capacity expansion, some on system management, and others on tolling. Transit congestion and roadway congestion are the primary indicators. The PSRC has divided the region into 12 broad transportation corridors and is compiling existing data and information for each to generally describe the transportation system and the expected or projected need for the future.

Responding to Strategic Planning Challenges

Long Range Transportation Plan

The PSRC still identifies deficiencies based on level of service, providing a bias towards expansion. Low cost/high benefit items will likely be scoped into a larger or broader improvement project. For example, HOV system projects would also include interchange improvements or SC&DI elements. The region has identified bottleneck fixes in all corridors and they tend to rise to the top; but overall, the lack of funding has maintained the focus on bottlenecks.

All arterial ITS and signal coordination improvements have been put into the constrained plan (not the unconstrained plan) as a must-fund activity. The LRTP is still determining how to fund the plan, including looking for the tolling projects to then fund the low cost/high benefit activities (if you toll SR 520, can those funds be used towards ATM type projects/activities). The first round of analysis

looked at higher amount of transit investment, focused much more on High Capacity Transit infrastructure, rather improvements in localized transit. PSRC worked with the transit agencies to include more bus service at higher frequencies in the system, which could eventually transition to HCT.

On the whole, ITS has not been the most popular strategy by planners in the region, so PSRC has been trying to package it with other elements like TDM and transit when applicable. There is a lot of general support for more ITS type projects, but not one of the signal coordination projects was selected as part of the TIP. PSRC is trying to determine how to bring this into focus and obtain funding for these types of elements.

Funding Issues

Transportation funding has been decreasing and a funding shortfall is projected if the current funding strategy is maintained. The PSRC has started to include tolls and user fees as part of the funding scenario for Transportation 2040. In the initial years there is an assumed increase in the gas tax, with a transition to corridor tolls, and then to full system tolling, and eventually to VMT-based fees. Current funding for the 30-year baseline for the Regional level (based on currently levied taxes) is as follows: 66% goes to transit, 25% to local jurisdictions, 10% goes to state highways. The preferred alternative going forward could have a different distribution.

Interchanges

WSDOT has identified 22 direct access ramps/freeway-to-freeway connectors and 14 in-line freeway stop needs in the late 90's. Generally, the identified freeway-to-freeway interchanges are so dramatically expensive, that they are screened out most of the time, unless it is concerning a freeway with room in the middle. Sound Transit funded approximately 10 direct access ramps (1 in-line freeway station) as part of their Regional Transit Plan. But determining who is responsible for building the interchange oriented facilities is challenging and funding tends to make them prohibitive.

WSDOT has tried other design options for freeway-to-freeway connectors, by constructing a center to outside lane flyover prior to the interchange ramps to allow transit and carpools to utilize the interchange ramps to make the movements (I-90).

Working with PSRC, WSDOT has identified bottleneck and chokepoints in the system that will be included in the financially constrained plan (which means that WSDOT thinks they can fund those interchanges).

Performance Measures

At the policy level, travel time reliability is recognized as an issue and WSDOT has actually tried to measure it as a function of congestion, but it is difficult to measure using the regional model. Travel time reliability is very important in the evaluation of alternatives. And PSRC is in the midst of updating and increasing the specificity of performance measure for Transportation 2040. Vision 2040 provided some general measure directives (high level) and also set up criteria that were to be run through the benefit/cost model. PSRC is working to design performance metrics that align with the Vision 2040 policies that are based on the regional goals. PSRC is working to use the

framework of the congestion management process and expand it to include the ability to assess service levels for other modes or needs, like freight and non-motorized travel, etc., for the 12 identified corridors. The performance metrics are probably going to be more extensive and include more varied measures.

Multimodal Corridors

WSDOT has been very explicit in their policies that they have a priority system on the freeways for transit. There is a whole series of HOV policies in place and some specific projects have made commitments, but the details of how it gets done and how everything plays out is more complex. For example the I-90 memorandum of agreement, is probably the most explicit in that the express lane speeds had to maintain a 45mph speeds; if not, the Mercer Island bound traffic (allowed SOVs) would no longer be able to use the express lane facilities, if 45 mph speeds were not maintained, then carpools and vanpools would be restricted and the facility would become transit only. And policy for the HOV system as a whole has a 45mph for 90 percent of the time understanding, but in many instances in the region, the system is overwhelmed and does not function at 45mph. But evicting the 2+ HOVs will cause other problems. The details of moving a managed lane system is being discussed (who can buy in, who is free, etc), and may be included in the RTP as an interim strategy. PSRC's Vision 2040 has an emphasis on providing transportation choices that compete with the SOV.

4.0 Findings

The principal finding from this effort indicates that the Minneapolis – St. Paul metropolitan area is not alone in recognizing there are insufficient funds to undertake major capacity improvement projects to meet anticipated travel demand. The Twin Cities has identified a preference for incorporating operations and management strategies into its long range transportation plan. In many ways, this policy preference reflects a more "European" approach to traffic management; however, other U.S. metropolitan areas are also relying on management and operational strategies to address anticipated traffic congestion and growth in travel demand. The primary difference between the U.S. implementation, including that of the Twin Cities, and European experience is the U.S. dedication of one or more managed lanes of travel for free-flow condition maintenance. Despite this difference, the broad implication is that urban areas across the developed world are increasingly investing in demand and system management strategies that emphasize operational performance rather than broad system capacity.

