Minnesota

I-394 Corridor
Integrated Corridor Management

Data Collection Report
Draft

May 24, 2007
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1.0 Introduction

The objective of the Integrated Corridor Management (ICM) initiative is to demonstrate how intelligent transportation systems (ITS) technologies can efficiently and proactively manage the movement of people and goods in major transportation corridors. Stage 2 of the project will include conducting Analysis, Modeling, and Simulation (AMS) for four of the ICM corridors.

The purpose of this report is to illustrate what data is available for the modeling and evaluation of ICM strategies on the I-394 corridor. The data capabilities of Mn/DOT and its partners for post-demonstration calibration and evaluations will also be documented. Samples and coverage of available data are included in the appendix.

The last section documents how the data would be utilized in evaluating the effectiveness of one of the ICM strategies presented in the Concept of Operations.

2.0 I-394 Corridor Key Roadways

The I-394 corridor extends from the Minneapolis CBD to the area’s rapidly developing western suburbs, a distance of approximately 25 miles. For purposes of this project, the corridor’s western limit is defined as the Hennepin County border. I-394 is the primary commuter route and runs through the heart of the corridor. The corridor is bounded by parallel routes, TH 55 on the north and TH 7 on the south. The corridor serves primarily commuter traffic heading to and from the western suburbs to the Minneapolis CBD and other destinations east and north on I-94. The corridor is illustrated in Figure 1. The key roadways are listed below by jurisdiction.

Mn/DOT
I-394 (I-494 to Minneapolis CBD)
I-494 (TH 55 to TH 7)
US 169 (TH 55 to TH 7)
TH 100 (TH 55 to TH 7)
TH 55 (CSAH 19 to Minneapolis Boundary)
TH 7 (CSAH 19 to TH 100)
US 12 (CSAH 19 to I-494)

City of Minneapolis
TH 55 (Minneapolis Border to CBD)
Hennepin Avenue (CSAH 3 to Minneapolis CBD)
Penn Avenue (TH 55 to I-394)

Hennepin County
CSAH 5 (CSAH 101 to TH 100)
CSAH 25 (TH 100 to CSAH 3)
CSAH 3 (CSAH 25 to Hennepin Avenue)
CSAH 40 (TH 55 to 7th Street North)
CSAH 19 (TH 55 to TH 7)
CSAH 101 (TH 55 to TH 7)
CSAH 73 (TH 55 to TH 7)
CSAH 6 (US 12 to TH 55)

City of St. Louis Park
Louisiana Avenue (I-394 to TH 7)
Figure 1  Map of the I-394 ICM Corridor
3.0 Data Collection Process

Data from a variety of sources are collected from the I-394/Highway 55/Highway 7 corridor. A detailed description of the data collected from each of the sources is provided below.

Freeway Network

Detector stations provide real-time information on traffic flow parameters including volume, speed, occupancy and density. Data is accumulated in the roadside controller and transmitted back to the RTMC (Regional Transportation Management Center) once every 30 seconds. This information is used for both real-time and archival applications. For example, travel times are estimated along select corridors and distributed to motorists via DMS (dynamic message signs) and Mn/DOT’s 511 website. Volume data is used by the ramp meter algorithm to automatically set metering rates. Speed data is used to post speed maps on the 511 website. Archived volume and speed data is captured as described in subsequent sections.

CCTV (closed circuit television) images are transmitted to the RTMC via fiber optic cable. CCTV images can be digitally recorded if requested. Images include time and date stamps and some video snapshot images are archived. The images produced by the CCTV system are owned by the State of Minnesota. Other agencies within the corridor can access CCTV images through the Mn/DOT 511 website, or by special request to Mn/DOT.

The DMS system archives every message change in status. The system also has a real-time communications health indicator that provides continuous updates on the communications link.

Ramp meters provide real-time information on metering rates and queue length probability. Data is accumulated in the roadside controller and transmitted back to the RTMC once every 30 seconds. Ramp meter data is archived by Mn/DOT at the RTMC and is available to the public through their website.

