MINNESOTA
URBAN PARTNERSHIP AGREEMENT

NATIONAL EVALUATION:
TRANSIT SYSTEM DATA TEST PLAN

U.S. Department of Transportation
Research and Innovative Technology Administration
Federal Highway Administration
Federal Transit Administration

FINAL
November 17, 2009
Publication No. FHWA-JPO-10-014

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Prepared for

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16. Abstract

This report presents the test plan for collecting and analyzing transit system data for the Minnesota Urban Partnership Agreement (UPA) National Evaluation under the United States Department of Transportation (U.S. DOT) UPA Program. The Minnesota UPA projects focus on reducing congestion by employing strategies consisting of combinations of tolling, transit, telecommuting/TDM, and technology, also known as the 4 Ts. This test plan is based on the Minnesota UPA National Evaluation Plan. It presents the sources for obtaining the data needed to evaluate the impacts of the Minnesota UPA transit projects, the data availability, and the risks associated with collecting and analyzing the data. The data analysis techniques are described and the schedule and responsibilities are presented.

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LIST OF ABBREVIATIONS

4Ts	Tolling, Transit, Telecommuting, and Technology
APC	Automatic passenger counter
ATM	Active traffic management
AVL	Automatic vehicle location
BRT	Bus rapid transit
CBD	Central Business District
CBA	Cost and benefit analysis
CRD	Congestion Reduction Demonstration
CVO	Commercial vehicle operator
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
HC	Hydrocarbon(s)
HOT	High-occupancy tolling
HOV	High-occupancy vehicle
ITS	Intelligent transportation systems
ITS-OTMC	Intelligent Transportation Systems-Operational Testing to Mitigate Congestion
MARQ2	Marquette and Second Avenue (downtown Minneapolis)
Mn/DOT	Minnesota Department of Transportation
MOE	Measure of effectiveness
MVTA	Minnesota Valley Transit Authority
NEF	National Evaluation Framework
NEP	National Evaluation Plan
NEPA	National Environmental Policy Act
NTOC	National Transportation Operations Coalition
O&M	Operation and maintenance
OTMC	Operational Testing to Mitigate Congestion
PDSL	Priced dynamic shoulder lane
RITA	Research and Innovative Technology Administration
ROG	Reactive organic gas(es)
ROWE	Results Only Work Environment
SOV	Single-occupant vehicle
TDM	Travel demand management
TMO	Traffic management operations
UPA	Urban Partnership Agreement
U.S. DOT	U.S. Department of Transportation
VII	Vehicle Infrastructure Integration
VMT	Vehicle miles traveled
VOC	Vehicle operating cost or Volatile organic compound
VT	Vehicle trips

1.0 INTRODUCTION

This report presents the test plan for collecting and analyzing information on bus ridership, bus travel time, bus trip-time reliability, and park-and-ride lot use for the National Evaluation of the Minnesota Urban Partnership Agreement (UPA) under the United States Department of Transportation (U.S. DOT) UPA program. This information will be used in the transit analysis contained in the Minnesota UPA National Evaluation Plan, as well as supporting other analyses. This is one of 11 test plans identified in the Minnesota UPA National Evaluation Plan.

The test plan begins with a brief overview of the Minnesota UPA projects, the relationship between the analysis areas and the test plans outlined in the Minnesota UPA National Evaluation Plan, and the use of transit data in the evaluation. The test plan presents the data sources, data available, and potential risks. The data analysis techniques are described. The schedule and responsibilities for collecting, analyzing, and reporting the transit analysis are also presented.

1.1 The Minnesota UPA

Minnesota was selected by the U.S. DOT as an Urban Partner to implement projects aimed at reducing congestion based on four complementary strategies known as the 4Ts: Tolling, Transit, Telecommuting/Travel Demand Management (TDM), and Technology. Under contract to the U.S. DOT, a national evaluation team led by Battelle is assessing the impacts of the projects in a comprehensive and systematic manner in Minnesota and other sites. The national evaluation will generate information and produce technology transfer materials to support deployment of the strategies in other metropolitan areas. The national evaluation will also generate findings for use in future federal policy and program development related to mobility, congestion, and facility pricing.

The Minnesota UPA partners include the Minnesota Department of Transportation (Mn/DOT), the Twin Cities Metropolitan Council, Metro Transit, the City of Minneapolis, Minnesota Valley Transit Authority (MVTA), and Anoka, Dakota, Ramsey, and Hennepin counties. The Center for Transportation Studies and the Hubert H. Humphrey Institute of Public affairs at the University of Minnesota are also partners in the UPA.

The Minnesota projects are focused on reducing traffic congestion in the I-35W corridor and in downtown Minneapolis. ITS technologies underlie many of the Minnesota UPA projects, including those focused on tolling, real-time traffic and transit information, transit signal priority, and guidance technologies for shoulder-running buses. Figure 1-1 highlights the general location of the various Minnesota UPA projects, which are described below.

- **High Occupancy Toll (HOT) Lanes**. The HOT lanes on I-35W represent a major component of the Minnesota UPA. This element includes expanding the existing HOV lanes to HOT lanes and constructing new HOT lanes. The HOT lanes will be dynamically priced. The existing HOV lanes on I-35W from Burnsville Parkway to I-494 will be expanded into dynamically priced HOT lanes. A new dynamically priced HOT lane will be added on I-35W from I-494 to 46th Street as part of the reconstruction of the Crosstown Commons Section.

- **Priced Dynamic Shoulder Lane (PDSL)**. The second tolling element of the Minnesota UPA is the implementation of a PDSL on I-35W in the northbound direction from 46nd Street to downtown Minneapolis. The PDSL incorporates active lane management techniques and technologies, including speed harmonization.
- **Auxiliary Lanes**. An auxiliary lane and collector ramp is being constructed on I-35W in the northbound direction from 90th Street to I-494. An auxiliary lane is being constructed on I-35W in the southbound direction from 106th Street to Highway 13.
- **Park-and-Ride Facilities**. A total of six new or expanded park-and-ride facilities will be constructed as part of the Minnesota UPA. Two of the park-and-ride facilities are on I-35W north of downtown Minneapolis, one is on I-35W south of downtown Minneapolis, and three are on Cedar Avenue. The following describes the general facility locations and the anticipated number of parking spaces. A new 500-space parking ramp will be constructed adjacent to the existing 1,000-space parking lot at 95th Ave along I-35W North in Blaine. A new 460-space parking ramp will be constructed along I-35W North in Roseville. A new 750-space parking ramp will be constructed along I-35W south in Lakeville. A new 120-space parking lot with an enclosed passenger waiting facility will be constructed along Cedar Ave at Highway 13 in Eagan. A new 200-space parking lot will be constructed along Cedar Avenue at 180th Street in Lakeville. A new 500-space parking ramp, a 250-space surface lot, and a side platform station will be constructed along Cedar Ave at 155th Street in Apple Valley.
- **New Buses**. A total of 27 new buses will be purchased as part of the Minnesota UPA. These vehicles include a mix of standard, hybrid, and coach buses. The buses will be used to operate new and expanded express bus service.
- **Downtown Minneapolis Dual Bus Lanes on Marquette and 2nd Avenues**. Double contraflow bus lanes are being constructed on Marquette and 2nd Avenues in downtown Minneapolis. Called the MARQ2 project, the lanes replace existing single contraflow lanes on each avenue. The project also includes construction of wider sidewalks, and improved lighting, landscaping, and passenger waiting areas.
- **Transit Advantage Bus Bypass Lane**. A "Transit Advantage" bus bypass lane/ramp has been constructed to facilitate the movement of northbound buses at the Highway 77/ Highway 62 intersection. A new bus-only left-turn lane has been constructed and new traffic signals have been installed to allow buses to make a left turn from Highway 77 to Highway 62.
- **Cedar Avenue Lane Guidance System**. A lane guidance system for shoulder-running buses will be developed, implemented, and operated on Cedar Avenue. The system includes lateral guidance assistance, collision avoidance, and automatic vehicle location (AVL) technology. Lane assistance feedback will be provided to the bus operator through a "heads up" windshield display, a vibrating seat, and an active steering wheel.