Management Strategies Deployed

Operations and management strategies have been actively pursued to one extent or another by many peer communities. Of particular interest in the Twin Cities region are those applications that provide a long-term return on investment, so as to provide a credible alternative to unaffordable capacity expansion. These strategies would be expected to enhance traffic operations through flow maximization, improve person throughput through increases in average vehicle occupancies and transit ridership, reduce incidents and crashes, and improve travel time reliability. To accomplish similar objectives, other communities have pursued managed lanes (common in the U.S.) and active traffic management (common in Europe). Managed lanes have many operational variants,

including occupancy allowances, time-of-day restrictions, vehicle-type restrictions, and congestion pricing. In the United States, common types of managed lanes are HOV lanes, HOT lanes, Express Toll Lanes, and limited-access express lanes. Active traffic management as deployed in Europe attempts to regulate the flow of all vehicles across all lanes of traffic through the implementation of speed harmonization, queue warning, lane controls, junction controls, dynamic rerouting, and dynamic travel time information.

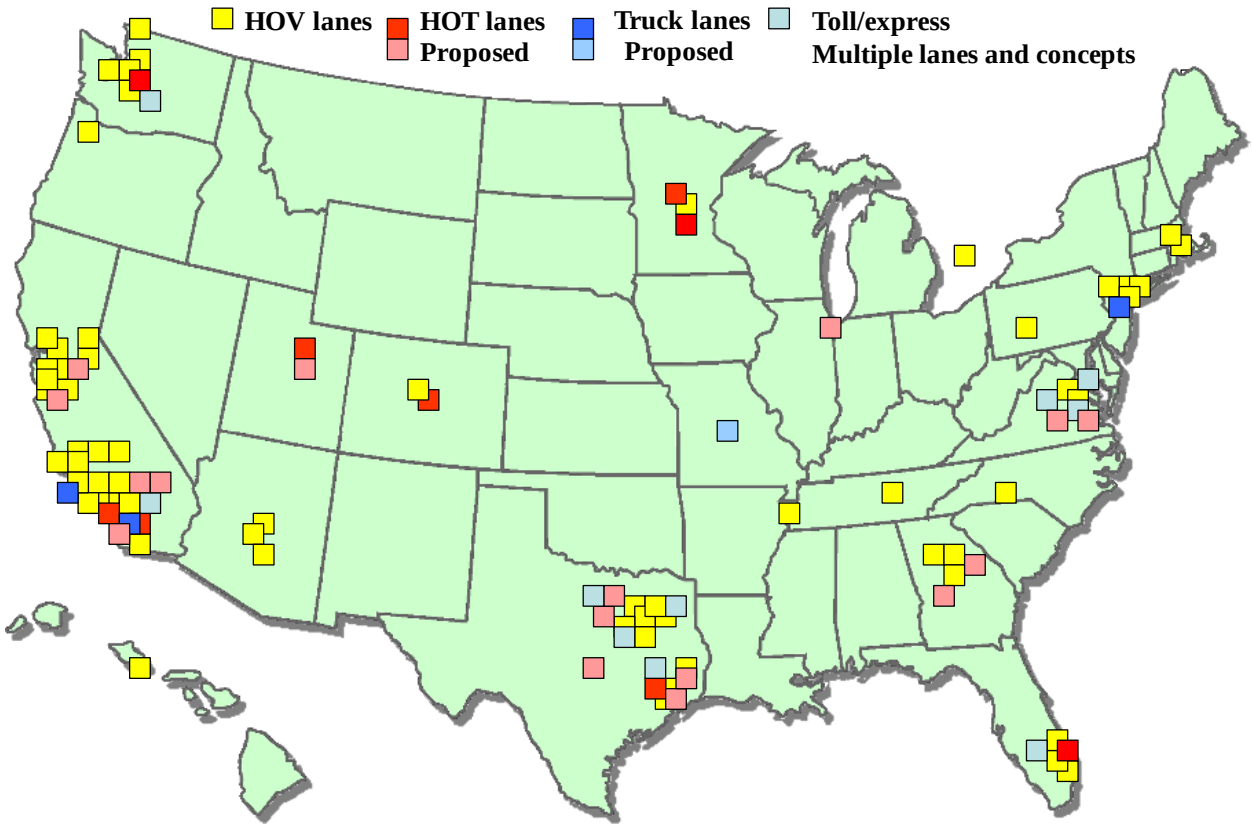

FIGURE 7: U.S. MANAGED LANE PROJECTS, PB, 2009.