HOT (high occupancy toll) lanes employ various technologies to collect tolls from single-occupancy vehicles (SOV). SOV drivers sign up at the MnPass customer service center for an in-vehicle transponder. The transponder is linked to the SOV’s account and is mounted on the windshield of the vehicle next to the rearview mirror.

In use, a SOV will pass a DMS with a posted toll amount for a distance of travel in the HOT lane. The SOV will then enter into the HOT lane at an authorized entry point, and the vehicle transponder is read. The system writes the date, time, transponder number, and a Roadside Toll Collection (RTC) site code to the transponder and sends the information to the Revenue and Accounts Management System (RAMS) at the MnPass customer service center. As the driver proceeds, the vehicle transponder is read at each successive tolling zone, and new data is written to the transponder and sent to RAMS. RAMS then determines the full trip and applies the proper charge to each segment utilizing the rate established upon entry. Thus, the permanent record for the account containing the transponder will have all the RTC location of the trip, including the date and time of each transaction and the toll charged.

Data from all of these devices are sent to the RTMC for archiving. Detector station data has been archived for the past 13 years. All ramp meter and DMS data has been archived for the past three years. All CCTV images are archived for approximately one week. Certain images, such as major incident response, are archived longer for training purposes.
**Arterial Network**

Traffic signals operating in interconnected systems capture a fair amount of data, including vehicle detection data; type of coordination operation; whether transitioning to new offset; and the cycle, offset and split in effect during each cycle. This data is calculated each cycle and transmitted to a master controller where it can be accessed by the respective operating agency.

Currently, Mn/DOT Metro Traffic is capturing hourly traffic volume data for 300 to 400 signalized intersections in the metropolitan area, including all of the interconnected signals within the study area.

Hennepin County is collecting count data from traffic signal detectors. The data is centrally captured and logged monthly in 15 to 60 minute intervals.

The City of Minneapolis collects count data from their traffic signal detectors, including data from both the machine vision detectors and the loop detectors. An event log is kept on a second by second basis at the central system. The timing is controlled by the central system at the Border Avenue TOC and includes the majority of the signals in the corridor. The data is backed up on a weekly basis, and is archived on site and off site for 2 years. The data is reliable and of high quality.

As described earlier, CCTV is located along freeways in the study area. These cameras provide a fair amount of coverage along the intersecting arterial network as well. They are used by RTMC staff for traffic management along the arterial network.

**Transit Network**

Metro Transit manages their fleet of transit vehicles through a Computer Aided Dispatch and Automated Vehicle Location (CAD/AVL) system called the St. Paul / Minneapolis Advanced Regional Transit Communication Management system (SMARTCoM). From the Metro Transit Control Center (TCC), Metro Transit operators can view real-time schedule adherence data. SMARTCoM can then predict arrival times at the next transit stops. This information is currently being displayed at the Uptown Transit Station on Hennepin Avenue and 28th Street in Minneapolis. Transit operators can manage the system through data collected and instruct transit operators on how to maintain their schedule.

The TCC collects data from transit vehicles automatically every 60 seconds or when ever an incident occurs. In addition, location data is sent with each time point crossing and other event message from the bus. Data is put into the diagnostic operations software at the TCC. Data availability is checked constantly by TCC staff and data reliability and quality is checked daily by the system administrator. The system administrator reviews data that is suspect and documents and resolves the problem. This data is stored in the database servers for 1 year before being archived to a separate server.

Metro Transit is the sole owner of the data it collects. Data is shared with the University of Minnesota for research projects in coordination with Mn/DOT and with Mn/DOT directly for the MnPass HOT lane facility. Metro Transit plans on increasing the number of APC (Automated Passenger Counter) devices on transit vehicles in the next two years. It also plans to increase its data radio coverage to fill in problem areas in the system.
4.0 Sample Data List

A detailed description of the available data is provided in the following sections, which correspond to Section 2.0 of the Integrated Corridor Management – Analysis, Modeling, and Simulation - Sample Data List; FHWA 12/06.