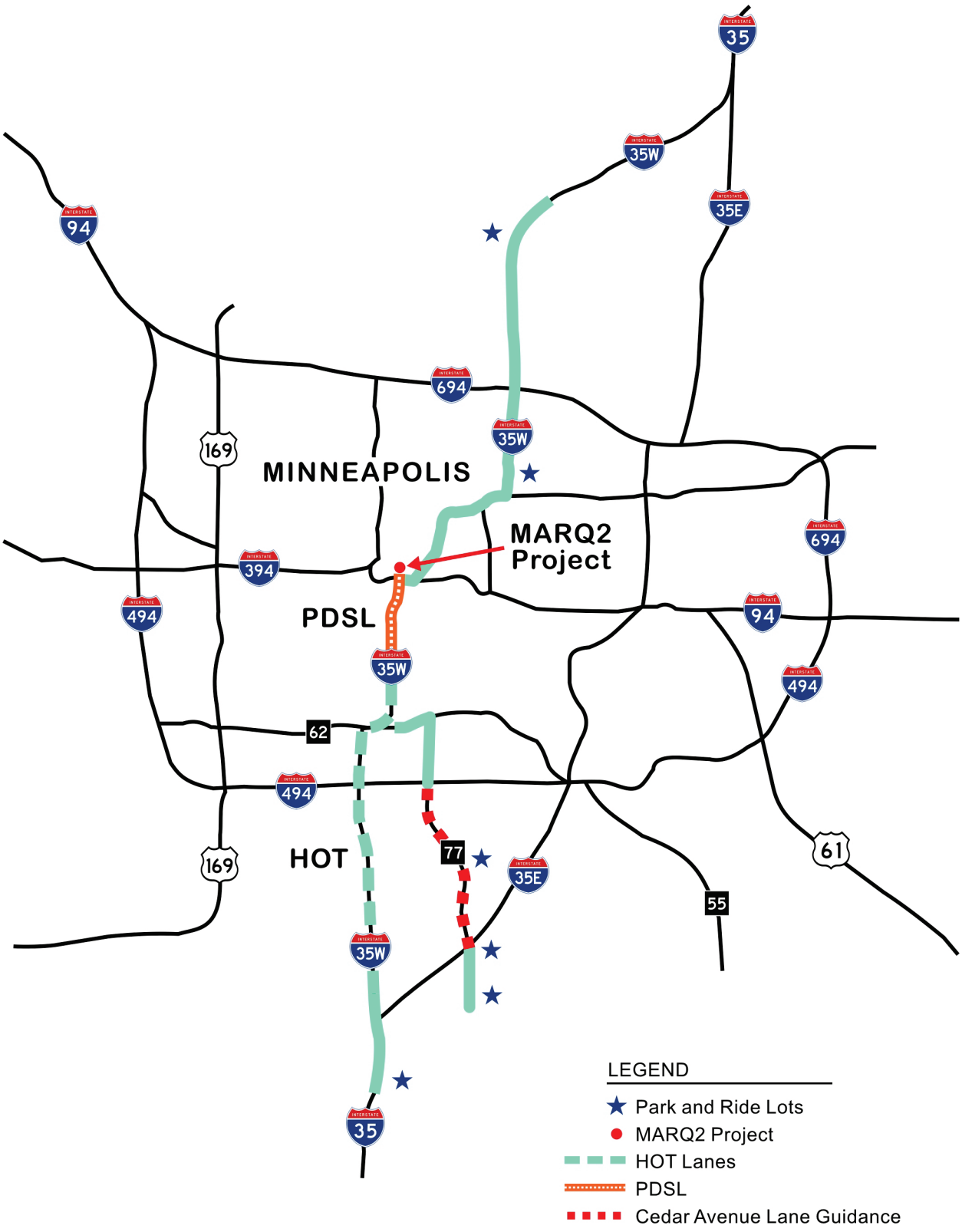

Figure 1-1. General Location of Minnesota UPA Projects

- **Real-Time Transit Information and Real-Time Traffic and Transit Information**. Real-time transit information, including next bus arrival information, will be provided along the MARQ2 lanes in downtown Minneapolis and park-and-ride facilities. Dynamic message signs along I-35W will display real-time traffic and transit travel times to downtown Minneapolis.
- **Transit Signal Priority**. Transit signal priority will be implemented along a contiguous stretch of Central Avenue north of downtown Minneapolis, and at selected locations around two park-and-ride facilities.
- **Telecommuting**. The telecommuting element of the Minnesota UPA focuses on increasing the use of Results Only Work Environment (ROWE), telecommuting, and flexible work arrangements throughout the region, including increasing the number of teleworkers and/or workers on flexible schedules in the I-35W corridor by 500 individuals. ROWE provides employees flexibility in the work location and hours by focusing on performance and results rather than presence at the office during standard work hours. ROWE is used extensively at Best Buy Corporation, headquartered in Minnesota. The UPA telecommuting component seeks to increase its use by other businesses in the region. The telecommuting element is funded entirely with state funds.

The Transit Advantage project became operational in December 2008. The majority of projects will be in operation by December 2009. The I-35W HOT lanes in the Crosstown Commons Section, the Cedar Avenue Lane Guidance System, and the Cedar Avenue Transit Station are scheduled for completion by October 2010.

1.2 Minnesota UPA National Evaluation Plan and Use of Transit Data

The Minnesota UPA National Evaluation Plan focuses on the 12 analysis areas outlined in the National Evaluation Framework (NEF[1]) and 11 test plans. Table 1-1 presents the relationships among the analysis areas and the test plans. Table 1-2 presents the transit data elements and the measures of effectiveness and hypotheses/questions the data will be used to help analyze. The data gathered and analyzed in this test plan is used in the transit analysis. Transit data also supports evaluation of the technology, cost benefit, congestion, tolling, environmental, and equity analyses. Information from the surveys described in the Surveys, Interviews, and Focus Group Test Plan will be used to evaluate the hypotheses and measures of effectiveness related to mode change to transit as a result of the UPA projects.

The transit analysis focuses on the UPA projects in the I-35W corridor, including Cedar Avenue and the MARQ2 dual bus lanes in downtown Minneapolis. These projects address the Minnesota UPA objective relating to reducing traffic congestion in the I-35W corridor. The spot traffic signal priority project on Central Avenue is not included in the national evaluation analysis as it is outside the I-35W corridor. Spot traffic signal priority projects have also been implemented in other metropolitan areas throughout the country, so it has less significance for the UPA national evaluation.

[1]The document is available online at following website:
http://www.itsdocs.fhwa.dot.gov//JPODOCS/REPTS_TE//14446

The remainder of this report is divided into four sections. Chapter 2.0 highlights the bus routes and park-and-ride lots influenced by the Minnesota UPA projects, as well as those in the control corridors. Data on these routes and park-and-ride facilities will be collected and analyzed for the national evaluation. Chapter 3.0 presents the data sources and data availability for evaluating the transit elements of the Minnesota UPA. Examples of data from the different sources are provided. The chapter also examines potential risks associated with the transit data and the data collection process. Chapter 4.0 describes the transit data analysis techniques that will be used to test the transit hypotheses and assess the measures of effectiveness. Chapter 5.0 presents the data collection schedule and responsibilities for completing the transit analysis.

