October 6, 2006

Mall of America Way-Finding Concept of Operations

City of Bloomington

SRF Consulting Group, Inc.

Mall of America Way-Finding

Concept of Operations

Prepared For:

City of Bloomington

October 6, 2006

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TABLE OF ACRONYMS

(Alphabetically)

Ave	*Avenue*
CCTV	*Closed Circuit Television*
CD	*Collector Distributor*
DMS	*Dynamic Message Sign*
E/W	*East/West*
HAR	*Highway Advisory Radio*
HOTLane	*High Occupancy Toll Lane*
Hwy	*Highway*
I-	*Interstate*
ICTM	*Integrated Corridor Traffic Management*
ITS	*Intelligent Transportation Systems*
LRT	*Light Rail Transit*
MOA	*Mall of America*
Mn/DOT	*Minnesota Department of Transportation*
MSP	*Minnesota State Patrol*
MUTCD	*Manual of Uniform Traffic Control Devices*
PD	*Police Department*
PDA	*Personal Digital Assistant*
PW	*Public Works*
RTMC	*Regional Transportation Management Center*
TH	*Trunk Highway*

INTRODUCTION

The purpose of this document is to identify traffic management enhancements "Way-Finding" for the transportation system surrounding the Mall of America (MOA). The Mall of America is currently proposing a Phase II expansion to the City of Bloomington, which is projected to have a potentially large impact on traffic around the Mall. The Mall of America Phase II development consists of 1,907,691 square feet of retail/mixed use, 1,250 hotel rooms, 300 residential condos, and 615,000 square feet of office. It is assumed that the proposed Phase II development will be completed by year 2011. Also, the City of Bloomington foresees expansion of development of the Airport south area and other attractions in addition to the Mall of America that will increase traffic volumes within the area.

The project limits include the Airport south area, the highway system surrounding the Mall of America including I-494 and Trunk Highway (TH) 77, and extends to the City of Bloomington Public Works Department at James Avenue and 98th Street. A map of the project area is included in Figure 1: Proposed System Layout on page 9.

CURRENT SYSTEM

The Mall of America is the largest tourist attraction in the United States bringing in more than 42 million visitors a year. It was opened in August of 1992 and contributes more than $1.8 billion in economic impact activity annually to the State of Minnesota. Traffic related to the Mall tests the limits of the main line accesses surrounding the Mall, while leaving less obvious routes to and from the Mall underutilized. For details, please see the Mall of America, Phase II Traffic Study and Supplements 1 and 2.

In the spring of 2006, a traffic study was submitted to the City of Bloomington. It projected traffic impacts as a result of the Phase II Mall expansion and concluded congestion would increase, but the transportation system can be enhanced to better handle the traffic.

Existing Freeway CCTV

There are six freeway Closed Circuit Television (CCTV) surveillance cameras in the project area (see Figure 1: Proposed System Layout). Locations of the CCTV include:

- I-494 and Portland Avenue
- I-494 and 13th Avenue South
- I-494 and Highway 77
- I-494 located between 24th Avenue and 34th Avenue
- Highway 77 South of Lindau Lane
- Highway 77 and Old Shakopee Road

The freeway cameras are viewed at the Regional Transportation Management Center (RTMC) in Roseville to monitor freeway traffic and aid in response to incidents. Neither the City of Bloomington, nor MOA staff has access to these cameras.

Existing Freeway Dynamic Message Signs (DMS)

Within the project area, there is a freeway dynamic message sign (DMS) on TH 77 and one on I-494 (see Figure 1: Proposed System Layout). A 17-inch by 34-inch graphic of the proposed Way-Finding System Layout is provided as an attachment to this document. Locations of the DMS are:

- TH 77 northbound, south of Old Shakopee Road
- I-494 westbound east of TH 5

The existing freeway DMS are controlled from the RTMC by Mn/DOT and Minnesota State Patrol staff. The signs are primarily used to warn motorists of travel conditions related to incidents. As a secondary use, the sign on TH 77 provides travel time information to commuters. The Minnesota Department of Transportation has statewide changeable message sign guidelines for operators to reference when applying messages on the DMS.

Existing Arterial CCTV (ICTM)

There are four existing arterial CCTV in the project area (see Figure 1: Proposed System Layout). Locations of the CCTV are:

- Portland Avenue and American Boulevard
- American Boulevard East of Highway 77
- American Boulevard and 24th Avenue
- America Boulevard and 34th Avenue

These CCTVs were installed as part of the Integrated Corridor Traffic Management (ICTM) project in the 1990s and are monitored and controlled at the traffic signal shop in Bloomington located at 1700 West 98th Street.

The arterial CCTVs are used to monitor traffic around the St. Paul-Minneapolis International Airport and the Mall of America.

Static Signing

Currently, traveler information and traffic management around the Mall of America consists primarily of static signing. The static signing consists of both brown with white text and green with white text.

The existing signing system for the Mall consists of static overhead signs to help guide travelers to the Mall. The signs are placed in accordance with the Minnesota Department of Transportations Manual of Uniform Traffic Control Devices.

Mall Surveillance CCTV

In addition to the existing arterial and freeway traffic management systems, the Mall of America has a surveillance system throughout its premises. Cameras cover the parking ramps, Mall areas and in the skyways between the parking ramps and Mall.

Portable Dynamic Message Signs

The Mall owns portable dynamic message signs that are deployed during predictable heavy traffic times. They use a handheld device at the sign location to post applicable messages to the travelers.

CURRENT ROLES AND RESPONSIBILITIES

Several agencies are involved in the management of the transportation system around the Mall. The Mall of America Security is responsible for getting people in and out of the parking facilities, the City of Bloomington is responsible for traffic on the arterials surrounding the Mall of America, and the Minnesota Department of Transportation is responsible for the freeway system.