- Available Models
- Network Data
- Travel Demand Data
- Travel Surveys
- Traffic Control Data
- Transit Data
- ITS Elements and Data

**Available Models**

Several models are available for the project area, including models for travel demand forecasting, microscopic simulation, and macroscopic operations. In Appendix A, Exhibit A.1 illustrates the overall coverage of traffic operations and simulation models that are available within the study area.

The Metropolitan Council maintains a Regional Travel Demand Model that includes the highway network and zonal data in the project area. Year 2000, 2010 and 2030 models are available. The Regional Model includes origin-destination information as well as modal splits.

The freeway network has been modeled extensively by Mn/DOT. Mn/DOT uses CORSIM as its freeway simulation model, and all models are created in this format. The models have been built with a fixed coordinate system, so that the models may be combined without re-coding the whole network. Exhibit A.2 provides details regarding the CORSIM models that are available in the corridor.

Both Mn/DOT and Hennepin County use SYNCHRO for traffic operations analysis. Models for all key roadways in the project area are available. However, traffic volume and signal timing information will require updating to provide a current representation of existing conditions. Exhibit A.3 and A.4 provides details relating to the SYNCHRO models available from Mn/DOT and Hennepin County, respectively.

The University of Minnesota is currently modeling the TH 169, TH 100, and I-94 corridors using the AIMSUM simulation model. They anticipate being completed with the projects by Fall 2007.

Samples of the electronic files associated with the CORSIM and/or SYNCHRO files are available upon request.

**Network Data**

Network data requirements include a detailed representation of the geometrics and configuration of the corridor. Network data includes link distances, free-flow speeds, freeway geometrics, arterial geometrics, location and size of parking facilities, and location and size of park and ride lots. Most of this data is available from previously constructed CORSIM and SYNCHRO models. The data available from the models will be supplemented by as-builds and field reviews. Appendix B includes samples of a freeway as-built (Exhibit B.1) and an arterial traffic signal layout and wiring diagram (Exhibit B.2).
<table>
<thead>
<tr>
<th>Network Data Required</th>
<th>Available Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link Distances</td>
<td>CORSIM, SYNCHRO, As-builds</td>
</tr>
<tr>
<td>Free-flow speeds</td>
<td><a href="http://data.dot.state.mn.us/datatools">http://data.dot.state.mn.us/datatools</a></td>
</tr>
<tr>
<td>Geometrics-freeways</td>
<td>CORSIM, as-builds</td>
</tr>
<tr>
<td>Geometrics – arterials</td>
<td>CORSIM, as-builds</td>
</tr>
<tr>
<td>Parking facilities</td>
<td>As-builds</td>
</tr>
<tr>
<td>Park &amp; ride lots</td>
<td><a href="http://www.metrotransit.org">www.metrotransit.org</a></td>
</tr>
</tbody>
</table>

**Travel Demand Data**

Travel demand data requirements include link volumes, traffic composition, ramp volumes, turning movement counts vehicle trip tables, person trip tables, and transit ridership.

Traffic volume data is available for all mainline freeway segments, as well as all the on- and off- ramps. Detector station data has been archived for the past 13 years, each day at 30 second interval resolution. Arterial link volumes can be estimated through system detectors, which are currently being archived at a 15-minute resolution.

The RTMC has developed several programs to mine traffic data. Two of these programs are used to mine data and are available over the internet to the public ([http://data.dot.state.mn.us/datatools](http://data.dot.state.mn.us/datatools)). DataPlot is a tool for graphing detector data, and DataExtract is a tool for extracting detector data to a file for analysis. DataPlot has access to more than 4,000 traffic detectors throughout the metro area, and data can be graphed by roadway and date for headway, occupancy, density, and speed.

DataExtract allows a variety of data sets to be extracted: the raw data, volume and occupancy, being two of those sets. In addition to raw data, the aggregate data sets flow, headway, capacity, density, and speed. The data can be extracted into a variety of file formats, versatile enough for most needs. Based on the file format that is selected, the data will be written to one or more files.