Table 1-1. Relationship Among Test Plans and Evaluation Analysis

Minnesota UPA Test Plans	Evaluation Analysis: Congestion Analysis	Tolling Analysis	Transit Analysis	Telecommuting/ TDM Analysis	Technology Analysis	Safety Analysis	Environmental Analysis	Equity Analysis	Goods Movement Analysis	Business Impact Analysis	Non-Technical Success Factors Analysis	Cost Benefit Analysis
Traffic System Data Test Plan	●	○	○	○	●	○	○	○	●	○		●
Tolling Test Plan		●					○	○	○			●
Transit System Data Test Plan	○	○	●		●	○	○	○				●
Telecommuting Data Test Plan				●								
Safety Test Plan						●						●
Surveys Test Plan	●	●	●	●	●	●	●	●	●	●	●	
Transportation Modeling Test Plan												●
Environmental Data Test Plan							●	○				●
Content Analysis Test Plan											●	
Cost Benefit Analysis Test Plan												●
Exogenous Factors Test Plan	○	○	○	○	○	○	○	○	○	○	○	○

● — Major Input ○ — Supporting Input

Table 1-2. Transit Test Plan Data Elements Use in Testing Evaluation Hypotheses/Questions

Minnesota Transit Data Element	Minnesota UPA Measure of Effectiveness	Minnesota UPA Hypotheses/Questions*
1. Metro Transit and MVTA: number of seats by route and segments	• Actual and percent increase in the number of seats by route and segments	MNCong-5 MNTransit-2 MNTransit-4
2. Metro Transit and MVTA: number of riders by route and segments	• Actual and percent increase in transit ridership on routes in the I-35W and Cedar Avenue Corridors • Increase in average vehicle-occupancy levels and person throughput • Average occupants per vehicles in the HOT lanes and PDSL versus general-purpose freeway lanes	MNCong-5 MNTransit-2 MNTransit-3 MNTransit-4 MNTolling-2
3. Metro Transit and MVTA : Park-and-Ride Lots – number of spaces	• Change in the number of available parking spaces at park-and-ride lots	MNTransit-2 MNTransit-4
4. Metro Transit and MVTA: Park-and-Ride Lot spaces used	• Actual and percent increase in park-and-ride lot use in the I-35W and Cedar Avenue corridors	MNTransit-2 MNTransit-4
5. Metro Transit and MVTA: Bus travel time by route and segments	• Actual and percent increase in bus travel speeds • Actual and percent decrease in bus travel times • Actual and percent change in trip-time reliability	MnTransit-1 MNTransit-4 MNTech-1 MNEquity-1 MNCBA-1
6. Metro Transit and MVTA: Bus travel on-time performance by route and segments	• Actual and percent change in trip-time reliability	MNTransit-1 MNTransit-4 MNEquity-1
7. Metro Transit and MVTA: Published schedule data	• Actual and percent decrease in bus travel times	MNTransit-1

*Listed are acronyms corresponding to hypotheses/questions to be addressed with data from this test plan. An explanation of these acronyms can be found in Appendix A, which contains a compilation of the hypotheses/questions for all the analysis areas from the Minnesota UPA National Evaluation Plan.

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2.0 TRANSIT ROUTES AND PARK-AND-RIDE LOTS

As noted in Chapter 1.0, the Minnesota UPA transit projects include adding parking spaces to existing park-and-ride lots, constructing new park-and-ride lots, adding service to existing bus routes, implementing new bus routes, constructing the MARQ2 dual bus lanes in downtown Minneapolis, adding real-time transit and traffic information signs, and other improvements. These projects, in combination with the HOT lanes, the PDSL, the Transit Advantage project, and the lane guidance system for shoulder-running buses will increase bus travel speeds, reduce bus travel times, improve on-time performance, increase service levels, and provide more accurate information on the status of buses. These elements will improve the attractiveness and competiveness of riding the bus rather than driving alone. Increases in ridership, including attracting individuals who formerly drove alone, should result from the UPA projects.

The Minnesota UPA transit projects focus primarily on the I-35W corridor, both north and south of downtown Minneapolis, Cedar Avenue, and downtown Minneapolis. The projects will enhance existing and new bus service operated by Metro Transit and MVTA in these areas. The routes and park-and-ride lots that will be affected by the Minnesota UPA projects, and thus are the focal point for the national evaluation, are identified in this section. In addition, the routes and park-and-ride lots in the I-394 and the I-94 North corridors, which will serve as control corridors, are also identified.

Table 2-1 presents the Metro Transit and MVTA routes influenced by the Minnesota UPA projects that will be included in the transit analysis. The route number, route description, and service type (express or local) are included in the table. The number of a.m. inbound bus trips are also presented to provide an indication of the current service level. A total of 30 routes have been identified in the I-35W corridor, including Cedar Avenue, to be included in the analysis. As shown in Table 2-1, the majority of Metro Transit and MVTA routes in the corridor provide express service to downtown Minneapolis. The MVTA also provides local service oriented to the Mall of America in Bloomington. In addition, the new route from Lakeville to downtown Minneapolis and the new route from the 95th Avenue North Park-and-Ride lot to the University of Minnesota are listed in the table. These two routes were implemented as part of the new and expanded park-and-ride lots associated with the UPA.

Table 2-1. Transit Routes in the I-35W Corridor

Route	Route Description	Service Type	Number of a.m. Trips[1]
Metro Transit			
I-35W North			
250	Lino Lakes to Downtown Minneapolis Via I-35W	Express	29
260/261	Roseville to Downtown Minneapolis	Express	18
288	Forest Lake to Downtown Minneapolis	Express	6
252	Blaine – University of Minnesota (New)	Express	3
I-35W South			
133	South Minneapolis to Downtown Minneapolis	Express	5
135	South Minneapolis to Downtown Minneapolis	Express	6
146	Edina or South Minneapolis to Downtown Mpls.	Express	9
152	Southdale to the University of Minnesota	Express	3
156	South Minneapolis to Downtown Minneapolis	Express	9
535	Bloomington and Richfield to Downtown Minneapolis	Express/Reverse Commute	13
576	Bloomington and Richfield to Downtown Minneapolis	Express	8
597	Bloomington to Downtown Minneapolis	Express	7
552	Bloomington to Downtown Minneapolis	Express	3
553	Bloomington to Downtown Minneapolis	Express	5
554	Bloomington to Downtown Minneapolis	Express	6
558	Bloomington to Downtown Minneapolis	Express	7
578	Bloomington/Edina to Downtown Mpls. Via I-35W	Express	7
467	Lakeville to Downtown Minneapolis (New)	Express	6
Minnesota Valley Transit Authority			
440	Apple Valley/Eagan to MOA[2]	Local	10[3]
441	Apple Valley/Eagan to MOA[2]	Local	12[3]
442	Burnsville/AV to MOA[2]	Local	22[3]
444	Savage P&R/Burnsville to MOA[2]	Local	27[3]
445	Eagan to MOA[2]	Local	20[3]
460	Burnsville to Downtown Minneapolis	Express	36
464	Burnsville/Savage P&R to Downtown Minneapolis	Express	8
465	Apple Valley/Burnsville to Downtown Minneapolis and University of Minnesota	Express	10
470	Eagan to Downtown Minneapolis	Express	10
472	Eagan to Downtown Minneapolis	Express	8
476	Apple Valley to Downtown Minneapolis	Express	10
477	Apple Valley to Downtown Minneapolis	Express	19
479	Rosemount to Downtown Minneapolis	Express	2