Each agency owns and operates the equipment on their property. For example, the Minnesota Department of Transportation owns, operates and maintains the overhead dynamic message signs that are on the freeway system surrounding the Mall. The Mall of America owns, operates and maintains the surveillance cameras throughout the facility. Existing roles and responsibilities are explained in the following sections.

City of Bloomington, Minnesota Public Works

The City of Bloomington Public Works has authority over the existing CCTV on the arterials surrounding the Mall. The control and viewing capabilities are located in the public works building.

City of Bloomington, Minnesota Police Department

The City of Bloomington Police Department has a center located in the Mall of America. In the upcoming months, Mall of America Security and the Bloomington Police will share a space, allowing for more cohesive response action to instances.

Mall of America Security

The Mall of America Security personnel have viewing capability and access to an extensive surveillance system. The Mall Security is responsible for handling traffic within and leaving the parking ramps of the Mall. In addition to the surveillance system, the Mall of America owns and operates portable dynamic message signs.

Minnesota Department of Transportation

The Minnesota Department of Transportation Traffic Operations is based in the Regional Transportation Management Center in Roseville, Minnesota. The traffic operations staffing hours are Monday through Friday 5:30 a.m. to 8:30 p.m., Saturday from 10 a.m. to 6 p.m. and on Sunday from 11 a.m. to 7 p.m. The traffic operations staff monitor and manage the metropolitan transportation system. They have viewing ability and control of the freeway CCTV and the Dynamic Message Signs.

Minnesota State Patrol

The Minnesota State Patrol dispatching operates continuously out of the Regional Transportation Management Center in Roseville, Minnesota. The State Patrol has control and viewing of all cameras on the freeway system, as well as, access to the overhead dynamic message signs on the freeway system. Typically the State Patrol operates the signs during evening and weekend periods when the Minnesota Department of Transportation Traffic Operations personnel does not staff the Center.

CURRENT OPERATIONS

Currently the traffic operations personnel for the Mall monitor traffic from the top of the east parking ramp, P7, level to watch for congestion on the arterials and ramp access points. Gates can be closed to force traffic to the access points that traffic operations personnel desire patrons to use to balance traffic levels.

Existing Traffic Conditions

Throughout the year, there are predictable days of greater transportation system stress around the Mall. An example of this is the Friday after Thanksgiving is a popular shopping day. Occasionally there are situations where unpredictable congestion occurs on the local roadway system that requires attention to help alleviate the impact. A traffic study was performed for the City of Bloomington in the spring of 2006. Key points from the traffic study are summarized below:

In a traffic study analyzing mid-August Thursday and Saturday peak conditions on intersections surrounding the Mall, the results of the operations analyses indicate that most of the key intersections, with the exception of Lindau Lane/TH 77 Ramps/IKEA Way are presently operating at acceptable levels of service.

The study recommends that the following improvements be made to intersections in order to function at acceptable levels:

Lindau Lane/TH 77 Ramps/IKEA Way

- Eliminate access from northbound TH 77 to eastbound Lindau Lane
- Remove concrete median on the west approach to allow southbound TH 77 traffic to make an eastbound right-turn movement on Lindau Lane to the existing MOA near Nordstrom's

For further details on the existing operations analysis, please refer to the Mall of America, Phase II Traffic Study and Supplements 1 and 2.

Forecasted Traffic Conditions with Phase II Build

The 2012 traffic analysis documented for the build-conditions in the Mall of America, Phase II Traffic Study, assumes several roadway improvements as listed in the study. Based on the assumptions made the report identifies future queuing problems will develop (spillback to the freeway) at the intersections of Lindau Lane/TH 77 Ramps/IKEA Way and 24th Avenue/I-494 Single Point Interchange. The study identifies the following improvements for intersections to operate at acceptable levels of service during the year 2012:

TH 77 CD Roadway

- Construct a new access to the northbound TH 77 collector/distributor (CD) from the existing MOA parking ramp
- Construct a new ramp from Thunderbird Road to the northbound TH 77 to eastbound I-494 CD roadway.
- Construct a new ramp from TH 77/I-494 CD roadway to Thunderbird Road

TH 77 CD Roadway/Lindau Lane

- Construct a new access to/from the TH 77 CD roadway to/from the existing MOA parking ramp

American Boulevard/24th Avenue

- Construct an additional southbound right-turn lane. Extend both turn lanes to the I-494 single-point interchange
- Extend the southbound left most left-turn lane to 500 feet
- Extend the eastbound left-turn lanes to 500 feet

- Extend the westbound left-turn lanes to 500 feet
- Construct an additional westbound right-turn lane to provide three westbound right-turn lanes
- The westbound approach should have four approach lanes that begin at 28th Avenue, two of these lanes would be trap right-turn lanes at the intersection

Lindau Lane/22nd Avenue

- Construct an additional southbound left-turn lane to provide dual left-turns
- Construct an additional northbound left-turn lane to provide dual left-turns
- Extend the eastbound left-turn lanes by 75 feet

24th Avenue/I-494 Single-Point Interchange

- Construct an additional westbound left-turn lane (triple lefts)

Lindau Lane/TH 77 Ramps/IKEA Way

- Eliminate access from northbound TH 77 to eastbound Lindau Lane
- Remove concrete median on the west approach to allow southbound TH 77 traffic to make an eastbound right-turn movement on Lindau Lane to the existing MOA near Nordstrom's
- Shorten the westbound left-turn lanes by 75 feet

Killebrew Drive/20th Avenue

- Eliminate the "free" southbound right-turn lane
- Construct dual-right-turn lanes with overlap signal timing

Killebrew Drive/22nd Avenue

- Construct an additional southbound left-turn lane to provide dual left-turn lanes

34th Avenue/I-494 North Ramps and South Ramps

- Replace the existing "All-Red" LRT signal timing with a northbound/southbound "Green" phase

For further details on the existing operations analysis, please refer to the Mall of America, Phase II Traffic Study and Supplements 1 and 2.