Users can extract raw data or graphically plot data from any of the Mn/DOT detectors by date. Multiple dates and detectors can be plotted on the same graph. The graph has a smoothing function that allows general trends to be seen in a clearer format. This allows freeway management staff to compare different days of the week, times of the year, and days with or without incidents on the same graph for easy analysis.

These tools are effective for viewing congestion data in a temporal and spatial format, allowing insight into bottlenecks, and congestion propagation throughout the freeway network. These tools have proven valuable in documenting the impact of various traffic management initiatives, such as revised ramp meter timing or MnPass HOT lanes.

Another useful tool for assessing the effectiveness of management tactics on Mn/DOT’s freeway network are congestion graphs. These graphs correlate the time of day and the distance along the roadway to show congestion hot spots. The graphs allow corridor managers to see congested areas along the roadway and the time of day these problems occur. Managers can also look at the same roadway segment on light versus heavy congestion days. This tool is especially useful during weather events, special events, or when a new traffic management tactic such as ramp meter adjustments is first applied to a corridor. Managers can take the necessary steps to improve roadway performance at these locations and improve the overall system.
In Appendix C, a loop detector report is included in Exhibit C.1. Exhibit C.2 illustrates a traffic volume plot by time-of-day. Exhibit C.3 illustrates a sample Congestion Graph used by the RTMC.

<table>
<thead>
<tr>
<th>Travel Demand Data Required</th>
<th>Available Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link Volumes</td>
<td><a href="http://data.dot.state.mn.us/datatools">http://data.dot.state.mn.us/datatools</a></td>
</tr>
<tr>
<td>Traffic Composition</td>
<td><a href="http://data.dot.state.mn.us/datatools">http://data.dot.state.mn.us/datatools</a></td>
</tr>
<tr>
<td>Ramp Volumes</td>
<td><a href="http://data.dot.state.mn.us/datatools">http://data.dot.state.mn.us/datatools</a></td>
</tr>
<tr>
<td>Turning Movement Counts</td>
<td>Some available, may be older than 3 years</td>
</tr>
<tr>
<td>Vehicle and Person Trip Tables</td>
<td>Regional Travel Model, CORSIM Models</td>
</tr>
<tr>
<td>Transit Ridership</td>
<td>Regional Travel Model, Metro Transit CRYSTAL Reports</td>
</tr>
</tbody>
</table>

**Travel Surveys**

An annual survey of the park-n-ride system is conducted by Metro Transit. The most recent report is the 2006 *Annual Regional Park-n-Ride Support, Metro Transit, Nov 2006*.

Every fall for the past 5 consecutive years, the regional transit providers and Mn/DOT have worked together to survey the regional park-and-ride/pool system serving the Twin Cities metropolitan area as a means of tracking growth. As part of the survey in 1999, 2004 and 2006, license plate numbers of every vehicle parked in every park-and-ride/pool was recorded in order to obtain the exact home origin of each vehicle registrant in order to understand where our customers are originating their trip. The vehicle counts and user home origins are invaluable data. Annual vehicle counts provide a snapshot of the system today to compare to previous years. Maps of user home origins help to delineate the unique, individual, park-and-ride/pool market areas and assist in locating new facilities. The report also details changes in the capacity of each park-n-ride lot.

**Traffic Control Data**

Traffic control data components include traffic signal layouts, signal timing plans, ramp meter locations and rates, and operation of HOV/HOT Lanes.

Mn/DOT and Hennepin County maintain as-built plans of all of their traffic signal systems, showing the lane configurations, signal phasing, detector locations, and other major features. Current timing plans are available through the ARIES software system, which allows traffic engineers to download current plans directly from the field. The ARIES software also logs signal system events, including preemption, cycle changes, and system alarms. In Appendix D, Exhibit D.1 illustrates a sample signal timing download from the ARIES system for a traffic signal system master and local intersection controller. Traffic signal plans showing signal system components were included previously in Appendix B (Exhibit B.2).