[1] a.m. Inbound Trips
[2] Mall of America (MOA)
[3] Weekday Northbound Trips Presented for Local Service
Source: Metro Transit and MVTA Bus Schedules

Additional trips may be added to some of these routes to accommodate the anticipated ridership growth from the new park-and-ride lot spaces and the travel-time savings provided by the HOT lanes, PDSL, and MARQ2 lanes. Other routes may have available capacity for new riders. Also, new routes may be added to serve new park-and-ride lots. The service plan for the new park-and-ride lot on I-35W in Roseville is still being finalized, some changes are known at this time. A new route, Route 252, was implemented in September 2009 from the 95th Avenue/ I-35W Park-and-Ride Lot to the University of Minnesota. Three a.m. and three p.m. trips are provided. A new route, Route 467, from the new Lakeville Park-and-Ride lot to downtown Minneapolis was also added in September 2009. Currently six a.m. and six p.m. express trips are provided. A new route from the new park-and-ride lot in Roseville with six a.m. and six p.m. peak period trips is planned for implementation in December 2009. As discussed in Sections 3.0 and 4.0, implementing new routes, adding trips to existing routes, and other service changes will be documented in the national evaluation, along with ridership and travel-time data.

Table 2-2 provides a list of new and existing park-and-ride lots on the I-35W corridor. The table includes the number of parking spaces in current lots, additional parking spaces being added to current lots, and the number of spaces at new park-and-ride lots.

Table 2-2. Park-and-Ride Lots in the I-35W Corridor

Lot	New/Existing	Current Spaces	New Spaces	Total Spaces
I-35W North				
95th Avenue/I-35W	Existing	1,000	500	1,500
Roseville/I-35W	New	—	460	460
Rosedale Transit Center	Existing	375	—	375
County Road H/I-35W	Existing	211	—	211
I-35W South				
Lakeville/I-35	New	—	750	750
Cedar Avenue/Highway 13	New	—	120	120
S. Bloomington Transit Center	Existing	195	—	195
Burnsville Transit Station	Existing	1,376	—	1,376
Knox Ave/Best Buy	Existing	525	—	525
Heart of the County	Existing	370	—	370
Cedar Ave/180th	New	—	200	200
Cedar Ave/155th	New	—	750	750

Source: Metro Transit

In addition to the bus routes and park-and-ride lots listed in Tables 2-1 and 2-2, selected bus routes and park-and-ride lots along I-394 and I-94N, which are identified as the control corridors in the Exogenous Factors Test Plan, will also be monitored and analyzed. Routes 672 and 652 in the I-394 corridor and routes 724 and 762 in the I-94N corridor are suggested to be used as

control routes. Information on these routes is presented in Table 2-3. The park-and-ride lots in these two corridors to be included in the control group are Plymouth Road Transit Center, General Mills Boulevard, County Road 73, and Louisiana Transit Center in the I-394 corridor and the Brooklyn Center Transit Center in the I-94N corridor. Information on these park-and-ride lots is presented in Table 2-4. Total annual bus ridership on all Minneapolis express routes and total annual utilization of all bus park-and-ride lots will also be monitored. Changes in ridership and park-and-ride lot use in the control corridors and system-wide will be used as comparisons with changes in the I-35W corridor.

Table 2-3. Bus Routes in the Control Corridors

Route	Route Description	Service Type	Number of a.m. Trips[1]
I-394			
672	Wayzata Park-and-Ride Lot to Downtown Minneapolis	Express	5
652	Plymouth Road Transit Center to University of Minnesota	Express	2
I-94N			
724	Brooklyn Park to Downtown Minneapolis	Local	15
762	Brooklyn Transit Center to Downtown Minneapolis	Local	2

[1] a.m. Inbound Trips

Source: Metro Transit Printed Schedules

Table 2-4. Park-and-Ride Lots in the Control Corridors

Lot	New/Existing	Current Spaces	New Spaces	Total Spaces
I-394				
Plymouth Road Transit Center	Existing	111	—	111
General Mills Boulevard	Existing	123	—	123
County Road 73 – South	Existing	732	—	732
County Road 73 – North	Existing	288	—	288
Louisiana Transit Center	Existing	330	—	330
I-94N				
Brooklyn Center Transit Center	Existing	239	—	239

Source: Metro Transit

3.0 DATA SOURCES, AVAILABILITY, AND RISKS

3.1 Data Sources

The transit system data test plan will use three main data sources available from Metro Transit and MVTA. The first data source is ridership data for bus routes in the I-35W and Cedar Avenue corridors. The second data source is park-and-ride lot counts and license plate surveys conducted by Metro Transit and MVTA. The third data source is bus travel time data and on-time performance data collected through the Metro Transit AVL system and the MVTA AVL system and on-board surveyors.

In addition to these data sources, basic information on transit service characteristics will be documented pre- and post-deployment. Examples of these characteristics include the routes in the corridors, the number of bus trips per route, headways by time-of-day and direction, and the types of buses assigned to the routes. Battelle team members will work with Metro Transit and MVTA personnel to record this information pre- and post-deployment.

Metro Transit and MVTA Bus Ridership Data. Both Metro Transit and MVTA collect ridership data on a regular basis. Metro Transit uses both APCs and fare collection data to determine ridership. Approximately one-third of Metro Transit's bus fleet is equipped with APCs. Depending on the analytic purpose, Metro Transit uses a combination of data from fareboxes, smart card readers and APCs. These data sources can be compared and/or combined for a complete ridership dataset. They can also be integrated with schedule and AVL system data for additional performance analyses. MVTA uses farebox revenues and manual driver counts to calculate ridership.

Pre- and post-deployment ridership data will be collected from both Metro Transit and MVTA for those routes affected by the UPA projects. Only post-deployment ridership data will be available for new routes and services. Point-to-point ridership data by route and run will be obtained for bus services operating from the new and expanded park-and-ride lots along I-35W and Cedar Avenues. Ridership on other routes influenced by the UPA projects will also be obtained and analyzed. In addition, overall ridership on Metro Transit and MVTA express routes and routes in the control corridor will be monitored to provide a trend line.

Table 3-1 provides an example of the total daily ridership for Metro Transit Route 552, which operates three express trips from Bloomington to downtown Minneapolis in the morning and three express trips in the afternoon. Table 3-2 provides an example of ridership by trip on MVTA Route 464, which operates express service form Burnsville to downtown Minneapolis. Ridership per trip for existing and new services will be monitored and analyzed for the national evaluation. Data may also be aggregated to a daily, weekly, and monthly basis as appropriate.

Park-and-Ride Lot Utilization. Metro Transit and MVTA conduct counts of vehicles parked at park-and-ride lots on an annual basis. For new park-and-ride lots, vehicles counts are typically conducted after the first week and after three months of operations. In special cases, such as after the I-35W bridge collapse, counts may be conducted on a monthly basis. Table 3-3 presents data on use of the five existing park-and-ride lots in the I-35W corridor that are expected to be impacted by the UPA projects. The table presents the counts for 2006, 2007, and

2008 to provide an example of the available data. Counts are also available for 1999, 2002, 2003, 2004, and 2005. The counts from all the years have been entered into a spreadsheet for use in the Minnesota UPA National Evaluation.