Assuming the implementation of the recommended build options, there are predictable routes travelers take to access the Mall. It is estimated that 30 percent of Mall visitors arrive from I-494 East, 25 percent from I-494 West, 25 percent from TH 77 South, 15 percent from TH 77 North and 5 percent from local streets. Figure 8 represents these paths and the options for travel with the build conditions. In addition to the paths represented with construction activities, the figure represents additional routes that will be taken by Mall patrons with the implementation of the Way-Finding system. Further discussion of these routes is presented in the proposed operations section of this document.

GOALS/OBJECTIVES

Since the Mall of America is a leading tourist attraction in the United States, the goals of this project are to assist visitors in finding their way to and from the Mall of America and to balance traffic on the routes surrounding the Mall to relieve stresses on the transportation system. The ultimate goal is for every intersection to operate at a level of service (LOS) of D or better. If the traffic can be balanced and all routes utilized, future roadway/intersection expansion efforts could potentially be postponed or eliminated completely, resulting in overall economical savings. In order to reach the aforementioned goals, the following objectives must be met

- Provide real-time traffic information to Mall patrons
- Provide real-time traffic information to Mall of America Security
- Provide real-time traffic information to City of Bloomington Personnel
- Provide real-time traffic information to the Minnesota Department of Transportation and State Patrol (RTMC)
- Take action to balance traffic flow conditions on entrance roads to the Mall
- Increase utilization of 34th Avenue entering and exiting the Mall
- Increase utilization of 82nd Street entrance to the Mall
- Increase utilization of Old Shakopee Road
- Relieve congestion on 24th Avenue
- Relieve congestion on Lindau Lane and Killebrew Avenue

PROPOSED SYSTEM

Supplementing the existing traffic management systems with additional Intelligent Transportation System tools will aid personnel in managing traffic around the Mall of America. The system is envisioned to utilize existing and proposed freeway and arterial CCTV and DMS. In addition, the installation of signing within the parking ramps of the Mall will also help travelers leaving the Mall make travel decisions. It is possible the information collected from the system will be able to be transmitted to personal digital assistants (PDAs), smart phones, and other devices to allow timely, mobile access by Mall patrons.

The proposed system will help balance traffic on the roadways surrounding the Mall and give guidance to the road users. Not only should the system help on days that traffic levels are high, it will also be useful during normal operating conditions. The proposed system will allow personnel to view the CCTV images, make decisions and take actions to manage traffic based on the information received. Figure 1: Proposed System Layout is on the following page.

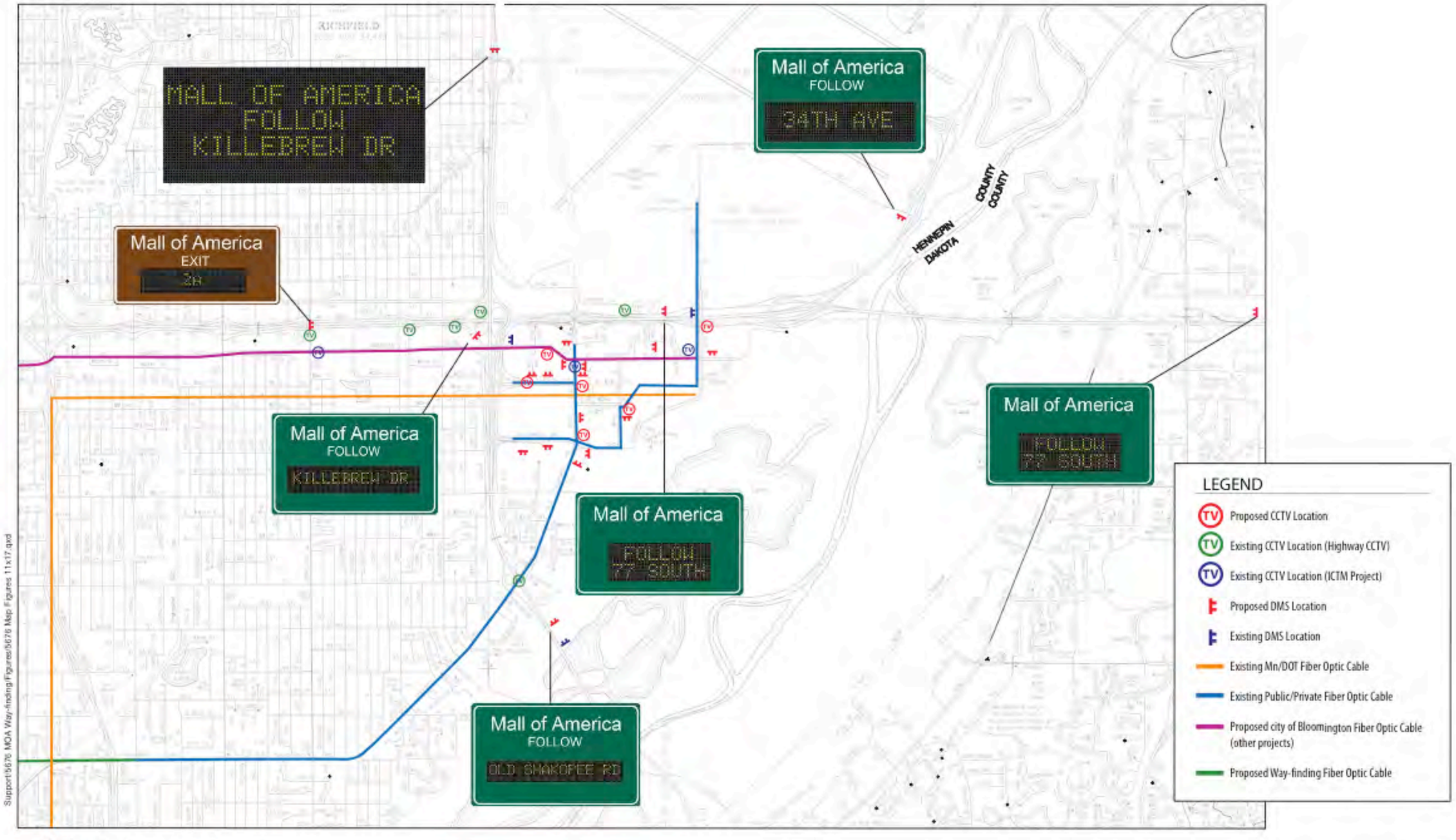
Existing traffic volumes on the current system are unbalanced, i.e., some roadways and intersections are over capacity while others are underutilized. It is desired that the proposed system aid in balancing the traffic levels based on the capacity of roadways surrounding the Mall. Alternate routes communicated by ITS components within and surrounding the Mall will lead travelers to use less-traveled roads and balance traffic around the Mall.