Ramp metering rates are archived by the RTMC and kept for three years.

<table>
<thead>
<tr>
<th>Traffic Control Data Required</th>
<th>Available Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp Metering</td>
<td><a href="http://data.dot.state.mn.us/datatools">http://data.dot.state.mn.us/datatools</a></td>
</tr>
<tr>
<td>Signal Systems</td>
<td>SYNCHRO Files, ARIES Software, as-builts</td>
</tr>
<tr>
<td>Mainline Control</td>
<td>CORSIM Files for HOT Lanes</td>
</tr>
<tr>
<td>Signal Timing Plans</td>
<td>ARIES Software (Econolite controllers)</td>
</tr>
<tr>
<td>Traffic Control Data Required</td>
<td>Available Data Source</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Transit Signal Priority</td>
<td>No systems within project area</td>
</tr>
<tr>
<td>Emergency Vehicle Preemption (EVP)</td>
<td>All systems have EVP within project area</td>
</tr>
</tbody>
</table>
**Transit Data**

Input data for transit systems includes location of routes and stops, schedules, schedule adherence data, transfer locations, transit speeds, type of transit fare payment mechanisms, and paratransit programs.

The Metro Transit TCC automatically archives every record created through the system, for a period of two years. Metro Transit uses Crystal Reports to mine their archived data. Metro Transit considers data containing vehicle operator names and data pertaining to Smartcard accounts to be sensitive and do not share this data with other agencies.

Several types of data are collected from transit vehicles including schedule adherence, lift usage, work assignments, call history, diagnostics, and text messages. Three databases are maintained: TMDailyLog (raw unfiltered message tables), TMMain (schedules and reference data tables), TMDataMart (summarized filtered reporting tables).

In Appendix E, Exhibit E.1 shows some of the key tables of data available from each of the databases. Exhibit E.2 illustrates the schedule adherence for a specific route, while Exhibit E.3 illustrates the “Corridor Late” percentages.

<table>
<thead>
<tr>
<th>Transit Data Required</th>
<th>Available Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule Adherence Data</td>
<td>CRYSTAL Reports Software</td>
</tr>
<tr>
<td>Transfer Locations</td>
<td><a href="http://www.metrotransit.org">www.metrotransit.org</a></td>
</tr>
<tr>
<td>Transit Speeds</td>
<td>CRYSTAL Reports Software</td>
</tr>
<tr>
<td>Transit Fare Mechanisms</td>
<td>n/a</td>
</tr>
<tr>
<td>Paratransit</td>
<td>Metro Mobility (<a href="http://www.metrocouncil.org">www.metrocouncil.org</a>)</td>
</tr>
</tbody>
</table>

**ITS Elements**

These data include detailed information about the characteristics of the ITS field elements, including surveillance systems, incident management systems, information dissemination, and tolling system details. Messages displayed on DMS are archived for approximately 3 years. CCTV images can be archived upon request.

Policies have been implemented to protect sensitive CCTV images and to ensure the privacy of the traveling public. CCTV is turned off for security reasons during certain events, such as when the President or Vice President travel through the corridor. Furthermore, CCTV is not used to identify specific individuals or to read license plates. The cameras are aimed only at the freeway/highway, unless there is an incident on local streets. In the past, some recorded CCTV images have been given out to other agencies but in general they are not made available. Some incidents captured on video are used for law enforcement or fire department training.

Incident data is available from two primary sources within Mn/DOT. The Mn/DOT Transportation Information System (TIS) includes crash data for all state, county, and local roads. The data includes, but is not limited to, date, time, location, # of vehicles, type of crash (rear end, sideswipe, right angle, etc.), injury severity, etc. In Appendix F, Exhibit F.1 includes sample data from the TIS for I-394 Crash Data in 2005. The code list, which gives an explanation of the different headings and codes used, is also included in Exhibit F.1.
The RTMC maintains a log of incidents on the freeway system, available for freeways only. Data includes: date, time, location, # of vehicles, type of incident (crash, stall, debris, etc.), response times, clearance times, etc. Exhibit F.2 illustrates the entry page from the Incident Log. Exhibit F.3 includes raw data from the Incident Log for 394 in April.