Managed lanes have been proposed and implemented throughout the U.S. Although the ten years between 1996 and 2005 yielded only five operational managed lane facilities, the past four years (2006 – 2009) have witnessed six new facilities open, with an additional nine under construction. The managed lanes adopt a variety of access and eligibility policies; indeed, there is no standard for the phrase "managed lanes", as each implementation is slightly different than another. That said, a principal finding of this effort is that not only are managed lanes becoming an increasingly important component of U.S. freeway operations, but for many regions, managed lanes have become a featured component for addressing long-term capacity constraints in a corridor.

CORRIDOR/STRATEGY SELECTION CRITERIA

The nature of managed lanes in certain communities has evolved from a short-term, corridor-specific, operationally-focused strategy to a long-term, system-wide, mobility-focused strategy. Although project development still occurs at a corridor level for managed lanes, capacity planning and systems integration are increasingly conducted at a regional / system level. In this context, managed lanes are often considered side-by-side with active traffic management.

For example, in the San Francisco Bay Area, a comprehensive phasing plan has been developed for the development of not only managed lanes, but also ATM (called the "Freeway Performance Initiative"). In a few corridors, managed lanes are implemented concurrent with ATM to provide better traffic management. In this context, the Bay Area generated a prioritized list of system management and capital investments for each corridor. From this list, a comprehensive benefit / cost analysis was conducted and prioritization / phasing completed. For example, for a corridor with a long-term projected need for managed lanes, an auxiliary lane might have been recommended as an interim measure to "buy some time" until the managed lane implementation was warranted and funding was available. By comparison, other corridors may have overwhelming need. Similarly, Dallas – Fort Worth's policy endorsing toll road viability has yielded a system-wide approach to implementing managed lanes. Both metropolitan regions envision managed lanes as the principal capacity expansion function for the 20-year long range plan. Regrettably, besides these two communities, no formal screening or corridor selection process has been adopted on a system-wide basis for management projects. Instead, it is determined by short-term prevailing corridor characteristics – such as the existence of underutilized HOV lanes or the desire to augment revenues for capacity expansion.

Integration with Regional Transportation Planning

There is no established guidance for the incorporation of management and operational strategies within the context of the long-range plan. Indeed, the development of the long-range plan as a 20- or 30-year snapshot of the future network is inherently biased towards identifying capacity improvements. Ongoing operations and management of freeway corridors is not easily represented in the narrative of a future network. Although many communities have attempted to incorporate managed lanes within the long range plan, these projects are often simply identified as an alternative line on a map compared to a capacity expansion.

The one exception to this practice is the San Francisco Bay Area, which has fundamentally changed the development of the long range plan through the Freeway Performance Initiative. The FPI created a system-wide evaluation of regional project priorities, but developed the list of priorities in partnership with the project sponsors. Thus, when projects were proposed for development or inclusion with the long range plan, the phasing of the project in the FPI determined its suitability for inclusion. If iterative steps (as identified in the FPI) were not conducted first, the project was not included. This prevents big-capacity projects from absorbing regional funds. Furthermore, it shows a preference for operational and management treatments that maximize the use of available capacity before new capacity is added to the system.

Funding Programs

A common element amongst all peer communities is an active avoidance of "big infrastructure" projects from absorbing identified and anticipated regional funding. Big infrastructure projects include bridges, tunnels, and interchanges that exist within a constrained environment, making substantive improvements and/or capacity enhancement cost prohibitive. In such cases, many urban areas (such as the Seattle, Dallas-Fort Worth, and San Francisco-Oakland regions) have established a policy preference for evaluating and implementing user-based financing as a means of paying-down the cost of these facilities. In most cases, these big infrastructure projects involve tolls across all lanes of traffic into perpetuity, providing a base of funding for the large capital outlay and for lifecycle considerations for operations and maintenance. In all cases, the intent is to prevent these structures from absorbing available highway trust fund revenue for large periods of time.

Outside of big projects, tolls remain an important force for infrastructure development. In Texas, the legislature provided a range of new transportation financing options for regional MPOs to consider in funding needed infrastructure. These tools include loans from the state infrastructure bank, local community-financed shadow-tolling, traditional toll financing, and public-private partnerships allowing for private activity bond financing and comprehensive development agreements. Other states have also enabled greater use of private-sector and toll financing for infrastructure. Unlike the big infrastructure projects, in most applications, tolls are to be applied for new lanes of traffic only or on converted HOV / shoulders.

In the project development process, toll viability screening has been successfully used to ensure revenue production possibilities are examined to complement public revenue. For example, the Dallas-Fort Worth region evaluates all new highway capacity using federal aid funds for toll road viability. Since adoption in 1993, the region expanded the policy to include express toll lanes and managed lanes. As a result, the region has an extensive projected network of toll and managed lanes facilities, with little new "traditional highway" capacity due to be constructed, unless it is concurrent with new toll lane capacity (such as improvements to frontage roads).

An interesting development witnessed in various metropolitan areas is the extensive use of regional partnerships to implement operational and management strategies for congested freeway corridors, and, to deliver new managed lane capacity projects. Although financing is a key consideration within the development, it should be noted that this extends beyond financial considerations. Partnerships with regional / county authorities, as well as non-profits (transportation management associations) and private-sector enterprises, have helped bring projects to fruition quicker and with greater regional concurrence.

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