To accomplish the aforementioned outcomes, technologies will be added to aid in monitoring traffic conditions and guiding traffic to balance conditions amongst roadways. The technologies to be added include freeway dynamic message signs, “arterial dynamic” guidance signs, closed circuit television cameras on the arterial system and dynamic guidance signing within the parking ramps. These technologies will be deployed to notify motorists of their options at decision-making points. This will allow motorists to select less stressed routes, which will aid in balancing traffic between the arterials and freeways surrounding the malls.

CCTV

The existing freeway CCTV will be used to monitor the freeways. It is the vision of this project that camera images will be shared not only with the City of Bloomington Public Works, but the Mall of America Security and the City of Bloomington Police that are located in the Mall of America.

Through meetings with stakeholders it was identified that primary control of the CCTVs will be based on the location, i.e., primary for the ramp CCTV is the Mall of America Security, primary for the arterial CCTV, is the City of Bloomington Department of Pubic Works and the primary for the freeway CCTV will be the RTMC. However, there are benefits to shared access to view and control the cameras. The goal is that the City of Bloomington Public Works will have access to the images from the freeway system and the arterial system at their facilities on 98th Street.



Support\5676 MOA Way-finding\Figures\5676 Map Figures 11x17.qxd

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LAYOUT 1

MOA PHASE II
S.P. NUMBER
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Figure 1

The Mall of America Security and the City of Bloomington Police, stationed in the Mall of America, will be sharing facilities, access to, and control of both the arterial and ramp cameras.

The information presented by the images will be used to make traffic management decisions related to existing conditions. Traffic management decisions will be based on the information provided by the arterial CCTV combined with the freeway CCTV. Personnel will monitor the video and when congestion is observed, a decision will be made to change the freeway and/or arterial message signs to route traffic to different access points. For example, the signs on southbound TH 77 will change from "Mall of America FOLLOW LINDAU LN or KILLEBREW DR" to "Mall of America FOLLOW KILLEBREW DR". This will divert traffic to Killebrew Drive and help to relieve some congestion on Lindau Lane.

Freeway DMS

Converting existing static signing to have a dynamic aspect will help inform road users of their options in traveling to the Mall. A similar concept was used for the dynamic pricing display on the I-394 HOT Lane (see Figure 2). For the Mall application, the portion of the sign to be dynamic will be the exit road names or exit numbers (a picture of the sign type is presented in Figure 3), which will allow traffic management personnel to direct travelers to the underutilized entrances. In addition to hybrid signs, a standard overhead DMS is proposed as part of the system for southbound TH 77 at 66th Street (see Figure 4). The Freeway DMS will continue to be controlled by the Minnesota Department of Transportation from the RTMC in Roseville.

Figure 2: MnPASS Hybrid Sign

Figure 3: Hybrid Dynamic Message Sign

Figure 4: Overhead Dynamic Message Sign

Arterial CCTV

The arterial CCTV will be controlled by the City of Bloomington (traffic maintenance) and used to monitor traffic related to Mall activities. The images will be shared with other agencies including the RTMC, police, and Mall security. The arterial CCTV will supplement the existing CCTV layout to maximize viewing area covered by the system. Traffic management decisions (i.e., DMS messages) will be based on the information provided by the arterial CCTV combined with the freeway CCTV.

Arterial DMS

The arterial dynamic message signing will be smaller signs (approximately 40" x 100") mounted on existing traffic signals. The signs will provide routing information based on existing conditions to help balance traffic levels on all routes surrounding the Mall. The signs will also help direct patrons from the freeways to the Mall entrances, which will allow patrons unfamiliar with the area to use underutilized roadways without confusion. They will be dynamic so that routes can be changed in real time depending on traffic conditions.