Tolls collected by the HOT Lane system are recorded using the RAMS at the MnPass customer service center. Based on information sent from the vehicle transponder, RAMS then determines the full trip and applies the proper charge to each segment utilizing the rate established upon entry. Thus, the permanent record for the account containing the transponder will have all the RTC location of the trip, including the date and time of each transaction and the toll charged. Exhibit F.4 illustrates a sample of MnPASS data.

<table>
<thead>
<tr>
<th>ITS Element Data Required</th>
<th>Available Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveillance System (CCTV)</td>
<td><a href="http://data.dot.state.mn.us/datatools">http://data.dot.state.mn.us/datatools</a></td>
</tr>
<tr>
<td>Incident Management</td>
<td>Incident Management Log</td>
</tr>
<tr>
<td>Hot Lane Tolling System</td>
<td>RAMS</td>
</tr>
<tr>
<td>TMC</td>
<td>Covered in other sections</td>
</tr>
<tr>
<td>Transit/Fleet Management</td>
<td>CAD/AVL/APC</td>
</tr>
</tbody>
</table>
5.0 Ability of Available Data to Measure ICM Impacts in Scenarios

In order to assess the ability of the available data to help model and predict the impacts and effectiveness of the ICM strategies at meeting the overall goals and objectives, the following pages present one representative scenario (Major Traffic Incident) with inserted text describing how the available data will support the modeling. Text is inserted in blue bold italics to describe the data available to either model or evaluate the impacts of the ICM strategies.

In addition to the data available about daily traffic, conditions, and incidents, the Mn/DOT RTMC incident logs and data access programs are capable of generating reports that summarize the number of each various incident type each year. This summary capability will assist the AMS team in estimating not only the benefits of ICM strategies on individual events (as outlined in the scenarios) but also in predicting how many times in a typical year those events will occur and the benefits will be realized.

Scenario #1: Major Traffic Incident

On a weekday morning about 7:30am, a serious crash occurs on eastbound I-394 just east of Hwy 100, between a truck and a passenger auto. The crash has caused serious injuries and is blocking all eastbound directional (inbound morning commute) lanes of travel for an estimated 90 minute clearance time.

Scenario 1 Illustration

A passenger riding in a vehicle upstream of the crash has been stopped behind the crash and phones 911 to report the incident within minutes from the onset. A State Patrol dispatcher in the RTMC receives the 911 phone call and immediately creates an event in the CAD system, describing the event (location and
impacts to traffic) and dispatches law enforcement and emergency services to the scene. *(State Patrol CAD and RTMC incident logs will house all records of incidents, including start and end time stamps. Incident logs can be queried to summarize the number of annual events of each type and predict annual benefits)*

- Almost instantaneously, the I-394 ICM Information Clearinghouse is automatically populated with an event report from the State Patrol CAD system describing the location and impacts to traffic. Within seconds, representatives from the ICM stakeholder agencies have seen an icon at their dispatch or work console alerting them to the event and view CCTV images to understand the event.

- RTMC operators, after seeing the event icon, have adjusted nearby CCTV cameras to view and verify the crash. RTMC dispatchers have requested a Freeway Incident Response Safety Team (FIRST) truck to the scene for additional verification and mobile traffic management. *(FIRST truck incident logs are available and support archives of all past events. These archives can support modeling by understanding typical response times and impacts on lane closures etc.)*

- The RTMC supervisor on duty has decided to open up the reversible lane (currently inbound HOV/HOT access only) to all inbound vehicles, in an attempt to flush traffic building upstream of the crash site. Remote access to the Mn/PASS facility allows this to happen within a minute, and travelers are notified by the Mn/PASS signs throughout the corridor. *(Loop detector archived data is available for all of I-394 describing volume and occupancy changes that occurred in previous lane and route closures to help model the impacts of such closures)*

- Accompanying the opening of the reversible lanes and the growing congestion due to the crash, an automated process posts variable speed limit messages of 45 MPH along I-394 to prepare vehicles for the likely slowdown and to prevent additional crashes.