Table 3-1. Daily Riders –Metro Transit Route 552

Date	Total Daily Riders
10/09/06	149
10/10/06	167
10/11/06	159
10/12/06	158
10/13/06	128
2006 Average	**152**
10/08/07	131
10/09/07	173
10/10/07	156
10/11/07	188
10/12/07	136
2007 Average	**157**
10/06/08	202
10/07/08	186
10/08/08	185
10/09/08	175
10/10/08	136
2008 Average	**181**

Source: Metro Transit

Table 3-2. Riders Per Trip – MVTA Route 464

Date	7:16 a.m. Trip Northbound	5:04 p.m. Trip Southbound
04/20/09	11	23
4/21/09	13	27
04/22/09	8	22
04/23/09	11	20
04/24/09	9	13

Source: MVTA

Table 3-3. Park-and-Ride Lot Use in the I-35W Corridor

Lot	2008		2007		2006	
I-35W North	**Capacity**	**Use**	**Capacity**	**Use**	**Capacity**	**Use**
95th Ave N. & I-35W	1,011	953	1,011	982	903	872
Rosedale Transit Center	375	345	375	372	300	541
County Road H & I-35W	211	143	211	149	211	139
I-35W South						
South Bloomington Transit Center	195	122	82	83	80	81
Burnsville Transit Station	1,376	1,305	1,376	1,387	1,300	1,304
Knox Avenue/Best Buy	525	52	525	150	500	97
Heart of the City	370	99	370	77	370	100

Source: Metro Transit

In addition, Metro Transit and MVTA conduct license plate surveys of vehicles parked at park-and-ride lots every other year on the even year. The locations corresponding to the address on record for the license plates of vehicles at the lots are mapped to illustrate the park-and-ride lot travel shed. Figure 3-1 illustrates the locations of the address of record for vehicles parked at the I-35W and County Road H Park-and-Ride Lot and Rosedale Transit Center. Metro Transit and MVTA compare the results to previous years to identify possible changes in the use of park-and-ride lots by bus riders. This information is especially important with the opening of new lots, as existing park-and-ride lot users may change to more convenient locations. Metro Transit and MVTA completed license plate surveys of park-and-ride lots in 2008. The next regularly scheduled survey will be in 2010.

For the new and expanded UPA park-and-ride lots, it is recommended that Metro Transit and MVTA conduct counts after the first week, after the first month, at three months, at six months, and at one year. Since the bus service operated from these lots is oriented toward peak-period commute trips, only one weekday midday count is needed. Based on the existing schedule, license plate surveys will be conducted in 2010. This schedule fits with all the UPA park-and-ride lots, except the Cedar Avenue park-and-ride lot, which will be completed by October 2010. Rather than wait until 2012, it is recommended that a license plate survey be conducted at the Cedar Avenue park-and-ride lot in 2011. The vehicles parked at existing lots with no additions in parking spaces or major changes in bus service are recommended to be counted for one day after one month, three months, and six months to identify any changes related to the UPA projects and then annually. In addition, overall utilization of Metro Transit and MVTA park-and-ride lots will be examined to provide a trend line from 1999.

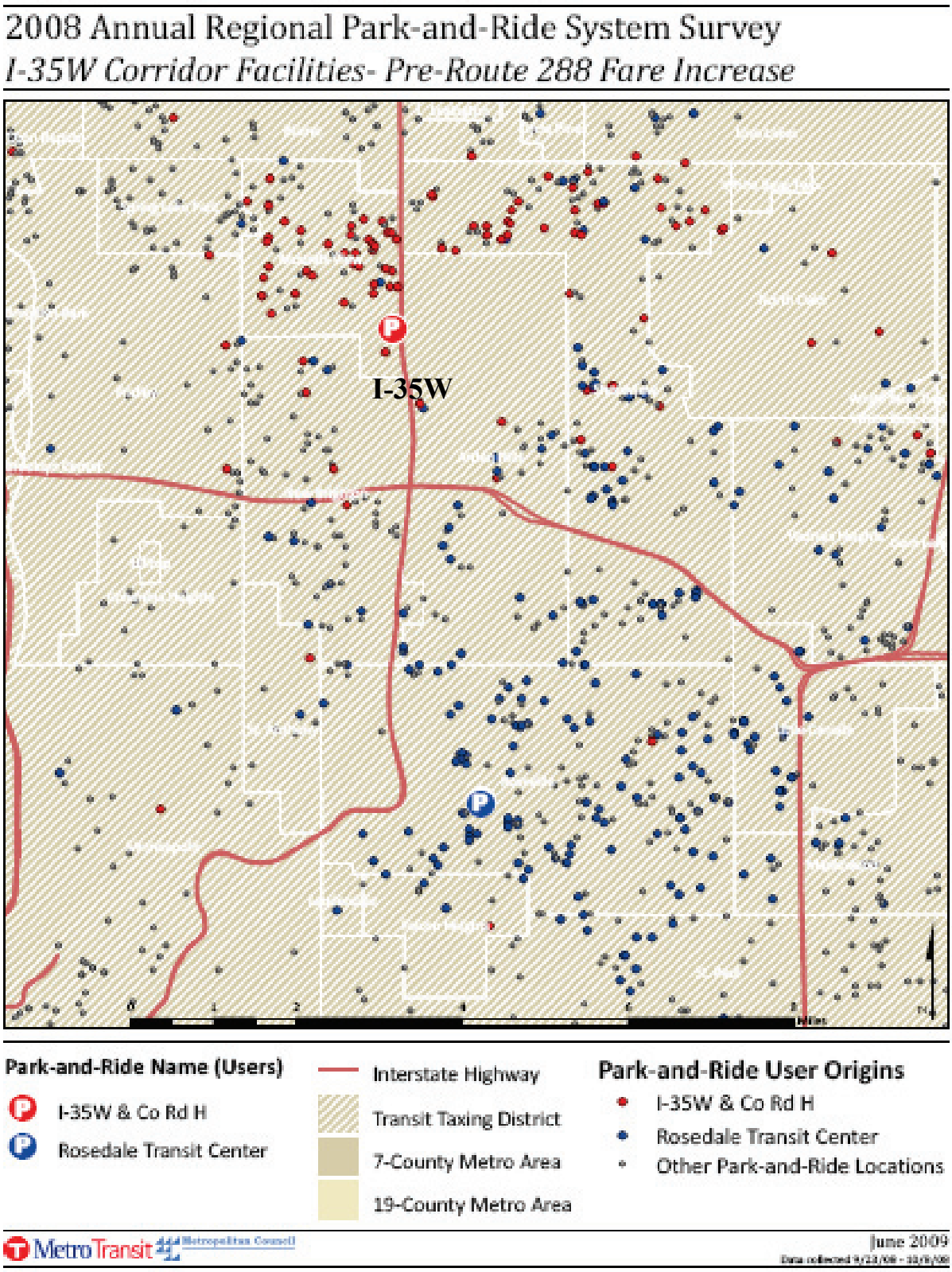


Figure 3-1. Map of Park-and-Ride Users at I-35W/County Road H and Rosedale Transit Center

Bus Travel Time and Bus On-Time Performance Data. The HOT lanes, PDSL, MARQ2 lanes, Transit Advantage project, and Cedar Avenue lane guidance system focus on increasing travel speeds for buses, reducing bus travel times, and improving bus trip-time reliability. Data to assess these changes will be obtained through the Metro Transit AVL system, which provides continuous travel time data, and from the new AVL system and manually for MVTA buses using on-board and/or point-checks with time resolution of seconds rather than minutes.