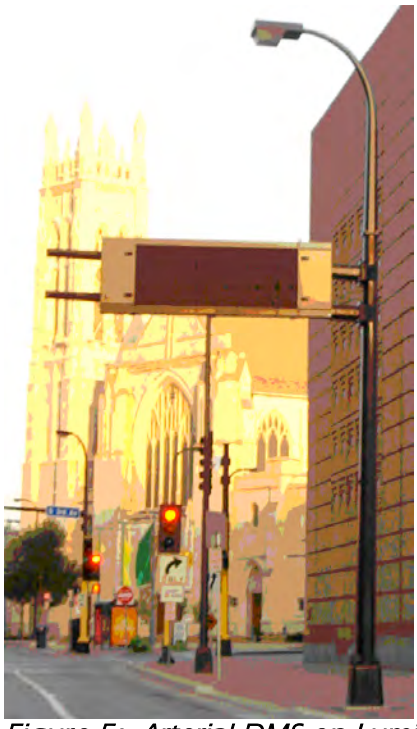


Figure 5: Arterial DMS on Luminaire

Figure 6: Arterial DMS on Signal Arm

Parking Ramp Exit Dynamic Signing

When leaving each ramp level of the Mall of America parking structures users have to make a decision on which way to exit because once they are down the ramp, their route is selected. Dynamic arrow signs (see Figure 7) will be placed on the exit ramp directing users which way to exit. Since the signs are dynamic they can be changed according to traffic levels and queues build up.

Figure 7: Sample Parking Ramp Exit Dynamic Signs

Communications

The proposed Way-Finding system will be designed to utilize existing communications systems. For the freeway components, the Dynamic Message signs will connect to the RTMC fiber backbone, which will allow data transfer between the freeway DMS and the RTMC in Roseville.

The existing fiber routes currently owned or leased by the City of Bloomington (see Figure 1: Proposed System Layout) will be utilized for the arterial DMS and CCTV. An additional fiber link will be required in order to complete a communications backbone which will allow data transfer between the City of Bloomington Public Works Department and the Way-Finding field devices. The link required will extend from Lyndale and Old Shakopee Road to the City of Bloomington Public Works Department at 1700 West 98th street, which is roughly a mile.

The Mall of America ramp dynamic message signs will utilize the existing fiber backbone throughout the Mall, however connections from fiber termini at each ramp level to the signs will be required.

Additional connections may be required to connect all stakeholders for sharing of data depending on the final design of the system.

PROPOSED ROLES AND RESPONSIBILITIES

Several agencies are involved in the management of the transportation system around the Mall. The Mall of America Security is responsible for getting people in and out of the parking facilities, the City of Bloomington is responsible for traffic on the arterials surrounding the Mall of America and the Minnesota Department of Transportation is responsible for the freeway system.

Since joint operations of the system will take place, operations staffing agreements between the City of Bloomington Public Works Department, City of Bloomington Police Department, Mall of America Companies, Minnesota Department of Transportation, Minnesota State Patrol and Hennepin County should be considered.

PROPOSED OPERATIONS

The deployment and implementation of an ITS Way-Finding System will provide additional route options to travelers. The Non-ITS Way-finding and the ITS Way-finding routes are presented in Figure 8.

In summary, the implementation of the Way-Finding System will help balance flows between traditional routes and direct traffic away from problem areas, as needed for the I-494 and TH 77 travelers. For I-494 and TH 77, dynamic signing will provide new routes to MOA that motorists typically would not use.

Dynamic and static signing on local streets will help balance flows exiting the Mall area. For example, signing could be used to direct traffic west on American Boulevard and use the Portland Avenue interchange to access westbound I-494. This will greatly improve operations at the American Boulevard/24th Avenue intersection.

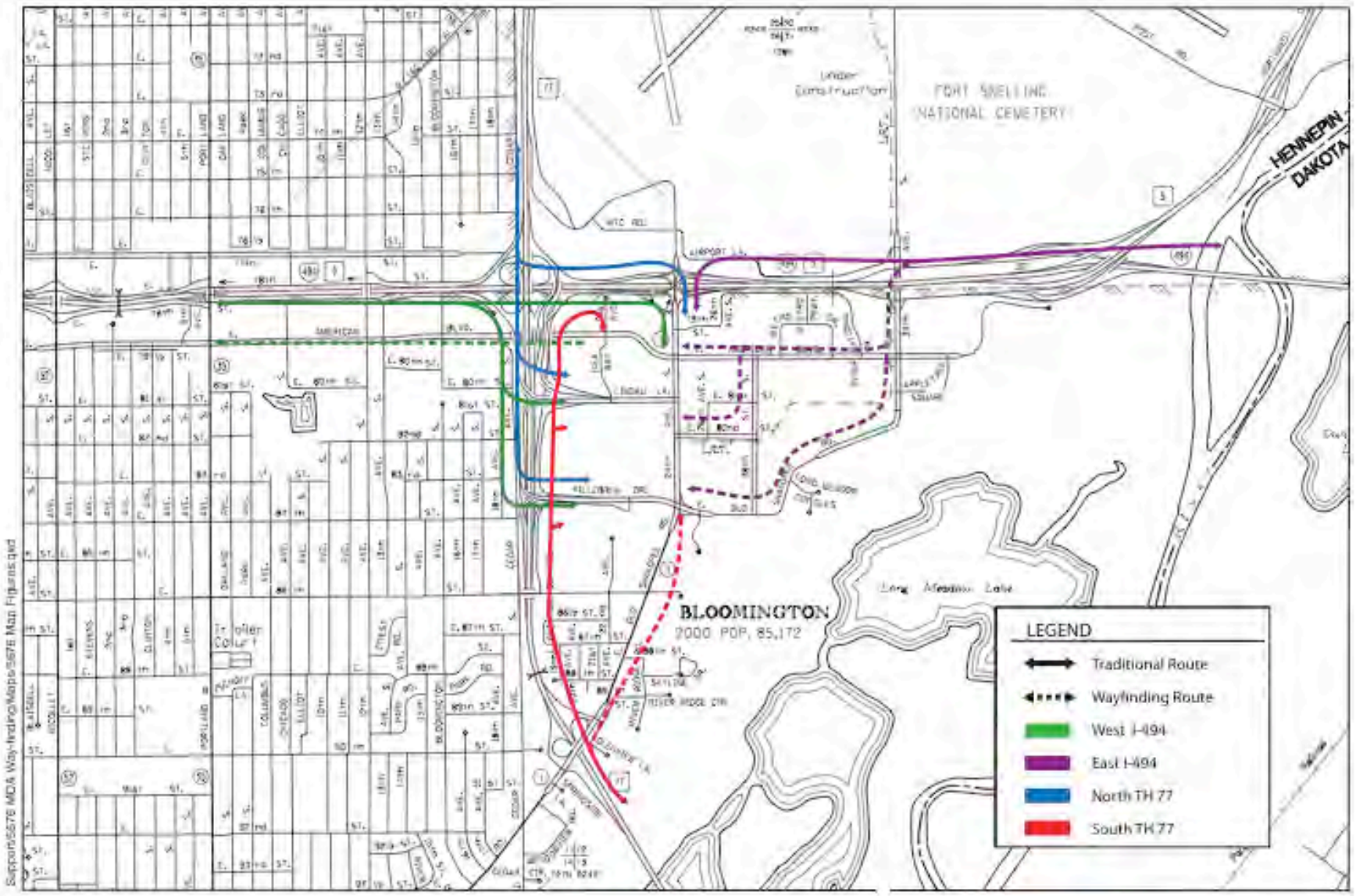
Figure 9 represents the potential impact that providing these additional routes will have on traffic levels of entry and exit points to the Mall (Saturday peak data was used to derive the figure).