- RTMC operators post messages on the Highway 7 DMS signs upstream of intersections with connector routes used by commuters to travel north in order to join I-394. The DMS messages warn of the crash on I-394 and advise travelers to remain on Hwy 7. As a result, the majority of travelers remain on Highway 7. RTMC operators post a similar message to DMS signs on Highway 55, and commuters generally stay on Highway 55, rather than diverting to I-394. Similar messages are posted on signs on the connector freeways (i.e. I-494, Hwy 169, and Hwy 100) advising of the crash and informing motorists to use Highway 55 or Highway 7 instead of I-394. *(Archived Loop detector data and SYNCHRO models are available for these areas of both Hwy 7 and Hwy 55 upstream and downstream of the intersections with connector routes and will support. Archived data from similar situations and SYNCHRO model runs will help model the impacts.)*

- The RTMC Information Clearinghouse automatically notifies the Mn/DOT Arterial Signals group of the event, and the signals group downloads flush plans to Highway 7 in order to accommodate the increased levels of traffic not diverting North at Highway 100. Monitoring traffic conditions on Highway 55 through CCTV and real-time traffic data, the Mn/DOT Arterial Signals group decides not to adjust signal timing at this time as the signals are handling the additional volume with no delays. *(Archived loop detector data for various situations and SYNCHRO models are available on Hwy 55 Hwy 7 to simulate the impacts of signal timing pattern changes if implemented)*
• The Mn/DOT signals group manually notifies the City of Minneapolis traffic group, and the traffic group alters the signal timings on the local road that is the continuation of Highway 7 once it enters the city (Lake Street). The signal is now timed for maximum progression of inbound Highway 7, relieving the added volumes to the extent possible.  *(Signal timing plans for Highway 7 / Lake Street intersection are available to support simulations of the impacts of changes to timing patterns)*

• RTMC operators manually adjust several ramp meter rates using the RTMC software to maintain a steady flow along the freeway.  *(There has been considerable modeling and analysis of the impacts of ramp meters on the Twin Cities freeways. This information will support modeling the impacts of ramp meter rate adjustments in this project)*

• At the Metro Transit Control Center, the AVL/CAD system has received the information push from the ICM Information Clearinghouse and now displays the crash at all the dispatchers’ CAD stations. The opening of the reversible lanes has prevented an extensive queue from forming and the transit vehicles traveling along I-394 are experiencing minimal delays (however delays have not been eliminated). The ability of buses to use shoulders on freeways and HOV bypass at the on-ramps has helped Metro Transit vehicles remain as close to schedule as possible.  *(CORSIM models are available for I-394 that would allow modeling of the effects of additional lane use on the shoulders and shifts in travel patterns. Archived transit schedule adherence and route performance data will support modeling of the resulting delays on transit vehicles, under this scenario)*

• The Metro Transit system automatically updates the Information Clearinghouse with a report of the transit travel times and arrival/departure information, as well as the available parking spaces at the park-and-ride lots.  *(Existing and archived transit route schedule and performance information will assist in modeling the impacts on routes based on increased traffic and reduced capacity)*

• The integrated ICM travel information system informs transit riders of updated arrival/departure information using ‘next departure signs’ at bus stops, park-and-ride facilities and transit stations, as well as the 511 phone system and Internet pages.  *(Archived transit ridership data and park-and-ride usage data will support eventual models on mode shifts in response to traveler information and other ICM strategies)*