End-to-end travel times, as well as travel times for specific route segments are needed to assess impacts on the UPA projects on bus travel times. The data collection protocol will document the travel-time savings from the individual projects and the cumulative effort of multiple projects in the I-35W corridor. Archived data will be collected to establish a pre-project deployment travel time baseline for buses operating in the I-35W and Cedar Avenue corridors, as well as on the single bus lanes in downtown Minneapolis. Post-deployment data will be collected on an ongoing basis.

Metro Transit uses the AVL system to monitor the on-time performance or schedule adherence for buses. Metro Transit considers a bus on time if it is less than five minutes late and no more than one minute early. The on-time performance of Metro Transit routes influenced by the UPA projects will be documented pre- and post-deployment of the specific project elements.

Table 3-4 presents an example of on-time performance data for Metro Transit Route 552. Data from 2006, 2007, and 2008 are presented. The time points are I-35W and Diamond Lake Road, where the buses enter and exit the freeway, the on-line station at I-35W and Lake Street, 4th Avenue and 11th Street and 3rd Avenue and 12th Street, where buses enter and exit the freeway downtown, and 8th Avenue/7th Avenue and 2nd Street, which is the downtown node. The scheduled time, the actual arrival time, and the actual departure time is recorded, and the dwell time and adherence at each time point is calculated and presented in the table in fractions of a minute. Late buses show positive time, early buses show negative time. Since Route 552 is an express route, northbound buses into downtown Minneapolis are allowed to run early after the Diamond Lake time point.

Table 3-4. Travel Time Data for Metro Transit Route 552

Source: Metro Transit

MVTA collects travel time data using on-board and/or point checks with time resolution of seconds rather than minutes. Table 3-5 presents travel time data for MVTA Route 464 collected with the new AVL system. The time the bus departed the Heart of the City park-and-ride lot in Burnsville is listed, along with the arrival time at 3rd Avenue and Washington in downtown Minneapolis. The total running time each day and the average running time for the five days are calculated.

Table 3-5. Travel Time Data for MVTA Route 464

Northbound 464 Starting 7:16						
Date	4/20	4/21	4/22	4/23	4/24	
Time left HCPR	7:37	7:38	7:38	7:37	7:36	
Time arrived WA3A	8:20	8:30	8:29	8:16	8:22	**Average:**
Running time	0:43	0:52	0:51	0:39	0:46	**0:46**
Riders	11	13	8	11	9	**10.4**
Southbound 464 Starting 17:04						
Date	4/20	4/21	4/22	4/23	4/24	
Time left GTWY	17:06	17:04	17:05	17:05	17:05	
Time arrived HCPR	17:45	17:52	17:55	17:55	18:00	**Average:**
Running time	0:39	0:48	0:50	0:50	0:55	**0:48**
Riders	23	27	22	20	13	**21.0**

Source: MVTA

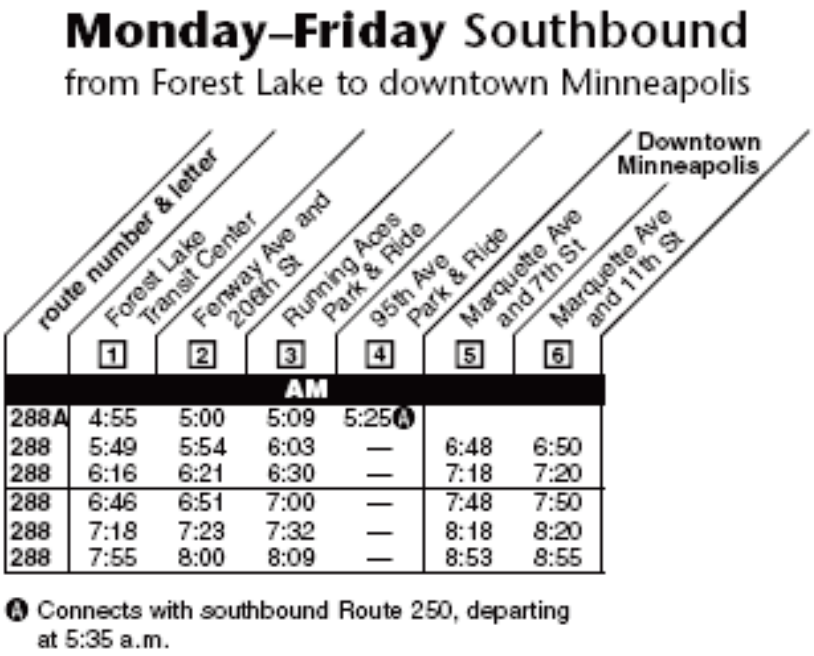
A few routes, including 250 and 260/261, were rerouted after the collapse of the I-35W Bridge. For these routes, historical travel time and on-time performance data from before the bridge collapse will be used, rather than the time period at which buses were operating on the detour routes. In addition, Metro Transit buses from the South Garage on pull-out, pull-in, and deadhead trips will be monitored for changes in travel times due to the UPA projects.

Published Schedule Data. The final information source for the transit test plan is the published schedules for the routes affected by the UPA projects. The published schedule information represents what riders actually see as a result of the UPA projects. The published schedules for the bus routes identified previously in the I-35W and the Cedar Avenue corridors will be documented pre- and post-deployment of the UPA projects to assess changes in bus running times that translate into actual changes in the printed schedules. In addition, the schedules of other buses that will operate on the MARQ2 lanes will be recorded pre- and post-deployment.

Figure 3-2 illustrates the printed schedule for Metro Transit Route 288, which operates from Forest Lake to downtown Minneapolis on I-35W.

Transit Service Characteristics. Basic information on transit services in the corridor will be documented pre- and post-deployment of the UPA projects. Examples of this information include the routes, number of bus trips per route by time-of-day and direction, revenue hours/miles, cost per passenger mile, boarding per revenue mile, and service capacity in the

I-35W corridor. Bus assignments will also be documented to monitor the use of alternative fuel buses on routes in the I-35 corridor for the environmental analysis.



Monday–Friday Southbound

from Forest Lake to downtown Minneapolis

route number & letter	Forest Lake Transit Center	Fenway Ave and 208th St	Running Aces Park & Ride	95th Ave Park & Ride	Marquette Ave and 7th St	Marquette Ave and 11th St
	1	2	3	4	5	6
			AM			
288A	4:55	5:00	5:09	5:25Ⓐ		
288	5:49	5:54	6:03	—	6:48	6:50
288	6:16	6:21	6:30	—	7:18	7:20
288	6:46	6:51	7:00	—	7:48	7:50
288	7:18	7:23	7:32	—	8:18	8:20
288	7:55	8:00	8:09	—	8:53	8:55

Ⓐ Connects with southbound Route 250, departing at 5:35 a.m.

Figure 3-2. Schedule for Metro Transit Route 288 Southbound

3.2 Data Availability

As Table 3-6 illustrates, pre- and post-deployment data is available for all of the transit system data sources. Obviously, pre-deployment data are not available for new park-and-ride lots and new transit routes. Also, as noted previously, historical data will be used on a few routes impacted by the I-35W Bridge collapse. The examples in Section 3.1 provide an indication of the available data from each source.

Table 3-6. Transit System Test Plan Data Sources and Availability

Data Source	Pre-Deployment Data	Post-Deployment Data
Metro Transit Ridership Data	Yes	Yes
MVTA Ridership Data	Yes	Yes
Metro Transit Park-and-Ride Lot Utilization and License Plate Surveys	Yes (existing lots)	Yes
Bus Travel Time and On-Time Data	Yes	Yes
Published Schedule Data	Yes	Yes
Transit Service Characteristics	Yes	Yes

3.3 Potential Risks

There do not appear to be any significant risks associated with obtaining the transit ridership, bus trip time and on-time performance, park-and-ride lot count and survey data, and general transit service characteristic information. These data are collected on a regular basis by Metro Transit and MVTA. Examples of data from the various sources have been reviewed by members of the Battelle team and presented in this test plan. The risk that transit and park-and-ride lot data will not be available is low. Thus, no special efforts to address the low risk are recommended.