Standard message sets will be valuable to the operations of the system. It will allow operators to perform their tasks more efficiently and will regulate information distributed to motorists. It is recommended that the stakeholders discuss and develop a set of standard message sets to be implemented as part of the Way-Finding system.

Following are examples of proposed operations that include the use of the devices to be implemented under this plan.

Operational Concept Example – Inbound No Action

With the "No Action" operation mode, cameras will be monitored when personnel feel the need, and dynamic sign messaging sets will have messages posted on them that indicate the multiple options of entrances to the Mall. This operation mode essentially leaves the operations unchanged from the existing operations of today except cameras are available for viewing. This operation mode will be used for a large portion of the time when traffic conditions are within capacity.

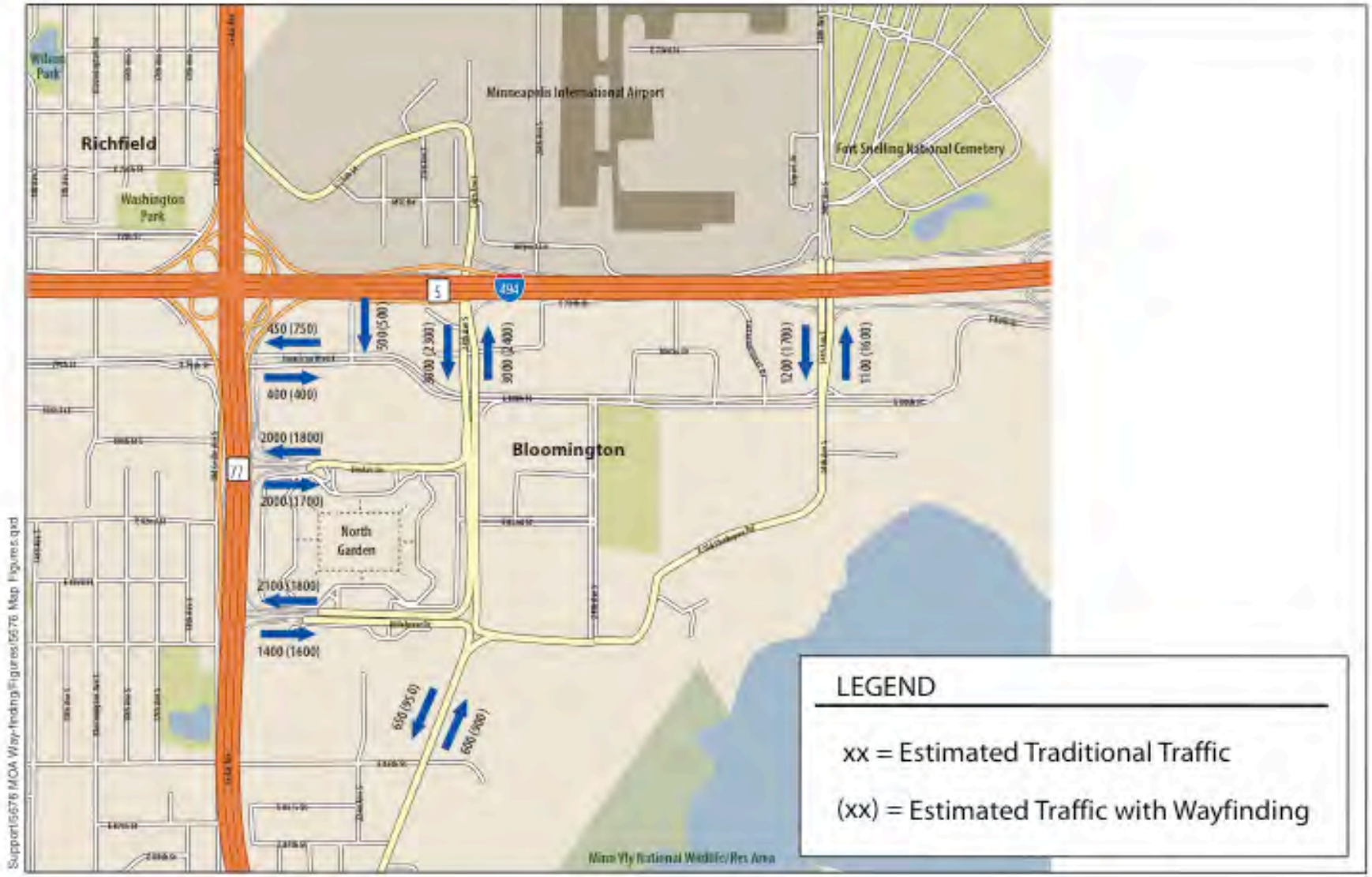


TRADITIONAL AND WAYFINDING ROUTES

MOA PHASE II

MnDOT & City of Bloomington

Figure 8



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ESTIMATED TRAFFIC-SATURDAY PEAK HOURS