• SouthWest Transit has received a push notification of the incident and notice of the growing delays on Highway 7 (as travelers are not moving to I-394).  SouthWest Transit buses have been following a route taking them Northbound on I-494 and then Eastbound on I-394. Given that they have no passenger pickups within the corridor, they have advised all drivers to take an alternate route where they can benefit from shoulder access and experience fewer delays.  *(CORSIM models of freeways in and around the corridor will help model the benefits of using the shoulders)*

• The ICM integrated travel information system has been informing travelers of the crash through 511, the Internet, and pushed messages to phones, blackberries and pagers. Alternate travel times are presented for four routes/modes, including:
- I-394 automobile travel is reporting longer travel times than normal, Highway 7 is reporting longer travel times than normal, *(Volume and occupancy reports are available for Hwy 7 and I-394 to assist in modeling the delays and impacts)*

- Highway 55 is reporting typical travel times, and *(Volume and occupancy reports are available for Hwy 55 to assist in modeling the delays and impacts)*

- Transit routes (benefiting from shoulder access, signal priority and meter bypasses) are operating with minimal delays overall. *(Archived transit schedule adherence data, schedule information, and route information is available to model impacts on transit delays)*

In addition, DMS signs throughout the corridor are posting travel time messages to keep travelers in the loop about their expected delays.

The ICM traveler information system has also notified a number of commuters who work for companies that participate in a telecommuting/commute delay program. These commuters (as well as their employers) are informed of this incident and the expected delays and clearance time. As a result, a small number of commuters work at home for the first hour of the day, then commute in after the event has cleared.

This information, combined with reports of those park-and-ride facilities with excess capacity, has caused roughly 500 commuters to select transit, and caused 300 commuters to choose to delay their commute to work for 90 minutes while they telecommute at home.

- At the RTMC, a Radio Broadcaster is giving continuous traffic reports throughout the duration of the incident on local radio station KBEM 88.5 FM. Another RMTC operator is providing traffic information to other local radio stations and television stations through a shared 800 mHz radio channel.

- The crash vehicles are towed and the area cleared within 90 minutes. The reversible lane is returned to normal status and the DMS messages terminated by RTMC staff. The incidents created in the information clearinghouse were set to expire after 2 hours, however were canceled early by RTMC staff when notified that the scene was cleared. Finally, the information clearinghouse presents the cleared event notification to the City and County and all signal timings are returned to their normal operational procedures.

As a result of the ICM response procedures executed on this morning, the only major delays were experienced by those vehicles immediately behind the crash site. These vehicles were safely moved past the crash site as soon as the first emergency responders arrived. In total, 800 commuters altered their modes or departure times, and the remaining commuters arrived at their destinations (many altering their routes) within their buffer time, with the average delays being 3-5 minutes.
6.0 Appendix – Sample Data

Appendix A – Available Models
Appendix B – Network Data
Appendix C – Travel Demand Data
Appendix D – Traffic Control Data
Appendix E - Transit Data
Appendix A – Available Models

Exhibit A.1 Model Coverage
Exhibit A.2 CORSIM Models – Mn/DOT
Exhibit A.3 Synchro Models – Mn/DOT
Exhibit A.4 Synchro Models – Hennepin County
Appendix B – Network Data

Exhibit B.1 – Freeway Segment Planned Construction Sheet – I-394
Exhibit B.2 – Arterial Corridor Traffic Signal Layout and Wiring - TH 55
Appendix C – Travel Demand Data

Exhibit C.1 – Freeway System Detector Raw Data
Exhibit C.2 – I-394 Volume Plot by time-of-day
Exhibit C.3 – Freeway System Detector Congestion Graph
Appendix D – Traffic Control Data

Appendix E - Transit Data

Exhibit E.1 – Transit Archived Data
Exhibit E.2 - Transit Schedule Adherence Data
Exhibit E.3 – Late Percentage Data
Appendix F – ITS Element Data

Exhibit F.1 – TIS Crash Data
Exhibit F.2 – RTMC Incident Log Entry Page
Exhibit F.3 - RTMC Incident Log Raw Data
Exhibit F.3 - MnPASS Daily Traffic