4.0 DATA ANALYSIS

The transit test plan focuses on collecting and analyzing bus ridership, park-and-ride lot, and travel-time and on-time performance data. Historical, pre-deployment, and post-deployment data will be used to assess the transit analysis measures of effectiveness. The transit data will also be used in the congestion and other analyses. The data will also be used in combination with survey and focus group results to analyze mode change. Information on the surveys and focus groups is presented in the Minnesota UPA National Evaluation Surveys, Interviews, and Focus Groups Test Plan.

The bus ridership, travel time and on-time performance, and park-and-ride lot use data available from Metro Transit and MVTA reflects a high level of accuracy. Both transit agencies use the data on a regular basis. As a result, both Metro Transit and MVTA personnel inspect the data for outliers and suspect data. Suspect data is checked against other information. For example, Metro Transit personnel use fare collection information to check any suspect APC data. Outliers and suspect data are flagged and discarded or adjusted as appropriate.

Members of the national evaluation team will conduct a second visual inspection of the data received from Metro Transit and MVTA. Any identified concerns will be discussed with Metro Transit and MVTA personnel, and appropriate actions will be taken to adjust or discard suspect data.

Standard statistical techniques will be applied to measures of effectiveness calculated using the transit data. Measures will also be compared with control routes and park-and-ride lots. Examples of measures to be used in the transit, congestion, and other analyses are discussed below.

- Total ridership by trip. The total ridership by trip on routes will be examined pre- and post-deployment.
- Total ridership by route. The total ridership by route will be examined pre- and post-deployment. New trips that are added to a route will be documented. Comparisons will also be made with system-wide changes in ridership.
- Change in ridership by trip. This measure, which is calculated as the total and percentage increase or decrease in ridership by trip, will be computed and compared pre- and post-deployment.
- Change in ridership by route. This measure, which is calculated as the total and percentage increase or decrease in ridership by route, will be computed and compared pre- and post-deployment.
- Total utilization of park-and-ride lots. The total number of cars parked at the park-and-ride lots recorded in the one-weekday counts will be compared pre- and post-deployment, along with analyzing historical trends.
- Change in utilization of park-and-ride lots. This measure, which is calculated as the increase or decrease in use of the park-and-ride lots, will be computed and compared pre- and post-deployment. Park-and-ride vehicle counts will also be compared to bus ridership data from the same park-and-ride lot to calculate any increase in bus riders who

access transit by other modes, including carpooling to the park-and-ride lot, being dropped off, walking, and bicycling. Comparisons will also be made with changes in the regional park-and-ride lot use.

- Bus travel time by trip. Bus travel times per trip will be analyzed pre- and post-deployment.
- Changes in bus travel time by trip. Changes in bus travel times will be calculated pre- and post-deployment.
- Changes in bus on-time performance. Bus on-time performance will be recorded and compared pre- and post-deployment. At the simplest level, the number of buses categorized as late arriving in downtown Minneapolis will be examined pre- and post-deployment. More detailed analysis will be conducted using the AVL data from different routes.
- Changes in bus on-time performance by trip. The change in bus on-time performance by trip will be calculated and analyzed pre- and post-deployment.
- Changes in bus running times in published schedules. The changes in times in the published schedules will be compared pre- and post-deployment to identify any reductions in travel time realized from the UPA projects.
- Transit mode share. Ridership data is needed for the calculation of transit mode share. Transit mode share is measured in terms of the proportion of total person throughput carried in the corridor by transit services versus other modes. Person throughput measurement requires obtaining samples of Average Vehicle Occupancy (AVO) data, which is multiplied by associated traffic volumes to obtain person throughput. Thus, transit ridership counts are required for the route sections and time periods covered in the AVO sample process.

The transit ridership data will be aggregated by freeway and roadway segment and by the morning and afternoon peak hours and peak periods for use in the transit analysis, the congestion analysis, and other analyses. The freeway segments include I-35W north of downtown Minneapolis, I-35W south of downtown Minneapolis, and Cedar Avenue. The definition used by Metro Transit for the morning and afternoon peak periods are 6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:30 p.m. The transit ridership data will be used in the calculation of average vehicle occupancy (AVO) levels, person throughput, and other related measures in the congestion analysis.

5.0 SCHEDULE AND RESPONSIBILITIES

Table 5-1 provides an overview of the historical, pre-, and post-deployment transit data collection schedules. Given the incremental nature of many of the UPA projects, it is recommended that the post-deployment data be collected for most elements on a continuous basis, rather than at only one point in time. For example, travel-time data from the Metro Transit AVL system is collected continuously and can be analyzed on a monthly basis. Table 5-2 presents the recommended post-deployment data collection schedule. As noted, the recommended schedule for summarizing ridership and travel-time data is monthly. Data on transit ridership, travel times, and park-and-ride lots in the control corridors and system-wide will be collected on the same schedule as the UPA projects.

Table 5-1. Overview of Transit Data Collection

	Historical Data	Pre-Deployment Data	Post-Deployment Data
	Collect by 9/09	Collect by 9/09	Ongoing 10/09 – 10/11
Metro Transit and MVTA Ridership Data	Some	✔	✔ *
Metro Transit and MVTA Park-and-Ride Lot Utilization Counts	Some	✔	✔ *
Metro Transit and MVTA Park-and-Ride Lot License Plate Surveys	Some	✔	✔ *
Metro Transit and MVTA Bus Travel Time and On-Time Data	Some	✔	✔ *
Metro Transit and MVTA Published Schedule Data		✔	✔ **
Control Corridor and System-Wide Data	Some	✔	✔ *
Transit Service Characteristics	Some	✔	✔ *

*Multiple post-deployment data collection recommended.

**When schedule changes are made.

Table 5-2. Post-Deployment Transit Data Collection Schedule

	Data Collection Schedule
Metro Transit and MVTA Ridership Data	Daily Ridership by Trip Collected Continuously/Analyzed Monthly
Metro Transit and MVTA Park-and-Ride Lot Utilization	One Day Use Surveys – take on one weekday New/Expanded Lots – Week One, Month One, Month Three, Month, Six, and Annual Existing Lots – Month One, Month Three, Month Six, and Annually.
Metro Transit and MVTA License Plate Surveys	October 2010 Next Scheduled Survey
Metro Transit and MVTA Bus Travel Time and On-Time Data	Daily Travel Time by Trip/Monthly
Metro Transit and MVTA Published Schedule Data	When Schedule Changes Made
Transit System Characteristics	When Changes Made/Monthly

*Recommend a special survey of vehicles parked at the new Cedar Avenue Park-and-Ride Lot be conducted in October, 2011. The lot is scheduled to open in October, 2010.

Historical data are available for many of the transit-service data sources, including ridership, travel time/on-time performance, and park-and-ride lot utilization. Based on data availability, a historical trend line should be established for the appropriate elements. Pre-deployment data should be obtained and analyzed from all the sources. The historical summary of some data, including park-and-ride lot usage counts, has been initiated with the development of this test plan.