MOA PHASE II

MnDOT & City of Bloomington

Figure 9

Operational Concept Example – Inbound

In this scenario, it is a popular shopping day and traffic has built up to capacity on 24th Avenue going into the Mall of America parking ramp on the north side of the Mall. Personnel review the CCTV images along 24th Avenue to confirm the information, and then check the cameras along 34th Avenue to determine congestion levels. Once confirmed that capacity is underutilized on 34th Avenue, staff will implement a predetermined action plan. The predetermined action plan will guide users to deploy message sets to various dynamic message signs in the system. For example the message on the westbound sign located on I-494 is changed to read "Mall of America use 34th Avenue." The arterial signs along 34th Avenue, American Boulevard and 28th Avenue will change messages to direct traffic into the 82nd Avenue entrance to the east parking ramp. Personnel will continue to monitor traffic operations and make changes accordingly.

Operational Concept Example – Outbound

The operational scenario for outbound traffic will begin as patrons leave the Mall. Dynamic message signs (arrow boards) will be installed at each ramp level exit will display arrows indicating which way patrons should exit to avoid congestion. Once exited, the arterial dynamic message signs will be used to notify patrons of actions to take in order to access the freeway system.

It is recommended that during the first year of operation that an additional staff person is added for peak events. After the agencies are comfortable operating the system it is envisioned that no additional personnel will be required for peak events since the proposed system has automated function.

TRAINING

Training will be required to operate and maintain the system properly; all personnel required to operate or maintain the system should be trained for their expected tasks. Specifically personnel from Mall of America Companies and the City of Bloomington Public Works and Police Departments should be trained.

ESTIMATED BUDGET

Since the Mall is proposing expansion, the systems laid out within this document are not only recommended to be installed for the existing conditions, but will also need to be incorporated in the Phase II construction. The cost estimate within this document is presented in Exhibit A of this document. The costs identified include installing 20 ramp arrow signs, 14 arterial dynamic message signs, 5 arterial CCTVs, 1 full matrix overhead dynamic message signs, 6 hybrid dynamic message signs and the appropriate networking and communications media for the system to function (locations listed in the following Table 1. Based on the estimate, the total cost for full implementation is approximately $2.19 million.

Table 1: Proposed Device Locations

Device Type	Quantity	Locations	Advisory
Ramp Signs	20	East and west ramps, levels 1-5, both exit points	Right or left to get to appropriate freeway (I-494/TH 77)
Arterial DMS	14	· Northbound Old Shakopee Road at Killebrew Drive	· Straight or left to get to available parking
		· Northbound IKEA Way at Lindau Lane	· Right or left to get to appropriate freeway (I-494/TH 77)
		· Northbound 24th Avenue at America Boulevard	· Straight, right or left to get to appropriate freeway (I-494/TH 77)
		· Southbound 28th Avenue at 82nd Street	· Right or straight to get to available parking
		· Southbound 24th Avenue at I-494	· Straight, right or left to get to available parking
		· Southbound 34th Avenue at American Boulevard	· Straight or right to get to available parking
		· East Ramp 82nd Street exit	· Right or left to get to appropriate freeway (I-494/TH 77)
		· East Ramp parking exit on Lindau Lane	· Right or left to get to appropriate freeway (I-494/TH 77)
		· Eastbound American Boulevard at 24th Avenue	· Straight, right or left to get to appropriate freeway (I-494/TH 77)
		· Westbound Old Shakopee Road at 24th Avenue	· Straight or right to get to available parking
		· Westbound American Boulevard at 24th Avenue	· Left or straight to get to available parking
		· Westbound American Boulevard at 28th Avenue	· Straight or left to get to available parking
		· Parking Exits (2) on Killebrew Drive	· Right or left to get to appropriate freeway (I-494/TH 77)
Arterial CCTV	5	· Lindau Lane and 24th Avenue · 28th Avenue and 82nd Street · Old Shakopee Road and 24th Avenue · American Boulevard and IKEA Way · Lindau Lane and IKEA Way	
Freeway Full Matrix DMS	1	· Southbound TH 77 at 66th Street	· Follow Killebrew or Lindau
Freeway Hybrid DMS	6	· Northbound TH 77 south of Old Shakopee Road	· Follow Old Shakopee Road
		· Southbound TH 5 at Post Road	· Follow 34th Avenue
		· Eastbound I-494 at Portland Avenue	· Exit 77 south or 24th Avenue
		· I-494 Southbound ramp to TH 77	· Follow Killebrew or Lindau
		· Westbound I-494 CD at 34th Avenue	· Follow 77 south or 24th Avenue
		· Westbound I-494 at Pilot Knob Road	· Follow 34th Avenue, 24th Avenue or 77 South

In addition to implementation there will be ongoing operations and maintenance costs of the system. Operations costs will include power to the devices and staff time. Maintenance costs will consist of minor preventative maintenance tasks such as wiping the face of the signs and checking connections of both signs and cameras. In addition to preventative maintenance, responsive maintenance such as troubleshooting failures will be needed. As a rule of thumb annual operations and maintenance costs are estimated at 10% of the system hardware cost. For the Way-Finding system the estimated annual Operations and Maintenance cost is roughly $95,000. The stakeholder group should consider developing standard policies and procedures for operations and maintenances of the Way-Finding system.