Personnel from Metro Transit and MVTA will collect the ridership, travel time and on-time performance, and park-and-ride lot data, and will conduct the park-and-ride lot license plate surveys in 2010 and the additional survey of the Cedar Avenue Park-and-Ride Lot in 2011. Members of the Battelle team will analyze the data. The responsibilities for collecting and analyzing the data outlined in the transit test plan are summarized below.

- Personnel from Metro Transit and MVTA will collect and provide in electronic format to the Battelle team the following data on the schedule shown in Table 5-2: transit ridership, travel time and on-time performance, and park-and-ride lot data for the routes in the I-35W and Cedar Avenue corridors, the routes in the control corridors, and system-wide averages. Metro Transit and MVTA personnel will also conduct the park-and-ride lot license plate survey and provide the digital map of the results based on the schedule is presented in Table 5-2.
- Battelle team members will analyze the data and will use the data to assess the measures of effectiveness. Battelle team members will present the results in the interim reports and the final Minnesota UPA national evaluation report.

APPENDIX A – COMPILATION OF HYPOTHESIS/QUESTIONS FROM THE MINNESOTA UPA NATIONAL EVALUATION PLAN

Evaluation Analysis	Hypothesis/Question Number	Hypothesis/Question
Congestion	MNCong-1	Deployment of the UPA improvements will reduce the travel time of users in the I-35W corridor.
	MNCong-2	Deployment of the UPA improvements will improve the reliability of user trips in the I-35W corridor.
	MNCong-3	Traffic congestion on I-35W will be reduced to the extent that travelers in the corridor will experience a noticeable improvement in travel time.
	MNCong-4	Deployment of the UPA projects will not cause an increase in the extent of traffic congestion on surrounding facilities adjacent to I-35W.
	MNCong-5	Deploying the UPA improvements will result in more vehicles and persons served in the I-35W corridor during peak periods.
	MNCong-6	A majority of survey respondents will indicate a noticeable reduction in travel times after the deployment of the UPA improvements.
	MNCong-7	A majority of survey respondents will indicate a noticeable improvement in trip-time reliability after the deployment of the UPA projects.
	MNCong-8	The majority of survey respondents will indicate a noticeable reduction in the duration of congestion after deployment of the UPA projects.
	MNCong-9	A majority of survey respondents will indicate a noticeable reduction in the extent of congestion after the deployment of the UPA projects.
Tolling	MNTolling-1	Vehicle access on the HOT lanes and PDSL on I-35W will be regulated to improve operation of I-35W
	MNTolling-2	Some general-purpose lane travelers will shift to the I-35W HOT lanes and PDSL, while HOV lane travelers will remain in the HOT lane
	MNTolling-3	HOV violations will be reduced
	MNTolling-4	After ramp-up, the HOT lanes and PDSL on I-35W maintains improved operations

Evaluation Analysis	Hypothesis/Question Number	Hypothesis/Question
Transit	MNTransit-1	The HOT lanes, PDSL, MARQ2 bus lanes, and Transit Advantage project, and shoulder running lane guidance system will increase bus travel speeds, reduce bus travel times, and improve bus trip-time reliability in the I-35W and Cedar Avenue corridors, and downtown Minneapolis
	MNTransit-2	The new park-and-ride lots and new and expanded transit services will result in ridership increases including a mode shift to transit.
	MNTransit-3	The mode shift to transit from the UPA transit strategies will reduce congestion on I-35W, downtown Minneapolis, and other roadways.
	MNTransit-4	What was the relative contribution of each of the Minnesota UPA transit strategies to mode shift to transit?
Telecommuting/ TDM	Tele/TDM-1	Use of telecommuting, ROWE, and other flexible work schedules removes trips and VMT from the I-35W corridor.
	Tele/TDM-2	Integration of telecommuting into the UPA project enhances congestion mitigation.
	Tele/TDM-3	What was the relative contribution of the telecommuting strategies to overall travel behavior changes, including secondary impacts of telecommuting
Technology	MNTech-1	Active traffic management strategies, including speed harmonization and DMS with transit and highway travel times, promoting better utilization and distribution of traffic to available capacity in the I-35W corridor.
	MNTech-2	Active traffic management strategies will reduce the number and duration of incidents that result in congestion in the I-35W corridor.
	MNTech-3	What was the relative contribution of each technology enhancement on congestion reduction in the I-35W corridors?
Safety	MNSafety-1	Active traffic management will reduce the number of primary and/or secondary crashes.
	MNSafety-2	The HOT lanes and the PDSL on I-35W South will not adversely affect highway safety.
	MNSafety-3	The MARQ2 dual bus lanes in Downtown Minneapolis will not adversely affect safety.
	MNSafety-4	The lane guidance system for shoulder running buses will not adversely affect safety.

Evaluation Analysis	Hypothesis/Question Number	Hypothesis/Question
Equity	MNEquity-1	What are the direct social effects (tolls paid, travel times, adaptation costs) for various transportation system user groups from the I-35W HOT lanes, PDSL, transit, and other UPA strategies?
	MNEquity-2	What is the spatial distribution of aggregate out-of-pocket and inconvenience costs, and travel-time and mobility benefits?
	MNEquity-3	Are there any differential impacts on certain socio-economic groups?
	MNEquity-4	How does reinvestment of revenues from the I-35W HOT lanes and PDSL impact various transportation system users?
Environmental	MNEnv-1	What are the impacts of the Minnesota UPA strategies on air quality?
	MNEnv-2	What are the impacts on perceptions of overall environmental quality?
	MNEnv-3	What are the impacts on energy consumption?
Goods Movement	MNGoods-1	CVOs will experience reduced travel time by using the HOT lanes and PDSL on I-35W if CVO use is permitted.
	MNGoods-2	CVOs will experience reduced travel time by the overall reduction in congestion on I-35W from the UPA projects.
	MNGoods-3	CVOs hauling or delivering goods will perceive net benefit of HOT and PDSL (e.g., benefits such as faster service and greater customer satisfaction outweigh higher operating costs due to tolls). The exception may be in downtown Minneapolis, where delivery and service vehicles will not be allowed to use the dual bus lanes during the peak hours.
Business	MNBusiness-1	What is the impact of the UPA strategies on employers? e.g., employee satisfaction with commute perceived productivity impacts employee retention/hiring impacts negative impacts (increased cost of doing business)
	MNBusiness-2	How are businesses that are particularly impacted by transportation costs affected (e.g., taxis, couriers, distributors, tradesmen)?

Evaluation Analysis	Hypothesis/Question Number	Hypothesis/Question
Non-Technical	MNNonTech-1	What role did factors related to "people" play in the success of the deployment? People (sponsors, champions, policy entrepreneurs, neutral conveners)
	MNNonTech-2	What role did factors related to "process" play in the success of the deployment? Process (forums including stakeholder outreach, meetings, alignment of policy ideas with favorable politics, and agreement on nature of the problem)
	MNNonTech-3	What role did factors related to "structures" play in the success of the deployment? Structures (networks, connections and partnerships, concentration of power and decision-making authority, conflict-management mechanisms, communications strategies, supportive rules and procedures)
	MNNonTech-4	What role did factors related to "media" play in the success of the deployment? Media (media coverage, public education)
	MNNonTech-5	What role did factors related to "competencies" play in the success of the deployment? Competencies (cutting across the preceding areas: persuasion, getting grants, doing research, technical/technological competencies; ability to be policy entrepreneurs; knowing how to use markets)
	MNNonTech-6	Does the public support the UPA/CRD strategies as effective and appropriate ways to reduce congestion?
Cost Benefit	MNCBA-1	What is the net benefit (benefits minus costs) of the UPA/CRD strategies?

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