BENEFITS

Although there are several benefits that may be realized by implementing the proposed system, it is also understood that there may be further benefits that may not be presented herein. Mn/DOT is updating the travel demand model in the project area and may specifically address the benefits that this proposed system would present. At the time of this report, the work is ongoing.

CONSIDERATIONS

In July of 2007, all airlines except Northwest Airlines (NWA) will shift from the Lindberg to the Humphrey terminal. This move will greatly impact traffic conditions on I-494 and 34th Avenue. This was considered in the development of this Concept of Operations.

As a result of the shifting of airport traffic, a signing plan has been developed to change the signing system surrounding the area. The project team received a copy of this signing plan and designed the proposed system around it.

Since the Mall of America is a high traffic generator, stakeholders should consider reviewing the signing on the freeway system at a larger scale to guide patrons to the Mall. For example, information presented on I-35 prior to the East/West split may be appropriate.

Dependant upon final design, permits allowing utilities into the various rights of way may be required. Specific permitting needs should be investigated as part of final design and should be considered while moving forward.

During the Phase II expansion, construction will significantly impact the use of Lindau Lane. It is understood, that for a portion of the construction efforts Lindau Lane will be closed partially or completely. By implementing the system proposed within this report prior to construction, the signs can be used to divert traffic away from Lindau Lane to other routes, which will help alleviate issues experienced due to construction.

CONCLUSIONS AND RECOMMENDATIONS

The existing traffic conditions analysis indicates not every intersection in the current roadway system surrounding the Mall is operating at acceptable levels, while others are underutilized. In the future, with the Mall of America Phase II build, additional intersections are predicted to operate at unacceptable levels. The recommended approaches to mitigate these issues, such as lane and road construction, can be very costly.

The first goal should be to balance traffic by providing travelers with real-time information so that they select the underutilized routes. Implementing an extensive ITS system will guide patrons to and from the Mall is recommended.

The original installation cost of this system will be roughly $2.19 million dollars, which compared to re-construction costs is small and will help utilize roadways currently underutilized. The proposed system includes the following:

- Dynamic arrow signs at all exits of the parking ramp
- Arterial dynamic message signs to guide patrons to the underutilized roadways and ramp entrances
- Arterial CCTV for personnel to view to make informed decisions on information to share with Mall patrons
- Freeway dynamic message signing to guide travelers to underutilized roadways.
- Complete communications backbone
- Overall message set standard

At the time of this report the final design of the Phase II parking structure was incomplete. It is recommended that an evaluation of the parking structure is performed in order to keep it consistent with the proposed ITS system.

APPENDIX

ITEM DESCRIPTION	UNIT	UNIT COST	TOTAL PROJECT QUANTITIES ESTIMATE	MALL OF AMERICA WAYFINDING PROJECT SITE 1 MOA AND RAMPS	SITE 2 TRUNK HIGHWAYS	SITE 3 ARTERIAL ROADS	TOTAL COST ESTIMATE
Mini DMS signs	Each	$5,000.00	20	20			$100,000.00
Power and Communications	Each	$2,500.00	20	20			$50,000.00
Wall Mounted Cabinet	Each	$1,000.00	20	20			$20,000.00
DMS Mount	Each	$500.00	20	20			$10,000.00
Sign Structure	Each	$80,000.00	1		1		$80,000.00
Full Matrix overhead DMS	Each	$75,000.00	1		1		$75,000.00
Power and communications	Each	$25,000.00	1		1		$25,000.00
Ground Mounted Cabinet	Each	$3,000.00	1		1		$3,000.00
Concrete Base	Each	$3,000.00	1		1		$3,000.00
Overhead Hybrid Signs	Each	$20,000.00	6		6		$120,000.00
Modify Existing Mounting Brackets	Each	$2,000.00	6		6		$12,000.00
Power and Comunications	Each	$25,000.00	6		6		$150,000.00
Pole Mounted Cabinet	Each	$2,500.00	6		6		$15,000.00
Testing	Each	$6,000.00	3		3		$18,000.00
Arterial DMS	Each	$38,000.00	14			14	$532,000.00
Power and Communications	Each	$5,000.00	14			14	$70,000.00
Pole Mounted Cabinet	Each	$2,000.00	14			14	$28,000.00
RS 900	Each	$3,000.00	14			14	$42,000.00
Extension	Each	$3,000.00	14			14	$42,000.00
CCTV	Each	$5,000.00	5			5	$25,000.00
Power and Communications	Each	$5,000.00	5			5	$25,000.00
Impath Encoder	Each	$4,500.00	5			5	$22,500.00
RS 900	Each	$3,000.00	5			5	$15,000.00
Head-End Communications							
Switch	Each	$10,000.00	1			1	$10,000.00
Impath Decoder	Each	$4,500.00	5			5	$22,500.00
Impath Rack Chassis	Each	$1,500.00	1			1	$1,500.00
Video Switcher (64x16)	Each	$7,500.00	1			1	$7,500.00
PTZ Keyboard	Each	$1,000.00	1			1	$1,000.00
Monitor	Each	$500.00	1			1	$500.00
Pole Mounted Cabinet	Each	$1,500.00	9			9	$13,500.00
Communications Backbone							
Conduit	LF	$4.00	5280				$21,120.00
36 Strand s/m Fiber optic cable	LF	$3.70	5280				$19,536.00
Splice Vault	Each	$2,000.00	2				$4,000.00
Splice Tray	Each	$150.00	2				$300.00
Testing	Each	$6,000.00	1				$6,000.00
Contingency (10%)							$158,995.60
Design or Construction Costs							$437,237.90
							$2,186,189.50
OVERALL PROJECT COST							**$2,186,189.50**